Exploring School-Based Teacher Professional Learning Practices in Thailand Through Actor-network Theory

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University of Stirling

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for awards at this or any other higher education institution. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made.

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Abstract

Thai education, being embedded in Buddhist cultural values and hierarchical structures, presents unique benefits and challenges in facilitating effective teacher development. Although substantial research has been conducted to address similar challenges in western contexts, these have not been fully explored in Thai schools. Technology, collaborative work, and professional accountability are now key issues for professional learning. To address these dynamic concerns, this study explores professional learning practices enacted in teachers' everyday lives in Thailand.

This ethnographic case study enrolled the concept of translation within an actor-network theory (ANT) approach to explore the relationships between entities within networks to understand how humans and nonhumans – teachers, administrators, policies, cultures, and materials – enact and influence each other, shaping the power and tension in the practices that produce teachers' learning. Sixteen teachers and school leaders in three schools participated to gain insights into their professional learning practices. An Interview Toolkit was designed and implemented in combination with ANT sensibilities to gather in-depth qualitative data from humans and nonhumans over two phases, using semi-structured interviews, relational maps, and photo elicitation methods. The tell-listen-retell storytelling technique was developed to unravel the stories of the three schools.

The work-learning continuum was found to be integral to teacher professional learning, shaping professional learning to be boundaryless, beyond one-shot workshops. Interactions among actors co-create powers that affect learning, revealing a paradox between traditional rote learning and the push for critical thinking and active learning. The arrival of technology amid COVID-19 balanced asymmetrical connections, creating reciprocal and professional co-productions to extend effects on teachers' and students' learning. Other hidden practices were revealed, such as borrowing materials and teaching techniques. This study provides practical contributions with the Interview Toolkit, and its insights have the potential to guide school leaders, policymakers, educators, and researchers in creating more supportive and dynamic environments for teacher development.

Ethics Approval

University of Stirling
Cottrell 3B1
Stirling
FK9 4LA

06/04/2022

Dear Phusima

Ethics Application Form : Teacher development model through sociomaterial perspectives 4406

Thank you for your submission of the above ethics application.

The ethical approaches of this project have been approved and you can now proceed with your project.

Please note that should any of your proposal change, a further amendment submission will be necessary.

If you have any further queries, please do not hesitate to contact the Panel by email to ethics@stir.ac.uk

Yours sincerely,

General University Ethics Panel

Abbreviations

Actor-network theory: ANT

Competency-based education: CBE

Continuing professional development: CPD

Continuing professional learning: CPL

The Equitable Education Fund: EEF

Ministry of Education: MOE

Obligatory passage point: OPP

Performance agreement: PA

Professional learning community: PLC

School-based management: SBM

Secretariat Office of the Teachers' Council of Thailand: KSP

Teacher professional learning: TPL

Thailand Education Partnership: TEP

Glossary of Thai culture

Term	Definition
Phuan-Kru (เพื่อนครู)	Colleague teachers who have the strong relationship, treating each other like a buddy.
Kru (ครู)	Teacher
Pu-Yai (ผู้ใหญ่)	Adult
Pee (พี่)	An older sibling in family
Nong (น้อง)	A younger sibling in family
Luk (ลูก)	Offspring
Maae (แม่)	Mother
Tan (ท่าน)	Those who are powerful with high rank in an organisation.
Kreng-jai (เกรงใจ)	Polite deference and hesitancy to bother others, generally used in one's attitude toward superiors (Wyatt and Promkandorn 2012) and involves the desire to be self-effacing, respectful, humble, extremely considerate, and avoid embarrassing others or intruding or imposing on them (Cavanagh 2024).
Kreng-klua (เกรงกลัว)	To signify inferiors' feelings of respect or fear towards those in positions of authority and power (Dakin 1988).
Bun-khun (บุญคุณ)	Indebted goodness is a psychological bond between someone who gives kindness and mercy to another person who needs help and is expected to reciprocate in the future (Holmes and Tangtongtavy 1995). The patron-client relationship tends to occur with persons of different status (Taylor n.d.).
Hai-kiad (ให้เกียรติ)	To give respect or show honour to another, often to one senior in age or position (Hallinger and Kantamara 2001).

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Chapter 1 Introduction

In Thailand, education is considered to be an essential factor in human resource development, as people are understood as a mechanism for economic and social development (ONEC 2017). Several education reforms reflect the ongoing attempts of the Thai Government to improve the accessibility and quality of education (ibid.), yet the reform result has not been satisfied. Previous reforms have minimally addressed the role of teacher education (MOE 2014). The Office of the Education Council (ONEC) reported that if teachers' professional development and leadership are well-managed, this would significantly contribute to the reforms (TEP 2019) because teachers' abilities impact student outcomes in the long term (Darling-Hammond 2006; Hanushek 2011). Consequently, investment in teacher preparation and development is now recognised as being necessary to ensure a high-quality education provision (Vibulphol 2015). As such, Thai teachers' professional learning should be addressed constructively, relating to both pre- and in-service teachers.

When an individual chooses to attend a programme for pre-service teachers in Thai universities, their decision is based on the institution's readiness to provide the programme rather than the nation's demand (Yamrung et al. 2017). This mismatch between demand and supply could stem from a lack of academics working in the required fields because the patronage system among professionals (Rohitarachoon and Hossain 2012) does not allow the right academics to be appointed to the right subject taught (Charoenpanit 2019). Additionally, the pre-service teacher education policy is inconsistently enacted because the minister, on average, only holds the position for approximately one year (Thaipublica 2014), which affects policy maintenance; for example, the duration of teacher education programmes varies between either 4 or 5 years for completion (Rakpolamueang et al. 2017). Such instability could potentially produce under-qualified teachers who then go on to become in-service teachers (TEP 2019). In-service teachers are familiar with attending offsite traditional workshops, generally initiated by central agencies, which is one of the reasons for removing teachers from the classroom (Rakpolamueang et al. 2017). Such approaches widen the gap between the training provided and teachers' professional learning needs.

Several Thai scholars support the school-based professional learning approach. For example, Sirirangtasi (2014) suggests a range of alternative mainstream practices to

increase the effectiveness of Thai in-service teachers' development, for example, developing a professional learning community (PLC), school clinics for teachers, a mentor-mentee system, peer learning, and internal supervision. The school-based learning approach is not only designed to promote professional learning, but also to re-clarify the teacher's job description, planning short- and long-term teacher development, and improving performance-based evaluation practice (Rakpolamueang et al. 2017). Natong (2019) also suggests that school-based professional learning simply keeps teachers' focus directed towards their classrooms, by not pulling their interests towards non-teaching tasks. Sudrung and Thanompongchart (2018) further insist that, without adding more financial resources, it is only feasible to implement the school-based teacher learning approach when stakeholders focus on how the school functions locally.

Although several school-based teacher professional learning practices have been widely discussed in the literature in Thailand, practice knowledge is fragmental. Previous studies of Thai teachers' professional learning practice might explain the above situation. Wiratchai and Wongwanich (2000) conducted a meta-analysis of 323 education research studies, revealing that 60% of the studies comprised policy relating to professional development for teachers. Half of the reports feature quantitative research, while the remaining half comprise qualitative research with content analysis. Considering the qualitative studies, there was appropriate knowledge reported in education administration and supervision. However, Wiratchai and Wongwanich (2000) concluded that there should be more research on human development practices, especially teaching and learning, professional learning, and performance evaluation. Likewise, Sampan and colleagues (1999) recommended in their meta-analysis report that professional learning research should explore the whole process at once, from current development needs to the professional development model and the model's assessment. They also suggested that qualitative research should be highly encouraged at the school and individual level to support teachers' growth (ibid.).

A literature search in the Thaiedresearch.org (2024) database for literature published between 2012 and 2022 revealed that only 58 out of 1,312 research outputs were found to include the "teacher development" keyword, and only one of these mentioned evidence-based professional learning research and the link between policy and implementation, while the remaining reported classroom action research (ibid.).

Similarly, Pitidol and colleagues (2023) and IPSR (2020) reported that there is a lack of knowledge to bridge policy and classroom implementation, especially in the form of guidelines, suggesting that this may add more challenges to classroom implementation.

As such, a gap in information research still exists, especially regarding two implementation issues in Thai schools: (1) practitioners lacking knowledge and experience (Mungmesuksiri 2021), and (2) rules and regulations as factors for or against practitioners' motivation and commitment to professional learning (Pitidol et al. 2023). Moreover, globalisation and connectivity also affect Thai education practices (Charoenrak n.d.). The COVID-19 pandemic dramatically changed people's daily and work-life routines, with each individual affected by materials, things, humans and nonhumans; exploring these interconnections reveal much more complexities and messiness than existed in the past (Mora et al. 2021). Thai teachers must now work on a revised set of learning indicators, interact with parents to foster pupils' learning and create new learning materials for at-home and online learning (Pinyosinwat 2020). This shows that their interactions with their surroundings might be expanded and become more complex than in their previous normality. Most crucially, the need for new research in teacher learning should be addressed.

Considering the current situation of education research in Thailand, most is still situated in single disciplines rather than being multi- or inter-disciplinary, especially research performed at the postgraduate level, because graduates work mainly to fulfil the programme requirements (Charoenrak n.d.). Without thinking holistically about the real problem, such research could provide a surface level of impact but is not able to provide a deeper understanding of more complex situations (ibid.). Winichakul (2024) explains that overemphasising the value of objectivity in Thai universities could limit the potential of subjective research at the other end of the discipline spectrum. Therefore, as Charoenrak (n.d.) insists, national research agencies should strategically encourage Thai scholars to conduct multidisciplinary research because society is constantly changing. Thai social scientists' sensibilities could be seen as obstacles to creative and breakthrough research methods and findings. If not addressed, a single-lens, positivist scientific approach will become the mainstream approach for all early career scholars. Supap (2014) states that it is essential to introduce other research paradigms for Thai social scientists to broaden their understanding of the world and its phenomena.

Winichakul (2024) further urges the university and research funding agencies to accept differences by customising criteria that better suit working across disciplines.

Wongwanich and colleagues (2011) conducted a meta-ethnography analysis of educational innovation development for teacher development based on education reform within 16 articles published from 2000 to 2009. They employed a meta-ethnography research method designed by Noblit and Hare (1988), whose technique allows the researchers to explore the research context to answer the research question deeply, and where the results can contribute to the future direction of the research (ibid.). This opens up possibilities for alternative findings by broadening and deepening the interpretation of data, critiquing research information, comparing works, and identifying the linkage between works (Noblit and Hare 1988). These purposes help the researcher connect ideas based on the information flow within the research context. Wongwanich and colleagues (2011) reflect that this method works due to the diversity of the research, rather than the quantity of the papers because teachers' learning has many metaphors to explore holistically. Their report recommends broadening teachers' learning opportunities by providing teachers with a suitable environment within a school and encouraging them to exchange their experiences with their colleagues while including new things and people to facilitate new and fresh experiences (ibid.).

The current qualitative literature on Thai teachers' professional development is quite limited. As a policy researcher, I also experienced the situation of adopting a mainstream research approach in adhering to the expectations of the funding agency and the Thai researcher community. Although the quantitative and qualitative literature on teacher learning does mention the existence of things, materials, surroundings, and environments as part of professional learning (Charoenrak n.d.; Wongwanich et al. 2011), these are considered in a more objective rather than subjective way, which might obstruct opportunities to produce or create diversified knowledge through research, especially within social phenomena (Winichakul 2024). Charoenrak (n.d.) remarks that, "We need to add new approaches and exemplary cases to the pool so that Thai Scholars can leave the old myth and try new perspectives to present alternative facts and solutions aligned with a dynamic change in society" (p. 9).

Despite the research paradigm urging Thai researchers to proactively embrace new approaches, Theravada Buddhism and Thai hierarchal cultures (Hays 2014) could create

tensions for them between being active and passive. These opposing beliefs are also translated into conflicting perceptions of learning (Parkay et al. 1999). Thai culture is imbued with the sense of Buddhism, represented through a hierarchical structure, seniority, and collectiveness, values which are characterised as being static and preservative, and which could act against learning, especially with the importation of foreign practices are emphasised (ibid.). Passivity is tied up within a seniority culture that encourages the younger generation to listen. Teachings of gratefulness, rote learning, a desire for disciplined subjects, and stability are further interwoven within the hierarchical Thai society (Young 2021). Without careful consideration, self-realisation under Buddhism is also borrowed to justify an understanding of passivity. However, Hanh (1999) argues that self-realisation is the process of learning and cultivating learning for all beings. Regarding this misconception, Goenka (2010) also argues that self-observation is not self-aggrandisement, but is instead the way to observe sensations and mental states that are impermanent and mechanical processes, leading to self-realisation. This argument aligns with the Thai concept of Pratītyasamutpāda.[1] We can see that, rather than viewing learning as self-aggrandisement, both rote learning and active learning are interconnected through a complex web that incorporates the concept of self-realisation while understanding the surrounding environment. It is clear to me, as an education policy researcher, how these conflicting concepts create difficulties for those who design active learning programmes without taking such paradoxes into consideration.

The situations of Thai teachers' professional learning and mainstream research grounded in Buddhist beliefs and Thai seniority culture, combined with my personal experience, became my strong motivation for finding new ways of understanding Thai teachers' professional learning. Adopting a sociomaterial approach seems to be another alternative sensibility for Thai Scholars to adopt in exploring professional learning practice by viewing its human and nonhuman components with symmetrical eyes. Based on the existing research and the policy narrative, the next section presents the Thai teachers' professional learning landscape to show a bigger picture of who and what

[1] Pratītyasamutpāda, or dependent origination, is a systematic way of inquiring and making sense of problems or phenomena with the central concept of interconnectedness that all things are connected and influenced by casual relationships in a complex web (Banruji 2012). It emphasises that everything arises and depends on multiple causes and conditions (Anālayo 2025). Therefore, humans and everything are relational beings in interwoven and interactive processes and energies.

affects teachers' learning, followed by a summary of current professional learning practices used in Thailand. I will then present the study's rationale, with the study's purpose and provide an overview of sociomateriality and actor-network theory and current trends within professional learning. At the end of the chapter, I discuss the study's significance and present the thesis's structure.

1.1 Landscape of Thai schools and teachers

1.1.1 The Thai school context and its culture

Thailand's education system offers free basic education, guaranteeing six years of primary school and three years of lower secondary school (MOE 2008). Public schools form the backbone of the education system, while private institutions can provide a wider range of curricula, coming with a higher amount of tuition (ibid.). Culturally, Thai society is woven from traditions, Buddhist values, and contemporary influences (Hays 2014) with a collective identity of language, religion and monarchy (Laungaramsri 2003), inherited by all Thai schools. Numerous well-established cultural norms, such as the Buddhist values of peace, respect, and non-violence, shape the attitudes and behaviour of pupils, parents, teachers, and principals about power and status as the natural order of life (Hallinger and Kantamara 2001).

A mixed norm transmits behaviours that could be defined as a patron-client relationship (Hays 2014) and might also strengthen authoritarianism in classroom cultures. Tirapanumpai (2021) depicts such behaviours by describing how pupils must adhere to strict discipline codes, such as wearing a uniform, reflecting the national emphasis on hierarchy and social order, and listening to their teachers, whereas teachers listen to their superiors. Between teachers and pupils, teachers focus on teaching the syllabus and finish teaching the textbook without encouraging pupils to ask questions. Rote learning and memorisation remain prevalent (Promchertchoo 2020); pupils, as passive recipients, merely accept and absorb everything that the teachers say (Inprasitha 2022), as the accepted norm of how pupils respect teachers. Tirapanumpai (2021) suggests that this authoritarian culture possibly shapes a classroom into a panic zone rather than a learning-safe zone for teachers and pupils.

Among teachers and superiors, due to the centralised educational system (Hallinger and Kantamara 2001), orders from above are orders for all and should be followed. This is

widely acknowledged as being a “compliance culture” – the dominant character of Thai school cultures (ibid., p. 388). According to Hofstede’s (1984) framework, Thai school leaders can achieve surface compliance more readily than their counterparts in the west, but they often fail to go beyond the appearance of change. For example, while teachers and superiors meet in the classroom for evaluation purposes, the classrooms that are observed are commonly well-prepared to comply with teacher performance standards. Chayaban and colleagues’ (2021) study found that Thai classroom observation tends to focus on pupils’ answers rather than observing how teachers deliver and how pupils obtain answers. Such situations may be critically explained by the Thai metaphor “ผักชีโรยหน้า or window dressing” (Ariya 2020, p. 1), a form of saving face for the teachers and the principal, as well as the concept of polite deference or “ เกรงใจ or kreng-jai” (Hallinger and Kantamara 2001). The cultural implications evidently make a comfortable web of mutual agreement among teachers and the principal but may not result in the long-term outcome of classroom or school improvement (ibid.).

While Thai people are embracing global ideas and awareness of educational practices and standards, this has accelerated the government’s attempt at education improvement by adopting foreign policies, such as school-based management, parent participation, child-centred learning, and educator professional development (MOE 2008). However, this might contradict the general Thai practices associated with traditional culture (Hallinger and Kantamara 2001). Pitidol and colleagues (2023) also insist that adopting reform policies in Thai contexts may not be as effective as in the west because of centralised mandates and the unique Thai culture. Similarly, Kaibamrung (2010) indicates that the Thai school culture directly affects the school improvement process. For example, for most Thai schools, working within family-oriented and bureaucratic cultures, deal with the process of school transformation as the ordered work from government projects, while the minority, working within customer and result-oriented cultures, tend to perform better in school improvement activities (ibid.). Sulong et al. (2014) clarify that this minority may refer to private school classrooms that have a wide range of classroom characteristics, whether active or passive learning or teacher-centred or child-centred, as they are more autonomous than public schools.

To sum up, Waitchaongcharoen (2024, n.p.) writes how “[r]epression among educators is a sin that has been passed down by senior teachers to younger ones and then on to

students". This shows how such culture, a mix of hierarchical and family-tie relations, has become part of the vicious circle that translates across the school and classrooms and affects the flexibility of classroom management and relationships between pupil-teacher, teacher-teacher, and teacher-superior.

1.1.2 Diverse perceptions toward the Thai teaching profession

"A teacher as the third benefactor" is one of the Thai national psyches reinforced by language, schooling, media, culture, and religious values (Chantapisit 2020, p. 2). Aligning with the indebted goodness of Bun-khun, Thai people prioritise the father and mother as the first two benefactors for children, followed by teachers as the third. The perception of professionalism, along with the Thai patronage system, is presented through family-kin relationships that people refer to those closest to them by using family personal pronouns (Raitaiboo 2012). Children must obey older people without arguing, parents and teachers can do anything, whether forcing the younger, as long as they hope for the best, following another Thai idiom that "If you love your cow, tie it up. If you love your children, you have got to spank them." Such belief is expressed through teachers addressing pupils as a son or daughter, while pupils call teachers by 'Kru' (ครู) followed by their name.

As for the teaching profession, Thai society expects all teachers to perform their tasks professionally without exception (Chalakbang 2016). The construction of Thai teachership discourse relates to religious, social and governmental institutions that are portrayed through four identities: 1) sacrificers, 2) intellects, 3) knowledge providers to pupils, and 4) hard workers (Chantapisit 2020). From the Buddhist perspective, teachers are expected to do good deeds without drawing attention to themselves, as embodied in the "put gold leaf on the back of the Buddha statue (Pit Tong Lang Prae)" Thai idiom. Media also strengthens the idea of teachers-as-sacrificers, whether as a ferry boat taking passengers to arrive at their destinations safely and then taking a new group of passengers to another destination (Chantapisit 2020) or movies and advertisements depicting teachers travelling up north to teach in remote areas, being on duty at night at the school, and working as cooks, drivers, and administrators (IAMKRU 2023). Therefore, pupils need to repay their teachers' kindness due to a mix of religious beliefs and social institutions. We may not know precisely when such a teacher appreciation ceremony first happened, but approximately when schooling was first held in a temple

in 1898 (Samian 2022). The government then legitimised this idea by formally translating it into an annual event in the official calendar in 1943 (MOE 2025).

Jantarasuk (2022) is critical about positioning the teacher's identity as the benefactor, arguing how this overlooks their capacity and competency, which devalues the importance of professional development and performance assessment due to their goodwill in the first place. Such a myth also discounts a teacher's professionalism; they are only ever associated with the concept of being the giver (ibid.). This also reflects the system and policy that poor teaching performance does not result in severe punishments such as termination due to ethical misconduct,[2] but rather in the lack of salary increases. Panyo and colleagues (2002) show that, particularly in collective rural society, beyond being teachers, they are community leaders; they act as links between the governmental and social institutions holding governmental and intellectual power as public servants (Sangtong 2020).

While some still buy into the discourse of teachers-as-sacrificers, teachers express their interests and concerns in different aspects. Phonglaor (2021) suggests that the high teacher turnover rate may suggest that the discourse is becoming less prevalent. A clubhouse session hosted by Chaichumkhun (2021) showed that teachers are increasingly aware of the conflict between the notion of 'teachers as sacrificers' and current global trends within education, which focus on child development and place less emphasis on irrelevant, time-consuming roles. Triaryapiwat (2022) insists that it is important to rethink the role of the teachers as ferry boats that carry every student in the same direction without considering their personal needs and differences. Ubon and Liamprawat (2020) also reveal in a synthesis of the contents of the "Arai-Arai-Koh-Kru"[3] or "Everything-is-teacher" Facebook page that the post that received the highest number of responses was about public relations regarding policies related to teachers, such as teacher development policy, and new rules and regulations about teacher

[2] Ethical misconduct includes corruption in duties and financial management, sexual offences, criminal offences, plagiarism, and excessive punishment of pupils (OTEPC 2017).

[3] The "Arai-Arai-Koh-Kru" (or Everything-is-teacher) Facebook page was established in 2013 by Supawat Promtan, a Thai teacher. The page has 464,000 followers (as of February 2025) (Everything-is-teacher 2025). The host aims to present facts about teachers' working lives through sarcastic humour in response to educational policies to reduce teachers' stress. This page symbolises the echo of the voice of human beings who are Thai teachers (Ubon and Liamprawat 2020).

personnel. Teachers' responsibilities and burdens received the second most responses, and that post discussed four areas of work: learning and teaching, paperwork, non-teaching ad-hoc tasks, and self-development. Teachers significantly expressed that, besides professional learning for the sake of self-development, they also need to ensure that it is responsive to new policies that arise all the time. Ubon and Liamprawat (2020) further describe how this Facebook page acts as the spokesperson for teachers for aligning themselves to the changes that have an impact on them. Panich (2012) similarly encourages teachers to develop continually to keep up with the rapid changes in society.

Conversely, I see things differently, because aspiring for teachers to learn and do better in their jobs should not isolate them from the journey without providing support. The voices from teachers seem to be being heard, as Oopkeaw and colleagues (2022) report that OTEPC have developed and introduced a performance agreement (PA) in order to compromise those various perceptions. The PA is a centralised policy, that is expected to be tailor-made to foster educators' commitment to their roles within their schools or education institutions (OBEC 2023). PA allows teachers to set their own teaching goals, lesson plans, and being observed by committees based on their contexts. This merit-based system is designed to ensure that high-potential teachers can earn the professional recognition they deserve fairly, and that they will be motivated to remain in their positions (Oopkeaw et al. 2022).

1.1.3 Education reform, policy, and Thai teachers' professional learning

Thai education reform has constantly attempted to educate pupils with better characteristics of thinkers, enquirers, problem-solvers, innovators and team players, and, more importantly, moral values (MOE 2006). The actualisation of these aspirations requires teachers to transform the teaching and learning process from a teacher-centred to a student-centred approach and Information and Communication Technology proficiency (ibid.). The Ministry of Education (MOE) has recognised the challenging tasks of teachers and educators, and their need to develop both classroom and leadership skills nationwide.

Therefore, teacher policy development is recognised as being one of the main top-down processes, although holistic and area-based considerations of supporting the change of a whole human resource management system are given some importance (MOE 2006).

According to the MOE teacher and education personnel reform 2004–2013, centralised agencies such as the National Institute for Development of Teachers, Faculty Staff and Educational Personnel (NIDTEP), were established in 2006 to operate in-service professional development support, such as workshop training and distance learning, based on the circumstances of each group of educators (NIDTEP n.d.).

According to NIDTEP's annual report, NIDTEP (2022a, 2022b) identifies the problem of insufficient budgets and capacity limiting educators' access to learning opportunities that need to (1) expand the activities covering monitoring and feedback, (2) diversify training courses to match diverse needs, (3) improve course quality, and (4) expand the professional network. School-based professional learning is also strategically promoted as a policy priority because the school is where learning and development occur, and teachers are expected to work at their best for students (Darbavasu 2017), as well as conceptually aligning with school-based management (SBM) under the Thai Education Act 1999.

Although SBM allows schools to contextualise their operation and instruction to improve pupils' learning outcomes (Fangsantia n.d.), teachers' professional learning under SBM might face similar challenges as other administrative functions due to the saving-face culture that could discourage authenticity in long-term development (Pramsukdee 2017). To overcome such challenges, the MOE (2021) established an online professional learning platform under a professional learning community (PLC) as the central platform where teachers share their challenges and practices. Pitidol and colleagues (2023) cautiously argue that such a response is the way policy stakeholders solve non-responsive need issues with centralised solutions through their direction and power, which might contradict teachers' understanding and implementation. Meanwhile, TDRI (2018) and Podjanalawan (2023) offer decentralisation as the key to reallocating the budget and distributing the mission to local agencies to contextualise professional learning practices for all Thai teachers. Lao (2023) agrees with the idea by critically highlighting the role of the school leaders as the bridge that connects policies to pupils.

Alongside centralised policies, challenges in professional learning keep accumulating, particularly as COVID-19 has become another strong catalyst for the need for teacher development. Bunnag (2021) highlights how UNESCO, UNICEF, and the World Bank

have identified three focuses for teachers post-COVID: their well-being, lifelong learning and professional development, and technology for education, which have since continued to influence Thai teachers' practices and policies. This can exacerbate the teacher skills gap if centralised support does not match their needs, especially in widening teachers' resilience and adaptability.

At the same time, the Thailand Education Partnership (TEP), a civic group for education development, alternatively initiated the Education Sandbox Act (2019) (officially, The Education Innovation Area Act B.E 2562 2019) and implementation project by acting through a bottom-up and participatory policy formation process by engaging with multiple groups of stakeholders. The Education Sandbox Act (2019) was designed to create new forms of partnerships and collaborations among the MOE, local administration agencies, and private and social sectors in the area to help create capacity for schools and teachers in order to avoid top-down decisions (Permjit 2023).

In the Sandbox process, lesson study and an open-class approach (Inprasitha 2022; Kampoon 2023) and professional learning communities (PLCs) (Sesact 2017; Chatmaneerungcharoen and Thammaprateep 2020) are introduced to schools through the Lighthouse School Network, as a professional knowledge sharing model. The details of how Thai schools implement both practices are discussed in Chapter 2. Poonsub and Rattanasiraprapha (2021) critically highlight that the implementation of those practices does not just decentralise decision-making to a school but also encourages a learning culture and accountability. This means that the development of processes, systems, and people – principals, teachers, and others – is required (Manokarn 2018). Otherwise, this new route of bottom-up policy still faces resistance to its establishment of competency-based education (CBE) initiatives and school-based teacher professional learning because of the existing hierarchical order (Permjit 2023). This implies that the two considerations influencing the success of the Sandbox process and teacher development are policy innovation to facilitate the process of professional learning and learning innovation to improve classroom practice (Poonsub and Rattanasiraprapha 2021). It can also imply that, regardless of level, although decentralisation is active, school-based teacher development is not just a school's job, but policy-related stakeholders also need to be included as they influence and facilitate the school's implementation of the developments.

Besides the initiatives introduced by the Sandbox process, the Lighthouse Schools still have to employ the government policy, such as the PA, as mentioned in Section 1.1.2. Although the process of PA involves working with a principal or a district leader, this contextualised and merit-based system can be challenging if there are no effective supports (Oopkeaw 2022). The Sandbox Clinic[4] seems to be a policy innovation where policy stakeholders and practitioners share the various possibilities in PA implementation and how the PA policy links to Sandbox opportunities (Thitiratsakul 2023). This example encompasses a new dynamic in policy implementation, showing that teacher development is not only the school's job but also relates to all stakeholders in facilitating the process. However, whether the development is situated within centralised policy or area-based policy, the inclusion and contribution of stakeholders, policy, ideas, and knowledge is needed because the success of policy is not its launch but the results derived from its implementation.

1.1.4 Thai values in professional learning

The Thai teacher professional learning process strongly emphasises respect for authority and diverse relationships (either hierarchical or flat). Based on Hofstede's (1984) analysis (cited in Harada 2017), Thai culture tends to have low individualism and less masculinity, which might tie in with Thailand as a collectivist society. However, while Hofstede's (n.d.) country comparison makes cultural aspects visible through graphs and numbers, it may not be able to draw on this model to compare between countries because each country's context may not be understood in the same way (Jan 2025). This reminds us that these estimated numbers should be treated with skepticism, therefore, the perspective from Thai scholars is also included.

Generally, Thai people are characterised as being genteel, showing respect to others, which could explain why Thai people are passive, non-competitive, and interdependent (Tu 2018). This means that they are concerned with what others think of their actions and they try to gain acceptance by acting appropriately to meet their group's expectations. The concept encourages individuals to be cautious in openly expressing disagreement or criticism, as it is also associated with saving face and avoiding a loss of

[4] The Sandbox Clinic is the learn-and-share community for the Lighthouse Schools to exchange ideas and experiences in implementing education innovation and policy that leads to school transformation.

respect. Therefore, they adopt indirect communication, such as using hints, non-verbal cues, and non-confronting language rather than being direct, while employing the concept of ‘Kreng-Jai’ or being considerate (Makthavornvattana 2012).

Under the concept of ‘Kreng-Jai’, conflict avoidance is deeply rooted in cultural values and norms and manifests in various aspects of group work, interpersonal relationships, social interactions and maintaining harmony. Among teachers, seniority and experience, as classified by professional rankings, are highly valued. Senior teachers are also the connecting point in communicating the policy discourse and driving its implementation, as change agents. With strong seniority but being genteel in expressions, teachers call their colleagues ‘pee’ (พี่) for older colleagues and ‘nong’ (น้อง) for younger ones, in the same way that they call family members. Senior teachers are respected for their knowledge and expertise, and their opinions hold significant weight. Junior teachers often seek guidance and mentorship from more experienced colleagues. It can be difficult for young teachers to be outstanding and outspoken without gaining support from older colleagues (Pimpa 2012), although they closely work and support one another with a sense of amicability and teamwork (Pumma 2021).

A high-power distance environment (Hofstede n.d.) is demonstrated through adopting a different language level to communicate with people with higher rank, position, and titles, which may allow everyone to accept inequality as the norm (Harada 2017). More importantly, traditional rituals and customs, such as ‘Wai’ (a gesture of respect and greeting), also play a crucial role in maintaining social harmony among people with diverse backgrounds. Such assemblages of processes and meaning, in enacting Thai realities, might be considered to be a form of what Law (2008a) describes as material semiotics, aligning with the elements of power, hierarchy, and seniority, and tend to be applied to any Thai environment, such as family, school, and organisation (Pimpa 2009). Therefore, Thai may perceive their leaders as being a controller or a boss rather than a colleague, which is referred to as the ‘superior-inferior concept’ (Thanasankit and Corbitt 2000) and is also clearly reflected in the public organisation through the leadership of ‘Tan’ (ท่าน), who are powerful in decision-making and strategic planning in organisations (Yeganeh and Su 2007).

‘Tan’ (ท่าน) also relates to Thailand as a high-level uncertainty avoidance society (Hofstede n.d.). Thai culture is influenced by Buddhism, which values order, hierarchy, and stability (Pimpa 2012). Such influences are adopted in Thai organisations that provide clear rules, policies, traditions, and structure as a sense of stability and predictability. Everything is kept in control to reduce risks and unexpected outcomes. This concept profoundly affects Thai management and operations because Thai tend to stick to the plan and not take risks in any activities to avoid uncontrollable colleagues exhibiting troublemaking behaviours. Considering schools as organisations, Thai teachers work closely with school administrators, such as principals and department heads, under a hierarchical relationship. Administrators may provide guidance and policies and monitor teacher work. Teachers may follow their instructions and consult with department heads to align their teaching practices with school goals and objectives. Working with the teaching team, they use collective decision-making and consensus-seeking to ensure group harmony and school goals (Mahimuang 2018).

1.2 Purpose of the study and research questions

Stronach and colleagues (2002) propose that there is no such thing as a school, and the notion of the school as a conservative force is already too generalised. If wanting to learn more about the relationship between teacher education and professional practice and renegotiate connections between the workspaces of teacher education and schools, it may be better to look at the processes of how this relationship is achieved rather than at the fundamental nature of either or both. Instead, it might be more meaningful to understand the professional learning practices of teacher by adopting an approach that identifies and explores the multitude of elements and practices, including both human (social) and nonhuman (materials) as they engage and connect in these activities. This is the key point for the rationale for adopting an actor-network theory approach through a sociomaterial understanding to explore teachers’ professional learning practices. The purpose of the study was defined as follows:

> *To explore the school-based teacher professional learning practices within the context of public and private schools in Thailand through an actor-network theory approach.*

To achieve this purpose, the following research questions are addressed and were used to guide the study:

1) How are school-based teacher professional learning practices enacted in Thai schools?
2) How do the assemblages of humans and nonhumans influence and mediate professional learning in Thailand?
3) What are the effects of these assemblages of professional learning practices?

1.3 Current related research

The sociomaterial approach within actor-network theory (ANT) has been used to understand professional practice and learning in several professional fields. The concept is designed to de-centre human beings, "not privilege human consciousness or intention, but trace how knowledge, knowers and known (representations, subjects and objects) emerge together with/in activity" (Fenwick et al. 2012, p. 7). ANT has the potential to provide an alternative thinking concept to respond to the widespread perspective of positivism in Thai academia, which might fill the gap between the current situation and the expectations of the study, especially school-based professional learning, which is described later.

1.3.1 Sociomaterial approach to knowledge and learning

Fenwick and Edwards (2010), in their exploration of ANT in the study of education, suggest that sociomaterial approaches range from adopting a more sociocultural to a more material focus, such as the epistemic culture concept of Knorr-Cetina (2016), to actor-network theory, as proposed by Latour (1987), Callon (1986a) and Akrich (and Latour 1991). In conceptualising ANT, Fenwick et al. (2012) argue how materiality includes tools, technologies, bodies, actions, and objects, but not in ways that treat them as being separate and distinct from humans, as well as texts and discourse but not so that their linguistic and inter-textual circulations are over-emphasised. Exploring materiality could help to avoid human-centric perceptions that place humans, meaning, and intention at the centre of practices (ibid.). However, relying only a material view may miss the crucial aspect of action, because all materiality is social, which is/was created through social processes and interpreted and used in social contexts (Leonardi

2012). Leonardi (2012, p. 32) states that '[a]ll social action is possible because of some materiality'. This is similar to Orlikowski's (2007 p. 1437) argument that:

> *Materiality is integral to organising … the social and the materials are constitutively entangled in everyday life. A position of constitutive entanglement does not privilege either humans or technology (in one-way interactions), nor does it link them through a form of mutual reciprocation (in two-way interactions). Instead, the social and the material are considered to be inextricably related – there is no social that is not also material, and no material that is not also social.*

Fenwick and colleagues (2012) summarise the idea of using sociomaterial perspectives to examine the whole system to appreciate human and nonhuman actions – which produce knowledge in systematic and relationship webs. The 'sociomaterial' also focuses on tracing interactions that lead to the formations and stabilisations of elements produced, reinforced, or transformed by actors who emerge with or in an activity, similarly to actor-network theory (ANT). They trace learning and interaction through networks (Nxumalo 2012). Without separating things or individuals, adopting such a sociomaterial approach helps to understand human knowledge and learning in the systems in which material action and interactions happen, rather than conceptualising that learning is derived from an individual's internalisation, understandings, and feelings (Fenwick et al. 2012). ANT is further introduced in Section 1.4 and discussed in more detail in Chapter 3.

1.3.2 School-based teacher professional learning and practice

> *In the new view of professional development, teachers are engaged in professional learning every day, all day long. It pervades the classroom and the school … teachers perform every day as they continually draw understanding about their performance from student performance. Teachers learn together. They solve problems in teams because every teacher feels responsible for the success of every student in the school community.* (NPEAT 1999, p. 2)

NPEAT's quotation above depicts how several stakeholders, things, and processes are involved as teachers engage in professional learning in different ways beyond isolated events, such as lectures and workshops led by external experts. Historically, however, such single activities have been classified as being professional development under educational bureaucracies, mandated in a top-down fashion. In contrast, Roseler and Dentzau (2013) argue that it is inappropriate to view teachers' professional learning as linear and simplistic teaching and learning because it does not align with the complexity of pupils, teacher expertise, classroom and school environment. They insist that this top-down, bureaucratically prescribed models "are not in the best interest of student learning or the development of teacher practices" (p. 621). Easton (2008) argues that such models are not always ineffective, however, despite the intent of the central government, centralised professional development does not always lead to professional learning (Easton 2008). In addition, Fullan (2007) argues that external approaches to instructional improvement are rarely "powerful enough, specific enough, or sustained enough to alter the culture of the classroom and school" (p. 35).

In contrast, Clarke and Hollingsworth (2002) argue that externally provided professional development events can provide valuable information to stimulate new knowledge that is sometimes put into practice. However, they also criticise the ineffectiveness 'one-shot' professional development sessions that are designed to resolve a deficit in teachers' essential knowledge and skills with the assumption that this requires expertise provided by external experts (Clarke and Hollingsworth 2002). This externally provided, top-down perspective separates teachers' learning from their teaching context and can potentially hinder their professional learning (Timperley 2011). Conversely, Vasee and colleagues (2023), in a systematic review of randomised controlled trials (RCT), explored teacher professional development results from lectures and workshops in five countries.[5] They found that the learning outcomes of lecturers and workshops can be varied and there is no one best approach for professional learning. The variability between country settings that they found also suggests that the single-event approach may be effective in some countries but may not in others because

[5] Five studies in five countries: Teacher training in rural areas of China (Loyalka et al. 2019), personal coach for teacher and student relationship development in Ecuador (Carneiro et al. 2022), training programme in entrepreneurship in Rwanda (Blimpo and Pugatch 2019), teacher training and teaching assistance for early childhood student in Columbia (Andrew et al. 2024), and a comparative study of online and on-site training in South Africa (Cilliers et al. 2022).

the outcomes of the learning depends on several factors: curriculum, understanding, technology, cultures, and implementation opportunities (ibid.).

To conclude, my research focuses on a wide range of teacher professional learning practices, from training activities to teacher learning processes, job-embedded support, and ongoing feedback. These multiple activities containing relational interactions that affect long-lasting change, continual growth, and innovation within schools for sustainable results for teachers and pupils (Boylan et al. 2018). I, therefore, use Elmore's (2004) statement to clarify my study's focus that "improvement above all entails 'learning to do the right things in the setting where you work'" (p. 73). I provide further discussion about professional development and learning in Chapter 2 and a clarification of the concept of practice and the unit of analysis in Chapter 4.

1.3.3 Professional learning and practice through sociomateriality

Beyond the issues relating to top-down professional learning process described in Section 1.3.2, current societal trends have changed teacher professional learning and practices to become more integrated with a wide range of stakeholders and technology (Fenwick and Nerland 2014). Specifically, technology is entangled in everyday life and spatiotemporally relocates working environments and radically alters professional learning contexts (Fenwick et al. 2012). Therefore, by adopting the concept of sociomateriality, we might better understand the dynamics of knowledge, human interaction, materiality, and the multiple and creative-constructive action of practices that form the characteristics of professional learning and practices.

1.3.2.1 Inter-professional work

Inter-professional work is the key to understanding today's professional work arrangements because it helps to deal with complex problems and various interconnected societal needs. Professionals work with others in multidisciplinary and interdisciplinary fields through collaborative practice to solve such problems (Fenwick et al. 2012). Not only do people play a role in inter-professional collaboration, but so do laws, guidelines, technologies, and clinical spaces (McDougall et al. 2016).

In response to inter-professional working, practitioners must understand professional practice beyond their own professional discretion, stable communities, and specific

knowledge (Fenwick et al. 2012), as knowledge and materials travel dynamically across the professions. As such, multiple and co-constitutive practices will emerge via inter-professional connections. Even when we consider a school as a single unit, collaborative practices still happen in several forms (Vangrieken et al. 2015). For example, teachers with diverse backgrounds may collaborate to complete a specific task about pupils, an integrated lesson plan, or a school project; in the assemblage of their individual experiences, they will work and reflect together on the job's purposes (Kelchtermans 2006). However, the boundaries between professions as expert domains sometimes may be recreated in professional learning spaces as they represent the expertise embodied in certain collaborative work, as Bechky (2003) and Mørk et al. (2008) suggest. While this sometimes creates tensions, these often broaden the possibilities for producing inter-professional work from these collaborative entanglements. McDougall and colleagues (2016) suggest that such possibilities stem from collaborative entanglements, which they define as "the state of human and nonhuman actants coordinating healthcare in the context of multiple, overlapping framings" (p. 113). McDougall and colleagues' (2016) ANT analysis of team-based intra-professional care for patients with advanced heart failure found that a patient symptom could be a common issue that each department member has cooperatively diagnosed without leaving their own area of expertise. However, where tensions sometimes arise among their individual interactions with materials such as symptoms, bodily fluid, and data, this could be regarded as a form of disentanglement, limiting the effectiveness of intra-professional collaborations. They conclude that, "while necessary, individual expertise is no longer sufficient in an era requiring collaboratively effective systems physicians … who can successfully integrate distributed, intraprofessional 'microsystems"' (p. 115). This is similar to tensions found in classroom action-research practices – although these professional learning activities are aimed at improving teachers' capacity, based on their inter-professional enquiry work, the integration of diverse research interests and an inflexible curriculum sometimes increases tensions. For example, in a qualitative study exploring the experiences of teachers in an action research programme in Australia, Edwards (2018) found that any benefits derived from action research activities are often difficult to sustain, primarily because of a lack of space in which teachers can take the findings forward to mobilise collaborative curriculum improvement (Edwards 2018).

1.3.2.2 Knowledge is not stable but transforming

Within a working context, knowledge cannot be viewed as a series of static objects but instead should be understood as being continually unfolding. As Fenwick et al. (2012) suggest, today's society helps to create a wide range of knowledge resources, potentially supporting or contradicting professional practice. However, the introduction of information obtained from those situated within and outside of the field contributes to a diversity of evidence circulating in complex networks. Countless forms of information are assembled to expand and deepen learning and professional development resources, rendering them richer than ever (ibid.). This can be understood within the ANT concept of translation or transformation (Law 2009), which is further discussed in Section 3.3. Briefly, translation can be seen as a continuous process that enacts the movement of different forms of entities, including culture, artefacts and knowledge (Czarniawska and Hernes 2005) within any organisation. The translation of professional development resources may also produce uncertainty and risks in identifying and integrating knowledge into professional practices. Consequently, as Fenwick et al. (2012) suggest, such dynamic and transforming information requires that professionals take responsibility for rethinking knowledge and opening up new possibilities for information engagement. Similarly, Knorr-Cetina (2016) argues that the integration of multiple professions must maintain a closer link to science and research in order to be able to bring new knowledge and materials to work and even to co-create new professional knowledge for practice. In her earlier work, Knorr-Cetina (2007) emphasises the influence of the emergence of global knowledge societies and the widespread circulation of what she terms 'epistementalities', which are defined as being beliefs about the knowledge production and distribution activities that operate across boundaries and constitute new organisational arrangements of roles and agencies. Knorr-Cetina's work (2007, 2016) not only illustrates how knowledge is transformed, but also how inter-professional learning (as mentioned in Section 1.3.2.1) works across sectors to co-create learning.

1.3.2.3 Professional accountability

In education, professional accountability and commitment are translated into expectations that teachers have sufficient expertise to determine ways to help pupils while participating in learning and reflective inquiry to improve their own professional

capacity (Sims and Fletcher-Wood 2021). When teachers engage in professional interactions, a wide range of knowledge, whether right or wrong, is created, even within regimes of bureaucratic accountability (Gore et al. 2023). This makes it even more challenging to identify and integrate the most appropriate knowledge for specific professional situations and to maintain professional accountability.

Professionals in many countries may focus on the regulation of work toward external audits and performance assessments rather than professional-internal control (Fenwick et al. 2012), particularly professional accountability related to materials such as standards and codes of conduct generated by a central government or an institution. This potentially influences each professional's individual discretion; as Broom et al. (2009) and Carey (2007) suggest, some may neglect to improve their professionalism because additional external regulations may limit the necessary space for the exercising of their professional judgment.

Not only standards and rules, but also technology intensifies professional accountability by publicly disclosing learning outcome data to all stakeholders. Lingard and Sellar (2017), for example, suggest that increased emphasis on audit and accountability produces "perverse systemic effects" (p. 106) as teachers are pushed to continuously improve while at the same time being competitive. This could be one of the effects that materially mediates the accepted levels of professional accountability and learning. Conversely, Gore and colleagues (2023) argue that thinking about the relationship, and whether professional learning affects how such judgments are made, could reduce the tension between teachers and accountability, while at the same time allowing teachers to focus on learning and teaching.

1.4 Engaging ANT for exploring teacher professional learning

In this theoretical overview, I introduce actor-network theory (ANT), focusing particularly on where it has been employed to observe teacher professional learning. I begin with Fenwick and Edward's (2010) quotation to illustrate the dynamic characteristics of professional learning:

> *Most phenomena of interest to social science research, such as education, are slippery, uncertain, constantly changing, emotional, vague, and diffuse.* (p. 144)

Here, Fenwick and Edwards (2010) are drawing on Law's (2004) book, *After Method*, which explores how to conduct social science research within such messiness. Law (2007a) suggests that research needs to be messy because it forms part of a significant element of the world that is messy and unknowable in a regular and routinised way (ibid.). Law (2004) asks, *"*How might the method deal with the mess?" In dealing with such complexity, ANT ontology requires a fundamental reconsideration of how interactions among human, material, and other actors produce change and continually redefine the roles of the actors for constituting a reversible network, without considering pre-existing conditions (Callon 1991); those interactions then produce effects such as knowledge, processes, objects, practices, and social customs (Rubin et al. 2021). At the same time, ANT methodologically provides a reflexive view of interconnectedness and destabilises analytic tools to understand the complex association and relationship between social and material entities across spatiotemporal dimensions. As Fenwick (2010a) suggests, "ANT takes knowledge generation to be a joint exercise of relational strategies within networks that are spread across space and time" (p. 110) where knowing and learning are performed in assemblages of human and nonhuman actor-networks. The usefulness of ANT in exploring the effects of the minutiae of these spaciotemporal connections in teaching and learning practices is effectively demonstrated in studies such as Luke's (2022) ethnography of the use of video pausing in a higher education teaching context, drawing on ANT's "multimodal sensitivities" (p. 1012) to identify overlooked modes that are highly influential in producing learning.

Law and Singleton (2013) suggest that knowledge is created in heterogeneous networks through the mediations or translations that render, assemble, reassemble, and de-assemble social and material entities within the practice. Therefore, educational practices are perceived as collective works rather than individual (Mulcahy 2005). ANT thus explores the association and relationship between social and material entities that emerge in such practices. As Fenwick (2010a) argues, learning and working are already entangled with materials, technologies, nature, and objects. Therefore, in decentring our understanding of learning practices from a human approach to a sociomaterial approach, ANT offers a very useful set of sensibilities for studying teacher learning, where everyday work interconnects inseparably with text, technology tools, and curriculum (Rubin et al. 2021).

Therefore, for my study, ANT is not just the approach adopted in performing the research, but the research itself is infused with ANT constructs and sensibilities to explore teacher professional learning. I engage these ANT concepts by shifting the research focus from individual teachers, or even groups, to a focus on understanding the stability and functioning of networks that influence teacher learning through the concepts of translation, network, and power.

1.5 Significance of the study

My review of the Thaiedresearch.org (2024) database revealed a gap in the knowledge relating to teacher professional learning in Thailand that has not been addressed, even after it was first identified by Wiratchai and Wongwanich (2000) over 25 years ago. My study has the potential to respond to Supap's (2014) appeal for Thai social science researchers to move beyond the positivist paradigm to open up new possibilities for research in Thai society. The findings of this research may be useful for educators and policymakers to gain a more in-depth understanding of how school-based teacher professional learning can be implemented, especially through the ANT perspectives, in its usefulness in exploring complex and messy constellations of practices. This study reveals how the diversity and complexity of professional learning research can be successfully enacted within an ANT understanding. The three case studies presented here provide the potential to advance existing knowledge by opening up a new perspective on school-based professional learning practice, that is, not merely in providing top-down, single-event workshops, but to explore in detail what happens in teachers' daily working practices to explore the complexity of their professional learning, including the link between activities and interactions among teachers and things. The research presented in my thesis illustrates how sociomaterial entities such as culture and policies influence and mediate teachers' professional learning. The originality of this study is its focus on nonhuman actors, such as policy, culture and norms, curriculum, lesson plans, and student work, each of which plays an active role in teachers' learning process.

In terms of its theoretical contributions, the study has the potential to provide new insights to enhance existing theoretical concepts or frameworks of school-based teacher professional learning. ANT allows us to appreciate things and recognise their shared agency. This key lesson contributes to the Thai teacher education perspective by

balancing human and nonhuman alignment toward teachers' learning. Moreover, with the notion of fluidity, ANT allows for practical methodological rigour in any context. Furthermore, my development of the Interview Toolkit, situated within a sociomaterial-based network exploration, along with the storytelling technique presented here, can be applied within any professional learning field and in any other area of school operation.

Treating culture as an actor, the stories and the analysis of the school practices shed light on the power in how cultures shape professional learning activities, especially when Thai schools have Buddhist education roots while adopting new foreign practices and coping with rapid change in society and technology. The findings show how each school's practices embrace new challenges and how these are negotiated to form mutually accepted ways of learning. Finally, the emphasis on policy makes us aware of how implementing education policies, such as those related to curriculum and teacher evaluation, shape and influence teachers' professional learning, which could be an actor that works for or against the production of professional learning.

1.6 Structure of the thesis

The 10-chapter structure of the thesis follows the research processes, which I have divided into four sections. The first section relates to the background and the concept of teacher professional learning, presented over the first two chapters. Chapter 1 introduces the study, depicting the context and theoretical framework used to explore professional learning practices. Chapter 2 elaborates on teachers' professional learning in terms of theories, frameworks, and models. This chapter explores the concept of teacher profession, growth, and professional learning and practices. It also describes several practical models from Singapore, by way of comparison with practices in Thailand, then explores the Thai model with its unique cultural dimensions.

The second section presents the research paradigm, methodology, and Interview Toolkit, outlined in Chapters 3 and 4. Chapter 3 presents the concept of sociomateriality and actor-network theory (ANT) as they are conceptually connected. ANT descriptions regarding principles, sensibilities, and translation are described as they form the central idea of this study. The final part of this chapter links to Chapters 1 and 2, as ANT is used to explain teachers' work and learning practices. Chapter 4 discusses the research design, including its orientation, the fieldwork plan, and the toolkits. The Interview

Toolkit was designed based on ANT concepts and the related heuristics, while the analysis toolkit unpacks the way in which data were enacted and processed. As the ANT researcher, the analysis does not represent the concepts derived of my own translation; instead, it embraces ANT sensibilities.

The third section presents the stories of the practices in the three schools and a synthesis of the findings. The stories outlined in Chapters 5–7 start from how I, as the researcher, approached the school assemblage, then tell the journey of the professional learning practices, from their formation to their implementation and stabilisation. Chapter 8 consists of synthesising the findings from the three schools, capturing the concepts of translation, power and relations, and their networked effects. In the final section, Chapter 9 analyses the reconceptualisation of professional learning through ANT and is divided into five key insights. In the final chapter, my reflections on the study and its implications are discussed.

Chapter 2 Teachers' professional learning (TPL): Frameworks, theories and models

This chapter firstly explores what teachers do, why teaching is a profession, and why teachers must continuously improve their professionalism. Later, I distinguish between professional learning and professional development, considering them from the perspective that learning and development are produced in co-constituted and sociomaterial processes in everyday practices (Gherardi 2016). I then describe the nature of professional learning and depict two practical professional learning models (Lesson study (LS) and Professional Learning Community (PLC)) in their Singaporean and Thai implementations. This chapter embodies one of the critical actors in my research assemblage that was co-performed to produce the contribution to the knowledge presented in the findings and analysis chapters. This will form my analysis framework, which embeds ANT sensibilities during the practice exploration.

2.1 What teachers do and why teaching is a profession

According to Tichenor and Tichenor (2005), the term, 'professional teacher', "refers to the status of a person who is paid to teach. It can also, on a higher level, refer to teachers who represent the best in the profession and set the highest standard for best practice" (p. 90). Based on this definition, we might assume that a teacher is responsible for creating and providing choices of pedagogy and learning activities, promoting the achievement of curriculum outcomes, and developing the values and attributes of pupils, including their wellbeing (Wächter et al. 2024). As such, the teaching profession may be recognised as the art of fulfilling such expectations (Schlechty 2004).

However, there are multiple views of what it is to be a professional teacher. Some align the professional teacher with student achievement; some focus on the level of their performance rated by supervisors; and some rely on pupils and stakeholders' comments as a measure of their professionalism (Stronge and Hindman 2003). These various perspectives encompass an understanding that professional teachers need to be equipped with certain characteristics, values and beliefs about pupils and teaching, including a commitment to continuous improvement, and gaining a wide range of knowledge – both subject and pedagogical knowledge (Clarke and Hollingsworth 2002). Beyond an

understanding of professionalism as being embodied in effective teaching, Sockett's (1993) typology of the professional teacher involves obligations, education standards, ethical and performance standards, and working relationships beyond the classroom, whether with colleagues and parents, or the public. Tichenor and Tichenor (2005) add that public education demands successful partnership with other professionals, and that collaborative leadership is essential in order to commit to a school's success.

These assumptions situate teacher professionalism within what Evans (2008) describes as an "amalgam of multiple 'professionalities"' (p. 28). As such, she argues, if we attempt to define professionalism within a series of complex and multiple values, ideologies, attributes and methods, then the presumption of "homogeneity, commonality or consensus which are generally identified as essential to professionalism necessarily become elusive" (ibid.). The very diversity of professionalism, Evans (2008) argues, challenges any attempt to define teachers' professional practices uniformly; such definitions often become unrealistic or meaningless when put into practice. Therefore, in order to support teachers' abilities to develop their professional practices, it is essential for in-service teachers to have ongoing support for their formative growth and in enhancing their professional attributes, beyond passing an initial teacher education (ITE) programme in their pre-service education programmes (OECD 2020). Timperley and colleagues (2007) state that, once they become teachers, their professional learning is never finished, as they must continue to deepen their knowledge and reskill their capacity through continuing professional learning. A more detailed discussion of professional learning is presented in Section 2.2 below.

2.2 Professional learning and professional development

Although professional development and professional learning are often used interchangeably in the literature (Bobis and Tripet 2023; Evans 2014), the concept of professional learning is broader than that of professional development. Professional development is often related to single-event workshops, seminars, or lectures, presented as a kind of one-size-fits-all approach (Scherff 2018), consisting of a repertoire of structural activities for learning (Opfer and Pedder 2011). For example, formal structures, such as courses and workshops, may serve some purposes. The instruments or practices used to enact professional development also depend on the objectives and needs of teachers and their pupils (Opfer and Pedder 2011). However, as mentioned in

Section 2.1, professional learning for teachers is never finished, and includes learning while they are working. Professional learning then becomes another learning element as it is a product of workplace-embedded professional development activities that help teachers to acquire new knowledge and assists them in improving their practices in ways that will benefit student learning (Bobis et al. 2020). It involves the production of curricula, the discussion of assessment data, or the sharing of strategies.

Instead of attempting to distinguish these two concepts, Darling-Hammond and colleagues (2017) highlight how they are linked – effective professional development comprises a structured professional learning process. However, when examining professional learning from a situated perspective, it can be larger than professional development because learning is part of teachers' daily work and serves as a catalyst for producing teachers' knowledge, awareness, action, and judgement expansions (Hagedoorn et al. 2023). Similarly, Opfer and Pedder (2011), in a review of the literature on teachers' professional development practices, also offer a model to understand the concept of teacher learning through three overlapping and recursive patterns among the individual teacher, the school, and the activities, tasks, and practices in which teachers engage. This relates to Clarke and Hollingsworth's (2002) interconnected model of teacher professional growth, which describes how professional learning is a non-linear, iterative process that connects across the personal domain (beliefs and knowledge), the external domain (professional stimuli), the domain of practice (teachers' experiments with lessons, strategies, and approaches), and the domain of consequence (salient outcomes of pupil's learning that further influence teachers' beliefs and practices).

However, whether teacher learning is called professional development or professional learning, its effectiveness depends on particular educational policy environments and school cultures (Avalos 2011). In Thailand, professional development is used to describe activities or processes that are intentionally used to prepare staff for performance improvement, initiated by a teacher or an organisation (Pipatmongkolporn 1999). Within a centralised culture, professional development is perceived as being formal and structural activities and processes, especially one-shot workshops (Wongnate 2015), while professional learning is perceived as being a learning process for acquiring knowledge and skills; for instance, teachers implement a lesson study process or employ

experiential learning to build new skills (Sirisampan and Kitrungruang 2018). Sudrung and Thanompongchart (2018) indicate that, although Thai policy nowadays tends to focus on professional learning through school-based professional learning policy, teachers' learning processes have not yet been fully embedded in their daily work. This could imply that the efforts to formalise professional learning may obstruct the potential of learning to reach what teachers experience in their daily work. More importantly, it might not be able to broaden the perspective of professional learning among Thai educators, as school-based professional learning is still less commonly practised in Thailand.

Despite this, this study adopts the term professional learning instead of professional development because placing the focus on professional learning could reinforce the influence of individual programmes, activities, or teachers, but can also be expanded to encompass the context and situatedness of teacher learning to show how the overlapping systems interact to produce learning (Opfer and Pedder 2011). Most importantly, this study could contribute with knowledge to broaden the Thai perspective in relation to teacher professional learning. Delving into professional learning, this section elaborates on its effective characteristics to demonstrate the production of professional learning, along with the concept of having teachers and other entities contribute to this learning. It is important to acknowledge the complexity of teacher learning, especially when teachers have to consciously and unconsciously engage in multiple activities. As Stollar et al. (2006) suggest, teacher professional learning comprises a complicated learning path that is connected within a nested system that involves systems within systems. In their review of 35 methodologically rigorous research studies, Darling-Hammond and colleagues (2017) propose a set of effect characteristics of teacher professional learning practice, each of which is discussed under the headings below.

2.2.1 It is job-embedded and student outcome-focused

Darling-Hammond and colleagues (2017) found that, because professional development is job-embedded, it should be situated in teachers' classrooms rather than being provided externally and "divorced from teachers' school or district contexts" (p. 5). In addition, they emphasise how professional learning should be aligned with school and district priorities and how its aim should be focused on mediating teachers' professional

practices so that pupil outcomes are improved. Similarly, Timperley and colleagues (2007) illustrate that, although teachers can choose to develop through content-focused or discipline-specific activities, professional learning must be embedded in the teachers' role and aligned with student outcomes. However, Timperley et al. (2007) argue how the scope of teachers' learning does not simply target outcomes – learning specific knowledge and skills – but broadly includes comprehending text, learning how to learn, developing collaborative skills, and improving well-being (ibid.). By treating the classroom as a learning source, the design of professional learning should be situated in the teaching and learning space. Additionally, teachers should be encouraged to think, inquire and reflect in order to learn from their experiences and circumstances (Darling-Hammond et al. 2017).

2.2.2 Active learning is a general frame for teachers' learning

Darling-Hammond and colleagues (2017) also found that the most powerful professional learning processes include active and collaborative practices. They define these as professional learning that moves beyond "traditional learning models that are generic and lecture based toward models that engage teachers directly in the practices they are learning" (p. 7). They also found that the most effective professional learning includes activities that are deeply embedded in classroom practices, and that incorporate similar learning activities that teachers design for pupils' learning. The Scottish Government (2010) argues how active learning, involving a conscious act of thinking, is important for pupils, especially in meaning-making, in which they delve into their learning journey and enact with their surroundings to co-create meaning. This profoundly implies the essential role of the teacher, urging the teacher's professional learning to be more active to provide highly interactive activities for pupils' learning (ibid.). As Greenleaf et al. (2011) argue, teachers need to employ metacognitive routines to make sense of the activities delivered and to reflect after each learning episode on the impact on the learning process and their pupils' development, which could be considered as being a key element of professional learning.

Trotter (2006) highlights the importance of self-directed learning, reflection and inquiry and positions these as being part of a framework for andragogy. Although Darling-Hammond and colleagues (2017) do not deny that active learning should be used to design teachers' professional learning, addressing how and what teachers learn, they

offer an alternative perspective – that active learning can shift away from traditional views to become a more interactive and engaging learning process through collaboration, coaching, feedback and reflection, as well as a model and process of modelling, that allows connections to be established among pupils, teachers, authentic artefacts, and other strategies, to address "how teachers learn, as well as what teachers learn" (p. 7).

2.2.3 Collegial interaction fosters an integration of new learning into existing practice

Darling-Hammond and colleagues (2017) also found that collaboration is necessary for each individual teacher as a school is a collegial community circumstance. Various collaborative practices occur, such as one-on-one teaching, small group interaction, schoolwide information exchange and online collaboration to develop this community. Opfer and Pedder (2011) suggest that this community of learning is underpinned by collaboration within a situated perspective that assumes that teachers learn through social interactions, whether from observation, discussion or collaboration, by engaging in what Lave and Wenger (1991) describe as 'communities of practice' and by taking on increasingly complex tasks. Additionally, considering the dynamic characteristics of the teaching profession, Darling-Hammond and colleagues (2017) argue that any learning that emerges should be re-introduced into the community as an ongoing and collective responsibility.

Conversely, Little's (1990) research suggests that too much collaboration brings conformity to group culture at the price of creativity, innovations, inventiveness, and initiative. Therefore, the degree of collaboration is debatable, because too much or too little limits learning opportunities; only by distributing the right proportion of collaboration can learning among teachers be stimulated and supported at a specific place and time (ibid.). Another critique about learning via interaction, suggested by Fox (2000), is that Lave and Wenger's (1991) conceptualisations of learning communities ignore the way in which power is understood in the learning process. Fox (2000) argues that, by adopting an ANT perspective, learning can be understood as an outcome of a struggling process involving self, others, and the surrounding materials. Struggles with others, whether humans or nonhumans, generally occur in collaboration processes because each member of the collective is endowed with "resistive agency: the capacity

to act back, granting or refusing translation" (Fox 2000, p. 863), especially power among them, which affects negotiation and knowledge construction. Therefore, it is noted that not only group conformity (Little 1990) but also power among and between groups affects the degree of participation and, eventually, professional learning (Roberts 2006).

2.2.4 The use of models and modelling leads to learning

Darling-Hammond and colleagues (2017) also found that multiple models and modelling, for example, video and written cases of teaching, demonstration lessons, lesson plans, classroom observation of peers, materials samples, pupils' assessment, and reviewing pupils' work, provide teachers with a clear image of their own learning and growth. As Snow-Renner and Lauer (2005) suggest, teachers can examine the model and use "the same sense-making activities that their students would" (p. 10) to uphold their learning through analysing, trying out, modelling, and reflecting on new practices. For example, a model that is commonly embedded in the curriculum, such as routine teaching tasks, can be implemented and used to revise teachers' lesson plan for the next class. However, Kleickmann et al. (2016) warn that teachers who use the curriculum without expert support and the sense-making process have lower student achievement than those who receive such support. Models and modelling, therefore, make the learning process visible, especially an exemplary practice that helps teachers to depict their own teaching sequentially through a subject learning concept and are thus able to facilitate student learning in a collaborative way (Doppelt et al. 2009).

2.2.5 Coaching and expert support

A key feature in 30 of the 35 studies identified by Darling-Hammond and colleagues (2017) was coaching and expert support. Coburn and Woulfin (2012) argue that instructional coaching is an influential mechanism for teacher learning in all aspects: new teacher induction, ongoing teacher learning, assisting in implementing new initiatives, and, most importantly, helping teachers understand and adapt their instruction to school direction and national standards. Coaching and expert support is a complex attempt requiring multiple stakeholders – the government, district, and university – to form a strategy for developing teacher practice. Meissel and colleagues (2016) argue that involving a local agency working with instructional leaders the role of

integrating coaches and adjusting coaching to match each school-based professional learning is particularly important in facilitating these professional learning practices.

Practically, whether onsite or remote coaching, Campbell and Malkus (2011) and Landry et al. (2009) agree that it should begin with observing teachers' classroom practices and then providing supportive and constructive feedback in the context of a teacher's own classroom. Therefore, this form of support often relates to other professional learning strategies, such as modelling or supporting group discussions. More importantly, as Darling-Hammond et al. (2017) found, it explicitly includes materials, whether exemplary or current student works, as elements of effective expertise sharing. Nevertheless, no matter the expertise or enthusiasm of a coach, coaching cannot mediate a change in teaching practices if teachers do not engage with the coaching process. This means that it is important to set comfortable and empowering surroundings, such as setting a clear goal and promoting a data-driven dialogue, where teachers are willing to open up to critique and recognise their personal areas of improvement, as Kraft et al. (2018) illustrated in a meta-analysis of the causal evidence.

2.2.6 Feedback and reflection

Darling-Hammond and colleagues (2017) also identified how feedback and reflection are powerful tools in effective professional learning and are necessary components of andragogy. These approaches work best when cooperatively employed during mentoring, coaching, and in other learning spaces, and work well in professional learning associated with student learning, providing built-in time for teachers to think about, receive input, and change their practices (ibid.).

Allen and colleagues (2015) demonstrate how coaching sessions and group workshops that generate feedback and support reflection often include opportunities to authentically share positive and constructive reactions to teacher practice. Feedback and reflection can also comprise interactive activities that connect teachers via conversation during everyday work. Conversely, Dunning and colleagues (2003) are critical, suggesting that self-perception in the reflection and feedback process is a form of bias that can diminish the effectiveness of the process. Therefore, an evidence-based process should be used to focus on actionable feedback. Gallagher et al. (2017) and Johnson and Fargo (2010) suggest that the use of multiple sources of data (e.g., lesson plans, demonstration lessons, or instruction videos, samples of pupil work) that are linked

explicitly to the teacher's reflection and learning practices can make learning visible and tangible. Similarly, Desimone and Pak (2017) argue that the most successful form of professional learning involves explicit feedback that draws on multiple artefacts, such as pupils' work and classroom observations.

2.2.7 Duration matters to sustain learning

In their review, Darling-Hammond et al. (2017) revealed that there is no clear agreement in the research about the most effective duration of professional development activities. However, they did find that teachers' learning that is fragmented and sporadic does not allow sufficient time for "rigorous and cumulative learning" (p. 15). Desimone (2009) agrees, arguing that duration should be considered as one of the core features of professional learning, and that the activities should be sustained, both in terms of the duration of individual sessions and the span of time across which they are offered. Similarly, Garet et al. (2001) argue that meaningful and impactful learning needs time and quality implementation, which cannot be accomplished in short, one-shot workshops. However, this creates difficulties for policymakers in planning resource allocation for facilitating teachers' professional development (Knapp 2003). Yoon and colleagues (2007) reveal that providing an average of 49 hours per year per teacher of professional learning is associated with a 21% increase in pupils' achievement scores. The sustained duration of professional learning allows teachers to continue their learning outside structured professional development activities. Thompson et al. (2020), in their in-depth study of teachers' experiences of professional learning in a school in Australia, found that sustained professional learning also supports teachers in changing their practices by allowing them to refine and apply their understanding to implement new strategies. In addition, the duration of professional learning effectively complements ongoing learning approaches, such as study groups and coaching, which could ensure application in classroom practice, something found by Darling-Hammond et al. (2009) in an earlier study. Such a process can function as a form of supportive accountability for teachers in providing evidence of improvements in teaching practice and professional support that lead to better outcomes for pupils, as Ciofalo and Leahy 2006) suggest.

2.2.8 Not only teachers, but also others must be involved

Buczynski and Hansen (2010) suggest that teachers face several barriers to implementing what they learn from professional learning activities. They challenge the common idea that professional learning will be successful due to teachers' will to employ the knowledge and skills they have gained. In their qualitative case study to measure the impact of a professional learning intervention with science teachers, Buczynski and Hansen (2010) found that teachers who have a will to implement professional development practices in the classroom tend to face obstacles beyond their control, while some are in their control but difficult to manage, particularly a lack of time and resources. Similarly, Lloyd and Davis (2018) found that, under challenging conditions, teachers' performativity and accountability could limit their sense of ownership of their professional learning. Darling-Hammond et al. (2017) have also noted that stakeholder support for teacher professional learning is critical for its success.

A school leader may assist teachers in applying their newly acquired knowledge and skills as gatekeepers to encounter outside school problems and then connect with authorised agencies to communicate the issue at the district and national levels to ensure long-term resource allocation and prevent or solve problems. Tooley and Connally (2016) and Darling-Hammond et al. (2017) suggest that those at the system level should find ways to identify teachers' professional learning needs and provide teachers with long-term, sustained support. Finally, monitoring tools and systems should be included in the professional learning activities, which need multiple stakeholders to analyse the quality and impact of professional learning cooperatively.

As Tooley and Connally (2016) suggest, without knowing what is working and why, sustaining and improving professional learning practices could be another challenge, specifically when power among stakeholders is imbalanced. Consequently, stakeholders, in centralised or decentralised work structures, must consider authentic engagement, contribute in a meaningful way, encourage shared decision-making, hold accountability and transparency, and regularly assess their performance for continuous improvement (Fullan and Langworthy 2013).

Opfer and Pedder (2011) and Desimone (2009) indicate that, despite a seeming consensus on the characteristics of professional development that lead to teacher learning and change, we are still unable to predict the success of teacher learning based

on these characteristics. Therefore, it is constantly necessary to study, discuss and reflect in dealing with teacher professional learning on the interacting links and influences of its history, current trends of educational need, the expectations of education systems, teachers' working conditions, and the opportunities to learn. In the next section, two school-based professional learning practices will be discussed, linking these with the characteristics of professional learning.

2.3 Exploring two school-based professional learning practices

This study is interested in school-based teacher professional learning in the manner of (collaborative) practitioner enquiry, which is similar to processes such as critical collaborative professional enquiry (as described by Priestley and Drew 2019) or action research (Education Scotland 2013), and, more importantly, learning that is situated in everyday teaching practices. DeLuca and colleagues (2015), in their review of 42 professional learning studies, identified how the collaborative inquiry process is characterised by three principal interrelated structural elements: *dialogic processes, taking action, and engaging in reflection*. This section provides a brief explanation of the concepts of lesson study (LS) and professional learning communities (PLC) as they align with these three elements, before providing a discussion of their implementations in Singapore and Thailand as exemplars.

Lesson study (LS) is a professional learning method that allows teachers to use empirical studies of actual classroom practice to promote continuous improvement (Shimizu and Chino 2015). LS's original approach involves teachers working in small groups to discuss learning goals, plan a lesson, observe how their ideas work in lesson implementation, and share the results with other teachers for professional learning (Takahashi 2006). Open approach (OA) is an interconnected activity that completes the loop of teachers' learning while helping teachers to change their teaching practices, so it includes active participation such as classroom observation and reflections (ibid.). Some of these activities are conducted publicly with thousands of observers from across the country and become part of the nation's cultural strengths of its teaching professions (Lewis and Tsushida 1998). LS/OA might be conceptualised as a learning community in which teachers continually participate to reaffirm their professional purposes in collaboration with colleagues to support pupils through improved lesson plans (Vescio et al. 2008).

In terms of the concept of a professional learning community or PLC, the term PLC first emerged in the 1960s when researchers offered the concept of team teaching in the United States (Joyce 2004) and became more widespread in the early 1990s when teachers developed the concept of educators as learners (Hord 2008; Du Four and Eaker 1998; Pumma 2021). DuFour (2007) briefly explains that PLCs are not programmes or courses but are instead something that empowers change within schools at all levels. PLCs are characterised by organic participation, natural learning, experience-based idea sharing, and the use of technology to expand knowledge (Mahimuang, 2018). PLCs are generally implemented in small groups of team-based units to examine the teaching and learning processes and discuss and implement solutions to engage and motivate pupils (Kanawapee et al. 2022).

The discussion below describes the implementation of PLCs in Singapore and Thailand. In addition to describing PLC practices in Thailand, I chose to include a review Singapore's implementation, as it demonstrates evidence of how the western concept of PLC transfers to Asian culture, particularly within Singapore's spirit of adopting a top-down approach, which may challenge the usual western conceptualisations of professional learning (Ho et al. 2020). The discussion demonstrates how each setting embraces the school-based professional learning practices, from policy to practice, as perceived through each country's cultural and material aspects.

2.3.1 Singapore

According to the OECD (2022) report on PISA scores, Singapore, one of the world's top-performing countries in education, adopted the concept of schools as learning organisations6 (Lee and Lee 2012; Dimmock and Yong Tan 2013; Hairon and Dimmock 2012). Therefore, much of Singapore teacher professional development occurs within school settings, where several work-embedded learning opportunities have been implemented (Bautista et al. 2015).

In Singapore, PLC is considered to be a top-down policy promoted by the MOE (Ng 2009), although establishing a school as a PLC is ultimately a local decision (Ho et al.

[6] In 'Schools that Learn' by Senge and colleagues (2012), the term, 'learning organisation' refers to school organisations that continue to promote the Fifth Discipline of learning organisations: systems thinking, personal mastery, mental model, shared vision, and team learning. As schools become engaged in building collaborative work cultures, the term 'learning organisations' came to be referred to as professional learning communities in schools (Dufour and Eaker 2009).

2020). In 2005, the Minister of Education publicised the slogan, “Bottom-Up Initiative, with Top-Down Support” (MOE 2005) in a speech designed to introduce policy reform in Singapore, which was aimed at “shifting focus from quantity to quality, and from efficiency to choice in learning” (ibid., n.p.). Subsequently, Ho et al. (2020) have argued that promoting PLC culture within Singapore’s centralised governmental structure necessitates a paradoxical “centralised decentralisation” (p. 639) approach, where professional learning is facilitated by the school leaders (principal, vice principal) promoting a wide and flexible set of directions within a tightly mandated strategic structure, in what might also be described as a tight–loose approach (Ho et al. 2020). That is to say, the policy is tight in that PLC were first mooted by MOE in 2008, strongly advocating a PLC model for Singapore schools with three big ideas (DuFour 2016) of ensuring that students learn, within the building of a culture of collaboration while at the same time focusing on student outcomes. At the same time, the policy is loose in that schools decide how they wish to implement PLC, and there is no tracking of how schools perform the PLC implementation.

In addition, the Singapore MOE also designed the associated handbook, “The PLC Starter Kit” (TDD 2010), which explains the benefits of PLCs, the roles played by the members, and the methods, procedures, and tools to be used when conducting classroom-based research and, more importantly, suggests how organisational and inquiry structures can both enable and constrain the distribution of leadership in a PLC. The MOE also provides training budgets for talented teachers at each school to train for and become “research activists” (Teh et al. 2013), who are expected to help their colleagues conduct classroom-based research (Ellis 2014) and adopt a research and development approach to proposing curriculum and classroom innovations with implications for educational policy and teaching practices.

Practically, Singaporean PLCs combine the practices of action research (Hairon 2006; Wong 2013) and Japanese lesson study (Lewis et al. 2004). Tan (2014) summarises the practice into four cyclical and recursive phases. First, teachers analyse the curriculum and set long-term goals in a study phase. Then, in a planning stage, they select lessons, anticipate student responses, and plan for data collection. They then arrive at an analysis phase to review classroom evidence, such as videos and student work. Later, entering to

the final stage of reflection, they discuss learning outcomes and identify next steps for inquiry.

Notwithstanding the clear implementation guidelines, Singaporean schools face challenges in various areas (Hairon et al. 2014). First, finding time within the school day to implement new practices is difficult for teachers and it is even more difficult to find the most appropriate time for teachers to meet in groups (Flogaitis et al. 2012). Moreover, not all teachers are committed to the demands of participating in collaboration activities. Hairon et al. (2014), in focus group discussions with teachers, school leaders and professional developers, found that this resistance becomes more intense when teachers are afraid of being criticised, disclosing their vulnerability and being seen to lack certainty in terms of their practical expertise. They emphasise, however, that teachers should not be blamed for these anxieties because, traditionally, all teachers have taught alone in their own classrooms, which creates an insulated and isolated environment. They argue that "the more hierarchically structured an organisation or institution is, the less the chances are of forming a community of practice" (Hairon et al. 2014, p. 3). Without establishing an appropriate in-school culture to support PLC, there is a danger that teachers could view learning as a criticism of their work and perhaps as undermining their authority.

The key to overcoming these challenges is to constantly provide the right support, whether leadership, organisational, or material support. Slick (2002) illustrates that the right support for teachers in PLC is embodied in the processes of inquiry and the creation of an environment that models, nurtures, and embeds an inquiry stance, while aligning toward the goal of learning. This establishes a re-focusing on what elements of support are needed to lead stakeholders to engage meaningfully in their professional learning, regardless of the top-down hierarchical structure.

2.3.2 Thailand

The image of teaching as a profession in Thailand might differ slightly from the general perception presented in Section 2.1. Thailand has officially adopted the PLC concept at both implementation and policy levels (Mahimuang 2018). Alternatively, schools that have a university partner adopt a 'lesson study and open approach' (LS/OA), which is less prevalent in teachers' implementation (SupaDaow 2019) when compared with PLC.

Thailand has imported the LS/OA model from Japan, however, schools use the 'classroom' as the unit of analysis to fit Thai classroom culture, instead of 'lesson', as Japan does (Inprasitha 2022). OA is part of the LS process to promote pupils' independent learning and to transform teachers' traditional teaching approach through the weekly Plan-Do-Check-Act (PDCA)[7] process (Inprasitha 2022), adapted from the 'Kaizen' concept as a cycle of instructional 'improvement' (Lewis et al. 2004). The LS/OA model is usually limited to mathematics teaching because it was first introduced to Thai teachers only in mathematics learning to develop procedural fluency. Teachers in other subjects may not concretely perceive LS/OA as a transformational process for teachers and pupils, particularly when they are familiar with rote learning, which places less emphasis on the meta-cognition process than does mathematics learning (Inprasitha 2022). Inprasitha (2015) proposes a nudge to correct such misperception by participating in the process of learning and feedback rather than only using a tangible teaching manual; this would broaden the opportunity to use LS/OA more effectively. However, without understanding and relying on the expansion of school and university partners, the use of LS/OA is not as widespread as the PLC process, as it is compulsory for Thai schools nationwide, especially public ones.

Public school teachers in Thailand record their attendance at professional development activities in an official report. This comprises at least 50 hours per academic year, to fulfil the MOE's teacher performance indicators (Muneekool 2018). The 50-hour requirement has recently become more flexible in that the prescribed sessions can be combined with other professional learning activities, such as individual learning and formal networking activities, for example, those established during COVID-19 (OTEPC 2020a). Although the PLC policy is delivered top-down from the MOE, the policy urges teachers to participate in PLC implementation through a bottom-up approach (Chananil and Nerttanomsak 2022) by identifying the real problems in teaching practices and classrooms. Therefore, some aspects of PLC activities need classroom observations, as this works as an activity to mediate the enactment of PLC-relevant dialogues. Additionally, non-teaching-related issues, such as school lunch management, or pupils' chronic absenteeism, are also included (Sesact 2017). Compared to the LS/OA, the

[7] The PDCA model is a 'quality loop' of quality management used to improve or maintain processes in various fields. In education, PDCA is said to promote the improvement of teaching quality (Huan and Nasri 2022).

scope for PLC in Thailand could go beyond lesson improvement, as it encompasses all daily teaching work (Vescio et al. 2008), which also affords a more flexible structure (DuFour and DuFour 2013).

The official PLC protocol and templates were created by central agencies and operationalised through the top-down structure, to promote the policy's ease of implementation. As Hairon et al. (2014) suggest, this rigid structure is traded off with its flexibility and contextuality in practice assemblages, but, as Kasintara (2018) indicates, this might be particularly suitable for Thai teachers as they lack knowledge about PLC practices in general. Thus, having the freedom to mediate the top-down PLC activities in an assemblage that promotes professional learning about PLC practices at a local level allows the teachers to explore ways in which they can be innovative in their professional learning while feeling as though they are still conforming to the professional (and social) hierarchy they expect and that is expected of them. The top-down policy also requires teachers to complete and submit the paperwork associated with their PLC activities, especially meeting records, as evidence of their PLC work (Kanjanasuang 2015). Although workload tends to limit teachers' participation in PLC, they at least cooperatively attend PLC events for solving ad-hoc problems despite placing less emphasis on collaborative dialogue and learning (Chananil and Nerttanomsak 2022).

Along with the PLC concepts described in Section 2.3, the combination of Thai values with the characteristics of PLC shows the unique way in which Thai schools adopt their professional learning practices, and these are helpfully represented within the following attributes, as suggested by Mahimuang (2018). This Thai model of professional learning practices is also visually illustrated in Figure 1 at the end of the section:

- Shared vision: School management, teachers, and superintendents have the same vision and direction for professional learning, showing the rationale for introducing PLC. Meesuk and colleagues (2021) suggest that it is essential to view PLC as problem-solving and learning rather than simply following directives from school leadership.
- Teamwork: School members with the same goal and commitment are cooperative in gathering for learning, exchanging ideas, and improving their work performance. Teamwork is not perceived as teachers working together but

also includes stakeholders. Chananil and Nerttanomsak (2022) and Kanawapee and colleagues (2022) note that stakeholders such as superintendents and principals, especially those who may not be physically present in the PLC meetings, have to provide continuous academic support and empower teachers to participate in the PLC process.

- Shared leadership: This involves a collaborative approach where multiple individuals share responsibility for decision-making and leadership. Shared leadership in PLC aims to foster a sense of ownership, collective responsibility, and commitment among all members (DuFour and DuFour 2013). Despite the hierarchical environment, all members should take the initiative and contribute to the community's goals based on their strengths, as shared leadership cannot empower members without also promoting distributed leadership and autonomy. Distributed leadership leverages diverse skills among school members, encourages the learning processes to become more innovative and creative, and overcomes the strong hierarchy, regardless of their positions (Harris and Spillane 2013).
- Professional learning: It is vital to diversify problems in breadth and depth in the PLC meeting, allowing teachers to share their experiences from different perspectives and present evidence related to specific issues (Chananil and Nerttanomsak 2022; Meesuk et al. 2021; Kanawapee et al. 2022). Reflecting on the issue by using their experiences could help teachers to customise innovative and practical ways to directly improve their working routines and professional and personal development.

  As well as developing teaching skills, professional learning should also expand to develop other skills, for example, so-called 'soft' skills, such as empathy, listening, respect, critical thinking, and reflective thinking (ibid.). These are important skills for improving the PLC discussion to further learn professionally. Nonetheless, cultures of saving face[8] tend to obstruct the process of learning and develop such soft skills. Teachers tend to say things indirectly, which makes it

[8] Goffman (1967) defines face as "the positive social value a person effectively claims for himself by the line others assume he has taken during a particular contact" (p. 5). The concept of "face" takes on a significant role in demonstrating politeness and giving respect in social interactions in Thailand, in that Thai people consider the maintaining of another's face as being the sign of politeness (Ukosakul 2008).

difficult to provide critical, constructive feedback in meetings (Chananil and Nerttanomsak 2022). These conditions limit them from critically examining the real problem for the PLC meeting and obstruct a collaborative and amicable environment (ibid.).

- Community of Kalyānamitta (caring or amicable community): A climate of openness, trust and respect fosters the exchanging of ideas and allows teachers' interdependency to promote PLC. According to Buddhism, Kalyānamitta is an external source to inspire and draw a friend to the way of enlightenment (Khienwong 2015). Similar to the philosophies of Immanuel Kant, moral friendship can be defined as a friendship of communion, open-hearted communication, and self-disclosure (Van Impe 2011, p. 131). These western and eastern concepts seem to share common characteristics that can be described as a kind person. However, in the Buddhist concept, friendship can be a relationship between a master and a novice; this directly shows the distance between friends needed to maintain respect (Khienwong 2015). Thai norms, especially Kreng-jai (being considerate) and Hai-kaid (respect), also shape teachers' collaboration in ways that follow these ideals, for example, juniors tend to be passive by taking on listening roles, while seniors actively dominate the conversation in the PLC activities.

  Tanyarattanasrisakul (2017) states that such norms are challenging for developing their caring community, which is a fundamental element of promoting shared vision and values and collective leadership among PLC members. With and without consideration of hierarchy, a PLC for Thai teachers is expected to function as both a learning environment and a social support group with opportunities to be heard and supported, while actively engaging in learning. Consequently, storytelling and empowerment are used in Thai PLCs to make members feel safe, trusted, sa-nook (means happy) and, more importantly, to shorten the strong hierarchical distance (Pumma 2021).
- Structure for PLC: Factors such as time, place, materials and supplies, group size, information and data, communication, and friendliness and relaxation should be addressed. It is essential to mutually set up the PLC goal to reflect on past performance and prepare for the upcoming academic year or, more importantly, align with the set schedule, whether one hour after school on

weekdays to maintain ongoing dialogue for progress, or a longer session during a school break. However, formality and structure should not be conveyed in PLC conversations; the PLC should be less formal and structured to maintain fruitful discussion (Chananil and Nerttanomsak 2022; Meesuk et al. 2021; Kanawapee et al. 2022).

- Knowledge management: This process involves exchanging, sharing, reviewing, and reflecting on school members' working experiences and performance for improvement (Suwapanit 2024). Reflective professional inquiry generates and circulates knowledge and feedback for teachers' professional learning (Pumma 2021). Although its implementation in Thai PLC mainly focuses on teachers reflecting upon something, it is important to recognise the interconnection with things beyond lesson plans, especially materialities that are invisible, such as cultural norms, power dynamics, and institutional structures. This PLC interaction does not only produce the representational knowledge on lesson plans and tangible techniques but also, and most importantly, the different forms of knowledge that are affected by teachers' learning in an ongoing process.

  PLC is interpreted differently in each school, leading to a diverse set of results for each PLC, and these encompass teachers changing their teaching practices, their personal learning of soft skills, and students' learning. Pedagogically, Chananil and Nerttanomsak (2022) illustrate that long-term results cannot be guaranteed because teachers may learn about new teaching practices without implementation in classrooms (Apiparinya and Sudrung 2019). Thus, it is important to establish a process to monitor and witness teachers' authentic learning (Chananil and Nerttanomsak 2022), along with the flow of bringing this information to the PLC. Having a quality loop within knowledge management structures helps teachers to review their improved teaching practices and increases the chance of successful classroom implementations and the circulation of hands-on experiences among teachers.

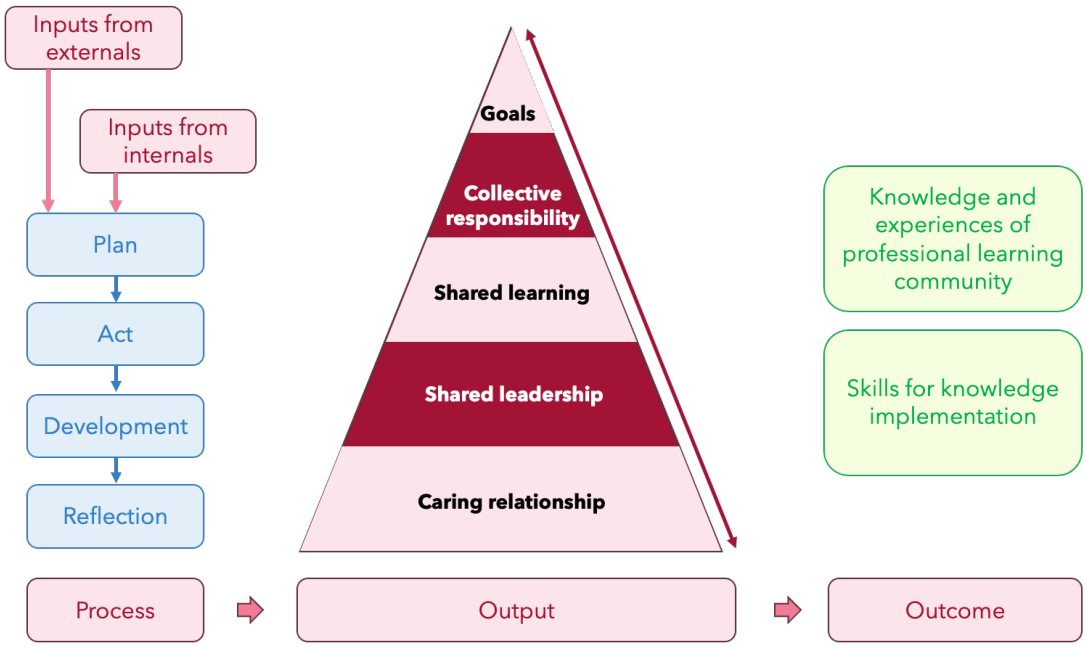


Figure 1: Thai Practical Model of PLC

Considering the model above, although the elements rely on goals and materials, we can see the emphasis on human contributions to plan, act, develop, and reflect. This can be understood as teacher agency playing the main role in PLCs, however Watson (2014) critiques the assumption that PLCs automatically foster teacher agency, especially in environments shaped by strong cultural norms. In Thai schools, where *Kreng-jai* and seniority influence participation, the potential of PLCs must be negotiated. This would make the goals, collective responsibility, shared learning and leadership become the effect of actors' negotiation. Based on this initial understanding, this research will further provide a discussion about agency within and among the professional learning community.

2.4 Epilogue and overflow

I started this chapter by providing an overview of the teaching profession and what teachers do, and discussing why professional learning matters. Because of the demand for continuous improvement and constant uncertainty in the classroom world, this environment requires that teachers are committed in continuous professional learning, which was explained through the terms of professional development and professional learning. However, professional learning is more extensive in that it is enacted in ways that involve how the nature of teacher learning is embedded into their routines, not

delivered in one-shot events. Later in the thesis, I explore how teachers learn through co-constituted and sociomaterial processes, demonstrated by the nature of professional learning.

Providing tangible examples, I chose the two professional learning models which similarly underpin enquiry-based, recursive, and collaborative approaches. Singapore's practice is conducted as a research enquiry, whereas the Thai model often promotes culturally-embedded community learning practices. The differences are not just in the detail of the implementation, but also involve invisible actors, such as culture and social norms. Despite this, both settings have the same focus in that teachers' learning and teaching practices are interconnected and relate to the improvement of their work and pupils' learning.

Together, the background provided in Chapter 1, and the exploration of the concept of teacher professional learning in this chapter, have holistically mapped the research landscape in which this thesis is situated. In the next section of the thesis, the assemblage of my research approach, conceptualisations of sociomateriality, and the sensibilities of actor-network theory will be discussed in relation to exploring professional learning practices in Chapter 3, and the Interview Toolkit as methodology will be described in Chapter 4.

Chapter 3 Sociomateriality and Actor-network Theory

This chapter introduces the concept of sociomateriality and actor-network theory (ANT) and describes how these concepts are situated in this study. First, the sociomaterial approach is presented with a focus on networks and relevance to ANT. Then, the chapter moves on to describe ANT conceptualisations regarding its principles, sensibilities, and understandings of translation. Finally, teachers' work and professional learning practices are described through ANT sensibilities.

3.1 Sociomateriality

Sociomateriality is a fusion of the social and materiality (Leonardi 2012). Social refers to symbols, meaning, desires, fear, and cultural discourse, whereas materiality is not a synonym for the physical (Moura and Bispo 2020), but instead refers to all the things surrounding us, either organic or inorganic, animate or inanimate, technological or natural (Fenwick 2014a). Both terms should be considered as being inseparably bound parts of reality fused in everyday practices through sociomaterial sensibilities (Orlikowski 2007).

In organisational practices, it is observable that materials are involved in a wide range of organisational matters, from the visible, such as meetings, rooms, and equipment, to the invisible, such as electricity networks, WIFI, and cloud storage (Orlikowski 2007). Coole and Frost (2010) respond to the notion that, admittedly, materiality shapes everyday life and human existence, whether to produce, reproduce, or modify conditions of daily life, so the concept of agency is thereby considered along with materials that perform, and are performed, through their interactions among humans. Latour (2015) adds to this point that intention is what differentiates nonhumans from humans. Although sociomateriality seems to be post-human oriented, it is not an "anti-human" post-humanism concept; as Fenwick et al. (2011) argue, it rejects the view that nature stands apart from humans and challenges the notion that learning is situated only in the human brain "as the primary trajectory of learning and change" (p. 166). Fenwick (2015) agrees that the sociomaterial approach may stem from different roots, but suggests that there are common concepts:

1) Dynamic interaction between human activity and nonhuman features builds and modifies daily practices;
2) Sociomaterial matters, namely technical, natural, and cognitive elements, heterogeneously unite and;
3) Humans and nonhumans are perceived as effects of connections and activities, performing according to existing webs of relationships.

Four theories can be considered under the umbrella of the sociomaterial approach: actor-network theory (ANT), cultural-historical activity theory (CHAT), and complexity theory, as these theories do not capture humans by their intentions or consciousness but instead investigate how knowledge, knower, and known, which are representation, subjects, and objects, respectively, emerge and assemble in activity (Fenwick 2015). In addition to these four theories suggested by Fenwick (2015), Moura and Bispo (2020) propose several further approaches that are also considered to be sociomaterial: organisational aesthetics, science and technology studies (STS), ANTI-History, and new materialism. Despite this array of possibilities, this study intends to view professional learning practices from the ANT perspective.

3.2 Actor-network Theory (ANT)

Actor-network theory (ANT) originated in the field of Science and Technology Studies (STS), proposed by Bruno Latour, John Law, and Michael Callon (Moura and Bispo 2020) in the late 1970s to the 1980s. From the 1990s onwards, ANT has been widely used as an analytical tool in medicine, public health, economics, digital humanities, new sociologies, and management and organisational studies (Thompson 2015). In adult education and lifelong learning, ANT is prominent in educational issues such as literacy, digital pedagogy, professional education, and policy (ibid.), employing central notions such as translation, generalised symmetry, and the heterogeneous network.

The social sciences, up until the 1990s, had traditionally focused largely on the individual, which may not extensively explain the words ‘social’ and ‘science’, particularly as, when used together, the term becomes a more complex and dynamic understanding of how individuals are embedded in webs of relations and interactions (Borgatti et al. 2009). As Ritzer (2011) argues, any attempt to explain social changes through a specific chain of causality reduces their scope to either social or material

elements. Adopting an ANT approach avoids the binary oppositions of agency/structure that pervaded the traditional social sciences approach (Ritzer 2011). Similarly, Vicsek et al. (2016) illustrate how, traditionally, science practices (including the social sciences) that aim to produce "scientific facts" that are "purely scientific" (p. 79) do not acknowledge that these practices are messy, arguing how "all kinds of different forces and effects (social, political, financial, etc.) shape and construct these entities before they reach their 'final' form" (ibid.). Rather than thinking of society as a fixed entity with a set of categories, Latour (2005) argues that the notion of society has now become perceived as a social context where plenty of activities occur, including those taken-for-granted, uninvestigated black boxes, and the hidden nature of humans and nonhumans.

Therefore, the notion of 'actor' here is not to play the role of agency and the notion of 'network' to play the role of society (Latour 1999a). Instead, as in the nature of light, they can be conceptualised in the same way in which we understand waves and particles, in that they cannot be thought of as independent, isolated elements of an actor-network; that "the social is a certain type of circulation that can travel endlessly without ever encountering either the micro-level … or the macro-level" (Latour 1999a, p. 19). As such, for ANT, the concepts of actor and network cannot be understood and utilised independently (Latour 1996a). The concepts of actor, network, and actor-network will be discussed in turn below to clarify how each term is conceptualised and understood throughout this thesis.

Actor

In terms of actors, ANT considers both humans and nonhumans equally as actors in an actor-network, promoting a form of symmetry. This does not mean that ANT is "the establishment of some sort of 'absurd symmetry between humans and nonhumans'" (Latour 2005, p. 76). Instead, as Latour (2005) and Law (2004) argue, adopting a methodological approach that does not prioritise one over the other allows a researcher to overcome the asymmetry inherent in the traditional production of scientific knowledge. This means that ANT allows us to reject the "methodological symmetry" (Law 2004, p. 102) inherent in such knowledge production to instead understand that knowledge is mobilised "in the course of interactions between different actors" (ibid.). For Latour (1996a),

> *An actor in ANT is a semiotic definition – an actant – that is, something that acts or to which activity is granted by others. It implies no special motivation of human individual actors, nor of humans in general. An actant can literally be anything provided it is granted to be the source of an action.* (p. 373)

There are no actors without actions, relations, influences, and impacts (Richardson 2019). More importantly, actors are not defined as being only stable sets of relationships because relations develop dynamically and shape and reshape the actors to recursively define their characteristics in multiple contexts (Cordella and Shaikh 2003). The idea of society, in considering all of the physical surfaces, territories, and settings of reality, is thereby transformed into a form of circulation.

Network

The concept of a network, within an ANT understanding, is not as simple as the lines linking train stations on a rail map (Richardson 2019). Instead, as Latour (1999a) explains, the network concept, on its own, and particularly with the pervasion of the world wide web, has lost any cutting edge innovation, signifying "transport without deformation, an instantaneous, unmediated access to every piece of information" (p. 15). Latour (1999a) regrets his use of the word 'network' in developing a new way of "understanding the series of transformations – translations, transductions – which could not be captured by any of the traditional terms of social theory" (p. 15), as this new understanding of the idea of a 'network' betrays the move to understand these transformations as dynamic circulations, beyond rigid understandings of institutions, society, and nations. By introducing the idea of transformation through processes of translation and transduction, Latour (2005) suggests that, through our sociomaterial relations, things (human and nonhuman) that form (and are formed by) networks are not simply connected but are also mediated by (and mediate) each other. This significantly opens up the perspective that there is no macro-structure and micro-interaction, but instead that the micro and macro are local effects that circulate (and are circulated by) actors (ibid.). While actants are effects of relationships in a network, Elder-Vass (2015) defines a network as an assemblage of human and nonhuman entities, which Mitchell (2021) further explains are held together through ongoing work to produce even more

entities, environments and knowledge. This shows that actors and actor-networks are naturally embedded in open ranges of relationships, as part of the network, where complexity, power, and actor-networks emerge (Cordella and Shaikh 2003; Dwiartama and Rosin 2014).

Dwiartama and Rosin (2014) suggest that adopting an ANT approach demands that we "shift our perspective from system-based (emphasizing the emergence of stable patterns and self-regulating mechanisms) to network-based (focusing on contingency as part of the equation)" (p. 5). This allows us to embrace what Law (2004) calls the 'messiness' of social science research, to capture the complexity of these contingent entities within the actor-networks that form relations and in "free and random combinations with others and fluidly flow across all directions" (Dwiartama and Rosin 2014, p. 4). This provides an alternative way to understand the notion of 'network', not as a system of connections, but as a larger assemblage of entities that "engage in free and random combinations with others and fluidly flow across all directions" (ibid., p. 4), contingent on the relationships that are shaped with other entities in what might be understood as an actor-network.

Actor-network

Callon (1986a) defines an actor-network as being "distinguished from a simple network because its elements are both heterogeneous and are mutually defined in the course of their association" (p. 32). The hyphen in actor-network refers to the symbiotic link between the actor and the network (Richardson 2019). However, the hyphen is not a pointer to the interactions between the social actors and the system, nor to occupy a position in the agency/structure debate, not even to overcome this contradiction (Venturini et al. 2019). The actor-network, made visible through actor associations, consists of tenuous connections that "shuttle back and forth" between actors even though their realities may be separate (Latour 1993, p. 3). Latour (2005, p. 169) describes the 'actor-network' as "at one the actor and the network in which it is embedded". This can be understood as a tension, as Law (1999a, p. 5) describes, "a tension which lies between the centred 'actor' on the one hand and the decentred 'network' on the other", or, as Michael (2017) suggests, an actor-network emerges during a process of alignment between an array of heterogeneous elements, "entailing the circulation of materials … that serve in the (partial) enrolment of elements into the

relevant … roles" (p. 154). Therefore, as Callon (1987) proposes, "an actor-network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of" (p. 93). In other words, "an actor-network is both an actor (which networks) and a network (which can act)" (Thompson 2015, p. 5).

As Ireland (2019) suggests, unlike traditional social theories, ANT is more interested in exploring how actor-networks form, hold themselves together, or fall apart, by granting equal importance to individual actors, collective agents, objects, established practices, and invisible effects. Flows within and between the actors and the actor-network can be understood as a series of transformations, whether translation or transduction (Law 1999b). Thus, ANT is not a theory in the sense of social networks to generally explain why something happens, but ANT is instead descriptive, telling stories about 'how' flows or relations assemble or do not. This would therefore disappoint those looking for strong accounts and generalisation (Law 2007a).

ANT serves to understand such flexibility as it is diversely described as a theory, approach, method, sensibility, and toolkit (Thompson 2015). ANT seeks to understand how actors – anything/anyone that acts upon others (Law 1984) – are brought together in a stable and heterogeneous network aligned with the goals of the network (González 2013), through the material-semiotic approaches to map material (between things) and semiotic (between concepts) relations (Law 2019). ANT sensibilities perceive semiotics as being broader than language, including all of the components of the network without prioritising some over others (Ireland 2019). ANT is also more dynamic than traditional social science methodologies in that it provides an understanding of the world's *being* and *becoming* by seeing how actors, networks, and nodes are not fixed but are instead constantly evolving.

In different networks, the actor's role, whether to manipulate, influence, convince, etc., tends to differ from one practice to another, in which reality multiplies. Mol (2002) uses the example of the body, the patient, the disease, the doctor, the technician, and the technology to illustrate this concept; all of these actors, together, are more than one, more than singular. The big question to respond to would be how they are related. Mol (2002) argues how different actors experience and enact multiple realities; therefore, attending to these multiple realities opens up the possibility of investigating the

network's effects, as they result from actors assembling in networks of connections and associations.

Thus, ANT portrays a nuanced picture of the dynamic relationship between other actors while accounting for their interrelatedness. McLean and Hassard (2004) provide a technical explanation that ANT's main idea is to investigate and articulate how networks emerge, to trace what relations exist, how they move, how actors join a network, how parts of a network form a whole network, and how networks achieve temporary stability. While entities are transformed by other actors in the network via their connections and associations, networks are traced, whether at the micro or macro level, how they come to be implemented, and what work keeps them together in the face of blockages and network disconnections (McLean and Hassard 2004). Law (1992) concisely describes the proposition of ANT:

> *The core of the actor-network approach concerns with how actors and organisations mobilise, juxtapose, and hold together the bits and pieces out of which they are composed; how they are sometimes able to prevent those bits and pieces from following their own inclinations and making off; and how they manage; as a result, to conceal for a time the process of translation itself and so turn a network from a heterogeneous set of bits and pieces each with its own inclinations, into something that passes as a punctualised actor.* (p. 6)

This suggests that the basic idea of ANT is to understand how actors – both human and nonhuman – are brought together in stable, heterogeneous networks of aligned interests (Law 1992). Various qualitative methods have been adopted to tell such a story with ANT, particularly studies that include participant observations, interviews and narrative, and these are situated within an ethnographic tradition; however, it is rare to include quantitative methods (Fenwick and Nimmo 2015). These qualitative methods will be used to track a specific material's situation details, sites, times, activities, practices and so on, allowing for the verification of understandings about how things appear, become, and affect one another (Fenwick and Edwards 2010), without taking any actors for granted (Cresswell et al. 2010). The methodological possibilities also include narrative, auto-ethnography, and multi-sited ethnography (Hine 2007) by following the actor and

mapping its associated paths, mechanisms and effects (Broad 2013) through interviews (Fenwick and Nimmo 2015), observations (Nicolini 2009a), and the use of film, photos, and archives (Moura and Bispo 2020).

3.2.1 ANT Principles

To employ an ANT analysis, it is necessary to embed the three principles of agnosticism, generalised symmetry, and free association (Latour 1987; Callon 1986b). First, the principle of '*agnosticism*' recommends that the actor-network explorer needs to be impartial, should not favour any interpretations, and should not take pre-existing conditions into consideration (González 2013) nor make definitive claims about the nature of reality. ANT differs from constructivist approaches because it is agnostic in neither asserting that everything is socially constructed as social constructionism does, nor that everything is pre-existent as realism does (Cresswell et al. 2010). Although such pre-existing conditions are unavoidable as they possess power in their own right, they can be treated as actors in an assemblage. As such, ANT allows us to understand actors as being "a patterned network of heterogeneous relations, or an effect produced by such a network" (Law 1992, p. 4). This means that ANT also avoids privileging any one sort of actor and instead accepts the diversity of actors, including humans, objects, and technologies. Besides avoiding pre-existing conditions, it is also necessary to systematically avoid censoring any interpretations provided by the actors being studied when they speak about themselves or other actors (Callon 1986b), while also respecting any disagreements (Law 1986a).

Secondly, the idea of 'generalised symmetry' uses a single explanatory frame to follow actants, whether humans or nonhumans. Both should be analysed on the same terms, without making any discrimination (Callon 1986b; Law 1987), as they are all actors, enrolled in a network, with the same power and agency to shape and be shaped by each other (Latour 2005) to construct actor-networks in their relations (Latour 1987). This aspect leads to the concept of generalised symmetry (Callon 1986b).

Generalised symmetry can be understood as a means of challenging the assumption that human actors should be explained in terms that differ from those that describe the material actors. As Law (2004, p. 102) explains,

> *Investigations should offer the same kinds of explanations for events in the natural and in the social worlds. The argument is that since both nature and culture are being produced together and in the same process, it is unsatisfactorily asymmetrical to assume that (say) nature has a particular and distinctive form, and there fore needs to be explained in terms that are different to those of the social.*

However, how ANT defines actors is still radical and controversial as there is no distinction made between humans and nonhumans (Van House 2003), particularly as the definition of agency is broad beyond human intentionality. However, from a symmetrical perspective, Michael (2012) explains that agency in ANT is distributed, pluralised, and contingent. Therefore, it is "anything that does modify a state of affairs by making a difference" (Latour 2005, p. 71). Consequently, to respond to this notion, human and nonhuman actors need to be able to take action so that actors can be anyone or anything (Law 1986b), as they can circulate forces to get things done in the network (Fenwick and Edwards 2011).

Third, in relation to the concept of '*free association*', ANT also abandons the distinction between natural and social phenomena and all prior relationships between humans and nonhumans (Callon 1986b). As ANT researchers, the concern is "to map the way in which they [actors] define and distribute roles, and mobilize or invent others to play these roles" rather than being concerned with mapping interactions among individuals (Law and Callon 1988, p. 285). Association among heterogeneous actors can be proposed and attempted, failures or successes; this describes how networks become larger and more durable through enrolling social and material actors, and where power comes from and is exerted (Cressman 2009). Therefore, association in an ANT approach can fluctuate (González 2013), including relations and effects that may not be linear and causal but are instead produced from associations among actor-networks (Cresswell et al. 2010). As Law (1992) notes:

> *It is important not to start out assuming whatever we wish to explain … we might start with interaction and assume that interaction is all that there is. Then we might ask how some kind of interactions more or less succeed in stabilising and reproducing themselves: how it is that they overcome resistance and seem to become 'macro-social'.* (p. 380)

Association and heterogenous networks show that "everything – people, organization, technologies, natures, politics, social order(s) – are result, or effect, of heterogenous networks" (Cressman 2009, p. 4), which leads to two consequences. First, any form of social ordering is the effect of the association; even humans can be the effect. Therefore, as Cressman (2009) argues, "there are no essences, only heterogeneous networks" (p. 5). Second, ANT rejects the concept of dualism by removing the distinction between entities without dismissing them. It is assumed that things have no inherent qualities, whether true or false, large or small, agency or structure, human or nonhuman, before or after, knowledge or power, material or social, activity and passivity (Law 1999a, p. 3). Cressman (2009) provides an example, describing how, when we start from a statement such as "organisation X is a powerful and influential actor, we begin to impart a difference between it and other networks, thus implying an essential characteristic that is static" (p. 5). Cressman (2009) concludes that size, power, and influences are effects that are performed by other actors, not permanent conditions. As such, enrolling an ANT approach signifies "to study the connections between heterogeneous actors enrolled within a network" (ibid.). Subjects, objects, agencies, and actions that emerge from particular networks through the co-emergence of entities are also effects (Fenwick and Edwards 2010). Using the association concept opens up possibilities for researchers to see the emergence of these entities through the enactment of diverse forms of association as network effects (ibid.). This might be considered a form of resistance to normative modes of knowledge production. For the ANT researcher who wishes to oppose this, the challenge is to practise the idea of generalised symmetry while being agnostic, because "censoring interpretations can hide an in-depth understanding of the network under investigation" (González 2013, p. 52).

3.2.2 ANT Sensibilities

Among ANT believers, most refuse to call it a theory, although ANT also offers an explanatory frame because ANT thinking is moving, shrinking, stretching, and dissolving in any effort to make it firm and static (Fenwick and Edwards 2011). Therefore, the application of ANT is more like a way to sense and draw a phenomenon rather than being a theoretical device (ibid.). ANT sensibilities – performativity, fluidity, multiplicity – serve as effective grounds for practice exploration and understanding. The collective nature of ANT is a means to support researchers in employing the sensibilities of ANT to develop profound awareness of the relations and powers in any networks

explored (Callon 2007), especially those with difficult ambivalent situations, messes, multiplicities, and contradictions embedded in a phenomenon (Fenwick and Edwards 2010). Ireland (2019) explains that ANT sensibilities, combined with a researcher's capacity to perceive, and an acknowledgement that they form part of the assemblage, helps researchers to actively engage in these multiple realities within the context of the complex and dynamic world of practices.

3.2.2.1 Performativity

Drawing from science and technology studies, post-structuralism and material semiotics insights, ANT is accepted for its "commitment to practice and the stuff of the world" (Law 2008b, p. 643). Instead of asking why things happen, the ANT researcher asks "how they occur; how they arrange themselves" (Law 2008b, p. 632). ANT theorists use the term 'performativity' to accentuate practices, to indicate that reality is brought into being through practices (Mulcahy 2011). Within these practices, actors are perpetually in action and, as a consequence, in a continuous state of mutation, which represents the characteristics of the performativity of actor-networks, where actors perform in, by, and through relations (Law 1999a). As such, performativity does not exist outside its doing in diverse and different practices. Law (2009, p. 1) continues:

> *If we think performatively, then reality is not assumed to be independent, prior, definite, singular or coherent … If reality appears (as it usually does) to be independent, prior, definite, singular or coherent, then this is because it is being done that way … Practices enact realities … This means that if we want to understand how realities are done or to explore their politics, then we have to attend carefully to practice and ask how they work.*

Through ANT sensibilities, practices are noticeable and ordered sets of material-semiotic relations. Studying practices with the sense of performativity then focuses on the analytical and empirical task of exploring possible patterns of relations and how they become assembled in particular locations. Law (2008a) illustrates how material semiotics allow us to explore the enactment of multiple realities as they are being assembled, materially, and semiotically, or the *ontological*. Furthermore, and more importantly for my research, Law (2008a) also illustrates how they help to describe the

mobilisation of knowledge, or the *epistemological*. Watson and Huntington (2008) agree, suggesting that "to describe the practice is to describe the making of an assemblage to achieve its interest performatively" (p. 263). Greenhough (2011) proposes these essential guiding questions for the exploration of learning practices through these performative sensibilities: 1) what needs to be assembled for learning to manifest, and 2) what forms of learning assemblage – patterns of learning relations – emerge from these 'needs'? Together, these sensitivities guided my own exploration of professional learning practices.

Performativity in material practices, if understood as a narrative, is a useful way to make enactments visible in understanding how individuals perform teaching and learning (Ireland 2019). Mulcahy (2016) also describes performative practices in professional learning – that, in this conceptualisation, attention is not only given to what professional learning is, but also what it does – the effects it creates. ANT renders the cooperation of sociality and materiality in learning and sees humans and nonhumans at once. Therefore, thinking performatively could dissolve dichotomies such as professional knowing (education) and doing (work) to make them visible and shed light on constitutive roles of what is unrecognised (ibid.). In this way, as Mol (1999) suggests, "we can examine how this reality is done and enacted rather than observed" (p. 77).

3.2.2.2 Fluidity and Multiplicity sensibilities

ANT sensibilities embrace the messy practices of relationality and materiality of the world. As Law (2007b, p. 2) notes:

> *The actor-network approach thus describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects, subjects, human beings, machines, animals, 'nature', ideas, organisations, inequalities, scale and sizes, and geographical arrangements.*

The notion of performativity moves to fluidity and multiplicity, as the materials form a larger association, engaging in free and random combinations with others and fluidly flowing across all directions (Dwiartama and Rosin 2014). Müller and Schurr (2016) raise the point that, within an actor-network, attuning to fluidity and flow leads to

change without rupture, but assemblage thinking can expand greater openness towards the random and unpredictable phenomena studied. The similar aspects between assemblage and actor-network are a relational view of the world, in that action emerges from linking together initially disparate elements, specifically the sociomaterial association of humans and nonhumans, and a view of space that distance demonstrates the intensity of a relation (ibid.). Law (2009, p. 147) indicates that they are "almost the same", but, in contrast, Harman (2009) argues that they are "irreconcilable opposites", citing how Latour, before 1999, asserted that "actors are always so specifically deployed with various accidental qualities and outward-bound relations that they cannot survive changes in these qualities and relations" (Harman 2007, p. 30, cited in Müller and Schurr 2016). Nevertheless, many after-ANT works tend to promote such understanding of the network in a more fluid and rhizomatic way (Ireland 2019). This shows how well aligned the concepts of actor-network and rhizomatic assemblage could be.

When ANT made the significant turn to more ephemeral forms of relations through fluidities and multiplicities in the 1990s, the concept of actor-network become much closer to assemblage thinking as they are cross-fertilisations in some ways and directions more than in others (Müller and Schurr 2016). Mol and Law (1994) offer fluidity as an alternative metaphor to the network. Entities move in and out of the network, and new relations may be formed, and existing ones may be cut. As Müller and Schurr (2016) suggest, instead of disrupting the whole network, this fluidity transforms only the resultant actor. Such ordering shows that flow is not static and, more importantly, varies in time and space. Thus, space is part of the relations that constitute the network with fluid attributes (Vandeventer 2019). Mol (2002) argues that, regardless of the ins and outs of the network, it is unnecessary to mark boundaries because they are constantly moving and re-constituting and, as such, are not fully part of a physical network.

As suggested above, just as the two concepts of actor-network and assemblage are aligned, so does the fluidity concept align with the idea of 'rhizomic structure' suggested by Deleuze and Guattari (1987), showing that the complexities of the network can never be composed of a closed system. An assemblage can be understood as a complex tangle of natural, technological, human and nonhuman elements or actants that

come together and can produce expected and unexpected outcomes in everyday life (MacLeod et al. 2019). As Deleuze and Guattari (1987, p. 23) suggest:

> *An assemblage, in its multiplicity, necessarily acts on semiotic flows, material flows and social flows simultaneously (independently of any recapitulation that may be made of it in a scientific or theoretical corpus).*

An assemblage operates non-hierarchically, like a system of plants, while each actor or network responds by reacting to other changing systems to align in the environment (Colebrook 2002). As Deleuze and Parnet (2007) state, "it is never filiations which are important but alliances, alloys; these are not successions, lines of descent, but contagions, epidemics, the wind" (p. 69). While unpredictability is unravelled within an assemblage, "an assemblage is precisely this increase in the dimensions of a multiplicity that necessarily changes in nature as it expands its connections" (Deleuze and Guattari 1987, p. 8).

Vandeventer (2019) further builds on the Deleuzian notions of 'assemblage' and 'rhizome' as 'rhizomatic assemblage', which could metaphorically explain the thinking about the constitutiveness of the network in multiple and fluid ways. The way actors do so is to form connections with each other continuously, leading to the establishment of bonds within fluid space to cause other actors to become unstable (Mol 2002). Any entities, whether knives, questions, forms, files, technicians, etc., none of these are static, but each has a similar character to the fluid roles of a surgeon, which appear to be multiple, as Mol (2002, p. 143) describes:

> *The surgeon enacting atherosclerosis as "pain on walking" may have the same face, voice, and name tag as the surgeon who "scrapes a thick intima out of an artery." But they differ. While the first is a talker, the second is a cutter. A single person may be capable of shifting from one repertoire (talking) to the other (cutting). The repertoires, in their turn, with all the materialities they involve, are capable of shifting the locally enacted identity of the surgeon.*

Multiple connections (and multiple roles) assign each other and collaboratively form an assemblage, which could produce both expected and unexpected effects (Vandeventer 2019). ANT sensibilities, particularly when combined with notions of fluidity and multiplicity, enrich thinking by making visible practices of stabilisation, change and affect, with an explicitly spatial account in which assemblages are drawn together to reach across space and are stabilised. In contrast, assemblage thinking describes change as a form of rupture, or events, while embracing the concept of fluidity (Müller and Schurr 2016). Using such concepts to think about teachers' professional learning ideas allowed me to explore the roles of teachers between teaching and learning and the tension between stabilisation and change in their professional learning journey.

3.3 Translation

In embracing ANT sensibilities to see these flows in the network, the concept of translation in ANT can reveal encapsulated events that explain either the success or failure of any change attempts (Carroll 2018), as noticing translations, or how actors are mediated, allows us to trace all of the negotiations and their effects (Fenwick and Edwards 2011). Thompson (2015) states that translation is a powerful ANT concept that helps researchers explore how assemblages come to be and how actors react with others, whether in a willing, pressured, or unknowingly way, along the way when an assemblage becomes disassembled or reassembled.

Translation can also be understood as the process of forming identities and conditions and characterising representations by converting and substituting entities, and black-boxing by simplifying or retaining differences (Ritzer 2004). However, these mediations, modifications and conversions, as with linguistic translation, can be seen as both a powerful mobiliser and as a form of betrayal, depending on how actors assemble and relate to each other. The enactment of translation in ANT terms reveals its arbitrary nature. As Ritzer (2004) describes, "translation is both a practice (making equivalent) and an outcome (both realized effects and the displacement of alternative possibilities) (p. 2). Fenwick's (2010b) conceptualisation of the translation process reveals how it requires micro-negotiations among actors to work, to shape, and to link interconnected activities. 'Translation' describes what happens when entities connect, transforming each other as they form links, particularly when looking at the micro-connections formed by heterogenous elements (Latour 2005; Fenwick and Edwards 2010). Due to its

dynamic characteristics, we can understand that translation is not permanent. Law (1992, pp. 5–6) also describes how "translation is a verb which implies transformation and the possibility of equivalence, the possibility that one thing (for example, an actor) may stand for another (for instance, a network)". Silva (2019) perceives such movement as displacement, which is the process of ordering struggle in actors to gain support, reorganise connections, and shape networks. Power is then generated in a relational and distributed manner through ordering, negotiation, and persuasion action. As a relational effect, translation produces society and agency, nature and machines, as well as knowledge and knowing. This means that the sensibility of translation is useful for exploring actor-networks where entities assemble to produce knowledge (Ritzer 2004).

Callon (1986b) proposes that translation involves four interconnected translation moments: problematisation, interessement, enrolment, and mobilisation, as illustrated in Figure 2 below. Although the diagram seems to represent a one-way process, Hernes (2010) emphasises that these moments "represent transitions in time whereby the representations of actors in relation to the network, change" (p. 169). Because the processes and outcomes of translation are constantly negotiating, and being negotiated by, the introduction of multiple entities, the effects sometimes become stable and continue, while others are weakened and disappear. As Callon (1986b) suggests, in the process of translation, an entity, as a form of problematisation, is introduced by certain actors and subject to negotiation, and "subsequently weakened, confirmed or transformed" (p. 25), and thus, translations are not achieved through a linear process.

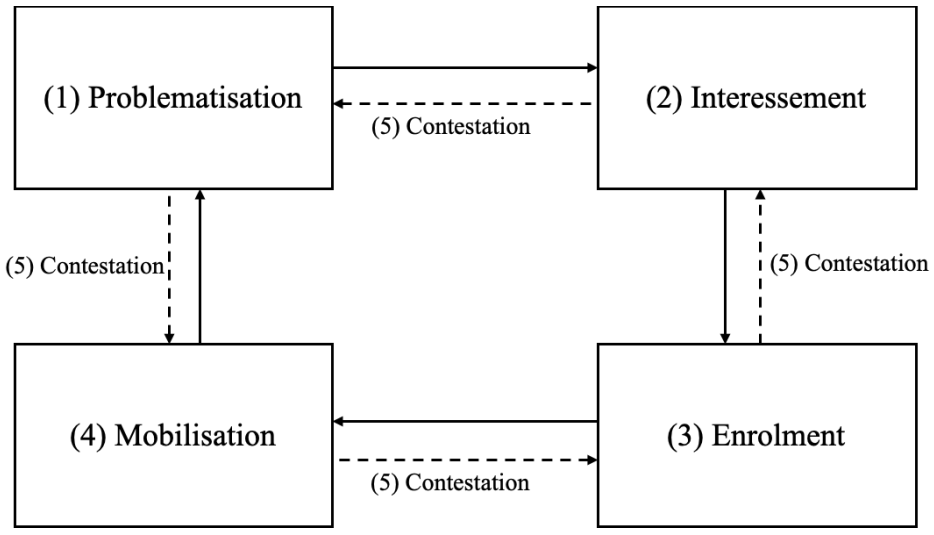


Figure 2: Four moments of translation and contestation (modified from Callon 1986b)

Wæraas and Nielsen (2016) and Silva (2019) offer some helpful discussion on Callon's (1986a, 1986b) concept of translation. They describe how the translation process begins with 'problematisation', when actors offer problem statements and delegate themselves as the focal and obligatory passage point (OPP) of the network. The OPP comprises not only the problem defined by the focal actors in their own terms, but also needs to be made indispensable (Callon 1986b), persuading other actors to resolve their problems by passing through the OPP (Law 1986a). Before passing through the OPP, however, they first need to modify their current interests to align them with those of the controlling actor, in what is termed 'interessement' (Rivera and Cox 2016).

Thus, the second moment is interessement – a French-English word, a synonym for 'interposition' – which occurs when the focal actor corresponds with others to motivate them to agree with its proposal (Callon 1986b). Some targeted actors might define their identities so that they prioritise other elements that do not align with the network; therefore, controlling actors need to use various strategies and tactics to achieve successful interest, including isolating those that may challenge the legitimacy of the OPP (Sarker and Sidorova 2006).

The enrolment moment occurs as an immediate result of successful interessement (Callon 1986b). The enrolment process is about "negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed" (Callon 1986b, p. 211). Negotiations need to take place between controlling actors exercising what is proposed in the OPP with the actors targeted, as well as with those actors who potentially obstruct the network stability (Rivera and Cox 2016). Controlling actors may exercise alternatives, such as seduction, transaction, consent without discussion (Callon 1986b), persuasion, force, and mechanical logic (Fenwick and Edwards 2011).

Mobilisation, the last moment, is the process by which actors are displaced and reassembled across the network to achieve the goals defined in the problematisation stage. The controlling actor "borrows the force of the passive agents that it has enrolled by turning itself into their spokesman" (Law 1986a, p. 16). Some actors need support from allies to modify others' behaviour; this is called the inscription process, and this allows them to facilitate actions from a distance (Van House 2003, p. 15). Therefore, inscriptions are seen in the form of "durable and mobile emissaries" (Law 1986b, p. 22). As a spokesperson, the controlling actor speaks on behalf of others (he, she, or it) who

may or may not consent, to represent their interests, establish roles and advances for actions. Nonhumans, such as technology, technical support and documentation, can also be envoys, forcing others to behave in certain ways. Law (2007b) notes that some materials are more durable than others, which influences the extent to which the effects can be achieved. Yim (2009) further suggests that a more durable material may have a greater capacity to maintain longer relational patterns. Therefore, using durable materials to embody relations could ensure ordering. More importantly, neither envoy nor inscription can achieve control alone, they need to strengthen their relationships with others. This presents Law's (1986b) perspective on control, the notion that those who aim to exert control over others need to create actor-networks.

Therefore, successful mobilisation within an actor-network is achieved through a spokesperson and a translator negotiating on behalf of the remaining actors, and a spokesperson acting in line with its interests. However, these relations are never permanent, as Callon (1986b) suggests, "[t]ranslation continues, but the equilibrium has been modified" (p. 224). When these relations begin to fluctuate, ordering and reordering is never completed or repeated (Rivera and Cox 2016). However, it is possible that those actors who have been enrolled will not follow their spokesmen and instead might challenge or refuse it. In some cases, contestation as illustrated in Figure 2, the fifth moment, according to Callon (1986a), may occur if disagreements emerge at any time after negotiations and alliances are formed, and this is when "translation becomes treason" (Callon 1986a). Treason's origin as a word is an Anglo-Norman French word, '*trahison*', but it also signifies 'translation' in French, illustrating how translation can also be a form of betrayal. From successful translation to treason is only a short step, especially when the translator-spokesperson is betrayed or is challenged and opposed by actors who do not acknowledge their role or enrol in the network. Such contestations will set in and redefine the network's balance, as translation will only continue if the network's equilibrium has been modified (Callon 1986a). As such, the process of translation can be incremental or delayed across space and time (Fenwick and Edwards 2011).

A network effect, because of such translations in the network, happens when actors attempt to advance their own goals, and the network, in terms of its process and actors, stabilises and constantly maintains itself in the network (Fenwick and Edwards 2011).

Nonetheless, no network is immutable because counter-networks are constantly arising to challenge existing networks. Therefore, continuous efforts are needed to hold networks together, bolster the ruptures, and counter the tricks (ibid.) because the order is always provisional, as is the stability of the network (Ritzer 2004). Law (1992) explains that an ANT approach situates power as an effect rather than being a set of causes; therefore, the translation process generates ordering effects, which can be counted as resources – arriving in a variety of forms: agents, devices, texts, relatively standardised sets of organisational relations, social technologies, boundary protocols, organisational forms and any or all of these.

Law (1992, p. 385) proposes that "[a]ll phenomena are the effect or the product of heterogeneous networks". Network effects are sometimes taken for granted, especially such precarious simplificatory effects, as they are punctualised or black-boxed and further link to other networks to create larger actor-networks (Cressman 2009). As Callon (1991) suggests, this "process of punctualization thus converts an entire network into a single point or node in another network" (p. 153). Although punctualisation – the network pattern frequently performed until it becomes routine – could be more or less overlooked in the translation process, they certainly manifest as an essential feature of social networks. Therefore, as Ritzer (2004) points out, to maintain a stabilised network, black boxes can be reopened to allow punctualised objects to shape or form relationships with other actors to produce a new network effect.

A further conceptualisation, the *ripple effect*, as a form of *network effect* in ANT, illustrates how changes or translations initiated in one part of a network can extend across other actors, often with broader and sometimes unintended consequences (Fenwick and Edwards 2010). Mulcahy (2012) notes that ripple effects are not uniform or predictable; they depend on relational work within actor-networks and reflect the performativity of the network. However, the metaphor of a ripple can risk oversimplifying this process, suggesting a passive or linear spread of influence. Law and Singleton (2005) argue that such effects are directly mediated from a central source but are *enacted through multiple performances*. This means that it could overlook the resistance, conflict, or ruptures that may arise as effects across the network. Therefore, to employ the concept of the ripple effect, we have to be situated within *fluidity and*

multiplicity rather than presumed linearity, so that it can visualise the complexity of network.

3.4 Exploring work and learning practices through ANT

In adopting a sociomaterial approach, the material and the social are viewed as mutually implicated in producing everyday action and knowledge (Orlikowski 2007). Therefore, it is unavoidable to dismiss things and objects in everyday work and learning practices. Looking at the surface of materials in adult and lifelong learning, objects, things, and even stuff may be detectable, regardless of how they perform in spaces. Educators might not know how on-the-job training, in-class work, or other informal activities help them to perform their pedagogical skills. These might include curriculum, policy guidelines, classrooms, Google, books, foods and beverages, data, etc. Thompson (2015, p. 1) suggests several key questions that help to highlight the contribution of such things:

> *Think about something you do at work or when you are learning; what things saturate this practice or perhaps float in the background of the activities performed? What if these things were not there: if there were no PowerPoint presentations, databases, clocks, assignments, coffee cups, Post-it notes, teaching schedules, texts, bulletin boards, or internet connections?*

To answer these questions with ANT sensibilities, in addition to the process of translation discussed in Section 3.3, things are not just tools resting in the background of human activities, but instead invite humans into a way of doing and being (Thompson 2015). Some may be friendly invitations, but some may not, for example, some may exclude and others might reinforce. Objects therefore perform and are political in terms of permitting and prohibiting. Instead of analysing practices within the notion of a community of practice (COP) (Lave and Wenger 1991), which situates humans at the centre of the practices, ANT enables an appreciation of how knowledge and practice are mingled and circulated (Fenwick 2014b). In addition, it also acknowledges the boundaries between different worlds of practitioners and their sociomaterial practices (Mol 2002).

Aligning with these principles and the 'sociology of translation' (Callon 1986b), then, professional learning does not simply involve mental changes within consciousness, situating humans are the centre, but can instead be understood as a shift that produces new ideas, innovation, behaviour change, and transformation that emerges from relational interactions across space and time (Law 1992). Learning is therefore the effect of the process of continuous struggling among enactments of technology, objects, and humans (ibid.). Therefore, 'knowledge' is seen as a product or an effect of a network of heterogeneous materials as agents, social institutions, machines, and organisations generate it. Moreover, other related concepts can be used to trace the professional learning actor-networks of teachers in schools, as discussed in the following sections.

3.4.1 Nonhumans matter

Although I have mentioned the concept of 'actor' in Section 3.2, this section delves further into key ideas relating to the notion of 'actor'. As described above, as well as considering humans as actors, nonhumans are also equally considered as actors. ANT uses the term 'actant' to differentiate actors from a traditional concept of individuality and intentionality (Dwiartama and Rosin 2014). An actant is understood to be "an effect generated by a network of heterogeneous, interacting materials" (Law 1992). An 'actant' can be understood as a worked-upon entity, while an 'actor' is a working entity (Fenwick and Edwards 2011). 'Entity' is a flexible way to refer to diverse things, both humans and nonhumans (ibid.). As an effect produced by these interactions, an 'entity', therefore, is not always a tangible object. Instead, we might think of these as being objects enacted in practices (Mol 2002). This shifts our understanding of what constitutes an 'entity'. As Ireland (2019) suggests, we might understand the production of knowledge within these actor-networks as "objects-as-practices" (p. 107). According to Law (1999a), when actants become translated into becoming a performing element of the network, these entities then behave with particular intentions and what seems like consciousness, and even subjectivity. When the translation process is successful, the entity being worked upon is mobilised with a particular role and then performs as an actor. Dwiartama and Rosin (2014) use the example of a human who becomes a consumer of food through the forming of connections to retailers and farmers and the food eaten. Without actants, humans cannot be food consumers. Therefore, nonhuman actants/actors can be anything: nature, commodity, product, technology, or ideas and

knowledge (ibid.). Whether they are more or less abstract is not the point, because the key feature is that they are identified and have material effects on a network's relations to make it visible (Law and Singleton 2005).

Within working-learning practices, ANT opens up understandings of objects as legitimate actors, exploring how, when and who they act. It is important to remember that thinking of learning as matter is a highly material shift. Therefore, the focus on nonhumans is looking at "mediators making other mediators do things" (Latour 2005, p. 217) rather than listing all the materials in a network. Bruni (2005) introduces the notion of the connected object to describe how nonhumans, such as software or documents, mediate and configure work practices by linking diverse actors within networks. These objects are not passive tools; they actively shape the flow of knowledge, structure communication, and stabilise professional practices. However, while the concept reinforces ANT's commitment to recognising nonhuman agency, it has drawn critiques for potentially flattening human intentionality and overlooking abstract elements (Whittle and Spicer 2008). Therefore, we have to recall the principle of symmetry while cooperating the concept of connected objects to minimise the risk of overlooking humans and abstract elements such as cultural, political, and ethical consequences embedded in material artefacts.

However, nonhuman objects, who seemingly lack power, are capable of making others, humans and nonhumans, do things. As Callon (1991) writes, "objects are not as dumb as we think!" (p. 136). Drawing on a literary metaphor, Callon (1991) argues how objects (or artefacts) can be compared to texts, in that, as texts both describe and form a discourse, nonhuman actors both "describe their networks in the literary sense … and compose them by giving them form" (p. 135). Thus, nonhuman objects are still necessary in the network as they transport actions from elsewhere – "like texts, they link entities together into networks in ways that may be decoded" (p. 137). Callon (1991) defines the latter group of nonhuman actors as intermediaries, while the first group with power is perceived as mediators that add something to a chain of interaction or an association (Latour 1992). They are both changed by their circulation and change others through their circulation, meaning that they act and require new modes of action from other actors (Sayes 2014), including modifying relations between actors (Latour 2004). To classify nonhumans, Latour (2005) states that nonhumans as mediators are

considered as being more than casual actors, so it is impossible to treat such nonhumans as simple substitutes for human actors. Sayes (2014) categorises these conceptualisations within four contributions of nonhumans that affect daily life:

1) Conditions for the possibility of human society as the necessary stabiliser or formation of the human collective (Latour 1993);
2) Mediators that add something to a chain of interaction or an association and let new modes of action and make stable arrays of relations in the network (Law 2004);
3) Moral and political associators that transport human morality and politics in ways that may change the moral and political association through problematisation for performing purposeful action; and
4) Gatherings as the assembling of a network of actors of variable times, variable space, and variable ontologies. The gathering signifies where the relative solidity of human association is visible.

3.4.2 Assembly required

Müller and Schurr (2016) suggest that "[a]lmost everything today is 'assembled' – made up of precarious socio-material relations" (p. 217). Actor-networks and assemblages are perceived as being an entry point for practices. An assemblage can be a wide range of things, such as a piece of technology, an idea, or a recommended dish (Cresswell et al. 2010); actants, as points or nodes, can be human or nonhuman, with equal value and agency. Actants constantly reform networks with different positions and changing roles. Early ANT conceptualisations depicted a network as both the flow and clear points of connection among actors assembled to perform processes and practices in linear chains or pipelines (Fenwick and Edwards 2011). However, such an explanation may not fit with the notion of globalisation and social capital, which are dynamic and complex. In the assemblage, humans and nonhumans develop a social order that is not static but varies in time and space. Regardless of this seemingly linear process, Nespor (1994) pinpoints movement, space, and time to describe learning and knowledge, in that learning is about people moving through space and constructing space-time through practices of representation; this is considered to be movement that involves participating in an actor-network.

Mol and Law (1994) explore an alternative explanation of fluid spaces that can approach the complexity of dynamic events, avoid the linear network model, and demonstrate diverse shapes and forms of networks. Some networks are temporary and divergent, while some can be ordered, stable, and designated (Fenwick and Edwards 2011). Whether an actor-network will be rigid or fluid depends on the way in which the actants form networks among each other (Dwiartama and Rosin 2014). So, the focus should be on assemblages which are differently assembled and how learning emerges as an effect of such assemblages. Law and Singleton (2013) suggest that ANT is an approach to examining an assemblage and learning how people, animals and objects get assembled in those practices. The assembly of the network relates to the process of translation, where actors become engaged, and new entities or behaviours are produced and translated directions (Fenwick and Edwards 2011). The translation process also extends to other locations through actor-network mobilisation.

According to Röhl (2015), in tracing different spaces and actors in education work, a classroom is not the only place in which the education process is performed, but other places and times, interconnected with actors, such as devices and objects designed for curricular activities, play a role in linking practices, and, although it may not be an explicit learning strategy, learning possibilities are expanded. Tracing actors' interconnections in assemblages makes the linkages and relations of object power between situations and sites visible (ibid.). As an example, Fenwick's (2014b) study of knowledge in inter-para/professional work activity shows how knowledge circulates across 14 professional practitioners in an emergency mental health context. With ANT sensibilities, Fenwick's (2014b) analysis describes how knowledge sharing and practice coordination need more than communication, as she observed how practices in a hospital contain order and control that influence professionals' actions. This highlights how ANT can be used to understand what things do and what influences different material assemblages.

3.4.3 The politics of thingly gatherings

In work-learning practices, researchers may witness co-constitutive and performative relationships between humans and nonhumans that relate to notions of power and legitimacy, otherness, differences, morality and multiplicity (Thompson 2015). Thompson and Adams (2013) explain the politics of thingly gathering as being the

combination of the network of practice with doings, realities, capacities, voices, tensions, and negotiations. Things gather actors from other times and other spaces (Callon 1991). Thingly gathering refers to the process by which objects and technologies become entangled with humans, forming complex networks (Graaf 2017). For example, 'things' such as smartphones, computers, or even buildings can shape our social interactions, cultural practices, and political systems. The 'politics' in the 'politics of thingly gatherings' (Thompson and Adams 2013) refers to the power dynamics, negotiations, and struggles that occur as these things become integrated into our lives.

In other words, social structures can be used to explain the process of thingly gatherings. However, in ANT logic, social structure is not a noun but a verb (Mol 2010). ANT social structure is not free-standing and rigid, like scaffolding on a building, but a site of struggle where relational effects are recursively generated and recreated (Law 1992). Therefore, no structure, agent, or organisation can be completed, autonomous and final. Social order (Law 1992), as actions to assemble the network, are always 'interactions', shared with ontologies, times, spaces and durability and, as Latour (1996b) suggests, shared with actors who cannot present their power independently.

In contrast, Barad (2007) argues that interaction could assume separate individual agencies as the pre-condition before interactions occur. Interaction implies a reciprocal relationship between entities with pre-condition of independent and self-contained entities (Maack 2024). Therefore, Barad (2007) proposes an alternative term – 'intra-action' – which "*signifies the mutual constitution of entangled agencies*" (p. 33). Intra-action involves the mutual constitution of meanings and identities that do not view agency as an inherent property but as "a dynamic set of open-ended practices" (Barad 2007, p. 167), and, as Maack (2024) suggests, these emerge through a more profound and dynamic entanglement.

Rosfort (2012) presents a strong critique of Barad's (2007) conceptualisation of 'intra-action', arguing how, by de-centring the human, Barad (2007) is unintentionally conflating ethics, ontology, epistemology and methodology. Rosfort (2012) describes how he is very sceptical about "the way she wants to arrive at this responsible entanglement of self and other" (p. 62), warning feminist theorists to be "suspicious about her methodological proposal" (p. 64) as, in positioning humans within entanglements of intra-action, her theory is potentially detrimental to gender studies. In

response, Hammarström (2012) argues that Rosfort (2012) has misunderstood Barad's (2007) proposal, and argues that Rosfort (2012) has not acknowledged how her conceptualisation of entanglements does not promote a reductive understanding, where two or more entities are reduced to one. Hammatstörm (2012) illustrates how, in Barad's (2007) theory, entanglement should be perceived through the idea that "two or more entities are intimately associated so that one of them cannot be fully described without considering the other(s)" (p. 42). Barad's intra-active perspective also radically demonstrates the idea of entanglement that the intimately related entities *are* entities only in and through the entanglement (ibid.). As Barad (2007) writes, "differentiating is not about othering or separating but, on the contrary, about making connections and commitments" (p. 392). As such, it is by acknowledging these relations, connections and entanglements that we might challenge such false binaries that circulate society such as gender. This, Hammarström (2012) argues, is a key principle of Barad's (2007) theory, and one key advantage that Rosfort (2012) has overlooked.

Considering these relational aspects within the ANT sensibility of translation, intra-action can be understood as the process of gathering actors in the heterogenous network, emerging in every stage as the constitutive material-semiotic works. While actors attempt to impose their interpretations and interests on others, relations and associations are built during enrolment when intermediaries work together to politically gather others to prepare to be in place. These are entities "passing between actors, which define the relationship between them" (Callon 1991, p. 134); they can be literary inscriptions (books, articles, patents, etc.), technical artefacts (machines and other nonhuman artefacts), humans (in particular, their skills and knowledge) and money (as an institutional means of exchange) (Callon 1991). Thus, the politics of thingly gatherings in teacher professional learning practices can be viewed through the concept of inter-professional actions (as mentioned in Section 1.3.2.1), in that intermediaries (such as policies, guidelines, and culture) need a political and collaborative process through intra-action, which brings actors (such as teachers and lesson plans) into positions and creates the association among them. Such complex gatherings, comprising micro-interactions, interweave within the network and spread across place and time, and it is these relations that then produce policies, knowledge and practices as an effect of these gatherings (Fenwick 2010c).

3.5 ANT and teacher professional learning

Professional learning is part of the becoming-teacher array, and includes processes enacted contingently in the classroom and other localisable practices (Mulcahy 2011). Applying ANT thinking to understand the school-based professional learning practices of teachers vividly shows that the process of learning is not simply a matter of acquiring knowledge or skills but rather is a complex process of translation that involves a negotiation of interests, values, and meanings between various actors in a network, especially practices that follow a collaborative and inquiry-based approach.

How the school implements its professional learning activities stems from several sociomaterial actors, such as the school vision, action plan, working style, teacher characteristics, and so on. When a teacher is engaged in professional learning, they may be enrolled in a network that includes other teachers, educational institutions, policies, resources such as textbooks, and the broader cultural context of the school to which they belong. During the professional learning activities, they may negotiate the meaning of certain concepts or practices and adopt what they agree to implement in their teaching context. Their knowledge-transferring process is a relational effect of the networks' social, textual, and material connections (Thompson 2015). Instead of being a linear or one-way process, the learning transformation process can lead to the emergence of new actors, new relations, and new forms of power within the network, such as revised lesson plans and a new techniques in classroom management. Along with their daily work, teachers may have to intra-act with disorderly, iterative, and complex processes to enrol or mobilise relevant things, such as curriculum, the lesson plan, school problems, and the student situation, to develop new ways of thinking about their practices or new approaches to teaching that the actors in their network inform.

Such processes of teacher learning involve the transformation and displacement of knowledge, which ANT conceptualises as translation (Silva 2019), as mentioned in Section 3.3. Understanding these processes through ANT produces rich concepts and emphasises the dynamic and relational aspects of the professional learning practices of the organisation, providing valuable sensibilities for studying the process of teacher professional learning practice. ANT provides a deeper understanding of the social networks and relationships that shape the teachers' practice and reveals how these networks might influence their professional learning.

3.6 Potential challenges of using an ANT approach

It is essential to address both conceptual and practical challenges, especially for new ANT researchers. First, ANT, with its unique attributes of practical applicability, leads some to conclude that "ANT's main shortcoming is its being everything but a theory" (Callon 1997, p. 2). This criticism could be described as inappropriate naming (Doolin and Lowe 2002), however, Collins and Yearly (1992, p. 323) insist that ANT's focus on description without explanation makes it "a poverty of method", suggesting that it lacks value when compared to the rigour of scientific study. Whether ANT is either a method or a theory, its approach can be overly descriptive, and it has been criticised for failing to provide suggestions of how actors should be observed, and how their actions should be analysed and interpreted (Kaghan and Bowker 2001; Cresswell et al. 2010). However, Callon (1997) insists that less priority should be given to particular categories of actors, writing how "[t]he most important is that ANT is based on no stable theory of the actor; in other words, it assumes the radical indeterminacy of actor" (p. 2). Law and Hassard (1999) describe how, as a methodological approach, ANT unravels such indeterminacy by combining post-structural insights with analysis of materials in social life.

Consequently, rather than testing empirical evidence, ANT can be best used in combination with other theoretical approaches for the analysis and interpretation of actor-networks (Greenhalgh and Stones 2010), specifically research that does not attempt to smooth out complexity or simplify ambiguity. Callon (1997) insists that ANT, whether theory or method, is developed to analyse situations with difficulties in separating humans and nonhumans, especially actors with diverse forms and competencies. For example, Dwiartama and Rosin's (2014) agricultural production systems study, which complements a traditional view of agency with ANT view, enlarges this lens in recognising nonhumans and their relational effects on human intentionality. Kwa (2002) also notes that this perspective shifts the network approach to one that requires us to pay more attention to local contingencies, beyond assumptions of universal patterns.

In this study, I employ the four stages of translation. As noted earlier (Section 3.3), the oversimplification of these stages in a linear representation has led to misconceptions of Callon's (1986a, 1986b) intended meaning (Cordella and Shaikh 2006). This means that

it could be problematic to employ the concept widely in other settings, from academic publishing to management fashions, without inductively embedding the phenomena to reveal the emergence of the empirical case (Whittle and Spicer 2008). Consequently, the argument is not about producing theory-free data, but such theory-testing contradicts Latour's (2004) ANT commitment to perform a 'ruthlessly' empirical approach to studying associations. Cordella and Shaikh (2006) do not deny the usefulness of translation, but they instead suggest subscribing to the concept with an acknowledgement that translation is something that may exist 'out there' to be explored by the researchers, which potentially contradicts the intentions of an ANT-informed methodology. However, as Law and Singleton (2013) mention, ANT is not a theory; perhaps it is better thought of as a sensibility to the materiality, relationality and uncertainty of practices; it works to map the relations of practice. Whittle and Spicer (2008) then offer a practical approach by viewing the four-stage model as an analytical heuristic used by a researcher involving more than just four steps to make sense of complex observations, unravelling blind spots from the empirical complexity of each case.

After-ANT sensibilities, drawing on the concept of fluidity, could be a helpful alternative in considering such situations. Sørensen (2009) found, in her ethnography of education, that after-ANT is more suitable to describe the messiness, diversity and difference in practice. It opens up more possibilities rather than consolidating differences into a single point (Bleakley 2012). Enrolling a concept that understands the fluidity and multiplicity of realities may intensify the challenges of performing a network analysis because a researcher has to deal with complex results of organic network connections by balancing the investigation's focus and acknowledging that multiple realities can exist while not allowing these differences to obscure the complexities of relationships (Cresswell et al. 2010). Therefore, a clear spatiotemporal choice of study should be made between which context to study and which part to focus on, without ignoring the entire picture. A researcher must decide where to begin and end data collection at some point because there may be an infinite number of potential actors in a network, which raises the dilemma of what to include or exclude (Cresswell et al. 2010; Miettinen 1999). To challenge the dilemma, Mitchell (2021) explores Latour's suggestion (2005) that "ANT is more like the oligopticon, seeing little but seeing well, as opposed to the panopticon, which sees all" (p. 27). This argument could

address the practical element of dealing with complexity by acknowledging that something that appears as a singularity, but which then unfolds, through practice into a multiplicity, allows these complex details to emerge (Mitchell 2021).

Second, in a critique of symmetry, or what McLean and Hassard (2004) call symmetrical absurdity, excessive focus on treating all actors equally could lead to a dehumanising effect. Pels (1996) describes how viewing a situation symmetrically can create detachment, which can be translated as disinterested, dehumanising, and apolitical. Along with early critics, Collins and Yearley (1992) described Callon (1986b) and Latour's (1988, writing as Johnson) work as a "method of counterfactual hypotheses" (p. 318) and expressed concern that the notion of symmetry was a "backwards step" (ibid., p. 322) that arose from a "misconceived extension of symmetry that takes humans out of their pivotal role" (ibid.). Collins and Yearley (1992) were particularly critical of what they perceived as being an over-emphasis on description and a devaluing scientific expertise. On the contrary, they conceptualise 'symmetry' by describing how "sociologists of scientific knowledge should treat correct science and false science equally" (Collins and Yearley 1992, p. 302). They argue that early STS writings undermined the unique status and importance of scientific knowledge by suggesting that the "close description of the human activity makes science look like any other kind of practical work" (ibid., pp. 308-309), suggesting that enrolling symmetry in research practices diminishes the authority and prioritising of 'scientific' knowledge.

In response, Callon and Latour (1992) defended their approach, arguing that it aimed to challenge the privileged position of scientific knowledge and resist the "colonizing nature" (p. 358) of certain types of knowledge. They wrote:

> *How can they dismiss our work which tries to get at the content of science and does not accept the privilege of the scientific definition of nature? Because that would mean abandoning their privilege, and that of social scientists in general, of defining the human world, the social world.* (p. 358)

For novice ANT researchers, this may raise concerns about potential ethical implications, as it may obscure human beings' unique role and agency in shaping social and technological outcomes. Therefore, committing to ANT language is vital. McLean

and Hassard (2004) argue that, although practices may appear mundane and seemingly indifferent, we cannot ignore language because this is how practices are situated and given meaning. However, as Mitchell (2021) argues, the notion of de-centering humans should be performed alongside the careful and sensitive use of language when describing materials and balancing the treatment of humans and nonhumans equally.

Third, considering the use of ANT in Thailand, a small group of Thai social scientists have previously adopted the concept of ANT for social science studies and anthropology (Social Sciences and Anthropology TU 2017), possibly because of its challenging perspective in terms of exploring the influences of Thai culture and language. Although the concept of ANT is translated to ทฤษฎีเครือข่าย-ผู้กระทำ (theory of network-actor), representing a similar concept, the original terms of เครือข่าย (network) and ผู้กระทำ (actor) in Thai have different meanings to those of the English understanding, and this may affect Thai researchers when enrolling ANT. According to the Office of the Royal Society's (2011) Dictionary, network in Thai means a system, path, or connecting operation, for example, a computer network, radio network, and a network of people or organisations, where individuals share the same interests and support each other, for example, a researcher network. Patchemnan (2017) points out that the word network in Thai can also refer to the social structures comprising the relationships among people or organisations that affect their beliefs and behaviours, therefore, the study of networks has an extensive scope – from physical to boundaryless settings – in understand the element of relationships among the members of the network. In terms of actor, the term contains two words: "ผู้", which refers to a personal pronoun and "กระทำ", which is the verb 'to do' or 'to act' (Office of the Royal Society 2011). In the Thai language, the unique character relies on the word's position in carrying out meaning; an active actor (who generally is a human) connects with a passive actor via an action of active actor (Gevru n.d.). So, humans tend to be positioned at the start of the sentence, followed by their action and any other passive actors (ibid.).

Considering the meaning of the term 'translation' in English, it has a broader meaning than in Thai. In English, the verb, translation, is an action or the process of translating a word from one language into another and the action of transferring, conveying, or moving a person or thing from one place, position, or person to another (OED 2025). In Thai, translation, or "การแปล", is understood as *an interpretation of one language to*

another for understanding (Office of the Royal Society 2011). A direct translation of the word 'translation' implies that the Thai meaning of translation may not go beyond the notion of interpretation to signifying a mode of transformation, suggesting that this literal translation cannot create similarity and difference in the same ways that the concept of translation does in a western-centric ANT understanding (Achanakitti 2019). This might narrow the perspective of the ANT sensibility of translation where it is enrolled in a Thai context, much more so than in an English-speaking context. This issue has also been observed when cultures other than English- or French-speaking ones engage with the ANT sensitivity of translation, for example, Janicka (2023), in her in-depth analysis of Latour's concept of translation, demonstrates how, in Polish, the word 'translate' does not signify 'transformation' as Latour intended. Although Latour does write in English, Law (2006) identifies an issue with the translation of the word 'translate' from French to English (traduction/trahison), illustrating how the French word 'trahison' directly translates to 'treason' in English. Law (2006) argues how every translation always encompasses an element of betrayal in its enactment, writing how "all representation also betrays its object" (p. 48). All such language translations might challenge the view of ANT, especially where the researcher's understanding is derived from a human-centric language.

Fourth, not only the language used and the cultural challenges of enrolling ANT, but also traditional data collection may be an issue in balancing the positions of human and nonhuman. Nonetheless, it must be acknowledged that humans, as informants and interpreters, generally input textual and vocal data. This aligns with one strong methodological critique of ANT, offered by Whittle and Spicer (2008), who argue that:

> *by dividing the natural and material from the social, ANT is left with the impossible task of trying to gather evidence about the properties of nonhuman elements without involving human participants: that is, without the aid of respondents or researchers.* (p. 615)

Here, however, Whittle and Spicer (2008) overlook the essential point that all actor-networks are assemblages of all of these things together, and that the gathering of evidence cannot avoid the human actants in their relations with the nonhuman. As such, the 'evidence', as Latour (2005) would argue, is an effect of these actor-network

assemblages, which include both human and nonhuman actants. As Latour (1999b) writes, “we began to speak of nonhumans that were socialized through the laboratory and with which scientists and engineers began to swap properties” (pp. 15-16). As such, ANT offers an element of symmetry in affording both the human (social) and the nonhuman (material) equal magnitude.

Therefore, it is important to use various and suitable techniques of data collection, such as interview to the double – a methodology for articulating and re-presenting practice (Nicolini 2009a, p. 196) or interviewing objects (Adams and Thompson 2016; Moura and Bispo 2020), which I shall explain further in Chapter 4. A researcher should explicitly state his or her role and demonstrate an understanding of how accounts are produced and decisions are made (McLean and Hassard 2004).

Furthermore, ANT is a controversial and still profoundly contested approach to thinking about how networks of actors come into being. The lack of clear boundaries in networks can affect the clarity of interpretation (Smith 2015). This ambiguity can make it challenging to trace the relationships between actors and objects and understand how they contribute to the functioning of the network as a whole (Jones 2018). The boundarylessness of networks could be a double-edged sword in terms of interpretation. The boundaries of networks are constantly shifting and evolving, providing researchers with opportunities for new insights and understandings (Brown 2019). Nevertheless, rather than trying to trace the entire network at once, Law (2004) and Mol (2002) emphasise the value of attentive and situated observation in understanding complexity. I therefore focus on selected sites of activity to engage with the messiness of actor-networks without prematurely simplifying or closing them. As such, it is essential for researchers using ANT to be aware of the challenges posed by boundarylessness while also embracing the opportunities it presents for new insights and understandings.

Enrolling ANT to explore relevant professional learning practices provides a practical way to make these practices visible. Adopting this strategy will reveal how these translations happen and precisely identify areas where the teachers intra-act in the network and need additional support, as well as lead to an understanding of how to design more effective professional learning opportunities.

3.7 Chapter Summary

This chapter presented a critical discussion of the sociomaterial concept and described ANT sensibilities and how these are appropriate tools for exploring teacher professional learning as well as the advantages that the ANT-based approach affords researchers. As an ontological orientation and methodological approach, ANT can explain teachers' professional learning practices through translation, nonhuman actors, power and relations, and network effects, as informed by the three case studies discussed in Chapters 5–7. The principles of *agnosticism, generalised symmetry, and free association* were considered in relation to network exploration and analysis, while describing how infusing these with ANT sensibilities allows a perception of professional learning practices as performative and fluid. Although further challenges of using ANT exist, the next chapter introduces how the network exploration and analysis processes were structured and describes how these challenges were overcome in the study.

Chapter 4 Study Design: Orientation, Fieldwork and Analytical Toolkits

This chapter presents a translation of ontological positions to produce a practical ANT strategy to guide an empirical study. Post-qualitative inquiry, along with an online ethnographic case study design, were aligned with ANT for the preparation for the fieldwork. Thorough consideration of the case study and participant criteria was as essential as the following-the-actor and narrative strategies, as these worked together to envisage the emergence of the story. Although a research plan was prepared, it had room for the multiplicity of exploring three study sites, promoting flexibility and embracing uncertainty in each network.

4.1 Orientation and Strategies

4.1.1 Post-qualitative inquiry

Although the boundary between human and nonhuman is becoming blurred among the advancements of technology and society, the concept of humans having protagonist agency remains, because it is generally assumed that the human differs from all other creatures that they encounter; humans may be creatures, but they are also perceived as subjects who act and speak rather than as objects (Taylor 2017). As Meillassoux (2010) describes in his critique of "correlationism" (p. 10), such thought has shaped the idea of reality being connected only with human cognition. In this way, Brinkmann (2015) indicates that qualitative researchers prefer to play their roles in capturing and understanding their studies through dialogue framed by interview questions, then generally use a process of coding the data to detect the meaning of an interviewee's experiences. This form of what Brinkmann (2015) calls "Good Old-Fashioned Qualitative Inquiry" (p. 620) has become the standard approach found in the textbooks of many disciplines, following this human-centric stance (ibid.). However, Law (2004) argues that this may be unsuitable to deal with vague, diffused or unspecific, slippery or indistinct entities, which constitute experience in the everyday social world.

In contrast to a traditional view, the posthuman condition suggests that humans have reached the point where they rule and control all issues while also destroying them. In an unconventional way, post-qualitative inquiry embraces the assemblage of onto-

epistemological and poststructuralism concepts, such as human *being*, rationality, truth, discourse, language, and freedom (St. Pierre 2019), including the concept of *rhizome* and *assemblage* (Deleuze and Guattari 1987). Taylor (2017) clarifies that the goals of post-qualitative inquiry are: (1) to include nonhuman agency; (2) to embrace dynamic and relational knowing over individualised, rational, binary representational logics; (3) to shift from a consciousness-based, cognitive, interiorised, phenomenological view of experience to a materialist, co-constitutive, and affective views of experience; (4) to focus on material-discursive enactments instead of the interest in culture, language, and nature as in the constructivist approach and post-structuralism; and (5) to accept the partiality of our knowing and acknowledge our complexity and ambiguity, while avoiding the assumption of objectivity. These goals align with what St. Pierre (2021) defines: that the aim of post-qualitative inquiry is not to find and represent something existing in lived human experience, but to re-orient thought and create new forms of thoughts and life.

However, this positioning can suggest that post-qualitative inquiry is overtly sympathetic to postmodernist deconstructionism and that it prioritises epistemological doubt and interpretive multiplicity (Burman and MacLure 2005). Savage and Burrows (2007) pinpoint that such sociological concerns could diminish the expert status of the discipline of sociology, both in its forms of knowledge and expertise. Within the discipline, Adkins and Lury (2009) then raise fundamental questions about what the empirical is and how it matters, especially when confronted with the agency of nonhumans, whether in the form of technology, outbreak or animals. Taylor (2017) responds by suggesting that such situations are massive, and are appropriate for producing knowledge through a transdisciplinary approach, particularly post-qualitative methodological work, which can highlight the inadequacy of the “methods as usual” (p. 3123) approach, especially in confronting with the agency of nonhumans.

Without a methodological guide for post-qualitative research designs, methods, processes, procedures, or practices, it does not act as an alternative version of qualitative methodology (St. Pierre 2021). Instead, it presents a challenge to familiar qualitative concepts, such as analysis, coding, data, interview, and representation (Aagaard 2022). However without a template, Taylor (2017) contends that it is worthwhile for researchers to try to reorient something beyond a traditional framing for

research, especially in fieldwork where there is “an affective event where the materiality of the field rises up to meet us, rubs up against us, pushes back on our interpretations” (Childers 2013, p. 605). Embedding one’s research into the phenomenon, Koro-Ljungberg and colleagues (2015) suggest paying attention to ‘events’ and ‘particles’ as they are ‘raw partiality’ as researchers select to follow, instead of purifying experience and events and turning them into ‘data’. This attention can include multiple entities, such as buildings, books, spaces, animate and inanimate objects, policies, theories, and practices, which shifts what counts as the research object (Childers 2013).

In paying attention to events through ANT, Latour (1999a) suggests that actors should not be focused on the role of agency and network as the role of society, but suggests that they are two faces of the same event, like waves and particles, as discussed in Section 3.2. Latour (1999a) insists that human and nonhuman actors cannot be viewed separately because the event is a circulation of entities, each without differentiating macro or micro levels (ibid.). Therefore, as MacLure (2013) further suggests, following hotspots or the emergence of humans and nonhumans that are not within our conscious or intentional control as analysts are ways in which the researcher can engage with events by not getting lost in them.

In a study of telemedicine practices, Nicolini (2009b) stresses that a single method does not capture the complexity and multidimensional nature of practice in the way that a multiple method does. While positivists obtain a richness and wealth of data and manage, through the process of ‘triangulation’, to increase the creditability and validity of the research as well as depict a completed picture (Scoles 2017), Richardson and St. Pierre (2005) propose that the validity in post-qualitative texts cannot be revealed by a triangle with a rigid explanations, but instead combines symmetry with a multi-dimensional approach. As they suggest, “there are far more than ‘three sides’ by which to approach the world. We do not triangulate, we crystallise” (p. 963). In contrast, Ellingson (2009) argues that crystallisation does not replace triangulation because it does not complement positivists who believe in objectivity and the discovery of unbiased facts, but does provide an alternative for scholars who embrace knowledge as situated, partial, constructed, multiple, embodied, and enmeshed in power relations. However, there are other techniques that can be used to explore these complexities. To

this end, for the ANT researcher, post-qualitative inquiry opens up opportunities for enrolling diverse techniques to allow creativity to narrate the complexities of practices.

4.1.2 Ethnography

4.1.2.1 ANT and an ethnographic approach

ANT is proposed as being more of an ethnographic methodology than a theory (Latour 2005, pp. 21-49). ANT is sceptical of constructivist perspective, which assumes the existence of universal and independent truths but agrees that knowledge is developed through a "construction" process involving humans and nonhumans in pluralised and situated manners (Berry 2021). Therefore, as a methodology, ANT subscribes to the importance of observing how "socio-technical controversies" (Latour 2005, p. 80) work and to "follow the actors" (p. 68) while using "specific tricks" (p. 79) for interviewing them, however, often through humans, as Adams and Thompson (2016) describe. Whether the ethnographic goal of "thick description" of Geertz (1973, p. 41) or making manifest "non-coherent realities" by John Law (2004, p. 93), ANT ethnographers advocate embracing the unruliness of heterogenous networks to provide a rich and meaningful description of everyday practices (MacLeod et al. 2019). As such, an ANT ethnography is particularly interested in exploring practices as the basic way in which realities are created (Law 2004), and, as Schatzki (2012) asserts, the intimate relationship between practices and material entities is fundamental to understanding education activities, including teachers' professional learning (Schatzki 2012). To understand the connection between ANT and ethnography, it is important to understand about an ethnography that is defined as the philosophical study of people within the context of their cultural existence (Anderson-Levitt 2006) by learning about behaviours and experiences, such as ideas and beliefs expressed through language, material activities, and actions (Creswell 2013) and the cultural texture of social relations (Yin 2015). Ethnographic works can be messy, especially relying on a researcher's skill in making sense of complex data (Anderson-Levitt 2006). This suggests ethnographers must be reflexive in that they are aware of contingency in fieldwork to prevent pre-assumption leading to universal suggestions (Brewer 1994). More importantly, if we combine ethnography with ANT, tensions around humans and nonhumans in viewing practices should be considered.

First, ethnographers recognise the pre-conceptions that shape their analysis and interpretation (Klein and Myers 1999). They may walk in and out of the field to document an existing set of practices with hidden influences on the practices, but position themselves independently of the practice (Paradis and Sutkin 2017). Accepting pre-conditions contradicts agnosticism, one of the ANT principles; this differentiates an ANT researcher's position from that of ethnographers. Their work allows the researched to describe their own reality and unravel what is happening in the assemblage as they are part of it. As Mitchell (2017) describes, the aim of ANT is not to discover a pre-existing truth, and, furthermore, the 'truth' is only that represented by the researcher. Therefore, ANT researchers are not just outsiders observing what emerges in everyday practice but they also become productive and actually (re)configure the phenomenon studied within their engagement with the research. MacLeod and colleagues (2019) explain, such a situation assumes that "no assemblage exists independently of the researcher" (p. 180).

Human privilege is the second tension as it is the difference between traditional ethnography and ANT. Ethnography perceives people's experiences within relations and the assumption that individuals are both subjects and agents of nonhumans. Ethnographers pay attention to everyday activities at local sites that are produced by people (Thompson and Pinsent-Johnson 2011), particularly why people act, think, and feel the way that they do in their everyday settings (Harwati 2019). They categorise those social relations of people who employ law, government, professional organisation, culture, and discourse to achieve practices (Smith 1987). In contrast, ANT equalises the roles of humans and nonhumans as demonstrated through hybrid subject-objects enacting within networks (Thompson and Pinsent-Johnson 2011). For example, technology and people, chefs and knifes, teachers and curriculum, all connect in a co-constitutive relationship (Thompson and Pinsent-Johnson 2011, p. 696). Nevertheless, this difference does not present an incompatibility between ANT and ethnography – in ANT we carefully consider the role of the theory, the role of the researcher, the researched, and presumptions of reality (Elsayad 2017).

Both tensions urge us to think about the role of the ANT researcher in using ethnography, which requires us to take a more participatory role and consider the balance of power in what we observe (Mitchell 2017). For example, instead of utilising

conventional data collection techniques such as observation, contemporary methods, by incorporating technological tools, can challenge truth and the relationship between the researcher and the researched (Angrosino and Rosenberg 2011). MacLeod and colleagues (2019) define this as being a complement between ANT and ethnography as it provides meaningful ways of understanding the phenomenon. As Mitchell (2017) argues, ANT is still considered to be fundamental to the research. Consequently, Bleakley (2014) suggests that ANT ethnographers need "special qualities" (p. 180) to notice and attend closely to details. These special qualities are to acknowledge that practices are both social and material, to include both humans and nonhumans, and to focus on detailed descriptions of what is happening, including the mundane (Latour et al. 2013).

The complementary nature of combining ANT and ethnography is used to investigate knowledge and learning in my study. Furthermore, I adopted an ethnographic case study approach as it is a practical approach that has the potential to narrow down the focus. Moreover, as Kanger (2017) suggests, ANT studies can be successfully conducted within a case-study approach.

4.1.2.2 From case study to ethnographic case study

From a positivist perspective, Yin (2011) describes how a case study enquiry is based on the collection and analysis of empirical data. Yin (2014, p. 16) provides a definition:

> *A case study is an empirical inquiry that investigates a contemporary phenomenon (the case) in-depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident. In other words, you would want to do case study research because you want to understand a real world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case.*

As anything can be a case, such as a person, a community, an event, or a policy (Stake 1995; Bhattacharya 2009), the difficulty of differentiating context and case, especially contemporary events, are raised (Yin 2009). Stake (1995) then suggests that, if a case is viewed as "an integrated system" with a boundary and working parts, it is "holistic,

empirical and interpretative" (p. 2). Thus, Stake (1995) promotes a more flexible design with interpretivist orientation in a case study method, rather that adopting a positivist position. This shows the potential in combining a case study with ANT sensibilities.

According to Lowe (2001), "using ANT as a research strategy puts a strong emphasis on empirical enquiry" (p. 344). However, Hansen (2011) argues that ANT may radically challenge some of Yin's (2009) assumptions about reality in terms of a case study methodology.

> *According to ANT, phenomena are therefore real. However, their meanings and social roles are constantly reconstructed in practice each time they are mobilized. Reality or meaning is fluid and not something that is present in principle, which, in contrast, is what Yin assumes. Of course, ANT's assumptions of reality affect its conceptualization of methodology.* (Hansen 2011, p. 118)

Adopting a positivist approach in the social sciences seeks to produce objective and unquestionable facts through the construction of validity, rigor, internal and external validity and so on (Guba and Lincoln 2005). This seems to limit assumptions about the social sciences, especially the separation between science and society. But this does not mean that Yin's (2009, 2011) ideas cannot be used within ANT-informed studies. Beyond Stake's (1995) interpretation, the move from matter-of-fact to matter-of-concern helps us to overcome the differentiation between social and science by recognising that facts are actually matters of concern shaped by social and political forces (Latour 2005). Based on Latour's (2005) concept of metaphysics, reality refers to "the diverse and fluid nature of the world" (p. 120). Therefore, an empirical study cannot be conducted through abstract speculation or simply discovery but only through detailed empirical investigation of networks to create and stabilise matters of concern (Latour 2005).

Flyvbjerg (2011) points out that many ANT studies explore their nuanced view of practice by adopting a case study approach; Mitchell (2021) adds to this point by incorporating more flexible and non-prescribed frameworks and approaches that align with the everyday practices under investigation. An ethnographic case study, as an appropriate approach, combines two approaches to inquiry – ethnography and case

study (Bayeck 2023). Combining ethnography and case study philosophically contributes to rigorous academic procedures (Creswell 2013), and allows researchers to use the best tools, while avoiding the weaknesses of each approach (Fusch et al. 2017).

Ethnographic case study differs from case studies that adopt non-ethnographic approaches (such as studies of survey data and document analysis) as they are "employing ethnographic methods and focused on building arguments about the cultural, group, or community formation or examining other sociocultural phenomena" (Schwandt and Gates 2018, p. 344). Ethnographic case studies examine communities, individuals, and their culture with "prolonged observations over time in a natural setting within a bounded system" (Angers and Machtemes 2005, p. 777). Wickramasinghe and Bali (2009) illustrate how, methodologically, while ethnography can be used to directly observe behaviours and relations, combining this with case study helps in condensing observational field experiences and enrols other sources of data, such as document review and interviews.

Cresswell and colleagues (2011) combined a case study-based approach informed by multi-sited ethnography and applied ANT as a theoretical approach to evaluate the implementation and adaptation of electronic health record systems. Their approach methodically advocates how to investigate specific groups of people with specific contextual criteria in specific contexts, which can be an organisation, hospital ward and community or team, or within its real-life context by using multiple sources of evidence, which also aligns with Yin's (2009) model. Another study of how three teachers use technology, conducted by Angers and Machtmes (2005), depicts how an ethnographic case study was useful in exploring teachers' beliefs and their surroundings in using a technology-enriched curriculum. Using this approach allows deep exploration of actions and events in the practices of teachers with their integration of technology and curriculum over a long period of time in their natural setting (ibid.).

However, Angers and Machtmes (2005) also raised concerns about the validity and reliability of the ethnographer's interpretation, in considering that researchers are also 'instruments'. These concerns relate to subjectivity, which refers to the researcher's biases, values, beliefs, and life experiences that influence their interpretation of data (Louis and Barton 2002). Bayeck (2023) also reminds researchers to revisit the focus of the research as being the essence of an ethnographic case study as it relates to other

factors such as participants, location, the process, and the timeframe for conducting the ethnography. Such multiplicity in research further leads to the importance of the researcher's positionality, as their identities are not static but shift spatiotemporally within networks of relationships (Maher and Tetreault 1993). These narratives contribute to an ambiguity in terms of situating ethnographic practices within any one particular philosophical paradigm. However, ANT may offer a solution, as employing ANT does not mean to be flexible in blurring a focus and in mixing methods of analysis, but instead recognises how the researcher's position can be unstable, shifting, multiply situated and situationally contingent (Choi 2006).

Yin (2011) additionally offers practical suggestions for achieving reliability while maintaining the focus, and these can be done in many ways, particularly the development of a flexible case study protocol, including the overview, field procedures, questions, and a reporting guideline. This approach aligns conceptually with a set of heuristics for exploring these multiplicities published by Adams and Thompson (2016). Choi (2006) also suggests that engaging in 'deconstructive' reflections on the research journey is a way for the researcher to recognise their positionings. Avoiding adopting a rigid and prescriptive protocol in planning the study design allows the researcher to investigate practices through the participants in the practising setting and understand how the practice works and how the relationships between human and nonhuman aspects are enacted within a culture-sharing community (Hallett and Barber 2014).

Regardless of the boundaries of the research site, Chen and Rhoads (2016) advocate that an ethnographic case study that combines traditional ethnographic data collection techniques with case study design expands opportunities for the researcher to focus on one or multiple sites. The time may prolonged, however, due to its situatedness, the research is still grounded in the local (Bayeck 2023). Drawing the conclusion of research design from the above discussion, while the case study approach illuminates the complexity and interrelatedness of professional learning, the breadth associated with ethnography allows the wider contextual picture to be incorporated. Whether the research is conducted onsite or online is discussed in 4.1.2.3.

4.1.2.3 Traditional and online ethnography

The COVID-19 pandemic has irreversibly shaped new ways of working and learning for teachers, as well as the way in which research is conducted in their settings. Because the ethnographic case study approach can be used across several settings, whether online, onsite or hybrid, in this section I further discuss why I decided to use an online ethnographic case study while also incorporating documents.

The online approach conveniently helped me to explore the co-presence of learning, regardless of its location. Beaulieu's (2010) research, conducting a digital ethnography through the lens of science and technology studies (STS), explains how the shift from co-location (sharing a physical space) to co-presence (sharing interaction more broadly) broadens new opportunities for lab environment studies, in which its presence becomes more diversified in terms of where the lab is situated. Dean (2023) points to the contribution of Beaulieu's (2010) work of the adoption of co-presence through digital ethnography, making visible the relationships between the ethnographer and the interviewee and among interviewees across different locations. This helps ethnographers in investigating knowledge production spaces where, nowadays, research is less controlled and less centralised. However, this also challenges ethnographers to follow what might be understood as 'streams of practices', or forms of knowledge production which are mediated by information and communication technology (Hine 2006). Indeed, the key challenge is the commitment to engage in other discourses, such as texts and inscriptions, besides face-to-face communication and interaction (Beaulieu 2010). The move to digital ethnography expands the ethnographer's capacity to witness both face-to-face interactions or any forms of interaction (Gieryn 2006), and this offers a way to strengthen problematisations in the study.

Recently, during the COVID-19 pandemic, online ethnography became a frequent and necessary approach for ethnographers when in-person fieldwork was restricted, however, this shift brought unintended benefits. As Eggeling (2023) suggests, "[w]hat COVID-19 has revealed is that it is time to *follow the field* itself to learn about what we deem it to be a field *of* (p. 1344, italics in original). Grijalva (2021) explains that ethnographers usually start any ethnography, whether online or in person, remotely, via e-mail, WhatsApp, and social media. This shifts the idea of observation from engaging in a paper-pen and field notes mode to a more localised social media platform, including

the way in which questions are asked or conversations are held (Dean 2023). It also helps researchers to reduce the cost of travelling and gain diverse and complex accessibility to a highly interesting virtual settings in both international and intercultural spaces (Markham 2005; Hart 2017). Nevertheless, Grijalva (2021) also points out the faults that remote methods introduce, for example, they obstruct participation in everyday interaction in a field site. Similarly, Lamerichs (2018) cautions that a critical challenge of online ethnography could be that it limits the ethnographer's involvement, the data collection methods, and the researcher's presence in online settings, especially for novices. Although online ethnography might be feasible in many settings, ethnographers need to build knowledge not only about how to get the relevant tasks done, but also about local ways of speaking, handling conflict, and operationalising the process in the virtual environment to make better sense of situated meanings within these heterogenous networks (Hart 2017). Lamerichs (2018) suggests that a methodological hybridity might be considered, as it allows researchers to access rich and social spaces to explore various interactions. In my research, completing the pilot study helped me to determine an appropriate plan and procedures for the main study (Yin 2009), especially when ethnographic tools are not prescribed in a set of protocols but are necessary when delving into the complexities that arise from being a part of a study. Adams and Thompson (2016) have suggested a set of heuristics relating to the conducting of post-humanism and ANT-related ethnographic studies. As Mitchell (2017) suggests, these are designed to guide ANT researchers rather than to provide a rigid set of instructions or a "set of stages to follow in sequence" (p. 70). Aligning with the concept of post-qualitative inquiry as a methodology-to-come type of research, there can therefore be no certain methodological protocol for such a study; it is performative and applicable to any transformations. Furthermore, as Sade-Beck (2004, p. 46) suggest, using an online approach and when participants take part online, they can freely express their emotions and feelings, and this sometimes encourages self-disclosure, allowing them to share new perspectives on certain topics. This would be an appropriate approach to take with teacher interviewees, as their schedule within their time at school is dedicated to teaching and non-teaching tasks, so they may not have the flexibility within their schedules to take part in participant interviews. Nonetheless, Hart (2017) insists that the online approach needs to be carefully planned in terms of both its ethical and strategic considerations. Gaining prior ethical approval of the research proposal provides sound measure in ensuring informed consent, confidentiality, and protecting

interviewees' identities, especially in virtual settings (Markham and Buchanan 2012). This can also be strategically used to communicate with gatekeepers who control access to others by allowing them to provide participants with the permission and confidence to participate in the research.

Deciding whether an online approach is appropriate is open to debate. A decade prior to the COVID-19 pandemic, Cresswell et al. (2010) described that, if the study investigates the work practices of professionals, it is essential not to place too much emphasis on technology but to instead focus on the organisation or community. However, it is also important not to lose sight of other wider actors, such as any technological actors that shape the community and its professional practices. With the mediation of COVID-19 in research practices, it now seems imperative to reconsider the implications of these altered positionalities. For example, as Weiner Davis and Obertino-Norwood (2024) suggest, while traditional ethnographic methods insist that physical presence is crucial in engaging in meaningful encounters, this notion has been challenged. While the pandemic necessarily forced me to shift into an online ethnographic approach, others have suggested that this has also "problematized assumptions that colocation is necessary or realistic for engagement in field research" (Weiner Davis and Obertino-Norwood 2024, p. 1273). Considering the above-mentioned discussion, for my research, adopting an online approach while following performativity was most appropriate in terms of providing a broader scope for the problematisation of professional learning, and in considering the interviewees' readiness and convenience for participating in the research. In the next section, several key heuristics are introduced, which I adopted as a guide to inform my data collection practices.

4.1.3 Three Heuristics

Notably, ANT and ethnography are not linear, prescriptive and predictable, as they involve the process of exploring and unravelling (MacLeod et al. 2019, p. 181). Adams and Thompson (2011) propose eight heuristics that are useful for assisting qualitative researchers in exploring things and objects in educational settings. These are not prescriptive methods but possible approaches to be adapted in the field based on the researcher's experiences (Adams and Thompson 2011). Following the actors (ANT) and listening for the 'invitational' quality of things (phenomenology) open up possibilities

for exploring human-technology interrelations, including gathering anecdotes and studying breakdowns, accidents, and anomalies (Adams and Thompson 2016). The other four techniques are used to deepen analytic heuristics to loosen the meshwork and discover hidden practices evolving in everyday life (ibid.). These may be perceived as having some conceptual similarities, compatibilities, and contradictions (Adams and Thompson 2011). Below I describe how I selected three of these heuristics to guide and complement my ANT sensibilities.

4.1.3.1 Attuning to objects and attuning to things

Entering the network, researchers attend to objects and attune to things (Adams and Thompson 2016). For *gathering anecdotes,* as Heuristic 1, anecdotes are little stories – lived-through details, an incident of life happening that attacks, interests, or concerns us, and such stories contain key insights of phenomenological inquiry (Van Manen 2023). This heuristic is used to describe and show what happened, not explain why it happened. Therefore, it narrates concrete stories, taken from life as an example (ibid.). Sociomaterial anecdotes are recreated by the participation of both humans and nonhumans by interweaving them from multiple sources of raw materials (Adams and Thompson 2016). Traditional sources such as in-depth interviews with humans and field observation could be used, including other sources such as personal experiences, online sources, documents, journals, reports, films, images, and any other media.

Oftentimes, researchers reconstruct anecdotes from various sources that provide humans with thinking built with and through their nonhuman surroundings (Mulcahy 2013). However, in ANT-based inquiries, anecdotalisation tends to involve a more radical decentring of humans (Adams and Thompson 2016). Crowther and colleagues (2017) explain this as an artisanal process of "story crafting" (p. 826), where post-humanist researchers transcribe verbatim interview data, then recapture the narrative by culling, editing, and honing the text to reflect a vigorous human-nonhuman lifeworld. Mulcahy (2012) defines "enactment" as data reconstructing stories. She emphasises that this process is complex, however, and that it is not as simple as "add material objects [to stories] and stir" (p. 135), but instead looks for attempts to disrupt data stories, particularly in describing the effects of social and material relations, to show the necessity of things. Therefore, the storyline needs to be woven with both humans and nonhumans together.

The anecdote is not statically composed, but its assembly or reassembly is situated, embodied, and unfolding (Adams and Thompson 2016). It is used to note the appearance of things, attune to lived effects, and trace motions and vital gestures. Such discursive processes adumbrate the rhythm and motion of phenomena, revealing the initial site of research performance. While not claiming to be accurate or verifiable, the anecdote aims to reflexively open up any contingent and tentative possibilities of human and nonhuman relations (ibid.).

Heuristic 2, *following the actors*, means tracking micro-practices and other key actors that are implicitly active in those practices (Adams and Thompson 2016). It is a way to explore chains of entanglements that co-constitute practices (Gourlay and Oliver 2016). Two related activities are identifying potential actors and mapping those related micro-practices for further examination; a challenge is to make the invisible visible, both objects of interest and negotiations and relations that keep the network mobilising (Adams and Thompson 2016).

Gourlay and Oliver's (2016) study found that, after following postgraduate students' learning practices, these reveal no exact set of practices bundled together to be defined as 'studying' but are instead a complex set of micro-practices, such as following a particular iPad, creating an account, and searching, reading texts for curating, noting questions, speaking with others, and so on. Their study highlights the significant role of objects and material actions. Similar to Latour's (2005) explanation, following the actors is not about creating all-inclusive lists of all entities in the network but is instead related to looking for "mediators making other mediators do things" (p. 127), human or nonhuman. Although following the actors could be perceived as looking for a single entity, it traces the complexity between actors' connections and beyond the actor-network (Adams and Thompson 2016). As Fenwick (2014a) suggests, sociomateriality views things as effects of connections, so the starting point does not originate from one entity. This is because the entity has already been intra-acting with others, as Barad (2003) suggests.

Michael (2004) further introduces the idea of following the hybrids, which are called co(a)gents. These interweaving agents represent the connections between human and nonhuman actors, showing how agency is distributed throughout a network and entangled in multiple relations and what is transpiring in the practice of interest (Adams

and Thompson 2016). Following the actors can help researchers eliminate the overwhelming list of actors by focusing on actors of interest. Looking at specific entanglements creates possibilities to draw on other heuristics for further examination and deepening an analysis (ibid.).

4.1.3.2 Uncovering translations and networks

The first two heuristics, in attending to objects and attuning things, emphasise actors with interest and interconnected micro-practices. Both anecdotalisation and following the actors help researchers focus on what is "related" to what and how (Adams and Thompson 2016). By "*unravelling translations*", Heuristic 7 can be used to delve into how the set of actors (humans, objects, discourses, and incidents) come to be assembled, unassembled, and reassembled. Through the process of translation, described in Chapter 3, researchers can further examine how actors interact and how gatherings of actors emerge with willingness, coercion, or unknown. Callon (1986b) defines the sociology of translation as a "new approach to the study of power" (p. 196). In the early years, the four moments of translation (presented in Section 3.3, Figure 2) were used as a framework to depict the movement and connection of actors in the assemblage. Translation has also been used to explore complex networks in terms of stability and fluidity, which specifically link to the ideas of hierarchy, power, and politics (Adams and Thompson 2016).

While Law (2009) uses the term "collateral realities" to explain multiple sociomaterial worlds and the politics of gatherings, such realities are produced incidentally and unintentionally through everyday practices. Thompson (2018) raises the example of multiple digital devices with which workers are entangled, and which often overlap and conflict. By looking for gaps and tensions with actor-networks, differences will be unveiled (Law 1999a). Singleton (2005) explains that such tensions are productive as they fluidly expose boundaries. Tensions also work against the stability of actors with an attempt to order or re-order to generate stabilisation as a ripple effect, as "stability is often an illusion" (Adams and Thompson 2016, p. 78). Analysing actors in one assemblage may make the presence of connected assemblages and realities visible (Adams and Thompson 2016).

Fenwick (2014b) traced how knowledge circulates across multiple emergency mental health care contexts, including a wide range of practitioners. Unravelling translations focuses on how things, activities, and people move between the different networks of paramedics and police instead of looking at a translation of a particular actor. The rich prehospital knowledge of paramedics' reports tends to be left out at the admission counter, while hospital knowledge, such as assessment forms, protocol, technical vocabulary, and patient histories, circulates within their own material boundaries. These emergences show failed attempts at translation, knowledge and object enrolment in connected networks. Fenwick's (2014b) novel study draws attention to the effort of actors and circulation to stabilise and disrupt through inter-actions and relations, which helps researchers to map smooth and complicated practices while allowing researchers to make "matters of concern" visible (Latour 2005).

4.1.4 Overflow to my research assemblage

The orientations and strategies, described above, formed my qualitative research design. Post-qualitative inquiry conceptually offered a nuanced, diverse, uneven emergent set of inquiry approaches, open to any possibilities and uncertainty. The online ethnographic case study method adjusted the clarity of the focus and placed it on the networks that I studied to allow me to explore teachers' learning networks beyond their classroom and school. Finally, adopting the three heuristics allowed me to navigate these ideas to form my own heuristics strategy. The next section presents the translation of these conceptualisations to the implementation strategy.

4.2 Preparation for Fieldwork

4.2.1 Preparation

The COVID-19 pandemic shaped how I conducted the research in similar ways to which the pandemic changed school routines in Thailand. In my discussion with the President of the Thailand Research Development Institute (TDRI), gaps between the policy and the school and the ways in which schools were connecting during COVID-19 were highlighted, and it was emphasised that these should be bridged with modified processes and practices. This illustrated to me that Thai education policy cannot rely only on human contributions but, importantly, it is the essence of these materials that have the potential to shape people's thinking and routines. Connecting with the Arsom

Silp Institute of the Arts and the Starfish Foundation allowed me to extend my professional networks by approaching some key contacts, as well as broadened my experience in understanding how teachers use technology and materials in their everyday lives, allowing me to better understand the contexts of my study. Based on my own sociomaterial understandings, this also allowed me to think further about exploring teachers' learning. To extend my knowledge about the Thai school context, I used my professional connections and reviewed relevant literature to draft the research proposal in 2021.

First and foremost, COVID-19 urged me to answer: what is the practice in this study? I started thinking about it in the beginning to provide myself with a chance not to miss any associations in the network that I was looking for, while not limiting the frame of my exploration. My perception of practices in this study are not represented in rigid and structured ways with humans at the centre, but move towards an attuning activity (that (un)intentionally happens) and connections which relate to the relationships between humans, and between humans and nonhumans (MacLeod et al. 2019). As professional learning is embedded in everyday work, professional learning practices consist of sayings, doings, and relations in daily life, as mentioned in Sections 1.3.2 and 2.2. Second, I asked myself what would be the practical way to conduct this study within the pandemic situation. The pandemic did not leave me any choice but to choose an online approach, but rather encouraged me to adopt online ethnographic case study of teachers embracing technological tools in their everyday work.

Third, not only in preparing the site for study, I also prepared myself as the ANT ethnographer by adopting the ANT sensibilities and employing an ethnographic approach. Guided by Fenwick's (2012) conceptualisations, I chose to define and understand the notion of practice as being an assemblage of all of the human and nonhuman relations coming together in networks to "emerge in webs of activity" (p. 81). As Fenwick (2012) suggests, the practice elements that form the actor-network are at the same time producing, and are effects of, the interactions of all of these elements that assemble together to produce the actor-network itself. I also practised my use of the ANT language to attune to the practices by maintaining a consistency of ANT sensibilities, especially any language used to promote the equal prioritising of both humans and nonhumans. For example, instead of using the terms 'causing' and 'acting',

which could lead to human-centric understanding, Fenwick (2014a) suggests the terms: attending, attuning, noticing, tinkering, and interrupting to focus on workplace learning practices.

While the ethical application was in progress, I had planned the data collection strategy under the concept of an online ethnography case study for the pilot and main studies, including the school inclusion criteria, the interviewee selection, and the Interview Toolkit, both the Thai and English versions. Later, I approached 6 school leaders whose schools fit my chosen criteria for introducing my study and chose 3 of them. As I had known them before my PhD study, most showed interest because they also wanted to learn about and unpick their own complex practices.

4.2.2 Ethics considerations

The General University Ethics Panel granted ethical approval on April 6, 2022. The approval application document was not only completed to fulfil the University's requirements (see Appendix C), but it also acted as a way for me to explore concerns I had about the tensions in the schools and, as an ANT ethnographer, that might limit the research. I explore these in more detail below.

4.2.2.1 Tensions around practice and relationships between actors

The first concern related to team tensions around practice implementation during an interview and the consequences for a teacher if any negative comments were expressed (BERA 2018). These related to the roles of the principal and the teacher interviewees within a hierarchical organisational structure (discussed in Section 4.1.2.3). The control of the principal as the gatekeeper could limit the access to potential interviewees. Recruiting interviewees of the principal's preference might mean that some teachers may feel as though they are being given additional tasks and become frustrated due to their existing overwhelming workloads (Vibulphol 2015), as well as produce selective interviews in order to prevent disagreement in the group, a risk that aligns with the saving-face culture mentioned in Section 1.1.4.

To minimise this risk, although a principal might have agreed to participate in this research, each teacher was recruited individually and communicated with me one-on-one in a non-judgmental, comfortable, and safe interview session. They chose their own

setting, such as at home after working hours, and I explicitly described my role as a researcher for each part of the interview to reduce any such tension. The relationship between the researcher and interviewee might be developed in such a way as to lessen these tensions (Husband 2020). As I see subjectivity and positionality as being related but distinct, my subjectivity has played a role in the way that I position the interviewees and the way in which they would position me. As an outsider, I connect interviewees through my professional connection with the sense of seniority and respect; this culturally placed my position as being humble but still eager to learn from them. I was open and honest with the participants and other stakeholders and avoided non-disclosure of any important information in order to ensure that the appropriate data were collected.

Additionally, I adjusted the Interview Toolkit to adopt a friendly approach and made preparations to ensure that the environment in which the interviews were held was safe; for example, many interviewees preferred to provide verbal consent during an online video interview instead of signing the consent form. This is a major concern for Thai people, who are acutely aware of the legal consequences of signing any contracts, especially via e-signature (Numnon 2017). Rather than using an official mode of communication, such as email, I decided to use the more informal LINE application (Figure 3), as teachers are familiar with this platform.



Figure 3: Connecting interviewees via the LINE application

Furthermore, I ensured non-traceability with the interviewees' data. For privacy reasons, the names of individuals and schools and any additional names of stakeholders

indicated by the participants were not revealed in this thesis. I also referred to people and schools using pseudonyms in the form of numbers and letters when writing my analysis. I used gender-neutral pseudonyms when presenting the participants' names in the thesis. Because the thesis is written in English, this may also practically protect Thai interviewees' personal information in relation to the accessibility and the quality of the translation. Addressing confidentiality, non-traceability, and transparency helped me to reduce such concerns, while developing trust with the interviewees.

4.2.2.2 Overcoming a human-centric focus

The second concern, having a tendency to overly-focus on humans, as mentioned in Chapter 1, Thai people are familiar with a human-centric approach; this could present a research challenge for interviewees, as well as me. This affected my subjectivity. Therefore, I practised the sensibility of symmetry by following the actor to prevent overly human-centric interviews. The choice of language is significant, especially choosing the words of nonhumans rather than objects (Mitchell 2021, p. 24). Within the interviews, I positioned myself as being the participant's equal, and I encouraged my interviewee to position themselves as being equal to nonhumans by framing the conversation and using choice of language so that the interviewee and me could cooperatively invite nonhumans to speak via the photo and relational map. In this way, I provided equal priority to both humans and nonhumans and maintained a flat ontology in the conversation.

My positioning is shaped by the Interview Toolkit with its ANT-based exercise and the daily report in which I reflected on my own biases, observations, and thoughts. Both tools also influenced my subjectivity, especially the way in which I ask the questions via the method I used and in the interpretation of the information I collected. Moreover, using the Interview Toolkit significantly helped me to improve my ANT sensibilities, which are necessary for my storytelling and discussion of the research findings.

I could not deny my subjectivity due to my ANT-researcher role in the research in that I possibly shaped the way in which the teachers' practices worked. Therefore, I clearly emphasised on the information sheet that their participation could catalyse professional learning practice by shifting the focus from self-reflection to practice-reflection through

a ANT-based exercise. This allowed the interviewees and me to potentially explore any unseen elements of the practices, while fully considering the ethical issues.

4.2.2.3 Ethics in translation

In depicting the practice story, I was aware of the translation of ethics, particularly in relation to the ANT translation concept, which became crucial considerations for these three aspects: Thai culture, linguistic translating by non-professional translators (Wongseree 2017), and translating the untranslatable (Ruitenberg et al. 2016).

The first concern, as mentioned in Section 3.6, is that the challenge of using ANT within the Thai context could be influenced by human-assembled thought. This could be translated as being distorted by overly emphasising humans. This challenge presents a difficulty in translating what actors say into stories as the talk passes through multiple translations. Human-centric distortion can also make the story's translation become treason in being depicted through ANT-ish ways. The second concern is the current focus on ethics in translation, which relates to the practices of professional translators, despite the increased visibility of non-professional translators (Wongseree 2017). Tymoczko (2009) highlights the concern of textual fidelity and obligations to stakeholders. In addressing the accuracy of my translations, as a non-professional translator, I am aware of my bias could distort the description of the event. To that end, I employed a back-translation method (discussed in Section 4.3.3.1) and stayed in touch with interviewees, informed them of the research findings and provided feedback on the findings in an audience-friendly style. Additionally, I involved one interviewee who possessed an English teaching qualification and who was currently teaching English in each school to take part in the translation process to recheck the accuracy of the translation of each extract without revealing the interviewee's identity. This assured the non-traceability of the interviewee, while ensuring the cultural appropriateness of the extracts.

Drugan (2011) additionally supports the second point made by Tymoczko that non-professionals' ethics in translation practices can focus on shared values in communities and encourage them to perform better. Therefore, ethics in translation go beyond the accuracy of the language translated; other nuanced elements of informants need to be considered. This leads to the third concern about translating the untranslatable or things

that cannot be communicated through language translation, such as cultural meaning (Ruitenberg et al. 2016), idiomatic expressions (Leavitt 2014), especially as finding the equivalent terms in English can be difficult when dealing with culturally specific concepts. I therefore worked with this concern through the concept of trick translation offered by Appiah (2021) in order to address untranslatable. This technique relates to annotating and glossing a particular translated term or concept with its rich cultural and linguistic context of origin (Sen 2020). Therefore, I translated not only the meaning of the language but also the socio-cultural meaning, which I have included as footnotes and in a glossary.

More importantly, Sen (2020) suggests that trust plays a significant role in ethical translation, not only a commitment to translation and stakeholders. Chesterman (1997) also links trust as a key concept to translation ethics. In translated texts, translators need to maintain clarity in the target texts and truth, which involves the accuracy in transferring the meaning from the source texts to the target texts (ibid.). At the same time, trust refers to the interpersonal and multidirectional value, which involves all parties involved in translation, including the translators, the original writer, the client, and the readers (Sen 2020).

4.2.3 Case and interviewee criteria

Schwandt and Gates (2018) explain that there are varied definitions of what a "case" is; this provides an interesting reconceptualisation of the study. It is important to define what, who, and where relates to the practices I aimed to explore. The school is an appropriate beginning point to connect with teachers, educational leaders and materials to provide a holistic picture of the practices. Therefore, I set two criteria for school and interviewee criteria, while opening up for possibilities to see any emergences.

4.2.3.1 Case study criteria

Several criteria for inclusion in this research were applied to identify three Thai schools (one pilot and two main cases) among 1,680 Sandbox Schools within Thailand's 20 provinces (Edusandbox 2025), each of which had the goal of implementing competency-based education (CBE) in their schools. The pilot was also useful in determining what value might be assembled from performing ANT-based research (Cowan and Carr 2008), including adjusting the interview questions (Kvale 2007). It

also developed my experience as a researcher in performing the study methods and provided an estimate of the expected number of interviewees (In 2017). Depending on the outcomes of the pilot study, the plan to follow an actor in the main study was adjusted to reduce subjectivity (Elsayad 2017).

The main case study aimed to explore and understand the practices in one public and one private school. The differences between public and private schools[9] include the school's level of autonomy, the school's philosophy, and the organisational structures. The criteria below were developed through the discussion with professional partners, the Arsom Silp Institute of the Arts and the Starfish Foundation, and also the school charactersistics, according to the Education Sandbox Act 2019.

- A Thai school operating a compulsory education programme for pupils aged 6–15 (grades 1– 9) is classified into two types: public education opportunity expansion schools and private schools (Michael 2018);

- A school where the internal quality assurance (IQA) result is average and beyond regarding the Thai education standards.[10] The school operates its quality control, continuous development and school-based professional learning with transparency and accountability through IQA-informed decision-making (Hattapradit et al. 2017). Additionally, for the main cases, the success of the school process reflects on the external quality assurance (EQA) result, as well as the high scores on student learning achievement tests, rate of completion and pursuit of higher education. Schools with such characteristics[11] are defined as

[9] Private schools have more autonomy in curriculum management and education processes than public schools. Public schools lack autonomy in hiring, firing of teachers, and budget allocation (Jantavit and Tanmantong 2011). This affects organisational flexibility, school philosophy, education management, administration, and teacher working culture. In a private school, the director can appoint various positions such as headmasters or senior teacher coaches. This leads to unique positions and job descriptions in each private school. In contrast, public school principals cannot change school structures, as they are standardised by the central government (OTEPC 2020b). Public school teachers and principals must fulfil various duties in line with national policy, while private school teachers focus on teaching and lesson planning (Thanyathap 2023). Private school teachers are accountable to the school, students, and parents, while public school teachers are generally accountable to the central government (Jantavit and Tanmantong 2011).

[10] Three standards: student achievement, management and administration, and child-centred teaching and learning (MOE 2018).

[11] The school with ambitious goals addresses the diversity of student needs with differentiated pedagogical practice – without compromising on standards, while investing in both pupils' academic success and their well-being. The school has moved away from administrative control and accountability

high-performing schools as student test scores alone cannot offer essential information to provide a complete picture of the characteristics of high-performing schools (Schleicher 2018).

- The school's professional learning practices comprises several actors, such as teachers, external agents, materials, technological tools or objects connecting in one or more events that occur in the daily work and become regular activities, continuously for at least 3 years. Teachers use their learning experience to amend their working processes, such as lesson plans, teaching and learning, and assessment strategies. Additionally, for a school included in the main case studies, its practice has been shared with other schools through the Lighthouse School Network.

4.2.3.2 Interviewee criteria

The three schools were purposively chosen by my initial contact; however, each school's justification for inclusion was evidence-based, with statistics and prior information. The number of interviewees for each school was determined during the first interview, with approximately four-to-six interviewees with diverse roles and characteristics who were willing to participate in two rounds of interviews. The prescribed characteristics of the interviewees, along with the rationale for choosing them, are presented below in Table 1.

to professional work organisation by encouraging teachers to be innovative, improve their performance, and pursue professional learning with colleagues. It looks not only upward within the school system's administration but also outward to reach out to other schools to create a culture of collaboration and strong networks of innovation. More importantly, the school aligns national policies and practices across their system to ensure their processes are consistently implemented.

Table 1: Interviewee criteria

No.	Position	Interviewee Characteristics
1	School principal or vice principal	School management team member who participates in the school's professional learning practice as an initiator and an academic supporter. The management would be able to shed light how the policy is enacted and leads to professional learning practice.
2	Academic lead	He/she plays the managerial role in the school's operation and most importantly, the academic role that strategically supports the school's curriculum and instruction, learning assessment.
3-4	Senior teachers	Senior teachers with more than ten years of teaching experience participate in professional learning practice with different degrees of participation. One interviewee as the key person in professional learning practice instructionally supports colleagues by providing guidance and suggestions. Another one attends the practice less than the others.
5-6	Classroom teachers	Junior teachers with less than five years of teaching experience dramatically improve their skills within a short period of time. They would be able to share their experience about the practice.

As a gatekeeper, the school principal was approached as the first interviewee unless he/she referred me to another interviewee with the proposed characteristics. The current interviewee then suggested the next potential interviewee. This snowball sampling was used to select the interviewees, as one of the most widespread sampling methods in qualitative research relying on networking and referral (Parker et al. 2019). Parker and colleagues (2019) explain that the researcher will start with a few initial contacts who fit the research criteria and are invited to become interviewees within the research process. The agreeable interviewees will then be asked to recommend other contacts who match the research criteria and might also be willing interviewees who further recommend other potential participants, and so on. Their social networks establish the initial links, with sampling momentum developing, capturing an increasing chain of interviewee networks (Parker et al. 2019).

This form of snowball sampling is effective when accessing hard-to-reach populations (Baltar and Brunet 2012; Woodley and Lockard 2016; Parker et al. 2019) because its flexibility allows for network expansion. It is often combined with purposive sampling, whereby participants are selected based on their specific characteristics. It may be viewed negatively for not producing samples that meet the randomisation criteria in the

statistical sense, and the representativeness of samples may also be questioned (Parker et al. 2019). Although such forms of sampling are criticised for their selection bias, lack of external validity, generalisability, and representativeness, these concepts are situated firmly within a positivist understanding of the value of the research, and snowballing sampling is more likely to be advocated and employed by qualitative social researchers, interviewers, and ethnographers as the referral process is used to select criteria-fitted interviewees (ibid.). It is also said to promote selection bias because it draws on the researcher's resources and contacts, but this approach also leads to a more cooperative relationship between interviewees and interviewers in a process of "dynamic moments where unique social knowledge of an interactional quality can be fruitfully generated" (Noy 2008, p. 328).

When considered through an ANT approach, a snowballing technique aligns with the fluid processes of assembling the network (Salomão and Kamp 2019), in this study, school-based teachers' professional learning practices. The interviewees depicted their professional learning stories, focusing on their learning in a collaborative school culture, demonstrating translation processes that shaped their realities through a relational map. For the second interview, a snowballing technique was also enroled to interview nonhumans. Human interviewees engaged in a photo elicitation exercise, an object-engaged activity. This exercise also describes the way in which I follow the actors by using "specific tricks" (Latour 2005, p. 79) for interviewing them, often accessed through humans (Adams and Thompson 2016). I interviewed the participants in reverse order so that the final interview with the leader would be used to conclude the whole school interview process.

4.3 Network Exploration and Analysis

I conducted the research during the post-COVID-19 period, which has brought a new normal to teaching and learning, especially by expanding the landscape from in-person to online learning. Therefore, in this research, I did not limit the scope of the network within the school, but the schools were chosen as a hotspot to open up possibilities to explore unexpected effects and taken-for-granted actions. After the schools were selected, I started my follow-the-actor plan by using online methods to perform my ethnography. As I gained numerous data from the interview, it was important to make sense of the data and to crystalise (Richardson and St. Pierre 2005) the analysis to

unravel the practices. In this section, the schools selected are introduced, and the strategy of follow-the-actor and unravelling the translation are revealed.

4.3.1 Choosing the Schools

After I was granted ethical approval in April 2022, I spent 2 months, during the school break, approaching schools and learning about them, and chose three out of six schools from their profiles by reflecting upon the criteria presented in Section 4.2.3. School A was chosen as a pilot school, and the other two, Schools B and C, were chosen for the main study.

4.3.1.1 School A as the pilot study

School A is an opportunity expansion school, operating from the early years to a lower secondary level (6–15 years old). It is a medium-sized school with 895 pupils and 40 teachers in an industrial area of Rayong Province, Thailand. Most pupils come from low socio-economic families. I first knew about this school from the active learning and school transformation projects provided by the Arsom Silp Institute of the Arts, one of the school partners for teaching, learning, and school transformation projects regarding the Sandbox Project (Promotion and Agriculture Vocation Development Centre 2020).

School A has constantly strived to improve its education processes, and it was certified as the ideal school project by the MOE in 2010 (School A n.d.). In 2021, the school won the education technology and innovation award in the 'One School One Innovation' education district project and further shared its practices with other schools in the area (School A SAR working group 2021). Behind such achievement, the 2021 school self-assessment reports (SAR) summarised the lessons learned, that is to say, collaboration is one of the keys to success. The school collaborated further to improve things such as the school concept, curriculum, the annual plan, school projects, action plans, schedules, and teacher development strategies to align with the competency-based curriculum concept. The IQA result of 60–69%, considered good, resulted from the collaboration. The IQA report showed how teachers constantly worked together to improve the quality of education, as mentioned earlier, and areas for improvement (School A SAR working group 2021), as follows:

The 60–69% result stemmed from a more systematic process to equip teachers with technological skills and EdTech learning materials. Such facilities and teacher knowledge make the teaching and learning process more competency-oriented. A professional learning community (PLC) and teaching workshops tend to enlarge teachers' opportunities to talk and work together more comfortably.

Next year's priority is teachers' capacity building in quantity and quality. The plan is to increase the number of teachers to have the proper ratio of teachers per classroom and, more importantly, support professional learning to ensure that teachers design effective instructional delivery processes aligning with the school's direction. Professional learning in competency-based assessment will be filled with learning assessment for teachers to design, implement the assessment strategy and use accurate data for further lesson-related decision making.

The information above demonstrated the school's transformation journey that fit with the pilot case criteria as an average public school, showing both achievement and challenge for school operations while emphasising the necessity of processional learning practice. However, while the school has been working to improve their quality for quite some time, they have yet to reach their expected results. Consequently, I decided that this school was worth exploring as the pilot case to learn about how the professional learning journey occurred, changed, and transformed.

4.3.1.2 School B as the main study

School B is a successful alternative school, operating from pre-school to high school (3–18 years old). It is one of Thailand's most famous alternative schools (Sansuksom 2011; Jantavit and Tanmantong 2011; Chaosumun 2021), which tends to be established with a profound understanding of education and a motive to improve the quality of education by overcoming political challenges, such as bureaucratic obstacles and ineffective resource allocation, while prioritising accountability to parents and pupils (Jantavit and Tanmantong 2011). Jantavit and Tanmantong (2011) describe that all the alternative schools in Thailand are private schools; almost all have been established for

quite some time, but each has yet to transition to the next generation of management style.

Sansuksom (2011) depicts the school's success in terms of its financial operations, satisfaction of the parents and pupils, and, most importantly, the teaching and learning process. The school has become a learning place for all educators around Thailand, with the unique point of pupils having ownership of their learning journey (Chaosumun 2021). The school constantly invents new teaching and learning solutions in a rapidly changing world, including during the COVID-19 pandemic. Chaosumun (2021) describes that the school members always perceive problems as challenges to overcome; such a mindset helps teachers to take a lifelong approach to their learning journey to upskill and reskill for the changing situation and to support pupils and parents in playing their role effectively in the collaborative processes of pupils' learning. Nonetheless, behind this image of success, I noticed the school founder's strong attempt to maintain classroom quality through several projects. She explained how the school never stops developing and how this process is grounded in Buddhist beliefs:

> *Twenty years ago, the school was new to all Thai people, although the school adopted Buddhist learning concepts as they are the central beliefs in Thailand. Flexibility, the heart of the Buddhist concept, explains how things always change, including pupils. Therefore, teachers must change their teaching methods every year to ensure pupils' learning. Teachers must practice their questioning skills to scaffold learning for pupils to reach their potential. Currently, the school has become a learning place for Thai educators, but as teachers, we still have to learn and keep up with our pupils and a rapidly changing world.* (translated from Thai)

In contrast to traditional schools, School B does not place importance on student scores as the ultimate goal, but instead emphasises the process of student learning and holistic development to equip pupils with critical thinking and self-directed learner characteristics (Niyom 2018). The process eventually produces successful student learning outcomes, as the external quality assessment (EQA) reviewers reported, the school exceeded their student outcome goal at 84.30%, with 91.53% of pupils rated at being capable of developing their skills and competencies, integrating classroom lessons into life situations. Another standardised measure of the pupils' success is the Ordinary

National Educational Test (ONET), which pupils in grades 9 and 12 completed with a high score, ranking within the top 100 of the best schools in Thailand for several consecutive years (AdmissionPremium 2017; NIETS 2019 cited in Avisikivi 2020). The school not only achieves well in its teaching and learning process, but also in recruiting pupils from high socio-economic backgrounds with supportive families, which could be a small but significant contributing factor in the pupils' high levels of performance on the national test (ONESQA 2022), especially a private school with a source of income received from parents (Johnson et al. 2007). This allows the school to improve their performance continuously to ensure parents' confidence and trust (Sansuksom 2011). The EQA report indicated that (ONESQA 2022, pp. 1-2):

> *Given sufficient budget, the school designs its own management and professional learning practices under the concept of collective leadership. Collective leadership also becomes the core of school operations in setting objective key results (OKRs), planning annual action and teacher development plans. For teacher development, the school develops an ongoing set of practices, including classroom observation, critical reflection, and lesson plan improvement, implemented through amicable coaching and mentoring.*

The external reviewers suggested that the school design a set of teachers' competencies to use as a framework for supporting their training needs assessment and professional development planning and evaluation (ONESQA 2022). In addition to work-embedded learning, they also noted that teachers should be supported in conducting classroom action research as part of their professional journeys (ibid.).

The school was deemed to be appropriate for the main case study. Regardless of pupils' high socio-economic status, the school members strive to constantly improve the quality of education by using several professional learning activities under its continuous improvement culture. This satisfies parents and pupils and encourages educators to visit and learn from the school. All the processes exceeded the performance goal at an excellent level; however, access to such high-quality education and competent teachers is not affordable for all pupils. Thus, the school's story would provide insights for educators who want to improve the processes of school-based professional learning,

especially in understanding how teachers' and pupils' learning become united and transferable experiences.

4.3.1.3 School C as the main study

School C is an education opportunity expansion public school (grades 1–9, pupils aged 6–15 years old), operated under the Chiangmai Education District 1 and the MOE. It is a medium-sized school located on the outskirts of central Chiangmai city. As a public school, the school welcomes all pupils with diverse backgrounds in terms of their learning interests, ethnicities, minority groups, and socio-economic status who want to attend this school. Almost all are Hill ethnic pupils[12] with low and lower-middle socioeconomic status; those who can afford to pay fees for access to better opportunities in education choose to go to schools in the centre of the province. While diversity makes teachers more creative in working with differences in the classroom, as Handelsman and Fine (2014) suggest, it also brings challenges in supporting pupils' learning. Because Thai is the language of instruction, the school must contend with pupils' literacy in grades 1–3 as they use languages other than Thai as their first language, which could lead to severe learning problems at higher levels. Pupils in grades 7–9 may have issues exploring their interests in higher education levels. The school report (School C SAR Working Group 2022) reveals that 80% of grade 9 pupils pursue a vocational education or nonformal education, while 20% attend high school to go on to study in higher education. The teachers' opinions on the diversity are:

> *Pupils will not get opportunities to perform at their learning capacity if they use the traditional teaching approach because it does not fit such diversity, particularly after the pandemic. Teachers have difficulties customising their teaching responsive to pupils' backgrounds, whether cultures, languages, or learning preferences. The school principal then seeks for external collaboration for technical support … to prepare pupils for a rapidly changing world by creating the school concept and competency-based curriculum.* (School C SAR Working Group 2022, pp. 1-2)

[12] Hill ethnic pupils are pupils from tribes who live in areas on higher ground in Northern Thailand. They have their own spoken language and culture, which differs from that of other Thai people.

This excerpt from the report brought me to the school's 2022 self-assessment report (SAR), showing the IQA results. The school members assessed their performance against student learning outcomes and rated their teaching and learning at a very good level (70–79%), and management and administration standards at an excellent level (80–89%) (School C SAR Working Group 2022).

The IQA results reflect through the school goal and the school concept of 'Skills to be Inspiration' for three goals, aligned with three education ranges (grades 1–3, 4–6, and 7–9). To implement the concept, competency-based curriculum and professional development processes for boosting teaching and learning practices have become priorities in recent years (ibid.). Teachers gain constant support to improve their expertise within several practices, such as the internal supervision project, the professional learning community for teaching practice improvement, and workshops held by external experts (using EdTech applications and active learning workshops). Pupils demonstrate their knowledge, skills, and competency and, more crucially, become more aware of self-esteem and open-minded characteristics. However, considering the student learning outcomes and teachers' current levels of competency, there are further gaps to work on, for example, increasing the quality of internal supervision and adding more topic-specific workshops for a specific group, such as teachers in grades 1–3 for literacy education.

The report also addresses the challenge of some workshops assigned by the central government, which may confuse teachers to link what they gain from the school direction and their local classroom pupils. Teachers also admitted that learning about these new initiatives is also time-consuming, and the additional non-teaching hours are a common issue that can potentially affect teachers' classroom teaching hours, as mentioned in Chapter 1. Nonetheless, the school does manage to integrate these into the local context to reduce extra work by including technological tools to help their operation and by using the school concept as the working blueprint to reduce these extra non-teaching hours (ibid.).

These attempts to be a creative and innovative school designate the school as a "sub-district good school" (School C SAR Working Group 2022, p. 7) and is a member of the Chiangmai Education Sandbox Project. The school may not yet have the best educational outcomes in the district, as it does not have all of the standards rated as

excellent, but, over the previous five years, the number of new pupils had increased due to a better teaching and learning process (ibid.). Local residents choose to send their children to the school because the quality of education provided there is comparable with that offered by schools in the city.

The school was deemed to be a suitable main case study as a public school, and to serve as a contrast to School B as a private school. Within its ongoing journey, the school redesigns and readjusts its strategy to be ready with new policies and technology while considering student differences. The school's processes are worth exploring because, as a public school, it is generally perceived as having less autonomy than private schools due to bureaucratic obstacles (Jantavit and Tanmantong 2011), but the school seems to have a way to overcome such limitations. Without hesitation, I contacted the school principal. I asked for permission to conduct an interview, because exploring the practices in this school would make an informative contribution to other public schools.

4.3.2 Development of an Interview Toolkit to follow the actors in an online ethnographic approach

Law (2009) explains how, to understand how realities are performed, it is essential to attend carefully to practices and ask how they work. Following-the-actor allows objects and material practices to draw attention to "mediators making other mediators do things" (Latour 2005, p. 217). In her exploration of professional educators' practices, Ireland (2019) adopted Latour's suggestion to adopt fluid sensibilities to understanding the world – to 'follow the actors' and to 'go with the flow' to learn from them how an assemblage 'hangs together'. Aligning with these ANT sensibilities, I decided to 'follow the actor' to attune to materials while exploring the network to draw attention to attune the relations that occur around the actor, as it allows researchers to access rich data via the participant's journey (Adam and Thompson 2016).

I chose to follow the actors through an online interview process for the following reasons. First, it logistically fits with the schools in different locations and aligns with the after-school interview times. The online approach allowed me to set up an interview according to the semester calendar; this widens the scope for observation and data collection, regardless of where the researcher is situated (Angrosino and Rosenberg 2011). I started the pilot study with School A in the first semester of 2022 (June-August), after the two months of the ethical approval process. I then worked on School

B in the second and third trimester of 2022 (October 2022 – February 2023, and School C in the first semester of 2023 (May–August 2023). In the pilot, because I was situated in the UK, I interviewed remotely on Microsoft Teams. While the internet made the interview process convenient, the time difference presented an issue in arranging a suitable time for an interview appointment, particularly when considering teachers' schedules. I then decided to return to Thailand to conduct the main study but to remain online for the interviews.

Secondly, following-the-actor online allowed the interviewees to share their overall learning perceptions, including those relating to their online experiences (Sade-Beck 2004). This did not present difficulties in the ethnography, as the participants were already familiar with engaging with an online platform for their work, on the contrary, they seemed to be more comfortable using an online tool during the research process. Thus, a variety of platforms and sites were enrolled in the data collection process, to allow a layered analysis of space and place (Howlett 2022). The participants, now equipped with portable smart devices, were more likely to access more field sites than they did previously with their stationary computers (ibid.). For example, in this study, they were able to show evidence from their classrooms or to take their relational map photo with their smartphone during their interview. Some participants preferred to be interviewed while at home rather than in the workplace, as they felt safer in disclosing their experiences than they would if they were in a shared physical space (ibid.). The variations in presence in each interview essentially affects their story, so I recorded such details in my diary. Moreover, using online approach constantly urged the interviewees to provide their perspective on their digital involvement, effectively expanding the potential spaces within the ethnography. As Beaulieu (2010) suggests, and as described in Section 4.1.2.3, online interviews expand the location of learning, especially when shifting from sharing a physical space to sharing interactions in the online space. This allowed me to unravel how online settings affect teachers' learning, especially after the influence of COVID-19.

The most important part of the following-the-actor is its flexibility in identifying "that which makes them act" (Latour 2005, p. 237), including all of the other "circulating entities" (ibid.). As such, ANT acknowledges how the use of multiple data can act as a way to strengthen an empirical case (Hansen 2011), especially in exploring matters of

concern (Latour 2005). Therefore, I designed the study to collect data via a variety of sources: interviews, observations, and documentary analysis, while remaining open to possibilities by "going with the flow" (Latour 2005, p. 237) to deal with fluidity and multiplicity across the networks.

To decide what actor to follow, at first I had to ensure that I was not privileging the most obvious actors, particularly in terms of their rank and position, because prioritising their presence can lead to the absence of others. However, as Mitchell (2017) suggests, "some actors had more connections with networks than others, but to notice this, I had to follow them" (p. 219). Therefore, in order to include the less noticeable connections, which could be surprises regarding professional learning, it was important to gain support from the ANT exercises along with the interviews to highlight these overlooked actors.

4.3.2.1 In-depth interviews

A semi-structured interview is defined as an approach that combines open-ended questions with a predetermined set of questions (Adams 2015). Using this type of interview can allow the interviewer to freely vary the questions and adjust probing questions depending on situations in an interview, due to its flexibility (Bryman and Bell 2007).

However, I also acknowledge the tension of using a semi-structured interview process in Thai cultures, which may influence the conversation, for example, the saving-face values may influence the interviewees to provide recipe-like and structural conversations, and the centring of self-development may lead to the prioritising of the human. Bispo (2015) highlights that this can limit the capacity to capture the dynamics and complexity of the surroundings and other actors because interviewees may concentrate only on their spoken discourse, which might overlook the role of materiality in discourse. Therefore, it was necessary for me to develop an Interview Toolkit – one that not only reframes the interviewees' ideas, but also worked to ensure that the language that I used in the interview space was less human-centric (see Appendix A). Latour (2005) advocates that researchers must describe, and also argues that humans cannot do this without telling stories. While I follow Latour's suggestion that my interviews with humans have helped me to extend my understanding in seeking to

explore the extent to which nonhuman actors affect their actions, there was the potential that this may not solve challenges that Adams (2015) raised about standardisation and potential bias. To this point, striking a balance between the flexibility and structure of the interview is crucial, so using several techniques can provide a holistic understanding of the practice while balancing human and nonhuman perspectives. I therefore employed alternative interview strategies, combined with a semi-structured interview technique and ANT exercises, to maximise the focus on ANT perspectives and minimise the potential for the interview's limitations, by using the Interview Toolkit (see Appendix A).

Relational map

At the start of the first interview, participant mapping was used to generate a visual overview of the key actors and components in the assemblage and to reveal its complexity (Stuyfzand et al. 2022), as well as to identify relationships, which makes it different from traditional maps (Fenwick et al. 2015). The conversations with interviewees before the first map drawing exercise explored teaching and professional learning experiences. Later, I introduced the interviewees to the exercise by asking them to situate themselves in the centre of the map and to illustrate everything that affects their professional learning in different distances from the centre and to use arrows to show the various different interactions between them. Although this exercise seems to have a human-centric emphasis, this significantly helped the interviewees to reject their prior experiences of hierarchy to flatten relations and ensure the visibility of nonhumans. This exercise, in committing to symmetry, primes the idea of nonhumans that are usually taken for granted. The feelings surfaced in this activity were then also brought into the next exercise, which was embedded in their professional learning and working routines.

Interview-to-the-double

The second exercise in the first interview is the interview-to-the-double (ITTD) technique. ITTD has the heuristic potential for sociologists to find alternative ways of capturing the procedural and linguistic nature of the process of organising or practices (Nicolini 2007). Following the ITTD technique described by Nicolini (2009a) and Bruni and Gherardi (2013), participants were asked to imagine that they were training a

‘double’ to take their place at work. Their double, although appearing identical, did not know what they did in their job, so they were tasked with providing as much advice as possible to their double, so that their replacement cannot be detected as being an imposter. Lloyd (2014) explains that ITTD, with the merit of turning participants into observers of their practice, helps interviewees to capture their own experiences of information and produce its description. However, Lloyd (2014) points out that it is important to realise the difference between other techniques, such as think-aloud, and that ITTD is set up between the participant and the double, not the researcher and the participant. However, for an ANT study, this is not considered an issue – as Nicolini (2009a) suggests, the process of ITTD is based on the “premise that all research, interviews or other, necessarily generate ‘data’ whose nature cannot be separated from their process of interpretation” (p. 200). This means that the data generated through ITTD is a valuable way to understand practices, regardless of the focus of the relationship between the interviewer and the interviewee.

As a projective technique through an insider perspective (Lloyd 2014), ITTD allows researchers to access the way participants view information, knowledge, and information-related activities, which includes local knowledge and ways of knowing situated in the practice. To explore the role of the interviewee, I used ITTD after their relational map to further open the access to their situations. However, the way in which I implemented ITTD was set through the relationship between the interviewee and me as the double. This may contradict the ITTD’s original idea of the participant and the double. However, to access participants’ ways of working and knowing, situating me as the double allowed the interviewee to reflect from inside by focusing on ‘knowing’ as a collective doing, rather than focusing on researchers’ attention on ‘doing’ (Gherardi 2009). Therefore, I asked them to imagine that they were being promoted and needed to give me advice as the replacement. The specific question was, “What would you suggest that I must do to ensure that I would be able to fully take on your position in the professional learning network?”

To conclude, an adapted version of ITTD allowed the interviewee to reflect on their own role in everyday actions, and identify what is important to them, rather than being directed to the theme prompted by the researcher (Nicolini 2009a). In this way, following them was an effective way to explore their interactions with other entities.

Photo elicitation

Before ending the first interview, I informed my interviewees about the photo elicitation exercise, asking that they prepare photographs of things that are essential for their professional learning to bring to the second interview. Photo elicitation is a visual method used to enhance interviewees' participation and is responsive to participants' experiences, especially through a form of communication rather than representation (Cooper 2017). Photos elicit longer and more comprehensive interviews, and are particularly useful in expanding the conversation to reveal overlooked elements (Harper 2002). Photos taken by researchers also help to explore taken-for-granted entities; asking participants to take the photos can help to decentre the authority of the researcher (ibid.).

People taking photos might challenge the concept of ANT because a human's response at the surface is not sociomaterially originated work (MacLeod et al. 2019). However, in a study of therapeutic alliance in addiction treatment, Bailly et al. (2018) showed how photo elicitation enabled them to deploy an analysis on the actor-network level, especially between patients and therapists and between patients and things in the hospital. While patients take photos, the conversation between the patient participant and the researcher discloses the visibility of places or things that affect treatment and relates to emotional and symbolic investment in care settings (ibid.). This study by Bailly and colleagues (2018) demonstrates that photos taken by people bring us to other relevant actors, human and nonhuman, that affect the treatment process. More importantly, the actor-network concept does not abandon humans but instead provides equal treatment of both humans and nonhumans in exploring their effects.

The photo elicitation activity enrols both the interviewee and photos or things to cooperatively share how they enrol in professional learning and their interactions. To complete this exercise, the interviewees went about their routine working lives and took 3–5 photos of important things that affect their professional learning. They were able to spend as much time as they wanted on this activity and were reassured that they could take any photos without the concern of them being wrong. In the second interview, the things in the photographs that were taken are used as the subject of conversation, while the interviewees were asked to share their experiences, emotions, and thoughts about intra-acting with the thing in the picture and assess its necessity in facilitating their

professional learning. This method highlights the hidden relations between the interviewee and objects, as told by the objects. This process was carried out as an open-ended discussion, and I used probing questions related to the images of the things. The driving questions were, "Why and how does this thing work?", and "What if this thing did not exist?" This was the moment to remind the interviewees about things and their power, and this was also useful to me as it illustrated how to let an object speak through humans.

4.3.2.2 Observation and daily report

My own reflections on the days I engaged with the other actors in the research assemblage allowed me to record fresh moments and relations in the assemblage. As an ANT researcher, I logged my reflections by following my template design. First, I recorded general information about the day I attended the network to allow me to know each interviewee's network. Second, my observations of the main events (the objects and human relations involved, interviewee presentations, other interactions, and what I learned about the school) were necessary, as the interviewees were asked to do active exercises alongside the interview, although the interview was conducted online. Third, recording academic notes (analysis ideas, theoretical links, and observations to think about further) helped me to identify clear points for the focus of the literature review and analysis chapters, as they were ongoing and dynamic writing pieces. The perceptions revealed in the interviews were used to fulfil the holistic perspective adopted in the study. Lastly, personal notes (reflections on my own practices) helped me to continuously improve my ANT-interview skills. This has sharpened my ANT sensibilities, the way in which I asked questions, and how I reacted to my interviewees.

4.3.2.3 Going with the flow from the pilot to the main study

Performing a pilot study allowed me to critically examine the Interview Toolkit and practise my ANT sensibilities as an ANT researcher. By going with the flow and developing the interview questions in the pilot study, I reflected on my experiences and observed the interviewees' responses. These were the material clues I used to adjust the questions and strategy I adopted for the main study network.

First, the flexibility of the interview schedule was the primary actor that allowed my interviewees to enrol in the interview network effectively; I found that using the LINE

application and making a phone call seemed to be the most appropriate method to contact them and to send the consent form and allow them to propose their most suitable time, for example, some chose to be interviewed after working hours, some after lunch, and some during the weekend.

Second, I ensured that gaining the participants' consent was responsive to the interviewees' needs, whether signing a consent form or providing verbal consent before an interview. Printing the consent form and signing it, then scanning or taking photos of it to send it back (see Appendix D), was a complex process, and I found that many interviewees preferred to provide verbal consent rather than signing on paper due to the personal concerns discussed in the ethics considerations (Section 4.2.2.1). I did ensure, however, that they had read and understood the consent form and the implications for them, as participants, in taking part in the research, before they provided their consent.

Third, although the duration of an interview can take up to 120 minutes (Knott et al. 2022), Adams (2015) suggests that it should not exceed one hour to prevent fatigue for both interviewer and interviewee. I also found that, when interviewing them onsite, teachers could be distracted during their interviews by other teachers or parents asking for their support. However, allowing extra time for teachers to make them feel comfortable without rushing was also important. Another concern identified in the pilot interview process was that the interviewees tended to provide quick responses; this presented a limitation in gaining rich and deep information. Therefore, I adjusted my main study plan by splitting the interviews over two semesters. This not only allowed the interviewees to experience their everyday work and professional learning and provide fresh responses, but also, for me, as the researcher, allowed me to work on the interview transcripts to inform the subsequent interviews and to ask the participants for any initial responses that needed clarification.

Fourth, performing a pilot study allowed me to rethink the interviewees' object selections. Whether the school leader is involved in professional learning practices or not, interviewing them was essential because he/she was able to represent the school's identity, which is an important background actor for understanding teacher professional learning. I therefore had to include the school leader as a crucial interviewee, as mentioned in the interviewee criteria described in Section 4.2.4.

Fifth, the interview questions were perceived as being easy to understand but difficult to answer because interviewees needed time to think about them. Interview questions are an important factor in making the interview network come alive and mobilise to achieve the research goal. Some interviewees needed more accommodations, such as the probe questions linking the questions to concrete experiences. In designing the interview schedule, the questions were divided into five parts (see Appendix A). The pilot interviewees were asked these within one interview, while the main study interviewees were asked the first three parts during the first interview and the rest during the second interview. My observations and the feedback from the pilot study relating to the interview questions is summarised below.

- Question Part 1: Information about you

  This part is appropriate; no adjustment is needed. However, it should not take more than 5 minutes. In the pilot, some enjoyed telling their stories so much that they kept the conversation going longer than 5 minutes.

- Question Part 2: Experience of professional learning practices

  This section related to interviewees' experiences, as they expressed their professional learning experiences about classroom management, teaching, and learning. From the pilot, I found that the answers to these questions may be repeated in the final part, so I adjusted my question by adding some questions about the value and benefit of professional learning practice in this section for the main study.

- Question Part 3: Relational Map and Interview to Double – current practice

  Relational Mapping

  The relational maps received positive responses from pilot interviewees because they helped them to stay focused on current professional development practices. I showed them a few examples of unrelated relational maps before they drew their own to ensure that they did not frame their thoughts on other interviewees' ideas. It was not difficult for them to do so, as they use this kind of map with

their pupils, for example, asking pupils to draw mind maps to summarise their learning. Therefore, this activity was also chosen to be used for the main study.

The interviewees perceived the relational map as a tool for generating their flow of thinking, helping them to consider the role of things in their professional learning practices, such as the shared lesson plan, a project-based learning plan, a classroom observation template, a screen, a coffee, a computer and tablet, and a schedule that affected their actions. The academic lead teacher and the deputy director stated that they found room for improvement in their practices from discussing their drawings in this activity.

Interview-to-the-double

This technique is designed to help an interviewee to effectively describe their own practices rather than asking them about their role. As the question asked the participants to suggest others to replace them, they were therefore able to talk about their role step-by-step and clearly and, more importantly, describe their emotions and feelings during each step. Particularly for the academic lead teacher, this activity helped her to think about the teachers' on-the-job training as a mentor. Nonetheless, some interviewees spoke about their general role alongside the professional learning role. Therefore, reminding them to refer to their map allowed them to stay on track during the interview.

- Question Part 4: Role of objects in the current practices – Photo Elicitation
  This interview activity was included as a separate activity in the pilot study, however, it was used as the method for the second interview for the main study. With this amended data collection plan, some of the pilot interviewees were asked to take a photo during the interview. Their feedback was that this photo activity seemed unnecessary because they can relate the role of objects to the map. However, they also described that this activity may be realistic and appropriate if they were able to take the photos during their next professional learning session and return with them to be interviewed later. This allowed them to explore things thoroughly in practice.

  I rephrased this question based on comments provided by two interviewees. When asking about "the necessary things (such as documents, smart devices,

etc.) that help them achieve their professional learning goal and how necessary they are", they felt that taking photographs would make it easier for them to think about the objects. Accordingly, I adjusted the question (Table 2):

Table 2: Pilot and revised interview questions

Pilot Version	**Revised Version**
Can you pick the 3 objects in the map that you think are the most important to help you achieve the goal of the practice? • How does the thing play its role in the practice? How does it interact with you? • When does it happen?	As you were asked to take 3 photos of things necessary for your professional learning, could you explain • Why it is important, and • What is its role in the activity and how does it connect with you?

- Question Part 5

  Teacher participants were able to provide examples of their teaching and learning practices related to the professional development activities, but I found that these were not related to the concurrent teaching practices. The answers to this aspect of the question were shared during the second part of the interview. To facilitate the participants' responses, I altered the question from asking about their experiences of teaching practice to explore how the interviewees witnessed the outcome of professional learning practice and took on the monitoring and facilitating role.

  For the main study, I modified the question by asking my interviewees to focus on their most recent activities to allow them to answer and share some of the evidence they had observed.

4.3.3 Data Enactments

Entering the networks brought me to the enactments of numerous data. Although following-the-actor drafted the pathway to explore these data, different data types were integrated naturally through my interviewees' interactions and my association with the research assemblage. In this section, I present how I dealt with language translation and the translation of materials or data into the story.

4.3.3.1 Different types of data and translation

My approach to data translation was situated, reflexive, and pragmatic, committed to ANT's notion of translation as transformation (Callon 1986b). I viewed translation not just as a linguistic exercise, but also as a form of actor mediation, where meanings are transferred and transformed. In this section, I explain how I intra-acted different types of data and translation strategies.

Documents and textual and visual transcripts – produced by interviewees and nonhumans

To begin with, documents were the first materials that I directly encountered in each school. I accessed the online school self-assessment report (SAR) and internal and external quality assurance (IQA and EQA) reports. This information was useful as I used it as a criteria filter before contacting a school leader. During the interviews, I was allowed to access several working documents provided by the interviewees, such as the school curriculum (including the school concepts and roadmap), a sample of the lesson plan, teachers' individual performance agreements, pupil reports, policy guidelines, and so on. Expectedly, some documents, such as the school curriculum and policy guidelines, are conceptually interconnected, making the invisible linkage between the schools visible, as discussed in Chapter 9. I accessed all three schools' lesson plans as the vital actors for teachers' learning, which vividly indicates how teachers' dialogues were formed in each school. The lesson plan template for each school, especially the after-teaching reflection or assessment section, framed the topic for the professional dialogue. For the performance agreement, although schools A and C used it as a common template for teacher performance evaluation, it shaped each school's professional learning practices in different ways.

In terms of the transcripts, I interviewed in Thai and transcribed in Thai verbatim for my analysis. This was not only for the transcribed text, I also inserted a relational map and photographs from photo elicitation in the transcript to help me attune to their explanations, along with the photos taken to see connections and actions. According to Moura and Bispo's (2020) suggestion, capturing the actions of nonhumans can by facilitated by incorporating these artefacts effectively into interview transcripts. These visual materials are the tangible objects that make the explanation rigorous and form part of the story that fulfils and communicates phenomena (Czarniawska 2014). Each

interviewee's relational map tells the whole story's dynamic, while photos are used to unravel the role of nonhumans and their interactions.

After reading through documents and transcripts with photos, I chose key quotations, according to the four-step translation process, and necessary information about the school, by highlighting the excerpts that had an impact on professional learning practices, especially those that make the invisible visible, such as cultural and semiotic materials. I started translating these into Thai and then re-translating it into English, in a process called back-translation. I employed this technique as it is the process of translating from the target language back to the original language and evaluating the equivalence between source and target versions (Chapman and Carter1979; Chen and Boore 2010). The back translator should be proficient at both languages, ideally bilingual and familiar with studied materials (Bracken and Barona 1991). As I am not a qualified translator, back translation is the way to recheck the accuracy of the translation. I also considered my familiarity with the area studied, both in Thai and English, and the process allowed me to review and polish the content to assemble the story. I did not use Google Translate (GT) for the translation because it provides inaccurate and incomplete translations. GT cannot fully translate Thai into English because of :1) Thai homonyms, homophones, and homographs, 2) Thai connotations and different modes of language used among people of different seniority, and 3) Thai has no tense (Kate-Phan and Sripetpun 2016). Another technical problem is the unbalanced data and vocabulary between a pair of languages, especially terminology and local vocabulary (ibid.). Along with the back translation, I also employed the trick translation (Appiah 2021), as mentioned in Section 4.2.2.3, to ensure the accuracy of translation in terms of hidden meaning and cultural significance, for example, some turns-of-phrase concepts regarding Thai cultures and perceptions. Trick translation allowed me to express the concept more profoundly and direct in relation to the meaning. I invited a native speaker to check the authenticity of the translations, and my interviewees to read the story and the extract I had translated, especially those majoring in English, to verify the extract's translation because they are proficient in the language and know the context and culture of the school. The techniques above helped me to ensure the accuracy of the messages translated. Based on these approaches, I, as a non-professional translator, was able to ensure the accuracy of translation according to the context and meaning.

This section of materials is the main text that I intra-acted with all the time. Therefore, I inserted a blank column on the right for noting or placing the Post-it note, which linked to materials produced by me. This allowed me to trace events and certain responses to the research questions.

Text and visual data produced by me

In my research assemblage, I contributed by engaging in producing materials. I logged my daily reports online every time I interacted with interviewees, particularly when any ideas naturally emerged. I then printed them out and included each daily report in each interviewee's transcript file. When I could not access my notebook but suddenly had a quick reflection, I used the online notes in the LINE Application and wrote these in the notebook later.

I first separated my notes into four sections: Schools A, B, C, and overall. I preferred to write down and draw the notes rather than type them because I also created my visual diagrams as visual notes, allowing me to summarise and depict the connections between networks. I then used Post-it notes to indicate the relevant information in my other text materials between my daily reports and the interviewees' transcripts.

Audio recordings

In dealing with textual and visual materials, I found a challenge in the messiness of the data so, I listened to the recordings again, particularly the sections relating to the photo elicitation activity. This significant part highlighted the role of nonhumans and allowed me to connect and find hidden micro-practices in my own relational mappings. The audio recordings also helped me to clarify my interviewees' emotions and feelings when referring to others, because Thai is expressed according to its unique culture, particularly seniority (Anansan 2001).

4.3.3.2 Nesting the story

Nesting the story was one of the key mobilisation processes. Data were organised by grouping them into the research questions and connecting each piece of material to the story. I started by scanning and reprinting all data described in Section 4.3.3.1. Adapted from Büscher (2006), photographing the process during the field study allowed me to compare my original view with this photomontage. Weichert (2020) problematises the

photomontage as a means to (de)construct content and photograph objects to make them more visible and available. Benjamin (2002) further assumes that its functions help in coping with the hermeneutical crisis – the crisis of experience and a loss of storytelling. Although Weichert (2020) critically expresses that the composition may not require a strong sense of experience, the possibilities to see the holistic perspective to end the story is necessary. Thus, it is not all about experience but directly related to narrative planning in dealing with fragments, complexity and messiness, because good planning shapes a specific emotional impact on the reader within complex meanings (ibid.).

However, I did not use this photomontage technique for photos only, but instead went beyond to include texts by treating them as concepts (Figure 4). Because of the potential of treating these data as materials, montage can become a tool for thinking that facilitates disjoining and combining the content and can cross the categorical (discursive) boundaries, instead of attempting to categorise their existence (Weichert 2020). I reshuffled the reprinted materials because the photomontage allowed me to create a new perspective on how the story is told, while it was also used to juxtapose the existing data (see Appendix B for visual versions). This also helped me to disrupt my tendency towards linear thinking. I cut the transcript into paragraphs to rearrange them with photos to answer the research questions. As an iterative process, organising and reorganising materials allowed me to nest the stories and show the whole network so that I was able to see what should be included or excluded to avoid shutting down any possibilities. As Latour (1996b) states, actual judgment is a matter of collaborative, intersubjective and interobjective in shaping reality through interaction, embodiment, and relations within dynamics and conditions (Rammert 1999 cited in Büscher 2006).

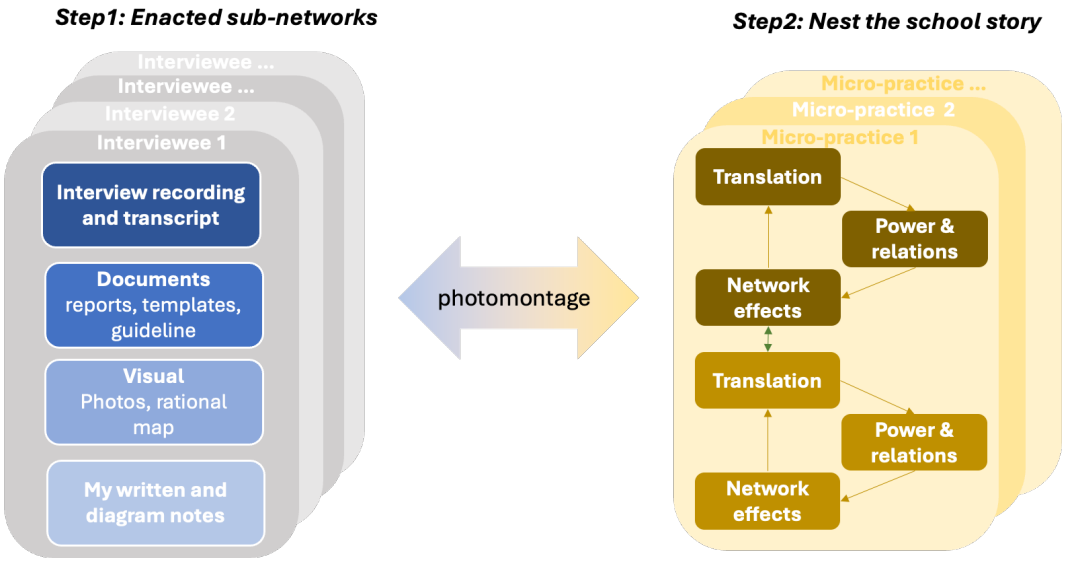


Figure 4: Nesting a story

4.3.4 Tell the story

In seeing the whole network nested, many actors were found to be part of the practices therein, including the patterns and the unpredictability that make professional learning activities actively possible (Fenwick 2015). I developed the 'tell-listen-and-retell' strategy by tying it with an interactive, sociomaterial, embodied and situated-in-practice approach, while considering the conceptual alignment within an ethnographic case study design, following the actors, and ANT sensibilities. The technique allowed me to assemble the story of what I investigated dynamically and performatively. This process was designed so that I could apply it iteratively within the techniques described below.

4.3.4.1 To Tell

'To Tell' with performative narrative and allegory narrates each school's story in Chapters 5–7, along with the ANT translation process.

Performative narrative

Not only are practices active in the network, but language and other symbolic forms that actors use can be made visible, revealing how they facilitate or hinder this translation process. Language is not simply a passive reflection of pre-existing social structures, but rather, as Halliday (1977) suggests, is also an active force as an interpersonal function in constituting social interactions and a textual function in constructing text to

communicate and maintain those structures. Sergeeva (2019) offers that narratives help in sense-making as actors use them to shape their understanding, as well as in sense-giving by crafting others' understanding for constructing relations to form collective meaning. Both sense-making or sense-giving work iteratively by the role shifting between producers and consumers; this process brings other actors into a new coalition and collective action (Kaplan 2008). As Van Leeuwen (2006) states, language can thereby shape and transform social reality.

Through ANT, Callon (2007) defines this situation as the performance outcome of nonhumans and human relations, which he calls "performation" (p. 15). In enrolling performativity, ANT is then one of the ways in which we can develop a performative narrative. Czarniawska (1998) advocates adopting a narrative approach to performing ethnographies of work organisations, describing how it helps to reveal "how big pictures of the network are drawn, and the taken-for-granted tiny or micro action problematise and perform" (p. 49). Hitchin (2014) proposes the use of the Narrative-Actor-network theory (NA-ANT) approach under the combined integration of sociomateriality, hybridity and translation. However, it is noted that narrative can be unstable because of the shift of equilibrium that people can implicitly or explicitly dominate narrative (Andrews 2004). To maintain the equilibrium and overcome the prioritisation of processes over objects in organisational narratives, Latour and Czarniawska (2012) further suggests that, instead of focusing on a traditional view of narrative through tellers, the concept of 'flip-flopping' can resolve the constraints of different stage of narrating the story by shifting the focus from individuals to actors that move between positions. This is to ensure that a narrative is not just a naïve description from an ANT perspective, but it might also allow the introduction of the changes and the processes of translation to become visible (Law and Singleton 2000).

Kaplan and colleagues (2004) explain how narrative and ANT work supportively together by the NA depicting a whole assemblage's incidents at both macro and micro levels to reveal how each actor relates to others in performing the ANT translation. Holstein and Gubrium (2012, p. 219) use the term "narrative network analysis" (NNA), one that uses narrative to map actions connecting various human and nonhuman actors; as well as focusing on the power relations within stories as empowering, marginalising

and dominating tales. From the perspective of performativity, power relations are perceived as being a dynamic process beyond actor-networks in the assemblage.

Similarly, Vickers and colleagues (2018) adopted Czarniawska's (2000) concept of using narrative in organisation studies by combining it with the ANT story, weaving the idea to become a form of NA-ANT. They used three steps to narrate the story: identifying the characters, identifying specific events talking about the translation way, and sense-making that included events and linked them into meaning sequences through the sensibilities of translation. Without mentioning actors as humans and nonhumans, this reflects the idea of generalised symmetry with no difference between macro and micro actors as rational logic applies on any scale (Callon 1986b). Furthermore, Törrönen (2022) uses the narrative method in analysing agency and identity navigation in addiction stories under the ANT concept. The researcher approaches addiction stories as "interaction", which is "how events are told" (p. 95). Bamberg (2020) explains the approach in which narrators interact with their listeners and position them in a specific kind of relation to the story. Therefore, it might be suggested that telling a story can be understood as an ongoing process of reassembling within acts of affecting relations and meaning. Therefore, these will necessarily be transformed when the telling of the story is accepted (Frank 2010).

Based on the NA-ANT approach, I developed the narrative tool to explore the actor-network of professional learning and used the tool to navigate through the four steps of translation, including whether it was a successful or failed translation, to embrace uncertainty. Thus I, as part of the research assemblage, am part of the story. This I achieved not only through event identification, but I would also highlight the connection between actors through their actions and connections. Knowing the character could be the background to understanding events and how each character enacts others and perceives each event. Identifying specific events underpins the concept of multiplicity. The diverse experiences of interviewees show that they are not fixed or stable entities with predetermined attributes or characteristics but are instead the result of the various networks in which they are enrolled; this includes nonhuman actors. The interpretation, the last step, provides power and relations, the key for the translation, and the network effect, aligned with the research question.

Allegory making things visible

As Law (2004) notes, “allegory flourishes as an art form in contexts where there is explicit repression” (p. 88), illustrating how agency is hidden in direct representation. Allegory as a rhetorical device is used to uncover hidden power or messages which might be absent (Law 2004) or silent (Latour 2005) within the text in various forms of writing, images, music, etc. The *Oxford English Dictionary* (2023) defines allegory as “a story, picture, etc., which uses symbols to convey a hidden or ulterior meaning, typically a moral or political one; a symbolic representation”. Furthermore, Ireland (2019) explains that an allegory is a story using characters, settings, and a plot to make readers believe it could happen, but which is not presented in fantastic and imaginary ways.

The use of allegory could refer to two processes: composing and interpreting. Writers may use allegory to express the double meaning of what appears at the surface and to point out what happens beneath (Copeland and Struck 2010). Allegory makes a narrative more interactive, not only disclosing a hidden message but also hiding radical critique of a dangerous topic of discussion. As an interpreter, allegory is more than a story; it could be the expectation and intention that individuals approach a piece of art as if it had a hidden or ulterior meaning (Bude 2023).

In professional learning practices, multiple absences tend to disrupt the processes (Ireland 2019), especially the unexpected incidents that interrupt existing routine processes (Mannion 2020), such as lesson planning and teaching as a plan. Sometimes, teachers have to experiment with new approaches to improve the quality of teaching, even teaching the same topic but with different groups of pupils or leading the same group of pupils on different topics. The tidy differences in each assemblage could motivate teachers to reshape their strategy by having new teaching practices enrolled in the assemblage and fostering intra-actions with pupils.

Viewing the professional learning practices with ANT sensibilities, allegory becomes the tool to mediate disruptive forces, as it articulates those unrevealed practices (Mol 2002), which leads to understanding actors become enrolled and participate in the assemblages to crafting their realities, also called the ‘translation’ (Ireland 2019).

4.3.4.2 To Listen: Confirm the story

Every moment of the interview *told* me about the professional practice networks and how the actors perform their roles. I reread interview transcripts to become familiar with them and *listened* to them, allowing me to trace and merge each network. I began connecting each relational map by seeing a mutual actor mobilising to another network; at the same time, I revisited the anecdotes, which are little stories woven into the fabric of ordinary conversation (Adams and Thompson 2016), and reshuffled each narrative story. The story performed within these assemblages will be told through anecdotes, relational maps, and the photos that interviewees took.

4.3.4.3 To Retell: From descriptive to analytical ANT story

The descriptive stories presented in Chapters 5–7 will be retold through the analytical part of the stories via the ANT sensibilities and ANT concepts, and in Chapter 8 by aligning these with the research questions. In Chapter 9, the analysis stemmed from the fabrication of retold findings and literature review and was illustrated in the professional learning ANT key insights. The following technique is used to enact each research question.

Unravelling the translation

The analytical part of the stories will reveal the practices through sociomaterial sensibilities by looking at how practices are formed, maintained, and sometimes fade away. With an interpretation of each case, this part sheds light on the linkage or connection between the actors in the teachers' professional learning practice assemblage and helps to tell the story of a live environment. Using the notion of translation, as described in Section 3.3, shifts the focus from following-the-actor to probing to the movement of a particular practice (Adams and Thompson 2016). This helps us to know how it came to be this way because, as Callon (1986b) states, "to translate is to displace" (p. 223). While Callon (1986b) proposed the four moments of translation, which was used for many education studies, Callon cautiously admitted that these moments never work separately. This means that the movement requires all four together for successful translation. Therefore, the retold story will intertwine the four moments to project the practice translation.

However, employing merely the notion of translation could lead to difficulties in reacting to complex questions such as stability and fluidity. Adams and Thompson (2016) expand this point by suggesting that other relevant concepts, such as hierarchy, power, politics and things, should also be given attention. This aligns with what Law (2009) proposes in the concept of collateral realities, as mentioned in Section 4.1.3.2. This helped me to broaden the story of translation, that is, not just working on the bullet list, or the so-called the traditional practices, but also by seeing the variety of movements and connections between actors, such as the social, technical, institutional, economic, cultural, and political.

The analysis will show how different actors are enrolled in the teachers' professional learning and how they influence, and are influenced by, each other. It will also show how each network is nested into one another through the mobilisation and connection between actors.

Identifying the role of power and agency

In responding to the second question, the importance of power and agency in shaping social networks will be highlighted, for example, how power relations are enacted between different actors in many ways. Based on the relational maps and interviews, these pointed to connected actors that were frequently mentioned, which could be an object. It will narrate the story demonstrating how other surrounding actors mobilise and coordinate other actors in the network and shape their relations and interactions by enacting this actor-network power. Some actors in central positions may control essential resources or information within the network, meaning they have structural power based on the network's overall structure. Some actors may have strong relationships with others and can build alliances and coalitions within the network through relational power.

Drawing on Bourdieu's (1991) concept of symbolic power, discursive actions—whether by humans or nonhumans—can shape meanings and establish legitimacy within networks to creates and recreates things. In particular, ANT focuses on the moment of negotiations that go on within the points of connection (Fenwick and Edwards 2011). This discursive power is then shared among actors in the network through situated relationships (Meadows 2018). However, it is noted that ANT focuses not on what texts

and other objects mean, but on what they do (Fenwick and Edwards 2011). What they do is always connected with other humans and nonhumans, so they are considered actors.

Three dimensions of discursive power include: 1) power in discourse, which refers to the social positioning providing legitimate representations, 2) power over discourse, or the mastery of the linguistic forms and a sensitivity to the politics of representation, and 3) power of discourse as the influence of any representation to further representational actions (Wodak 2012). Consequently, discursive power can be perceived as a process in which actors in particular settings collectively determine legitimate representations and affect others (Bloome et al. 2005, pp. 162-163).

Due to such forms of discursive power, actors interact differently in diverse relationships. Some may use negotiation, while others try to accommodate themselves, things, or others. Such strategies become part of how actors exercise their power and agency. Considering nonhuman agency, actors may arise in the four contributing roles described in Chapter 3.

When exploring the effect of power, it is essential to look at those special moments where power, relations and politics constitute learning (Fenwick 2015). This brings an understanding of the professional learning activities that become gathered and produce knowledge as the network effect, and, more importantly, it points out what interventions, disturbances, or amplifications occur in these webs (ibid.). Different moments require the exploration and identification of different sorts of agencies, such as enrolment, translation, problematisation and reflexive agencies. Law (1992) concludes that ANT views power, domination, and structures as processes resulting from actor-network relations among humans and nonhumans instead of each system's attributes.

The agency in the actor-network then extends beyond human intentionality as anything that modifies a situation by making a difference (Latour 2005, p. 71). The agency is not a matter of the intention itself but how it is intentionality created by extending causal relations between humans and nonhumans (Dwiartama and Rosin 2014). Therefore, the form of agency can be described as a force distributed across multiple, overlapping bodies, disseminated in degrees (Bennett and Bennet 2007). Such agencies are not mutually exclusive, but each actor may exercise multiple types of agency in their

interactions (Callon and Law 1995; Law 1992); more importantly, they may be shaped by many other actors' interactions.

Understanding material as the mediator

ANT emphasises the role of material – objects, bodies, technologies, and settings – in shaping social networks (Latour 2005). Material objects and technologies, such as professional learning resources and tools, participate in teachers' learning practices and have relationships with other actors in many ways. Waltz (2006) claims that material things tend to be analysed, attaching under human intention, design, and drive as part of representing human roles. However, from a sociomaterial perspective, nonhumans are considered with the values and interests that they use to negotiate and ultimately become part of the network (Fenwick 2015) because materials are performative. Through an inclusive view, perceiving a network dynamic and relation can account for social events being a whole assemblage, rather than the categorisation of either humans or nonhumans (Waltz 2006).

As material matters are highlighted in Chapter 3.3.1, the story will also focus on nonhumans who make other actors do things as active network members. Nonhumans can be objects, ideas, or entities, passing among the actors in an actor-network and enabling the network's connectivity. Objects that act as enablers create new forms of actions and interactions depending on the specific context of the network (Adami 2023); they influence the actions and interactions of each other and humans (Law 2007a) and could be a condition for the possibility of a network (Sayes 2014). As mediators, they facilitate interactions and negotiations between actors in moral and political ways. Therefore, it is crucial to trace what circulates and what makes the circulation be co-determined and transformed (Latour 1996b).

Exploring the network effect

Like other human activities, knowing is embedded in practices (Latour 2013). Teacher professional learning networks generate knowledge for teachers who join the networks. Each material pattern between the entanglement of human and nonhuman actors produces different forms of knowledge and different performances of humans (Fenwick 2015). Everyone then may follow different paths in adopting such knowledge. This fluid knowledge cannot be separated from learning, as it becomes part of everyday work.

Regarding their own story, narratives of the teachers' learning journey enacts diverse modes of knowing (Law and Ruppert 2016). Using the concept of professional learning in Chapter 2 along with ANT sensibilities allowed me to open up possibilities to explore teachers' learning experiences in a much broader way, where the effects could be expanded to include pupils' learning and parents' involvement as these are part of teachers' routine working that relates to their professional development goals.

To perform all the processes thoroughly, I used an iterative process to allow for the flexibility to interpret and bring new perspectives to the story. The more I repeated this process, the more the retold version was performed through my ANT eyes.

4.4 Epilogue and overflow

"Actor-network theory is neither a network nor a theory", as Ireland's (2016) blog title suggests, is a strong statement that reminded me of my tailor-made study design. Edwards (2012) explains that ANT is the domain of conceptual and empirical work that explores how people, objects, practices, and ideas come to be organised in particular ways. Without being lost in the network exploration, as there is a lot of data to intra-act, it was important to prepare strategies filled with ANT sensibilities while being able to go with the flow. The next chapter describes the pilot study that was conducted to test the feasibility of the strategy and to explore the network of professional learning in a public school. The two main case studies presented in Chapters 6 and 7 implemented the full amended version of the network exploration and analysis strategies that I developed.

Chapter 5 Stories of School A: Public School Assemblage (Pilot Study)

After contacting the school principal to ask for permission to interview, I contacted the academic lead teacher asking for her permission and for her to connect me with other teachers. In this pilot school, I interviewed four school members via Teams and completed the ANT exercises to connect me with the materials. The interviewee characteristics are described below:

- Interviewee 1: An academic lead teacher who started her teaching career 20 years ago as a contracted private teacher working in Rayong province before moving to this school in 2015. She taught at the primary level for 3 years and then the secondary level until now. She has taken on an additional role as the academic lead teacher to lead the development of a competency-based curriculum related to school plans, policies, and quality assurance. She wants to become a school principal one day to take a legitimate role in transforming a school.
- Interviewee 2: A vice principal who, before taking the recent position in 2020, was a public school teacher in the Northern province, teaching the Thai language to ethnic pupils. By 2020, the school had already implemented the competency-based curriculum and planned the new PLC agenda. Therefore, the principal assigned her a supporting role to carefully check rules and regulations and translate these into practical guidelines for teachers and attend the PLC circle.
- Interviewee 3: A grade 4 lead teacher who started her teaching career as a music teacher at a private school in Rayong 15 years ago before being accepted as a public servant teacher at this school in 2015. She has taught music as her main subject for grades 4–9 and project-based learning for grade 4 since 2021. She has also taken a school registrar role and is responsible for the student records and relaying any changes to pupils' records to the district for instructional purposes and budget allocation.
- Interviewee 4: A grade 1 teacher, the youngest teacher in the school, started his career at this school in 2017 by teaching music for grades 6–9 pupils. Later, he became the grade 1 homeroom teacher and taught foundation subjects – Thai,

mathematics, social sciences, sciences, and arts. He admitted that teaching the Thai language is the most challenging aspect of his role because of his background and the COVID-19 pandemic. Additionally, he has been assigned to arrange the classroom observation schedule for the performance agreement evaluation to comply with the national policy.

5.1 An initiative and revised school protocol: Things with power

A successful implementation of the policy initiative is that it is becoming part of the school routine and teachers' professional learning. An academic lead teacher and their team had tried to ensure the seamless transition to competency-based curriculum implementation from a policy initiative to the school's professional learning community (PLC).

5.1.1 Competency-based education (CBE) through hierarchy

After a school principal decided to join a Sandbox Project, the Competency-based education (CBE) initiative was later introduced to the school and local authorities through the MOE's memo, including the development of a competency-based curriculum. Although the initiative travelled one way straight to the school, teachers cooperatively developed the school curriculum based on their translation. The curriculum may not be the first and foremost material in professional learning, but it shaped the school's professional learning and dialogue, especially when the official announcement of using the new curriculum was launched (Figure 5).

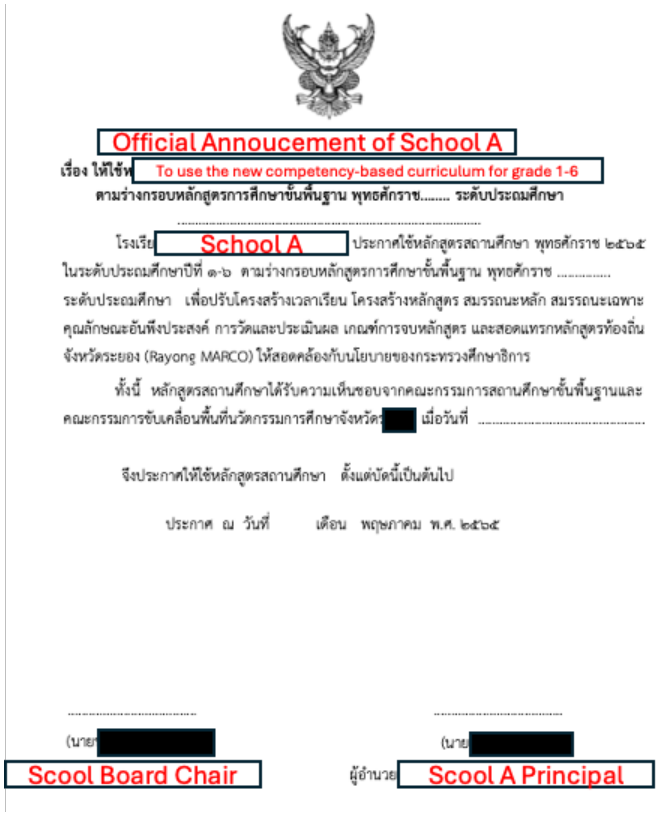


Figure 5: Official announcement

5.1.2 A more two-way connection in the problematisation of practice

After the academic lead teacher talked about the curriculum, she mentioned this again in the relational map (Figure 6). Once the CBE initiative arrived at the school and passed through the principal to the teachers, the principal, as the gatekeeper, appointed the academic lead teacher to prepare teachers, tasking her with ensuring the implementation of the competency-based curriculum. Such a big task required much collaboration for planning or problematisation as it affected the overall school operation and support functions, not only those performed in classrooms. The principal then introduced her to TEP external researchers from School B's partner academic institute for academic consultation.

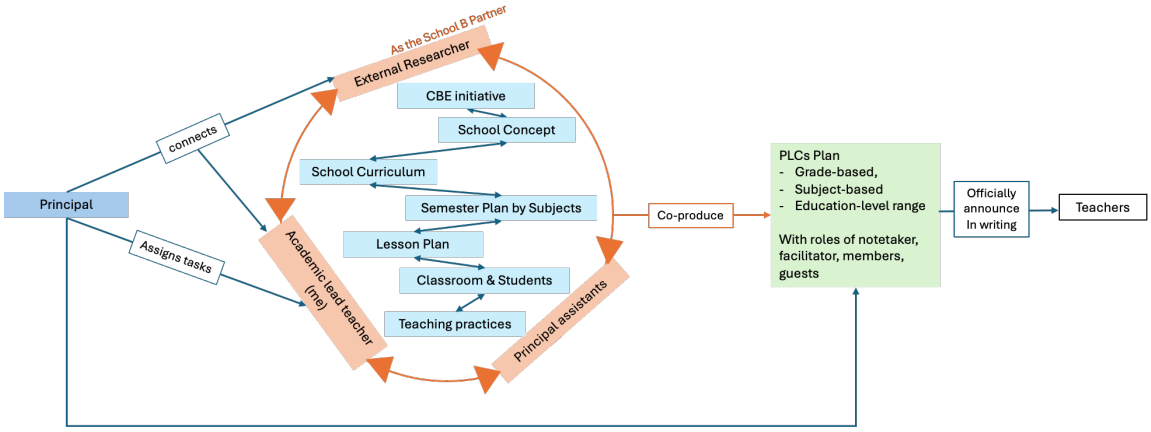


Figure 6: Academic lead teacher's relational map of school professional learning

In the above figure, the two-way arrows within the multi-connected network connected curriculum and instruction-related materials until they became the focal point for the academic teacher who worked with external researchers and her colleagues to engage and to achieve their aim of transforming professional learning practice. CBE initiative brought both challenges and opportunities to the negotiations in how to align other actors. The enrolment of materials and team members led to the co-production of the school PLC plan. The two-way arrows were used to illustrate informal relationships with two-way communication among the team members who used the terms 'Pee' and 'Nong', which means older and younger siblings, to refer to each other. Behind the map, these linguistic materials, unravelled through the explanation that informal connections, are socially and culturally established and affect the ways in which they work together. She recalled her experiences of working on the initiative in the interview.

> *Public servant teachers always follow the MOE, the local authorities, and the school principal's orders because of their high institutional and political power. Similar to previous government projects, this CBE would be high stakes, but this time, a group of TEP researchers made the project different as they directly worked with the school to provide long-term support.*

> *Working with them is just as smooth as working with the school team because we equally contribute to the work with informal relationships and ongoing communication. We frequently socialise after work, which is*

> *another way we gain information and fresh experience for the school's PLC.* (Academic lead teacher, School A, Interviewee 1)

Their connection reminded me of Sa-nook, or the state of being happy together. As such, Sa-nook informalised the working atmosphere to be inclusive and allowed members to interact with each other and things freely (Hallinger and Kantamara 2001). This translation produced new PLC practices, including subject-based, grade-based, and education-level groups. The practices became formalised when they were sent to the principal who announced these would act as the school protocol for further implementation.

5.1.3 Professional learning is not just PLCs

Beyond the PLC, professional learning refers to many things and activities. One-shot workshop events, delivered by the central government, sometimes did not fit with teachers' needs. Classroom observation was perceived as being part of the performance evaluation process (called performance agreement or PA). Therefore, the academic lead teacher tried to encourage her teachers to use classroom observation feedback for PLC discussions. As well as convincing teachers with tangible materials, she also told her double in ITTD that "Whatever we do affects our children" to remind the double of another important reason to engage professional learning in everyday work. The Thai moral concepts of being a teacher include honesty, integrity, fairness, discipline, trustworthiness, and, most importantly, the belief that teachers must sacrifice their lives and devote themselves to pupils, as discussed in Chapter 1. So, this belief tended to morally force teachers to include pupils in the dialogue. Another significant role in professional learning for her double was being a kind of walk-the-talk leader to persuade teachers. This was particularly evident in how she and the national curriculum work together to form the feedback for teachers whose focus is on only the teaching and learning process, not the curriculum. She further insisted in ITTD that the presence of the national curriculum was vital to identifying the gap between expectation and implementation, which should be brought to the professional learning conversation.

Not only the academic lead teacher, but also the vice principal made an explicit link between the PLC practices with other practices, especially the PA, via a top-down map

showing the policy affecting PLC practices through a hierarchical connection (Figure 7). I witnessed her careful examination of the use of PA as a supporter.

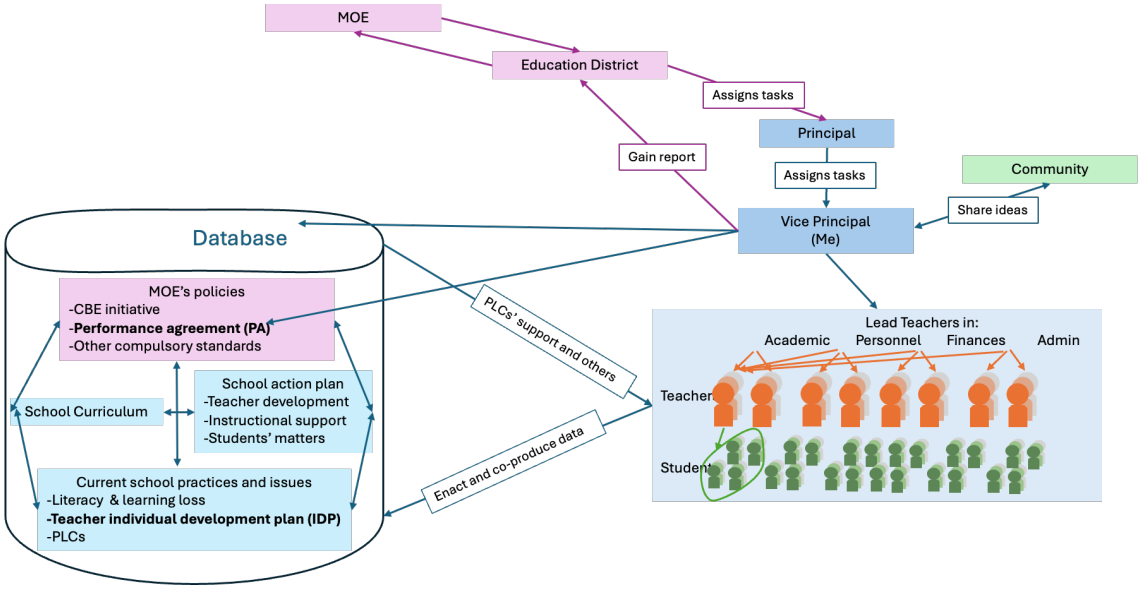


Figure 7: Vice principal's relational map

> *The arrow points to the PA from me because I am now finding the practical implementation for teachers to devise a solution to overcome their classroom challenges as promised in the agreement. I read many documents and pull insightful information to optimise learning potential in the PLC network. Therefore, the database is essential in helping teachers recall their learning and performance; this also connects with teachers' PA, their classroom performance, and their individual development plan (IDP). (Vice principal, School A, Interviewee 2)*

Professional learning extended beyond formal PLCs, taking shape through everyday practices, especially through policy links, curriculum frameworks, digital databases, and PA. Rather than existing in isolation, PLC practices were interwoven with broader systems where leaders participated in learning with care and accountability.

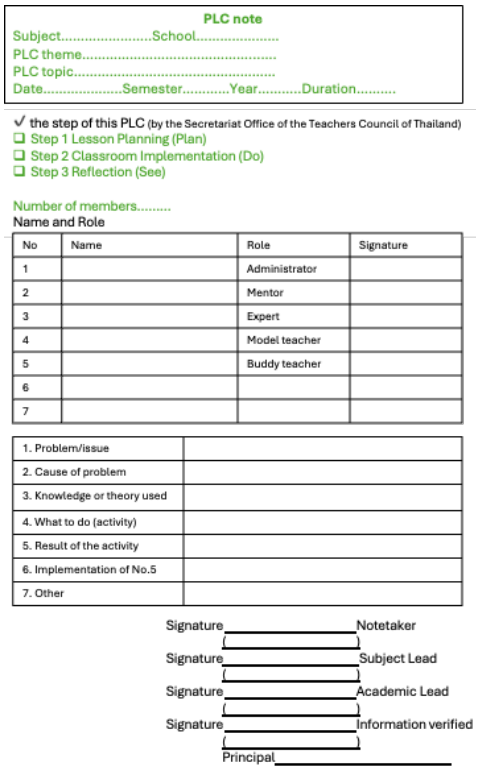
5.1.4 The PLC enrolment reshuffling actors again

Without including all teachers in the working group, two PLCs were implemented, and one failed to enrol. Interviewees responded similarly with their reasons for adjusting the plan to fit their settings. Grades 1–3 teachers combined grade-based and subject-based

PLCs as teachers in each of these grades were focusing on literacy. The co-teaching practices of grades 4–6 combined the grade-based and education-level range PLCs because they shared the same learning themes and projects. These adjustments reflect how teachers renegotiate practices to align their interests with those of the management team. Where the management listens and responds to these situations, these strategies draw teachers' interest in mobilising their learning.

5.2 Mobilisation to stabilisation: different networks, different stories

Two interviewee teachers walked me through their PLC implementation, explaining what their PLC looked like and how they had learned from it as their network translation. A general, standardised and authorised PLC template (Figure 8) influenced the PLC dialogue dynamic and practices in ways that ensured its mobilisation as usual, while also ensuring the static pattern of dialogue. In one way, it made the interviewees feel comfortable because the form included clear questions and aligned with the teacher performance evaluation report. Once teachers were enrolled, they knew their roles, shared ideas, and filled in the form. The form became a facilitating thing that helped teachers to complete the PLC participation within a short time so they could spend time on extra work, as mentioned in Section 5.2.1.1.



PLC note

Subject.....School.....
PLC theme.....
PLC topic.....
Date.....Semester.....Year.....Duration.....

✓ the step of this PLC (by the Secretariat Office of the Teachers Council of Thailand)
❑ Step 1 Lesson Planning (Plan)
❑ Step 2 Classroom Implementation (Do)
❑ Step 3 Reflection (See)

Number of members.....
Name and Role

No	Name	Role	Signature
1		Administrator	
2		Mentor	
3		Expert	
4		Model teacher	
5		Buddy teacher	
6			
7			

1. Problem/issue	
2. Cause of problem	
3. Knowledge or theory used	
4. What to do (activity)	
5. Result of the activity	
6. Implementation of No.5	
7. Other	

Signature_____Notetaker
(_____)
Signature_____Subject Lead
(_____)
Signature_____Academic Lead
(_____)
Signature_____Information verified
(_____)
Principal_____

Figure 8: PLC template designed by KSP, the government agency

Nonetheless, once the template was used in this way, it reconfigured the PLC sessions into tasks of documentation rather than professional learning. This was associated with the academic lead teacher's response that some teachers saw the PLC as extra work, as the form hindered meaningful dialogue and limited deeper conversation. The grade 1 teacher agreed that the form needs an adjustment unless the PLC is still designed to facilitate professional learning, so he tried his reflective questions, mentioned in Section 5.2.2.1, which showed how the list of questions shapes the teachers' dialogue and affects knowledge generation. The grade 4 teacher instead used other noting styles, as described in Section 5.2.1.1, to ensure the richness and meaningfulness of the PLCs.

5.2.1 Project-based PLC: Learning by doing a new thing

A grade 4 lead teacher briefed the school situation relating to the CBE, curriculum, and learning themes. They were not new but flipped her accustomed ways of teaching and working, so she needed support to update her skills.

5.2.1.1 A new vision of the PLC with a learning focus

Compared to using the template (Figure 8), the focus of this teacher's PLC became more student-related and active learning-focused, the triangulated connections between the lesson plan, pupils and classroom, and her illustrated by the arrows in her map (Figure 9). This problematisation showed that teachers needed to implement multidisciplinary project-based learning, using a shared integrated lesson, under the school's concept. These working conditions were exchanged with colleagues in the Pre-PLC process to find the best PLC plan for a semester (Figure 9). As this semester's co-teaching lesson was a project about pineapples, as it was local fruits that pupils wanted to know more about, a whole semester of PLC then focused on improving the co-lessons as they responded to all teachers' interests.

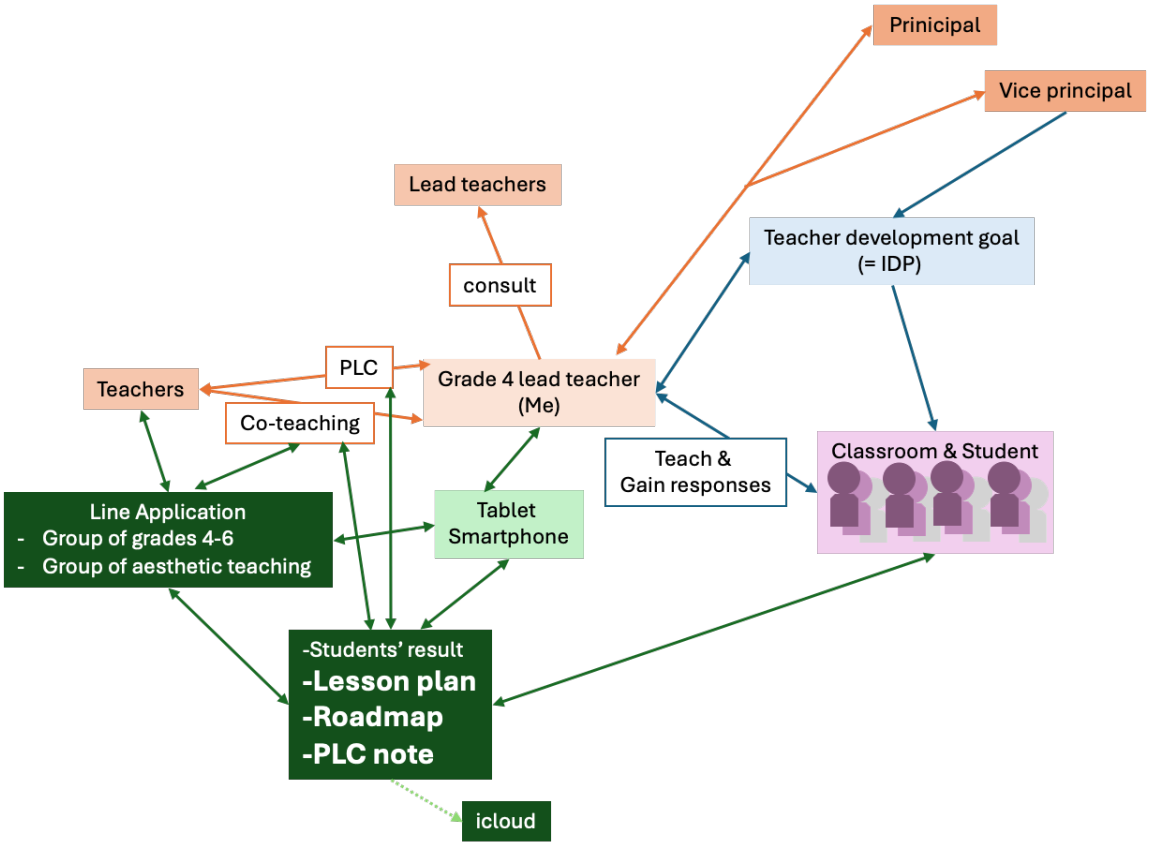


Figure 9: Grade 4 lead teacher's relational map

While Figure 9 shows the map of her everyday work, Figure 10 showed what happened in the PLC. She took me through the PLC map (Figure 10).

In the small meeting room, teachers with different subjects randomly share ideas about the Pineapple lesson plans based on their subject. I verbally and non-verbally encouraged everyone to actively join the dialogue by asking them 'why and how questions'; also metaphorise everyone as jigsaw pieces and insisted that "there is no right or wrong decision as long as thinking is based on a mutual goal". Maths teachers talk about cost calculation and pricing, social sciences teachers teach means of production, sciences teachers teach pupils to consider healthy ingredients and nutrition, and art teachers work on packaging design. A notetaker, one of the teachers, instantly writes the idea on the flipchart. (Grade 4 lead teacher, School A, Interviewee 3)

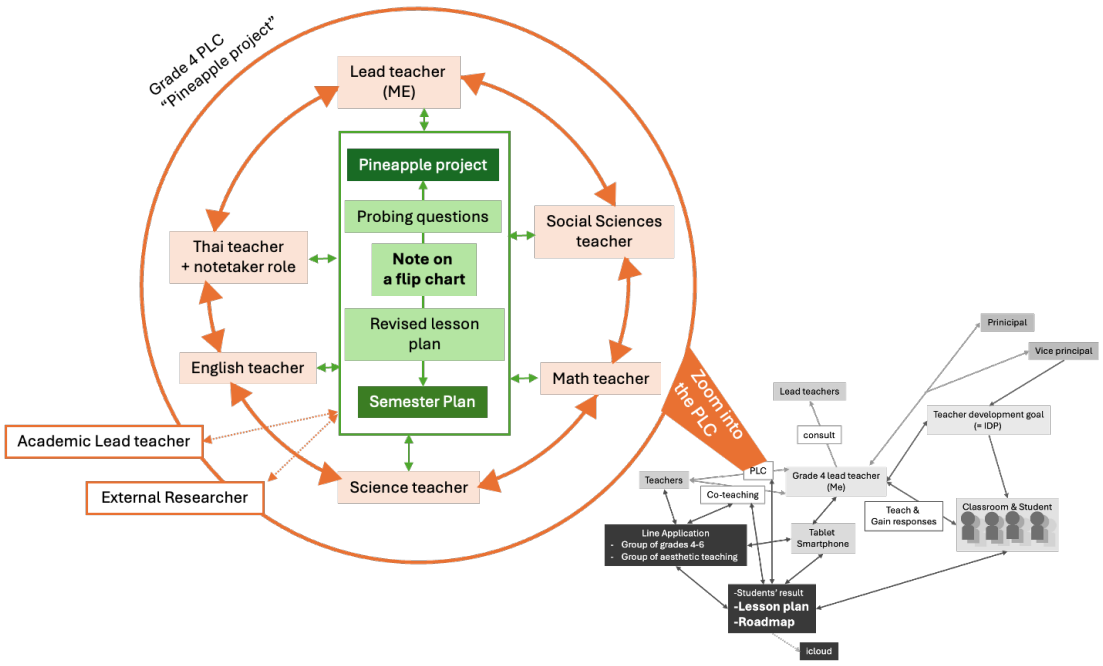


Figure 10: What existed and happened in PLCs

She described how she had talked to the academic lead teacher who came to the PLC with the national curriculum. Without having it on the map, the national curriculum was blended into the conversation and became her feedback. In addition, an external researcher brought a new perspective on teaching and learning to the PLC, such as its specific technique. Such feedback from occasional guests was perceived to be quite constructive, straightforward, and challenging, but teachers tended

to accept it confidently. However, with or without an external researcher, the PLC was regularly facilitated based on the semester plan that politically forced teachers to enact these as part of their jobs.

Each week, the dialogues could differ depending on the topic and who led that weekly lesson plan. For her, as a PLC host, the grade 4 lead teacher signed in with the government question protocol, asking about previous classroom implementation. Others, as members, shared their experiences regarding the lesson plans, bringing various perceptions and materials such as pupils' learning preferences and feedback, teaching evidence or teaching reflection. While listening to colleagues, she used her mobile phone to find further information. The notetaker noted on the flipchart instead of using the template (Figure 8). The 'note' (Figure 11), performed in real-time, helped everyone to focus, and it also actively shaped relations between facilitators and members to continue the dialogue beyond the summarised note. Different noting styles, such as bullet points and mind maps, brought different ways of facilitating the dialogue. For her, the mind-map better shaped the conversation than the bullet points as she was able to see the conversation's linkages.

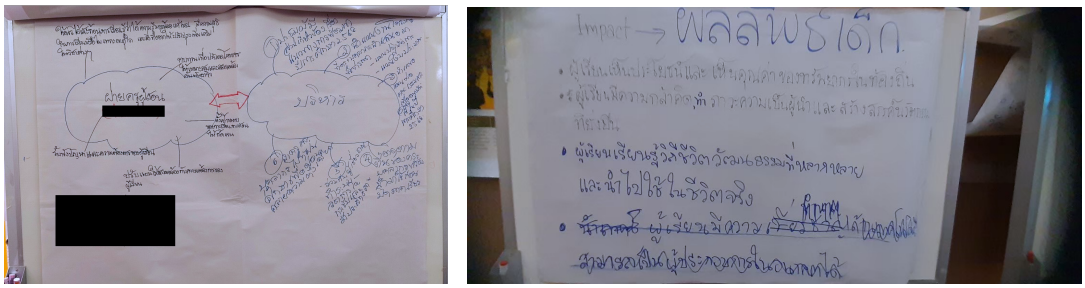


Figure 11: Notes

However, she also mentioned her workload, where, alongside the 26 teaching hours/week, additional duties temporally obstructed the teachers from engaging in professional learning practices. In ITTD, she talked with the double to reveal that, not only was she required to prepare a lesson plan and attend the PLC activities, as the new student registrar, she also had to manage school student records and report these to the district. This can often be seasonal work, but, sometimes, this distracts attention from work and professional learning. Therefore, it is important to plan ahead for this administrative work.

5.2.1.2 Learning expanding beyond the project-based PLC

At the end of PLC conversations, some members took a photo of the note (Figure 11) and shared it on the LINE application communication group. The LINE application, as the transporting tool, transferred the contents of the PLC into everyday conversation, making the particular contribution of taking on the role of being a buddy or an idea co-browser, and making the conversation visible and allowing it to continue outside the working day without waiting for the next PLC conversation to take place.

In ITTD, the grade 4 lead teacher further highlighted that LINE helped her to work on the Pineapple project with other teachers. Colleagues as helpers tested ideas because they responded to the messages spontaneously. This was strengthened as an ongoing process mainly because it was enacted as a collaboration and enquiry process. However, after discussing with colleagues in the LINE communication group, she took the ideas and adjusted the individual lesson plans for each classroom. This after-PLC dialogue clarified any curiosity or ambiguities from the PLC members, so it was crucial for all of the teachers to engage online in the LINE group.

5.2.2 Grade 1 PLC: Agenda of literacy recovery

I then interviewed a grade 1 teacher, who had never participated in an interview before. I began by asking him about his experiences in this school to make him feel comfortable. Despite his music education background, the challenge of teaching Thai arose from the issue that he had to learn how to teach Thai to young pupils from scratch. Like other grade 1 teachers, his focus had shifted, in his case, from teaching music to teaching young children's literacy, particularly through 'learning by doing'.

Based on his observations, he pointed out that the pupils' literacy problems, first experienced during the pandemic, were perhaps because of a lack of practice opportunities, and this became even more severe after the school had returned to regular operations. He insisted that "if pupils are illiterate, learning other subjects will be affected because they use Thai to learn other subjects". Such problems have become shared responsibilities for all four grade 1 teachers and the vice principal due to her Thai teaching specialisation.

5.2.2.1 Focal actors of overlapping activities

After the brief, the grade 1 teacher explained his map (Figure 12). Two interconnected professional learning activities were PLC and classroom observation. Although he was situated at the centre, looking into each circle, he only occupied a small part in each circle's outer ring.

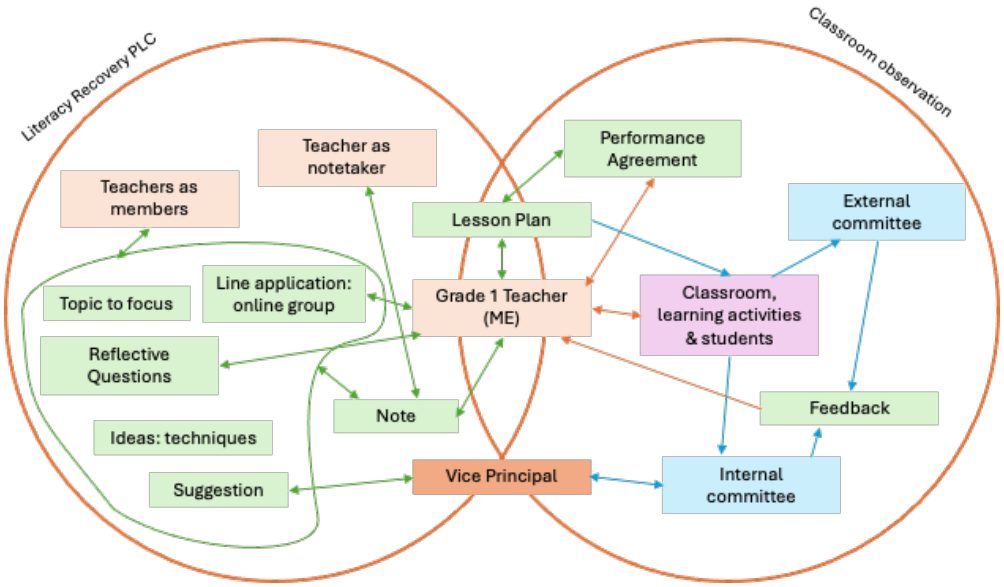


Figure 12: Grade 1 teacher's relational map

Classroom observation was a part of the compulsory teacher performance evaluation process under his performance agreement (PA), but, for him, this was a professional learning activity. Classroom observation engaged several stakeholders and things that also overlap in another network, especially the lesson plan and the vice principal. However, these are interconnected through classroom observation feedback and these travel through him and link directly to the lesson plan and the PLC, as illustrated by the green circle (Figure 12). In this way, he increased the chance of being able to act on the classroom observation feedback. In the set of practices circled in green inside the left-hand circle (Figure 12), the grade 1 teacher provided me with an example of the PLC with the topic of "difficulty recognising consonants". Before the PLC conversation took place, he had posted the topic in the LINE communication group for teachers to prepare the relevant techniques for the meeting. In the meeting, he started the conversation by sharing his classroom stories and posing a specific question about pronouncing the "ร-R" and "ล-L" sounds, as well as additional questions: "Why are they teaching in the

way it is, so what, and what now?", rather than using the template (Figure 8) He further explained:

> *This additional set of questions keeps this dialogue on track while a notetaker summarises opinions on the flip chart. Questions promote a sense of enquiry and are open for the teachers to discuss in a friendly way that everyone contributes to the dialogue regardless of the role assigned. ... A general template might be appropriate for new teachers joining PLCs, but if we expect PLCs to be more than a meeting, the dynamic of the dialogue is needed to allow new possibilities for teachers to take risks, especially the flexible template of professional dialogue. Therefore, each thing in the circle keeps floating around as it is the way teachers browse ideas* (Grade 1 teacher, School A, Interviewee 4)

When the vice principal joined the meeting, her expertise and rank seemed to create an imbalance in the circle dynamic, although she actively maintained teachers' interest and learning. Her position allowed her feedback to be heard, and teachers tend to engage by listening rather than questioning for more clarification.

5.2.2.2 PA: multiple connections toward professional learning

The performance agreement (PA) (Figure 13), speaking through the grade 1 teacher while he was showing me the document, illustrated that the PA relates to each individual's career advancement, travelling through a top-down route. The PA intra-acted strongly and politically with individual teachers because of its relation with performance indicator standards and strict classroom observation protocol. In the photo elicitation, the challenging task on page 10 of his PA document (Figure 13) was the goal set by him. This revealed that the goal was not only to talk about the improvement of pupils' attitudes and skills towards learning language, but also the process of helping him to achieve this. This was demonstrated well after the lesson plan was designed in the second step – the third step was to bring it into the PLC discussion and the classroom observation, so that colleagues would be able to engage with learning and teaching strategies, and the evaluation materials, to identify room for improvement for him. The links between the PA, lesson plan, PLC discussion and classroom observation,

including the pedagogical materials, worked together to enrol the professional learning topic and dialogue into everyday teaching and learning.

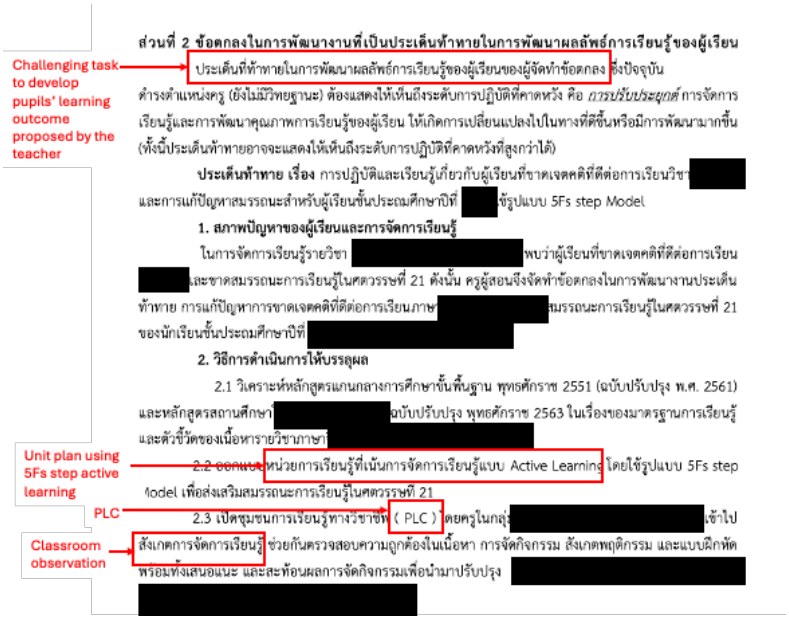


Figure 13: Page 10 of the PA document

Moving from PA to dialogue in the PLC, such connections show how "PLCs allowed me to enact a real problem and present possible solutions", as suggested by the grade 1 teacher. Learning happened when asking questions were enrolled within the green line in the left-hand circle in Figure 12, although the topic owner/introducer (the grade 1 teacher) seemed to benefit most from the PLC conversation, and when the PLC template (Figure 8), presented in Section 5.2, was used.

From his point of view, as a member of the PLC, the grade 1 teacher suggested to his double that "learning is a natural process because of our connection with our surroundings". The practice of asking a question was used to probe, and gaining the response from others expanded his critical reaction. The PLC discussion and classroom observation feedback overlapped and were practically connected with the pupils, their surroundings, and teaching and learning strategies.

5.3 The effect of learning strengthens teachers' daily work

The practical network effect each week consisted of note summaries, both on paper and in the online space, and practical classroom implementation techniques. At the end of this translation process, the dialogue became transformed into the techniques that

teachers gained as an effect of the dialogue in its assemblages with all of the other materialities, and emerged as a powerful actor in the classroom implementation of these new professional practices. The development of risk-taking, creativity, and openness to change and innovation might be spelt out over the result in both the project-based and literacy PLC processes. Moreover, some PLCs also culturally and socially strengthen teachers' relations and collaboration for co-teaching as an important part of their everyday work.

5.4 Conclusion

School A's teacher professional learning was enacted through political and professional connections among stakeholders, closely tied to pupils' learning and development as the goal. Although the school operated within public school constraints and the societal norm of 'teachers as sacrificers' , the way in which the school translated the policy to enact the PLC practice made it work for learning and improvement. Negotiation was crucial in this process that was enacted in the mixed connections between collective and hierarchical cultures. However, such processes were made more durable by student-related evidence, lesson plans, and teacher participation, producing practical results through complicated enactments, whereas, some materials, such as the PLC form, also affected teachers' learning in different ways.

Although the principal's view was not disclosed in the pilot study, ANT sensibilities still allowed me to see his connections between the teachers and other materials that occupied active roles in the professional learning network. Nonetheless, I revisited my network exploration strategy for the main study, as outlined in Chapter 4, which allowed me to follow the influence of the effects of the principal's practices in the professional learning network, despite not having interviewed the principal. Based on my insights and reflections of my research activities in the pilot school, the revised network exploration strategy will be used to explore the main schools' stories in Chapters 6 and 7.

Chapter 6 Stories of School B: Private School Assemblage (Main study 1)

As a top-tier private school with an alternative approach to teaching and learning – holistic education – this school was unique, and the initial discussion with the school director struck a chord with me:

> *Though others see us as perfect, we never stop improving because things change, as does the school. To be a top-tier means that we have to embed in the rhythm of the dynamic of society, school, and our pupils and teachers' families. As we decide to support other schools, it reflects whether we deserve to coach other schools. This pushes us to work for ongoing development committedly.* (School Director, School B, Interviewee 1)

Thereafter, in obtaining permission from the school director, I explored the official website. I summarised an excerpt from School B's website (2019), which described that holistic education is the key idea covering the three learning pillars[13] that need to be embedded in pupils' learning. Therefore, the school set the expectation that the teacher's role should be seen as being pupils' partners in learning, learning faith builders in encouraging pupils and parents, learning designers supporting pupils to learn through appreciative enquiry, competency-based instructional planners, and eager learners to improve themselves spiritually and professionally. The school also placed an importance on professional learning, describing that:

> *The school supports teachers through the school-designed PLC with amicable and professional environments. The PLC network also includes parents and community members as learning companions because they bring fresh and authentic perspectives of student-relevant development. The PLC network's connection expands to national and international*

[13] *Deeper learning* aims to improve the self's wisdom through critical reflection. *Learning by doing* supports pupils in learning from everything surrounding them, learning to solve problems and invent things. *Communicative learning* supports pupils in interacting, participating, and connecting activities that drive knowledge circulation.

> *networks, such as the alternative education group, the STEM group, Buddhist-based education, and holistic learning networks.* (School B's website 2019)

The website impressed me with its descriptions of teacher-professional learning through the text's narrative and its images of teacher activities. I then contacted interviewees. Their background information was as follows:

- Interviewee 1: A primary school director who moved to the school in 1997 as part of the pioneer project. Having completed a Master of Applied Linguistics, she had the chance to work in an asylum consortium as an English as a foreign language trainer and in international schools as a classroom teacher, respectively. She described how working in these places equipped her with an active and systematic working culture combined with her current working style. Her almost 30 years of experience in this school has been a long professional learning journey while occupying several roles. Currently, she is responsible for leading the grades 1–6 teaching and learning and school operations.
- Interviewee 2: The headmaster, Kru-Yai, has worked at the school for 20 years. Initially, he taught mathematics to pupils in grades 5 and 6. In 2012, he was promoted to headmaster and is now responsible for overseeing the academic activities of teachers for grades 1–6. The school fully supports him as an educational leader, allowing him to focus solely on curriculum and instruction without having to handle administrative matters. This unique position was created to support the school's director and is equivalent to the 'principal master teacher' role in the Singapore teaching track (Lee and Tan 2010). He is invited to serve as a teaching expert in external workshops for teachers hosted by the Arsom Silp Institute of the Arts, the school's official partner. This requires him to keep updated on new pedagogical practices to improve classroom implementation and provide feedback in coaching and training sessions.
- Interviewee 3: A senior teacher coaching grades 1–2 teachers with 16 years of working experience who began her career while finding a school for her daughter. She initially applied for an accountant position but was encouraged by the school director to start as a teaching assistant due to her lack of a teaching license. After obtaining her license, she taught mathematics for grade 5 and later

moved to teaching grades 1–2 at the suggestion of the management team. She has taught grade 1 for nearly seven years and now coaches other grade 1–2 teachers as a senior teacher.

- Interviewee 4: A senior teacher who coaches grade 3–4 teachers and has worked at the school for almost 20 years. She used to teach grade 3 before permanently teaching grade 4 and has held this role for some time. A recent reorganisation brought her additional coaching work, as each senior teacher is expected to coach at two education levels. She perceived this as her challenge to work with a large group of teachers.
- Interviewee 5: A mid-career teacher, he is a grade 3 teacher with five years of experience in this school and is responsible for an integrated learning unit. After five years as a teacher, he has continued to ignite his passion for teaching through learning from his surroundings and self-reflection. Being inclined to challenge himself, he found himself in a position with room for improvement. Within a few years, he became a head English teacher of grades 1–6.
- Interviewee 6: A junior teacher, this grade 5 teacher has two years of experience. Before taking this role, he was a tutor focusing on social studies. Two factors brought him to the school: the first was that his college friends suggested this to him, and the latter was about his wanting to find a better education setting because he had a traumatised experience as a student, particularly with the rote learning and authoritarian culture in Thai public schools.

6.1 The Yonisomanasikāra concept embodies the school's beliefs

During the first interview, the school director recalled when she was a teacher working directly with the school founder. Her prior experience of having a goal-oriented working style while being open to many possibilities as an accelerator worked to her advantage, helping her embrace the school concept of Yonisomanasikāra,[14] or wise reflection, within a short time and has been implementing it ever since. The concept grounded the

[14] The Yonisomanasikāra concept is a thinking framework described in the Buddhist Tripitaka or wise reflection (Kungnimitr et al. 2021), containing ten thinking elements: 1. Applying good inner values, 2. Awareness of true state, 3. Focus on the present situation, 4. Problem-solving according to Four Noble Truths, 5. Explaining based on facts, 6. Element stratification, 7. Finding cause-effect, 8. Connecting concept-objective, 9. Judging true-artificial values, and 10. Comparing advantages-disadvantages (Sivasubramaniam and Hayhoe 2018).

idea for daily work and activities among school members. Documentation in the schoolbook and on the website formed an invisible mutual agreement between all teachers to hold accountability to parents and pupils through performing such values. The school director thus insisted that the concept of Yonisomanasikāra is a necessity in teacher professional learning practices.

6.2 Pre-While-Post within the Yonisomanasikāra concept

The Yonisomanasikāra concept, as the school foundation, became the basis for the school's professional learning practices. The director shared her story of how the practice of wise reflection formed her learning by asking her the question "Why does it matter and how does it relate to life as the impact?"

> *At that time, we taught money and bargaining system classes. We set the simulation for each student to have one type of food (vegetables, fish, meat, rice, sugar, etc.), and asked them to cook one dish. So, they had to exchange things, while they were talking to one another like a chain in the chaos. We then used questions linking their spending experience and how people exchanged money back then and nowadays, which led them to the history of money and the value of money.* (School director, School B, Interviewee 1)

She described how she always shared this memorable learning moment with teachers because professional learning is not only about teaching, but also learning better teaching practices. Beyond each individual teacher, Yonisomanasikāra was also emphasised through a 'learning organisation' that encourages teachers to use the framework to think critically and make sense of knowledge, then share their tacit experiences with others. Yonisomanasikāra was linked to several professional learning practices, such as a lesson study from Japan and the PLC developed by Thai scholars in the pioneer team discussion These worked to co-produce the practices of 'before-action review' (BAR) and 'after-action review' (AAR) meetings. Additionally, alternative activities were implemented, such as formal training for introducing new necessary knowledge, a brushing-up activity, and classroom observation. The director depicted the school's practices as three non-linear stages during the academic year's operation (Figure 14). Each term, 'pre', 'while, and 'post', produced critical moments of learning

that pushed teachers to learn and work in multiple ways, each situated within various times, locations, activities, and roles. When enacted in this way, professional learning can be translated endlessly and each enactment affects the next cycle, making the translation of each term a seamless process.

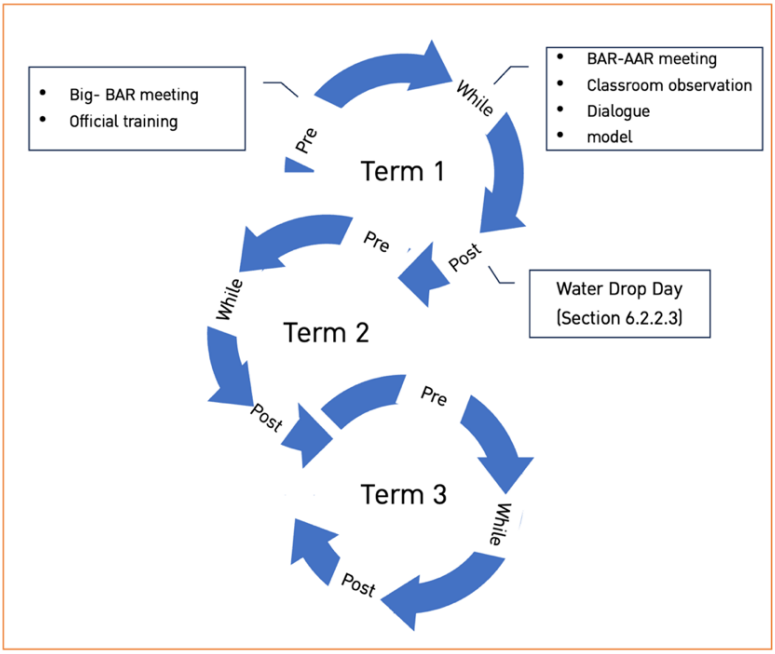


Figure 14: Pre-While-Post professional learning

According to the model, the school director situated the school's professional learning practices as residing within multiple activities that connect with daily teaching practices and pupils' learning. Therefore, professional learning is not a single practice but is understood to be a multifunctional and multipurpose process for teachers to improve lesson plans and pedagogical skills, for coaches to use each activity to support teachers' professional practices, and for the director to monitor the quality of instructional delivery.

In order to implement this complex model, the school director talked about a collective leadership process where she selected senior teachers who would provide cooperative support and consensus to achieve a mutual goal. Although the practices within this model of implementation had already been settled, the headmaster and senior teachers have to consistently communicate with teachers to maintain their interest in attending professional learning activities and the director has to continually assess the implementation process and improve it when any pitfalls are observed.

6.2.1 Stage 1: 'Pre' Professional learning activities

The Pre-stage during the school break is the golden time for teachers to prepare lessons for the upcoming year and boost their teaching competency. The director and the headmaster problematised the ongoing improvement of lesson plans to draw their teachers' interest. The director highlighted the importance of the timing of several short learning loops, during the trimester academic year, as being a contributing factor in allowing teachers to reflect on their teaching practices more frequently than in typical Thai schools, which have only two semesters.

6.2.1.1 Big-Before action review (BAR) session

During a few weeks' break in teaching, a Big-BAR session brought teachers together to deliberately review their previous work and polish their upcoming semester's lesson plans. During the professional learning dialogue, a teacher started presenting his/her roadmap and lesson plans to the school director, the headmaster, and other senior teachers, such as the instructional team. Later, the school director asked the teacher to assess the lesson plans to evaluate whether the learning objectives were feasible but still challenging to achieve through the planned learning processes (Figure 15).

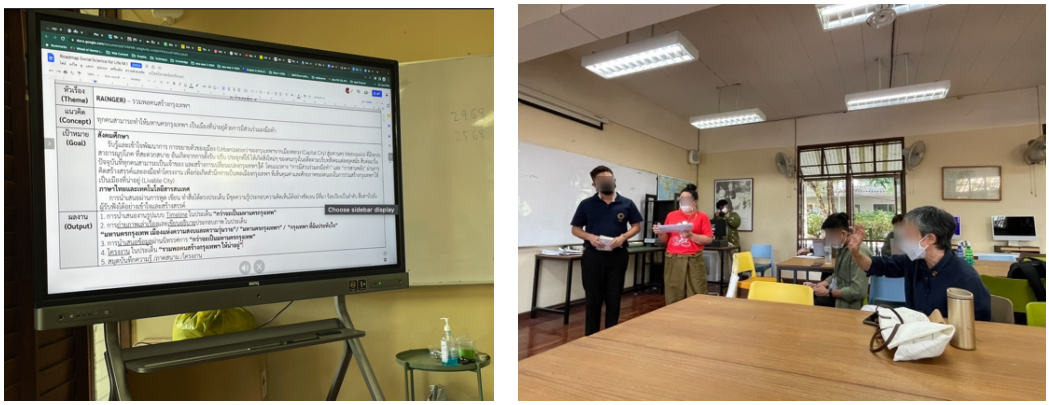


Figure 15: Big-BAR session to critique lesson plans

After the presentation, the dialogue could be diverse, depending on the questions and who asked them, because there was no defined list of questions. Interviewee 5 shared his experience as a commentator and learner:

> *As the head of the English teachers, I comment on teachers presenting their English lessons. I commented on the lesson plan based on the*

> *school's core curriculum and standards to ensure that the plan can deliver and provide pupils with active practising opportunities.*
>
> *Then, my role has shifted. As a learner, I joined the grade 3 integrated lesson session, which dialogue, including the learning theme and the core curriculum content, could be a flood of information. Therefore, I have to prepare beforehand and I believe that all grade 3 teachers revisit the learning roadmap before the lesson plan reflection as well because this helps the dialogue go effectively.* (The head of grade 1–6 English teacher and the grade 3 teacher, School B, Interviewee 5)

His point reminded me of the headmaster's comment that the Big-BAR sessions were spaces where teachers could reflect on their previous performance and find room for improvement. Although the teachers reused their previous roadmap and lesson plans, they had to rethink and revise them yearly to adjust to society's shifting dynamics.

6.2.1.2 Official training

Despite its advantages, the BAR-AAR meeting may not always be able to deal with significant changes, especially during the COVID-19 pandemic. The headmaster described how the management team problematised and decided to use the official training programmes by engaging with insights gathered from the BAR-AAR meetings and classroom observations, for example, a psychology and well-being training course for teachers during COVID-19. The headmaster mentioned that, when official training was used instead, it was normally held during the school break. Although the official training was structured, its convenience helped teachers learn to cope with urgent issues within a short period of time (3 times/year). The school director also described, "although the school's learning is organic and natural, we could not wait that long for teachers to learn and absorb in this situation". Therefore, using official training was acceptable if the core values remained. Interviewee 4 shared her relational map, and the material from the training programme in the photo elicitation exercise (Figure 16). She further explained that training was one of the quickest ways to learn, but its results depended on the chance to use this knowledge in her daily work. However, the material she shared was one of the examples of a competency-based test, and she described how

this concretely helped her to improve the content of her assessment materials after the training session.

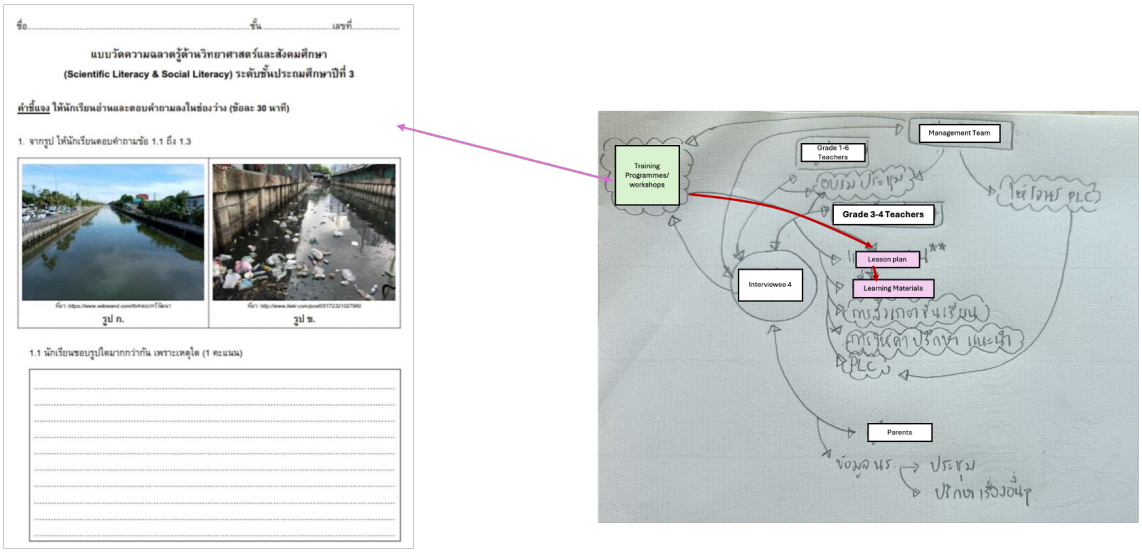


Figure 16: Interviewee 4 relational map and material from the workshop

6.2.2 Stages 2 and 3: 'While' and 'Post' Professional learning activities

The director depicted the linkage of 'While' and 'Post' professional learning activities through actors, such as a coach, a lesson plan template, a meeting agenda, schedules and questions in sub-activities such as classroom observation. The assemblage of these practices and materials made this iterative process easy for teachers to align professional learning with their work routines and the school's direction. Some teachers become lost in the BAR-AAR meetings, so sub-activities served as the connected signpost to link the pre-while-post incidents to bridge their learning (Figure 17).

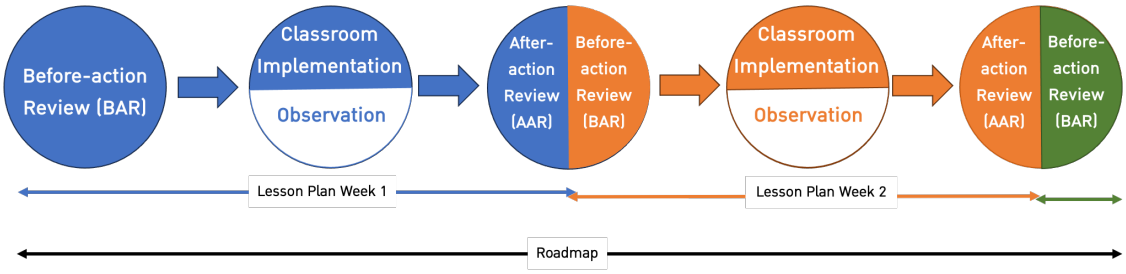


Figure 17: Connecting activities in While-Post

6.2.2.1 BAR-AAR meeting and co-teaching practice

The school director described the before-action review (BAR) as creating an impactful lesson and the after-action review (AAR) as reviewing the lesson implementation.

> *We start the first BAR in the Big-BAR session during the school break. A general session begins with AAR and is followed by BAR every Friday afternoon as scheduled. During the week, teachers may gather, discuss informally, and observe each other in the classroom. We named the process 'BAR and AAR', making it tangible for all teachers.* (School director, School B, Interviewee 1)

The grade 5 teacher shared his fresh post-experience of the AAR-BAR meeting and classroom observation during the ITTD, specifically without the presence of a grade coach (team leader).

> *While two senior teachers led the discussion by asking the team to reflect on the previous lesson implementation and expectations and whether the gap exists, we shared our ideas. The AAR-BAR meeting suits our team teaching because of the mutual lesson leading to the tangible and critical points in conversations. By ending the AAR, the senior teachers ask, "What would be done differently if we had another chance to repeat this lesson?" We then move further to the BAR session without notice. I see AAR coming before BAR as the process I learn to improve my lesson.*
>
> *Without the team leader, it sometimes makes me feel safe and allows me to express my ideas and feelings regardless of authority. People around me are colleagues, like my siblings, helping me learn through meaningful dialogue.* (The grade 5 teacher, School B, Interviewee 6)

I then connected this interaction with the co-teaching photographs that Interviewee 6 shared in the photo elicitation activity (Figure 18). He described how his team made him feel comfortable in sharing everything and helped him develop spiritually and professionally, in and out of the meetings. They cooperatively enacted learning materials in teaching hours and transformed the lesson plan and learning process in the

AAR-BAR meeting. The grade 5 teacher also mentioned that, while working on his master's degree final report about the integrated unit plan, he always exchanged and gained practical advice for classroom implementation for team members after school hours.



Figure 18: Co-teaching practices in and out of classrooms

Calling other teachers 'Pee' (older teachers) and 'Nong' (younger teachers) followed by their nicknames, made their professional relations less formal, which significantly contributed to co-producing professional learning via co-teaching. Under Pee and Nong, family-tie culture with Kreng-jai tended to involve all grade 5 teachers to join the meeting. Not having a coach did not seem to be a problem for the grade 5 teachers because of the distributed leadership and mentorship among colleagues.

However, Interviewee 4 was still convinced of the importance of a coach for all grades, while pointing out the concern of a dual-grade coach who had not yet fully contributed to professional learning, as expected.

> *Our dialogue disclosed what I previously overlooked that obstructed my coaching capacity for grades 3 and 4. First, the grade 3 and 4 classrooms are in different buildings, so I cannot attend grade 3 meetings as much as I participate in grade 4, which is located in the same wing, floor, and building. Linking to the second point, time limitation might be another problem; going back and forth between the buildings, I cannot get back to prepare for my class in time. (The grade 3–4 coach, School B, Interviewee 4)*

The coaching structure issue was later raised with the school director, and she considered changing from a dual-level coaching system to a single-level system after discussing it with teachers and the management team. This demonstrated the ongoing translation of professional learning practices.

6.2.2.2 Classroom observation

During the semester, the 'while' and 'post' professional learning practices occur as planned and unplanned activities. The lively consecutive activities began with the BAR meeting, followed by the classroom observation and AAR meeting to finish one learning loop. The open-door classroom welcomed teachers to observe other classrooms, regardless of the educational level assigned. This also diluted the boundaries and increased the ease of relationships among teachers. Classroom observation seemed to be a professional learning shortcut for new teachers as they were positioned as observers.

> *Without a teaching license, I started my career as a learning assistant, observing several classes. Then, because of my business major, I decided to pursue a license in mathematics teaching. Compared with the official training, I learned a lot from classroom observations because teaching is not just a lesson plan but a classroom implementation, and I saw several interactions and behaviours of teachers and pupils.* (Grade 1–2 coach, School B, interviewee 3)

Interviewee 5 also shed light on his learning journey relating to classroom observation. He suggested to his double that he should be both an active observer and an observer as his role has changed spatiotemporally.

> *Shifting from a private tutor to a classroom teacher is challenging, and I never had a chance to teach 25 pupils. My first year's classroom observations taught me the differences between useful and useless, which is essential for new teachers. I always pick up good tips from my colleagues' classrooms that help me prepare my lesson.*

> *Junior teachers started observing my classroom after 3–4 years of teaching, constantly pushing me to improve my teaching. I use classroom activity photos and videos they take for discussion in the BAR-AAR meeting. The feedback I receive impacts the next group of pupils using the same lesson plan. (Grade 3 teacher, School B, Interviewee 5)*

In the photo elicitation, he took a photo of pens, highlighters, and notebooks (Figure 19) as they connectedly helped him to be an active observer. He explained the steps by starting to take notes during meetings and classroom observations. These notes fulfilled his responsibilities as the head of the English department and as sources of information or reminders by comparing the notes between the BAR-AAR meeting and the classroom observation. If these notes did not exist, he could not complete his duties to provide feedback as an observer of English classroom practices. His Macbook (Figure 19) was another essential tool that helped him in sharpening his feedback by using it to search for concreate ideas. Combining all objects made the information flow smoothly between the classroom observation and the meetings in a more effective way. This shows that the notetaker's perspective and concreate ideas are important in keeping the dialogue alive as much as the photo of the classroom activities does.



Figure 19: Connected objects generating a better dialogue

In another meeting, the grade 3–4 coach shared the photo of the writing on the whiteboard during their observation of a colleague's class as it revealed the teacher's thinking sequence and alignment with their lesson plans (Figure 20). Although a lesson plan was the most mentioned connected object among interviewees, without evidence of the materialities embodied in the classroom activities, especially photos of whiteboards, a lesson plan may not be able to generate a conversation. The photo of the whiteboard

and classroom activities depicted the lesson plan implementation; and this initiated the conservation and generated concrete suggestions in the next AAR meeting.

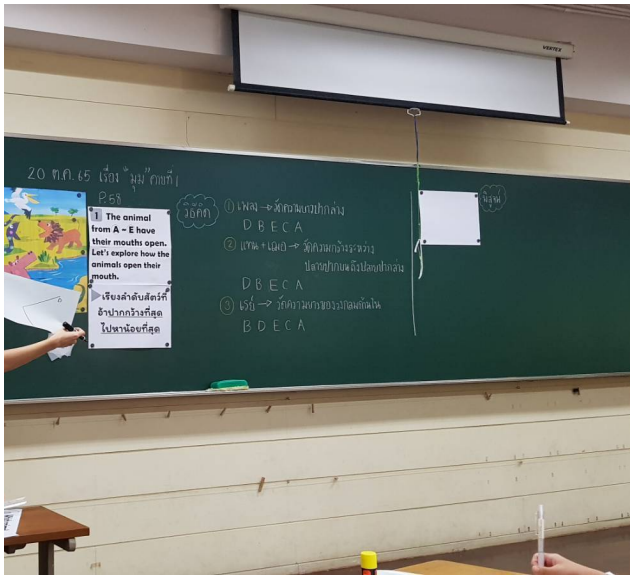


Figure 20: Whiteboard, the evidence of lesson plan implementation

6.2.2.3 Water drop day (วันหยดน้ำ Wan-Yot-Nam)

At the end of each trimester, a water drop day provided the pupils with a moment in performing their learning, while it was also a key week for the teachers' professional learning. As the interviewees talked about it, I searched the school website (School B 2021), which explained that the water drop day is the day when the pupils plan and set up a wide range of activities to present their articulated learning outcomes from an integrated learning project, while parents are also invited to cherish their child's learning. The water drop day is perceived as being a performance moment where pupils' post-learning enacts and embodies teachers' growth. As such, pupil performances also reflected teachers' performances, whether focusing on specific knowledge or holistic development. In the headmaster's photo elicitation activity, he showed me the photo of the grade 6 pupils' water drop day presentation, explaining the connectivity between water, trees, and the city (Figure 21).



The pupils set their outdoor art gallery because they wanted to express that, as human beings, we connect to water, trees, and the city. They draw pictures rather than using photos taken ... They highlight the link of water, trees, and the city as one extensive network. "We live in urban settings, but we somehow link to those who live in hill areas by the natural resources and river we share." Having a chance to visit a village in Kanjanaburi province, pupils perceived how local people live and converse natural resources so that we in urban areas have enough resources to consume. This makes pupils realise the concept of equity that should be addressed in many aspects of life, not just equality, because upstream people contribute a lot. What if urban people ignore this issue? The connection between water, trees, and the city will be diminished someday as we cannot save it. (The headmaster, School B, Interviewee 2)

Figure 21: Opening message of "Water, trees and the city are connected"

Pupils meaningfully reflected their knowledge in these complex dimensions, and this urged him to think about teachers' competencies, especially they align with their expected role. While using the water drop day as evidence for teachers to upgrade the next integrated project, it also provides a rationale for gathering teachers together to work to improve their lesson plans and their planning skills, especially in driving questions. The headmaster also provided some further advice, not only in the photo he shared, but also to his double. He described how has no scheduled teaching hours, however, the water drop day activities, interactions with pupils, whether in the hallway or the headmaster's office allowed him to keep updated with pupils' needs. His problematisation of pupils' needs became the necessary point that he used to draw out teachers' interests in improving what teachers still lack in terms of their skills.

6.2.3 Informal interaction across the stages

Dialogue (or discursive material) is not just the interactions in Pre-while-post activities, but it is also brought up as things that emerge across all stages, anywhere and at any time, with or without intentions, as illustrated in Figure 22. Dialogue sustained the teachers' interest in professional learning. I spotted several such dialogues, whether direct or indirect, affecting teachers' learning, through ITTD.

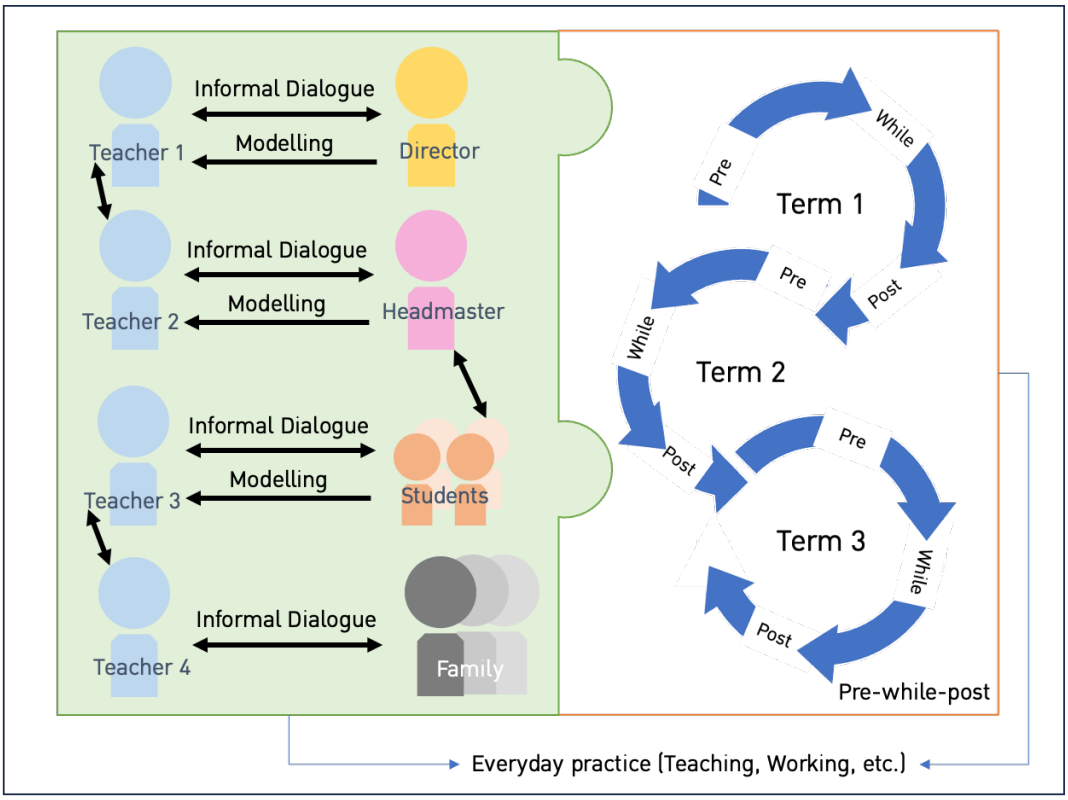


Figure 22: Dialogue sustaining professional learning's translation

6.2.3.1 Open-door policy enriching dialogue

Each teacher knew that if they had a problem with their work and life, the school director would always welcome them and exchange experiences in several aspects of life, according to the open-door policy and family-tie relationships. Dialogues with the school director became learning moments when the atmosphere was comfortable and safe to allow teachers to be open, without feeling judged and providing options for teachers to think critically about their options. Interviewee 5 shared his moment when he consulted the management issue in the department:

> *As the head of the English department, I faced a challenge to address a performance issue with my close colleague whom I affectionately referred to as "แม่ or mum[15]". I sought advice from the school director … Under the concept of Yonisomanasikāra, she advised me to prioritise the pupils, approach the situation without bias, and address it logically and thoughtfully. I was able to make a sounder decision by focusing on the pupils' needs. After giving my colleague several warnings, I suggested*

[15] An informal term for a senior female close friend

> *that the management terminate her employment. Later, the approval made rumours circulate among my team, so I openly explained my decision with them. This made the atmosphere among the team stable as usual.*
>
> *Back to the dialogue, despite being a listener most of the time, I gain positive thoughts without being dominated because the school director's responses keep me thinking further and develop leadership skills implicitly. She is my model, and I aim to grow like her one day.* (Head English teacher of grades 1–6, School B, Interviewee 5)

It was not only in solving administrative problems, but also the characteristics of being a great teacher, that influenced his professional learning through these dialogue interactions. He used the term Yip-dee (หยิบดี), which means cherry-picking, in the ITTD, suggesting that his double should have the courage to approach the school director when seeking suggestions.

6.2.3.2 Pupils are teaching me

In the relational map (Figure 23), the headmaster drew a shorter arrow between himself and the pupils than to teachers, as he did not have to teach and belong to any classrooms. Pupils' well-being and overall learning as a key responsibility became the source of his learning. While the Yonisomanasikāra concept encourages one to ask questions with critical thinking, meeting with pupils allowed him to translate such concepts into practice and, in so doing, to mobilise his own learning.

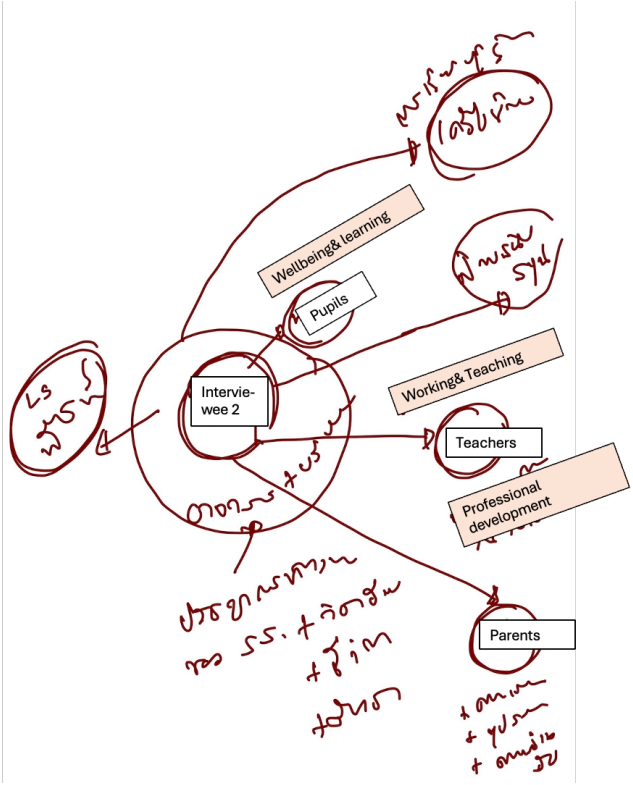


Figure 23: Interviewee 2 relational map

In the photo elicitation activity, he showed me a photo of a pupil's hands (Figure 24), pointing out that hands started dialogue and expanded his learning, especially everyday life dialogues that occur everywhere. Two first-grade pupils approached him and handed him a lost item. After the lost-and-found chat, he excitedly started a small discussion with them (Figure 24).



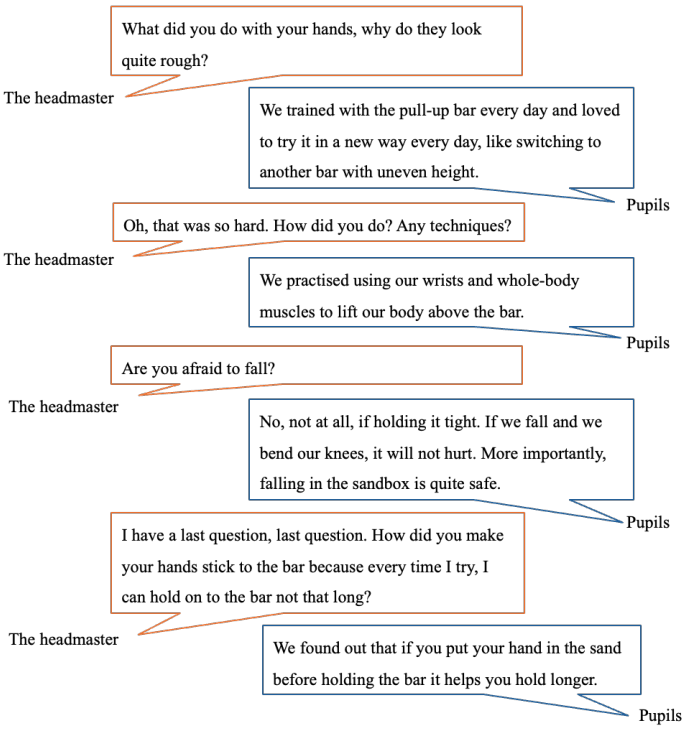


Figure 24: A pupil's hands and the dialogue

This impromptu and unexpected dialogue reminded him that pupils can reach their potential if given challenging tasks that interest them. He realised the importance of capturing pupils' learning through their stories. In the ITTD activity, he suggested that, as the headmaster, he had to encourage teachers to have conversations with pupils every day because they can learn from pupils, whether by telling teachers directly or being a model for them.

6.2.3.3 Dialogue leading to modelling and inspiring

Dialogue does not have to explicitly intra-act with teacher's learning, but it can bridge to other vicarious interactions, such as observation, modelling, and inspiring. The junior teacher shared how dialogue with the headmaster became a new form of professional learning.

> *I had the chance to observe the headmaster and was struck by his impact on pupils. … As he walks through the school, he engages with pupils during lunch breaks and after school. I have noticed that the pupils feel at ease and comfortable around him. I am still trying to understand his approach and want to incorporate some of his qualities into my interactions with pupils.*

> *I also admire the headmaster as a classroom expert. Initially, I struggled with managing the classroom orderly while fostering a sense of active learning that I could not grasp any techniques from the BAR-AAR session. So, I took the opportunity to speak with him in the hallway. He then demonstrated his technique in my classroom using my lesson plan. He asked the whole class to establish a few ground rules to ensure the process would go smoothly. He facilitated the discussion until the pupils agreed that the project's grouping would be based on each other's strengths and contributions rather than their proximity. I was impressed by the idea because I usually group pupils without asking them to ensure an orderly atmosphere and I do not want to leave anyone behind.* (Grade 5 teacher, School B, Interviewee 6)

Although he had yet to have a chance to reflect with the headmaster after class, he realised that one lesson plan could show diversity depending on who used the plan. Within an hour, he learned how the headmaster listened to pupils and how pupils opened up to him quickly. He perceived the demonstration as being another successful classroom practice, one that could inspire him and an experience that he could enrol in his other classrooms.

6.3 Network Effect

Teachers, in their intra-actions with many actors, agreed that they learned things they never expected to learn beyond the classroom experience. Alongside the official training programmes, they also critically examine and question their work, lesson plans, and relations with pupils, colleagues, subordinates, and supervisors. Not only did such translations emerge according to the Pre-While-Post model, but other informal translations also happen along with the teachers' daily work. These translations led to the professional learning effects in relation to the aspects of the teachers' roles that the school expected.

6.3.1 A better version of a lesson plan

The direct goal of BAR-AAR meeting as lesson plan discussions allow teachers to learn faster than in traditional methods because they learn from others' experiences and things that are directly related to their classrooms. The AAR, the first half of the meeting,

brings them back to the classroom implementation, investigating the delivery process, pupils' responses and outcomes. They transfer knowledge generated in the first half to the second half of the BAR meeting to produce a new lesson plan. Although the lesson plan belongs to only one teacher, others can learn from the discussion and use effective parts in their classrooms. The BAR-AAR meeting is an example that illustrates how knowledge is being transformed. Interviewee 3 talked about how revising lesson plans is a product of the BAR-AAR meeting.

> *I reuse the first-grade community mapping project unit plan every week because my pupils and I always experience different things and people for field visits. More importantly, pupils in each cohort have other interests, so we have various project themes. For example, we had Thai dessert making last year as pupils met the Thai traditional cook in the neighbourhood, and we have a planting theme this year because pupils are interested in growing edible plants. As a teacher, topics changed each year, making me consider revising the lesson plan. I then take the suggestion from the BAR-AAR meeting for improvement.* (The senior teacher of the 1st and 2nd grade coach, School B, Interviewee 3)

6.3.2 Character building

Experiences of non-teaching duties complemented professional development. Spiritual growth, as another unexpected learning artefact, was co-produced by interconnected formal and informal professional learning networks. Based on formal activities, such as the BAR-AAR meetings, teachers learned to improve their competencies as teachers in lesson planning and instructional delivery. Meanwhile, they could also learn from working as a team in and out of meetings and by practising conflict management, anger management, and awareness and consciousness, especially in a Buddhist way.

Four interviewees also mentioned discussing their non-teaching work problems with the school director. The one-on-one dialogue here was more abstract than the dialogue in the meetings. The director did not answer explicitly but provided opportunities for teachers to rethink what happened. The emergence of spiritual growth may not be detected during the dialogue, but it needs time until the articulated action is made

visible. By then, the interviewees valued it as part of their professional learning outcomes.

6.3.3 Lessons learned for improving the practice

As the school director monitored the implementation of the professional learning practices, she recognised the importance of balancing all stakeholders and ensuring that each participated meaningfully. As such, she highlighted the ongoing improvement of the practices.

The influence of Thai family-tie culture could be problematic in the professional learning assemblage, because sometimes teachers would not share their feedback straightforwardly as they were too aware of others' feelings and emotions. The director admitted that she has worked hard to explain to her senior teachers why their feedback should be fact-based rather than emotional-based and to her junior teachers why being critical and not leaning on others' ideas too much is essential for personal growth. However, she believed that the school culture could also be family-like and professional at the same time, but only if teachers and things cooperate. Thai family-tie culture also encompasses a sense of dependency in that teachers can learn from others' strengths without being alone. The key is to maintain this sense of dependency, while increasing the quality of dialogue and reflection. For example, the director was considering introducing semi-structured BAR-AAR questions into each meeting and using these as a means of communicating respectfully with senior teachers. The emergence of these discursive materials provided an example of how professional learning practices can be enrolled successfully in the assemblage of Thai culture and school expectations.

The lessons learned that emerge as the effects of these sociomaterial relations, are then translated to become an actor in another loop of translation, especially in presenting a clear problematisation, and this produces knowledge related to what should be included or excluded in the further translation of these professional learning moments.

6.4 Conclusion

School B is a private alternative school with unique educational beliefs and practices, including professional learning practices that are initiated by the founding team and

management. In wrapping up the story of the teachers' professional learning practices, several micro-practices arise with different purposes under a strong common interest, which is 'Yonisomanasikāra', the school's goal for self-development and pupil learning.

Although everyone seemed satisfied with how they learned and the knowledge that was mobilised and rated their current practices as exceeding their expectations, they all indicated that they still have concerns and are still curious, illustrating how the drive for continuous professional learning has become stable in this assemblage. The school director and the headmaster admitted that embedding a stable teacher development process in their daily work may not always mobilise meaningful dialogue and reflections due to the family-tie culture. This suggests that it may be necessary to enrol new materials, such as guidelines for senior teachers, because they take the lead in the meetings. Introducing guidelines to these professional learning assemblages may lead teachers to engage in evidence-based dialogue within a sense of dependency as family. However, the dual-level coaching system may not be as effective as expected, as the coach cannot work effectively as their duties effectively relate to their available time and the structure of the buildings. After writing the story, I raised this point with the school director and headmaster. As the researcher, I thus became an active actor, picking up an interest in school processes and practices and, through our conversations and the research process, influencing the management decision to restructure the coaching system to allow a single-level coach to provide enough coaching and meetings to support all teachers.

Chapter 7 Stories of School C: Public School Assemblage (Main study 2)

According to the case rationale described in Chapter 4, I first contacted the school principal and asked for permission to perform an interview. Six interviewees were interviewed, and their characteristics are described below.

- Interviewee 1: He has been a principal for almost 20 years and almost 8 years in this school. Although this was not a new role for him, it excited him because it was the school in his home community. He has intentionally contributed his expertise to transform the school and improve the quality of the education to match any other public or private school in town. He explained his desire for local children to access high-quality education in a community, so they do not have to pay for commuting expenses and tuition.
- Interviewee 2: A grade 4–6 mathematics teacher who has 15 years of experience working as a teacher at a senior professional level (level 4 of 6 professional levels). Working at this school for five years, she is currently holding the additional role as the school registrar recording pupils' enrolment lists, and attendance, completion, and dropout. These records are high-stake affecting the MOE decision on providing pupil subsidies. Previously, she was the academic lead for grades 4–6.
- Interviewee 3: A social studies teacher for grades 4–6 who has been promoted to head of the department after Interviewee 2 resigned to take on another position. She began her teaching career in her forties at bilingual, international, and private Thai schools before joining this school, where she has taught for over ten years. With an academic background in political sciences and sociology, she teaches social studies. She also implemented her prior experiences of multiple intelligences by Howard Gardner (2011) in this school. She is now seeking professional advancement to level 3 out of 6 professional levels.
- Interviewee 4: A grade 1 senior teacher with 25 years of experience and five more years of experience working at other schools, she works at a senior professional level (level 4 of 6 professional levels). Her expertise is in psychology and consultation, which puts her in the position to teach pupils in grades 1–3. Currently, she teaches all subjects for grade 1 and leads the school's

general administrative and quality assurance team. She plans to retire from teaching at this school in the next few years.

- Interviewee 5: A grade 2 junior teacher who is the newest teacher among the other teachers with six years of experience. She started her career at this school as her first-time teaching position, teaching grade 2 pupils in all subjects, although she graduated with an English teaching degree. Besides teaching, her non-teaching work is managing the school lunch record. Her passion is teaching, so she is also undertaking a part-time master's degree in English teaching, which is the primary source of her new ideas for her lesson plan and activities.
- Interviewee 6: An academic lead teacher who started her first job as a university lecturer, then moved back to her community to work as a teacher. She has been a teacher for 21 years in three schools, working at a senior professional level (level 4 from 6 professional levels). She has worked at this school for 6 years. At first, she was assigned to teach all subjects at a primary level, then English and career exploration subjects at a lower secondary level. Being a school academic lead allows her to interact with colleagues and pupils at all education levels; more importantly, she recognises the transition from grade 6 to grade 7 as a critical step for student growth. She is therefore interested in integrated-based learning, especially lessons with multiple subjects and links to real-world situations, to prepare young teenagers.

7.1 School transformation– turning point of professional learning

Every point in the school's transformation, whether shifting from passive to active learning, COVID-19, or the PA (performance agreement), there was an actor who/which affected teachers' work and professional learning. Interviewee 4 shared her experiences as being a teacher who had worked for the longest period of time at the school. Before the current principal was appointed, she depicted that the school's operations were the same as those of typical public schools:

> *Many principals used this school as a stepping stone to move on to take a role in a bigger school in town. Without consistent support, teachers work independently … Teachers have independent teaching territory, and we rarely talk about classroom improvement, though it is useful and*

> *necessary. I never invited my colleagues to observe my classroom, nor did I share my lesson plan. Instead, we talked about personal matters like family, health, etc., as the way we maintain a positive relationship.*
>
> *Nonetheless, the current principal, as a local, has initiated cohesive school directions and action plans and supported the teachers with the idea that "the classroom is the frontline in the school transformation". For me, the idea critically breaks the classroom territory and leads to collaboration in transforming school and professional learning.* (Grade 1 senior teacher, School C, Interviewee 4)

The principal pointed to the discussion with teachers in making sense of the school's expectations, and, more importantly, identifying it as a rationale for being a source of community support for child development. Based on my observations and interviews, the interviewees noted that all teachers are local and speak the northern language during informal and formal meetings. Although they may use different accents, each can be understood in the same way between communities. The principal also used the northern language in group and pair discussions to align personal and school interests and reach mutual agreements. Therefore, clear expectations seemed to be conditions of the school transformation and professional learning practice, and more importantly, guide other relevant activities such as teaching and learning, performance evaluation, curriculum, and partnerships. This became one of the obligatory passage points (OPPs) in the practice that forces actors to converge on certain topics (Kitchen 2000). He shared with me as his double in the ITTD activity that his role was to support teachers' learning while pointing them in the right direction to reach the school expectations. He suggested that his use of the participatory leadership approach allowed for two-way communication, helping him in bridging national policy, school concepts and classroom practices. This, to him, was the turning point for enrolling a new form of professional learning.

7.2 Three waves of school transformation

The principal described how, since he had taken on his role, that the school had experienced three waves of school transformation under his leadership. During each wave, there was a thing enacting the clear school expectations. In the first wave, the

school members dealt with policy transformation by rethinking the school direction along with the school's focus and its classroom routines. The second wave was mediated by the pandemic, which uninvitedly brought everyone into an assemblage with technology and online learning. The PA policy, the third wave, affected the teachers' careers personally. Each wave forced the school to include new and additional materials in its professional learning and operation activities. As the school grew, so did the teachers' professional learning.

7.2.1 The first wave

7.2.1.1 The small wave from being passive to active classrooms

In 2017, the principal focused on promoting active learning by connecting teachers with experts and providing capacity-building resources. The aspiration of "our school should be comparable with other high-quality institutions like international, private, and bilingual schools" was highlighted along with professional learning and accountability. Tangibly, externally provided training programmes were used to promote teachers' professional development, and quick-win results were expected to be seen in their classrooms. The principal pointed this out in his map and explained that learning from outsiders and seeing new things would motivate teachers to engage in their own professional learning:

> *Starfish Education, the local educational foundation, has been working with our school for many years, offering several professional learning programmes, such as online self-paced learning courses and coaching and onsite workshops. My teachers and I visited the Starfish school. We learned how pupils interact with learning materials, teachers, and their classmates to get their own meaningful learning. This is our partner supporting us in transforming our classrooms.* (Principal, School C, Interviewee 1)

The Starfish school introduced the STEAM design process[16] – the Starfish model of active learning– to School C's teachers. Once going back to the school, the academic lead teacher led her teachers to implement the STEAM design process in each classroom. While explaining about the STEAM design process, as illustrated in the map, she talked about ongoing meetings as a means to clarify doubts among colleagues.

> *A clear learning step of the STEAM design process allows teachers to follow despite having limited backgrounds. The process can be finished within one learning activity, and teachers can see the result of learning through pupils' work. Such experiences bring confidence to teachers, and convincing others to try alternative techniques to improve their active learning classrooms is easier. I hosted the meeting using the STEAM design process during our first few years because, although we may interpret and use the STEAM design process, our interpretation may be limited. This is why ongoing dialogue is needed for us to keep ourselves to be more creative in seeing this model.* (Academic lead teacher, School C, Interviewee 6)

The most senior teacher witnessed that such small achievements in the classroom inspired teachers' interests in learning something more difficult and challenging and pointed out that:

> *The principal started improving teachers' mindsets, raising student outcomes as the goal by connecting with external expert agencies for relevant training opportunities and leading by example – taking us to other schools on visits. As a learner, I could understand the concept, draw a picture of our active classroom, and bring practical techniques into the classroom activities. After such activities, he allows everyone to share ideas and co-design our classroom activities.* (Grade 1 senior teacher, School C, Interviewee 4)

[16] The STEAM design process is a design-thinking learning process, introducing by Starfish Education. The 5-step model of the STEAM design process starts from asking a question about a problem and finding a solution via thinking, searching, exploring, and working on it: 1) ask, 2) imagine, 3) plan, 4) create, and 5) reflect and redesign (Starfish Education 2022).

In her map (Figure 25), she explained how the principal, teachers, new techniques, technology, and curriculum influence her and the processes, using the purple and green colours in the map to illustrate the influence of the bureaucratic pattern of public schools. The grade range PLC is one of the work-based activities that relate to the improvement of teaching and learning process and classroom practices that stood in between her and pupils.

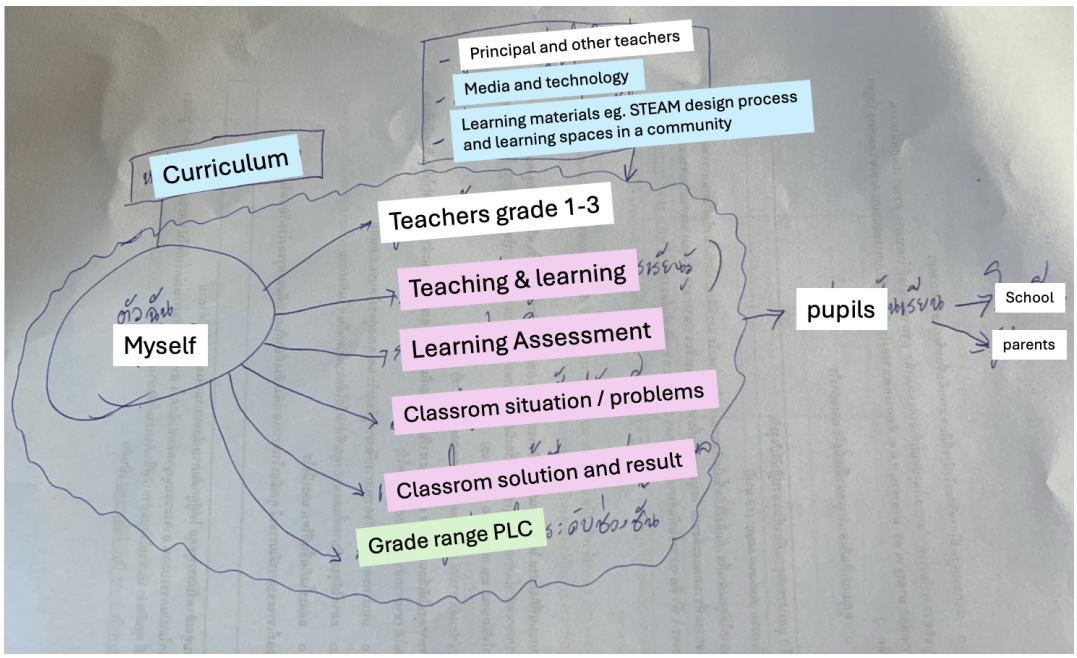


Figure 25: Interviewee 4's relational map

She further sent me the school's infographic (Figure 26), explaining the process above included the STEAM design process in the PLC to improve the lesson plan and teacher collaboration.



Figure 26: School C intervention journey (Starfish Academy 2021)

7.2.1.2 It's time to revise the school curriculum

The effect of STEAM design process and PLC made teachers recognise instinctively, in a process which mediated the school practices, that pupils became happier and more engaged in learning. An ongoing improvement and the launch of the Education Sandbox Act 2019 reached teachers' hearts and willingness to improve their curriculum, beyond instruction practices. The principal shared his perspective on how the Education Sandbox Act 2019 shapes school-based education and management practices based on community expectations while discussing the photo he brought to the photo elicitation (Figure 27).

> *As educators, we generally admit that public school's autonomy is quite limited due to the centralised management and top-down order. However, the Sandbox Project under the Sandbox Act can be different as it legally allows us to transform our school according to our needs. We grasp external ideas and opportunities to be creative while being confident with this legitimate transformation. This thin and B5-size Act loosens school management and administration restrictions, including curriculum, instruction, and financial management, which further affect teacher professional learning.* (Principal, School C, Interviewee 1)



Figure 27: The Education Sandbox Act 2019

The principal formed a team of potential leaders to help in communicating the curriculum redesign that could be made under the Sandbox Act, while being open to listening to teachers' questions and concerns. Most teachers agreed with the approach, while some had reservations. As he suggested to his double in the ITTD activity, the change needed time and communication, therefore gathering potential leaders as the team was crucial for helping other teachers in making gradual, inclusive strides to involve all teachers in the transformation.

Interviewee 6 described how "[s]pending half a year on the curriculum redesign was a big moment of learning and making learning visible, specially making teachers familiar with the curriculum as co-designers and implementers", a similar perspective to what other interviewees shared. They agreed that the curriculum let them interact with other materials and teachers; this helped them to have a better understanding of the school goal and their colleagues' interests. The process started with a meeting to revise the school concept and to create a learning theme, and this then became part of the school's monthly meeting routine.

In the first curriculum redesign meeting, the principal, informally shares information about the world situations with VUCA[17] and education trends, such as differentiated instruction and personalisation to urge teachers to rethink about the goal of education beyond the national core curriculum. Then he asked: what would the school goal be to develop pupils to live in the rapidly changing world? How do we educate them with life skills, knowledge, and self-realisation?

*We have several discussions toward these questions during school break on-site meetings … and a clear agenda in developing materials, such as the school concept, the learning theme, and the competency-based curriculum. … As a result, our school concept is "*ทักษะสู่แรงบันดาลใจ*: Skills to be Inspiration", as it could bridge pupils' learning and help them to pursue their goals. The school concept leads to the three learning goals divided by education range (grades 1–3, 4–6, and 7–9): Build up / Search for / Be inspired. These encompass and guide teachers' learning direction and become the tangible point for professional discussions.* (Academic lead teacher, School C, Interviewee 6)

After learning themes were extracted and rearranged according to each teacher's responsibility, Interviewee 2 shared these relevant photos (Figure 28) that she took from the vinyl graphic displayed on the wall and explained how, through her responsibility, the grade 4–6 theme of 'search for' firstly guided the discussion among colleagues, then the lesson planning activity.

The vinyl graphic on the wall in the meeting room was the principal's idea because this meeting room is also used for external stakeholder meetings. So, we can easily communicate the purpose and process we deliver to our pupils. It is also essential for us as a reminder of our dialogue about lesson planning and serves as our professional learning goal. (Grade 4–6 mathematics teacher, School C, Interviewee 2)

[17] VUCA: volatility, uncertainty, complexity, and ambiguity.



Figure 28: Meeting room with teachers and written learning themes displayed on vinyl graphics

7.2.1.3 Discussing as a new meeting

After using the learning themes, teachers always discuss them with their colleagues because translating learning themes to competency-based lesson plans is an ongoing process. This makes professional learning activities challenging and never-ending, whether the school is open or closed. However, the school unexpectedly shifted their conventional, one-way meeting format to an informative and dialogue-embedded meeting format when they achieved the curriculum redesign.

The principal pointed out that they used meetings in several forms, such as informal professional dialogue, in a formal gathering. Without having time to monitor every activity, the principal used the school's monthly meetings to catch up with his teachers' routines and give them tangible ideas, and he set one specific agenda for each meeting, such as the sharing session agenda.

> *The meeting is a means that they use to open their conversation, so it is not limited to a place to meet and a number of participants. It could be the backspace in the classroom, the online group chat, the teacher lounge, and the small meeting room. Teachers may use the big meeting room next to my office, especially on the topics they need to work on together, such as an integrated lesson unit or learning activities. In this case, I tend to join their meeting.* (Principal, School C, Interviewee 1)

Interviewee 5 perceived that the monthly meeting led by the principal was not counted as being formal because of the friendly and safe environment, as illustrated in the photo (Figure 29).



My first teaching experience was at this school with this principal. When he appoints me to attend the outside workshop, I enjoy learning new things and connecting with other school teachers. In this meeting, we summarise and present learning points and recommendations for others who could not attend 'Learn-and-share' as one of the routine meeting agendas. During my turn, I present information and open for opinions and questions … get valuable tips for my classroom; this helps me learn faster from other experiences … shortening the process of trial and error.

(Grade 2 junior teacher, School C, Interviewee 5)

Figure 29: Monthly Meeting

She added that the process above could be considered extra work in other public schools, because, with or without performing these professional learning practices, all public teachers are governed by the same performance standards, career advancement processes, and salary regulations. However, as she described, "by the end of the day, talking with my colleagues and the principal always reminds me that the pupils' outcome is the goal, especially when the principal always shares new techniques and ideas in the school LINE communication group" (Figure 30). This made professional learning become part of everyday life, so this to her, would not be extra work.

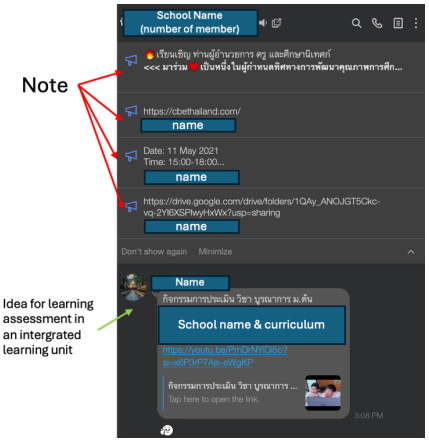


Figure 30: School C's LINE group

Despite being a public school, the school did not use the government PLC template. The academic lead teacher explained that the meeting result should be broader and deeper than the template defines, once they develop the learning concept, theme, and curriculum. They acknowledged that the tangible result was the implementation of the changes in the classroom, not the meeting record.

> *We use "the learning theme" as the connecting point where all teachers return to visit when they design their own and their team lesson unit, not the PLC template. Therefore, this allowed the possibility of dialogue to go beyond the edge.* (Academic lead teacher, School C, Interviewee 6)

Therefore, in each grade range meeting, we are able to see how the learning theme acts as the background to the conversation, which was enrolled in any kind of conversations and relationships, which led to professional learning.

Grades 1–3: Borrowing lesson plans

Dialogue was generated through the lesson plan mobilities and intra-action with teachers. Among the grades 1–3 teachers, the grade 2 teacher, whose degree was in English teaching (Interviewee 5), was assigned to teach all foundation subjects as the youngest teacher. At first, she tried to use the English teaching technique as she had to teach grammar, writing, and reading. However, each of these aspects differs from English teaching practices. Interviewee 5 then explained how she approached other senior teachers (Interviewee 4) to find support, telling his double that:

> ***I have less experience than others, so it is important to be like a glass half full to fill learning. Although public school teachers tend to be independent … not intervene in each other's classrooms … I have had different experiences at this school, especially a mix of seniority and a collaborative working culture. I asked the grade 1 senior teachers about the Thai teaching technique and pupils' prior experiences. She helped me to review my unit plans during the school break, which I printed out for her. She then offered me her lesson plan, and I took the idea for my classroom.***

> *Meanwhile, she sometimes asked me about English pronunciation and learning materials because she uses materials from the official book that tend to be irrelevant and unresponsive to the context. We sometimes borrow each other's learning materials, which is the best way I learn from her, by borrowing her belongings.* (Grade 2 junior teacher, School C, Interviewee 5)

Interviewee 5 further described how Interviewee 4's offering of her lesson plan was the beginning point of borrowing (Figure 31). This practice had gone beyond borrowing lesson plans to borrowing learning materials, which expanded the discussion point to offer a space for teachers to learn from others.

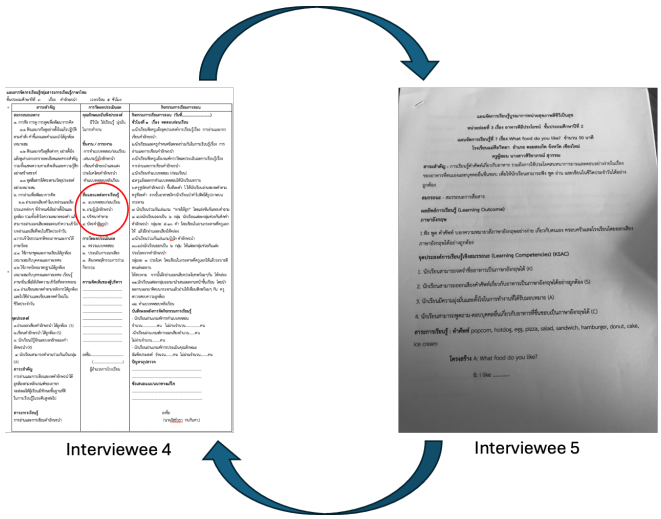


Figure 31: Borrowing the idea in lesson plans

Not only in taking a junior role, Interviewee 5 also showed photos of grades 1–3 teachers and three student teachers in her photo elicitation (Figure 32) and explained how student teachers transported updated knowledge from the academic world to real classrooms.





While brainstorming ideas for the literacy boot camp, one of the student teachers shared her idea about gamification, which she got from taking a course at the University… This is new for us … We then explored into details and decided to try her idea by creating game-based literacy activities. (Grade 1 senior teacher, School C, Interviewee 4)

Figure 32: Dialogue with student teachers

Student teachers thus brought new and fresh ideas to the school. Furthermore, their supervisor also actively approached the school through the school-university partnerships. Interviewee 4 shared that, generally, university academics are positioned as theorists, situated far away from the school teachers, who, as practitioners, are perceived to belong to a different world. However, this time, the academic faculty members approached the school in a more approachable and reciprocal way through the 'co-supervision' of the student teachers. Such connections extensively enroled the university academics into their professional learning network.

Grade 4–6: Co-planning lesson plans

Similar to the grades 1–3 teachers above, the grades 4–6 teachers also perceived lesson planning as collaborative actions. They learned and achieved together under the theme of 'search for' by using multiple intelligences. Interviewee 3, who has strong knowledge and experience of multiple intelligences, suggested that the double should use co-planning activities to allow teachers to learn the technique from others and to get to know each other better, and to soften the transition of each lesson conducted by different teachers.

In the photos that Interviewee 2 and Interviewee 3 brought to the interviews (Figure 33), everyone is seen to be enacting a teaching hour semester plan on the screen through the

conversation and each teacher has their own plans on the table as a reference and for revision. They then moved on to discuss the unit plan situated right next to the screen. Interviewee 3 pointed out that the unit plan under the theme ignited professional dialogue among grades 4–6 teachers in a more authentic and concrete way than attending a traditional training session would. Interviewee 3 led the discussion by giving an example, showing the association between multiple intelligences and the unit plan, and also talked about how assessment results from multiple intelligences would guide teachers in planning the lessons. The negotiation and dialogue introduced the whole idea of multiple intelligences and created a clear connection with each teacher's taught subject. Once, teachers came to a decision that pupils should perform a pre-self-assessment multiple intelligences test. This furthered their lesson plan for having pupils visualising their own results during the first two weeks of the semester and they suggested that the pupils should choose two to three areas to attend to for a whole academic year. Interviewee 3 suggested to the double that, to achieve the above discussion necessitated a two-way collaborative relationship, not the relationship of leader and followers among her colleagues.

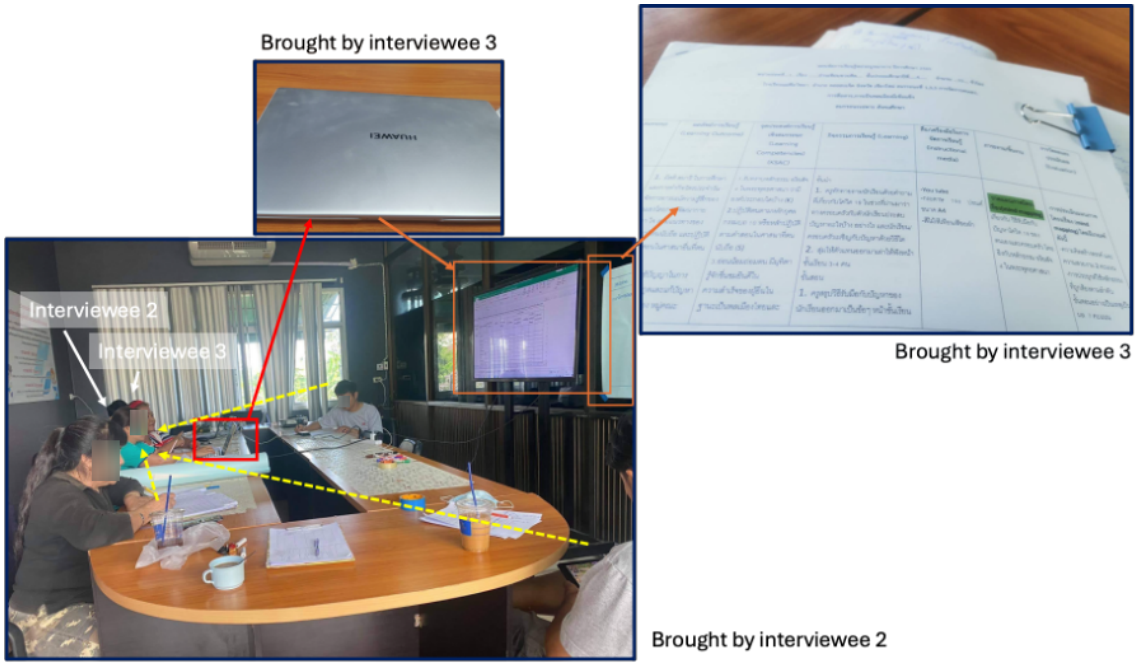


Figure 33: Connection in co-planning session

Interviewee 2 suggested to the double how they should keep colleagues engaged in meetings by circulating a clear agenda before the meeting started, which could be done in an informally way. Additionally, Interviewee 3 suggested that her double should

communicate the most important concept in every meeting about the use of the STEAM design process along with the use of multiple intelligences for designing a lesson plan.

> *Dialogue and our mutual understanding about using the STEAM design process for the lesson plans are the most effective results, showing that our learning journey aligns with the school context ... Teachers' familiarity with the STEAM design process is the nudge for teachers to accelerate learning about multiple intelligences.* (Grade 4–6 social studies teacher, School C, Interviewee 3)

Another ITTD suggestion from Interviewee 3 was to ensure that each week's meeting was connected to the next one because it would sustain the mid-week conversation. Therefore, the team established an online group communication method where they could share work, ideas, and feedback at any time without waiting for the weekly meetings. Unexpectedly, some conversations could go beyond the multiple intelligences lesson plan to the personal lesson plan, especially when teachers engage with new knowledge within their own taught subject. Interviewee 2, who taught only mathematics, talked about the by-product effect of the group meeting, in that she enrolled new knowledge to design logical-mathematical and interpersonal mathematics activities, for her PA implementation, as described in Section 7.2.3.

Grades 7–9: Meeting with outsiders

More than 50% of grade 9 pupils in School C continue into vocational education, which fits with the learning theme of 'be inspired' to broaden pupils' perspectives on career exploration. In his ITTD, the principal highlighted the connection with other stakeholders as an essential factor for teacher professional learning that allowed teachers to learn new things with pupils. Therefore, job shadowing and apprenticeship were admitted as being effective approaches.

> *My junior high teachers have to learn with their pupils as the world changes. Some teachers are not aware of remote, online-based jobs and may not know how to prepare pupils for these roles. It's important for them to transition from being the primary source of knowledge to becoming facilitators of learning while also familiarising themselves*

with new occupations. I encourage my teachers to ask questions or raise concerns so that I can support them in improving their skills. (Principal, School C, Interviewee 1)

However, the academic lead teacher suggested to her double that she should implement this learning theme as attending a single session would not suffice, so an ongoing meeting was used to gather the principal and the grade 7–9 teachers to align their interests and also invite external partners, such as members of vocational institutions and local businesses, to collaborate on a tangible learning plan and to work together to facilitate learning during the semester while teachers developed professionally (Figure 34).

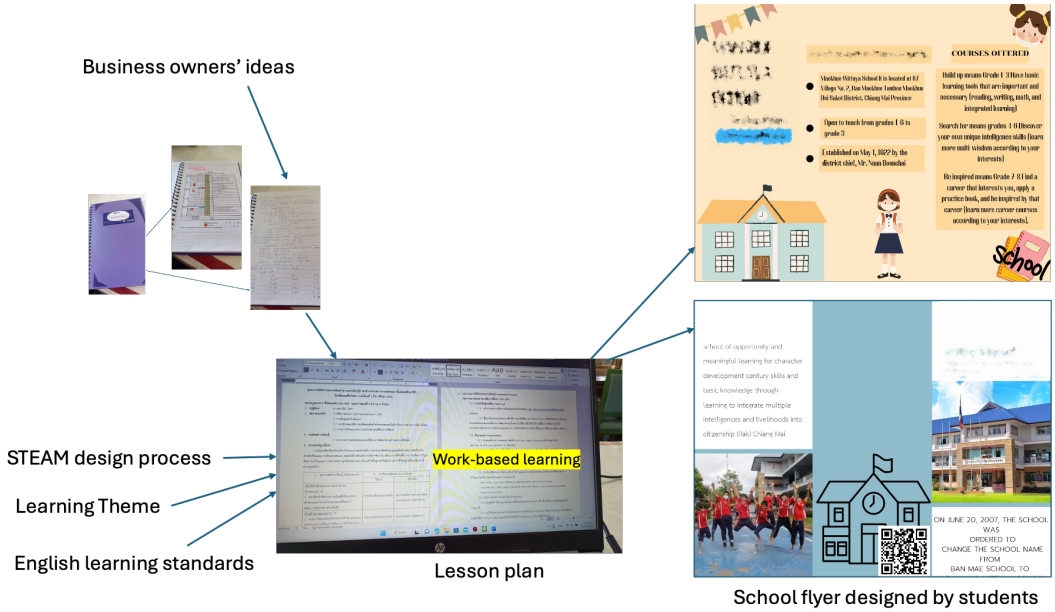


Figure 34: Lesson plan – the connecting point for several actors

As mentioned, lesson plans connected pupils' learning, the academic lead teacher's learning as a teacher, and the external stakeholders. In her map (Figure 35), she drew the unit plan in the centre, which was expanded into the connections to surrounding people and things through PLC and knowledge management (KM). The important materials, such as EdTech, learning style, and media, were invited into the PLC process to improve the process, fostering pupils' understanding of the occupation and their reflection on their experiences and learning.

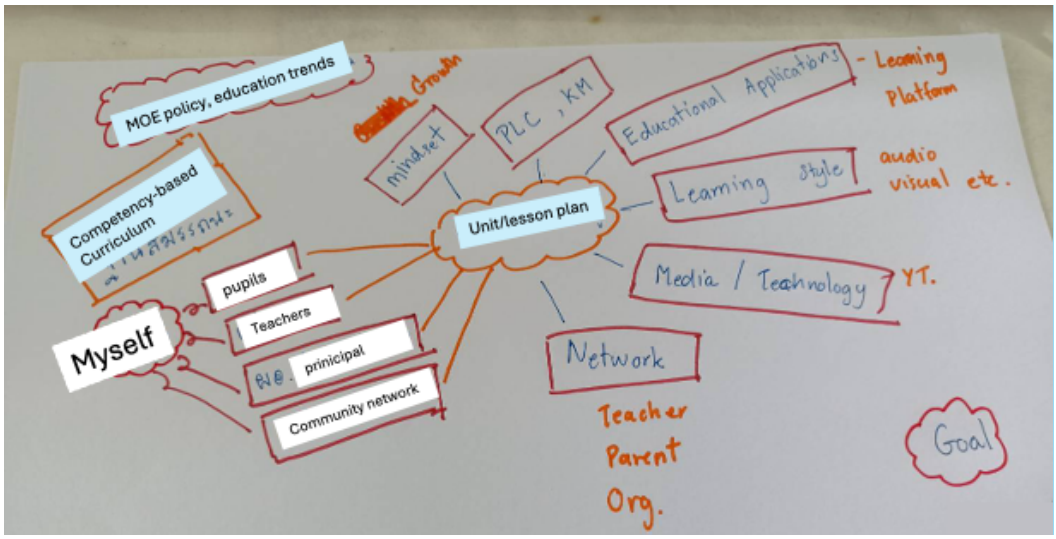


Figure 35: Interviewee 6's relational map

> *In the meeting, I, as the teacher, had a chance to look at the learning process through the eyes of a business owner. This allowed me to understand invisible and critical parts of business processes, such as communication and advertising, as the local businesses responded that they wanted to advertise their store and business in unconventional ways and with non-Thai languages.*
>
> *I note the ideas from the business owner and include them in my English unit plan by integrating the contexts as the learning activity and using the STEAM design process as the core learning process. In this 5-hour unit plan, I start by having pupils assess themselves in terms of their interests. Then, they are asked to create the school advertisement flyer or poster from their perspectives; this is a practising stage. Later, they will connect with each local business owner to co-create an attractive advertisement.* (Academic lead teacher, School C, Interviewee 6)

When pupils went out to do job shadowing, apprenticeship, or attending a guest speaker lecture, this was how external stakeholders influenced her lesson improvements. Additionally, through connecting with them, she gained valuable and practical experiences as a work-based teacher who can support pupils academically and vocationally, especially when such support aligns with her pupils' circumstances.

7.2.2 The second wave: The pandemic made the younger teachers visible

"In 2020-2021, the pandemic had forced us to embed technology in our working and professional learning activities", stated the principal. Interviewees 2, 3, and 4 said they were blind and felt lost in the situation at first because they still wanted to facilitate active learning, although their classrooms were home-based and the learning was enacted online. The inevitable situation affected the school operations and teaching and learning processes and directly translated digital skills from being a nice-to-have to a must-have skill, as described by the principal.

The principal then personally approached a computer teacher, who also provided the school's IT support and, in the background, supported the school's digital operating system. The principal asked him to expand his support from being computer-related to being technological-instructional-related. This was challenging at first when the computer teacher received this request. The support from the principal and the academic lead in gathering information about teachers' training needs allowed him to work comfortably in designing the the online learning assessment template and training teachers on implementing it in their practices. Interviewee 4 showed the online template (Figure 36) in her photo elicitation and explained how the template changed teachers' assessment practices and their understanding of competency-based assessment.

> *Technology and I are not friends but not enemies. Every technology training programme I had was from an external supplier, which was not exactly what I wanted … There are a lot of steps to remember, and we are not from the technology generation. However, the in-house training during the pandemic was what I wanted. The template helped me to record learning assessments more easily in an online setting. The computer teacher designed perfect tools for us to track pupils … Meanwhile, training with my young colleague (Interviewee 5) makes the learning process more comfortable because I can ask her after the training, too.* (Grade 1 senior teacher, School C, Interviewee 4)

The online template (Figure 36) and the workshop held by a young teacher changed the way in which teachers worked together because of the less hierarchical environment and the necessity of enrolling technology into teaching practices. It was not only technology

that was used as learning material; teachers who were more technologically savvy also gained more acceptance of this situation, regardless of their young age. I then noted in my diary that “This means that the connections between junior and senior teachers have less distinct boundaries and embody more professional manners”.

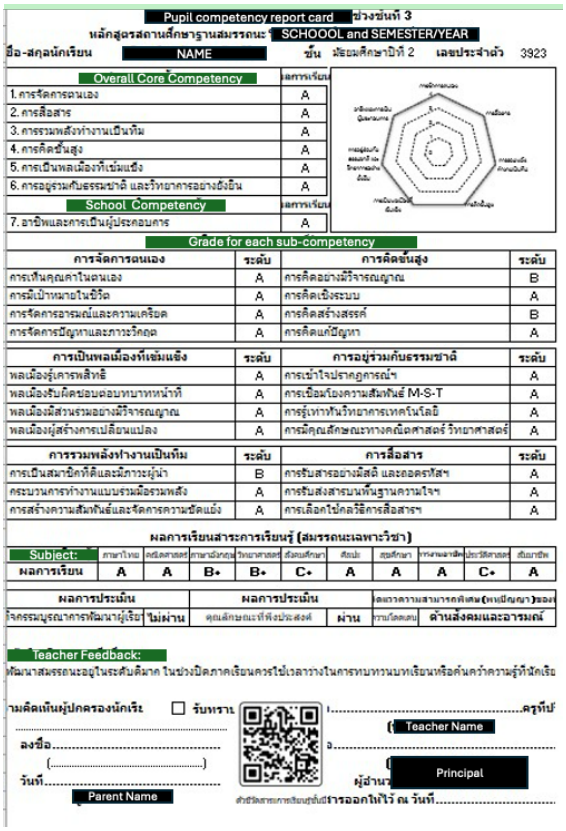

Pupil competency report card ช่วงชั้นที่ 3
หลักสูตรสถานศึกษาฐานสมรรถนะ SCHOOOL and SEMESTER/YEAR
ชื่อ-สกุลนักเรียน NAME ชั้น มัธยมศึกษาปีที่ 2 เลขประจำตัว 3923
Overall Core Competency
1. การจัดการตนเอง A
2. การสื่อสาร A
3. การรวมพลังทำงานเป็นทีม A
4. การคิดขั้นสูง A
5. การเป็นพลเมืองที่เข้มแข็ง A
6. การอยู่ร่วมกับธรรมชาติ และวิทยาการอย่างยั่งยืน A
School Competency
7. อาชีพและการเป็นผู้ประกอบการ A
Grade for each sub-competency
การจัดการตนเอง ระดับ
การเห็นคุณค่าในตนเอง A
การมีเป้าหมายในชีวิต A
การจัดการอารมณ์และความเครียด A
การจัดการปัญหาและภาวะวิกฤต A
การคิดขั้นสูง ระดับ
การคิดอย่างมีวิจารณญาณ B
การคิดเชิงระบบ A
การคิดสร้างสรรค์ B
การคิดแก้ปัญหา A
การเป็นพลเมืองที่เข้มแข็ง ระดับ
พลเมืองรู้เคารพสิทธิ A
พลเมืองรับผิดชอบตอบทบาทหน้าที่ A
พลเมืองมีส่วนร่วมอย่างมีวิจารณญาณ A
พลเมืองผู้สร้างการเปลี่ยนแปลง A
การอยู่ร่วมกับธรรมชาติ ระดับ
การเข้าใจปรากฏการณ์ฯ A
การเชื่อมโยงความสัมพันธ์ M-S-T A
การรู้เท่าทันวิทยาการเทคโนโลยี A
การมีคุณลักษณะทางคณิตศาสตร์ วิทยาศาสตร์ A
การรวมพลังทำงานเป็นทีม ระดับ
การเป็นสมาชิกที่ดีและมีภาวะผู้นำ B
กระบวนการทำงานแบบรวมมือรวมพลัง A
การสร้างความสัมพันธ์และจัดการความขัดแย้ง A
การสื่อสาร ระดับ
การรับสารอย่างมีสติ และถอดรหัสฯ A
การรับส่งสารบนพื้นฐานความใจฯ A
การเลือกใช้กลวิธีการสื่อสารฯ A
ผลการเรียนสาระการเรียนรู้ (สมรรถนะเฉพาะวิชา)
Subject: ภาษาไทย คณิตศาสตร์ ภาษาอังกฤษ วิทยาศาสตร์ สังคมศึกษา ศิลปะ สุขศึกษา ภาษาพาณิชย์ ประวัติศาสตร์ ศิลปาชีพ
ผลการเรียน A A B+ B+ C+ A A A C+ A
ผลการประเมิน ผลการประเมิน
จิตรรมบูรณาการพัฒนาผู้เรียน ไม่ผ่าน คุณลักษณะที่พึงประสงค์ ผ่าน ด้านสังคมและอารมณ์
Teacher Feedback:
พัฒนาสมรรถนะอยู่ในระดับดีมาก ในช่วงปิดภาคเรียนควรใช้เวลาว่างในการทบทวนบทเรียนหรือค้นคว้าความรู้ที่น่าเรีย
ามคิดเห็นผู้ปกครองนักเรีย ☐ รับทราบ
ลงชื่อ.....
(.....)
วันที่.....
Parent Name
Teacher Name
Principal
ผู้อำนว
ารออกให้ไว้ ณ วันที่.....

Figure 36: Online assessment template

Such an environment was replicated in other parts of the teachers’ work practices. The junior teacher observed that she could approach senior teachers by sharing her ideas about English teaching, while the senior teacher provided her with Thai teaching feedback. Seniority tended to be replaced by such reciprocal relationships in which each individual shares and supports the other with their own expertise. Expertise could then be considered as an actor that a teacher co-performs. These co-constitutive actions were visible in the feedback reciprocally provided by them. This allowed a professional learning community among teachers to naturally emerge without adopting formal plans and structures, making School C different from typical public schools.

7.2.3 The third wave: a strategic welcome of performance agreement (PA) policy

In Section 1.1.2, I described how PA implementation is mandatory for all Thai public school teachers. Unlike other schools, School C's teachers integrated this PA into both personal and school conditions. They set their own higher goal for 2022 – their commitment to pupils' achievement and self-development – along with the school learning theme. Their PA shaped their professional learning, lesson planning, and classroom observation. Interviewee 2 presented a photo of her classroom in her elicitation interview and described classroom observation as one of the PA processes (Figure 37). The challenge posed in the PA was to improve pupils' attitudes toward mathematics lessons. Therefore, multiple intelligence self-assessment results were reused for grouping pupils to ensure mixed backgrounds. Not only the PA, but also the effect from the grades 4–6 co-planning meeting, materially shaped the way in which Interviewee 2 designed her lesson plan.

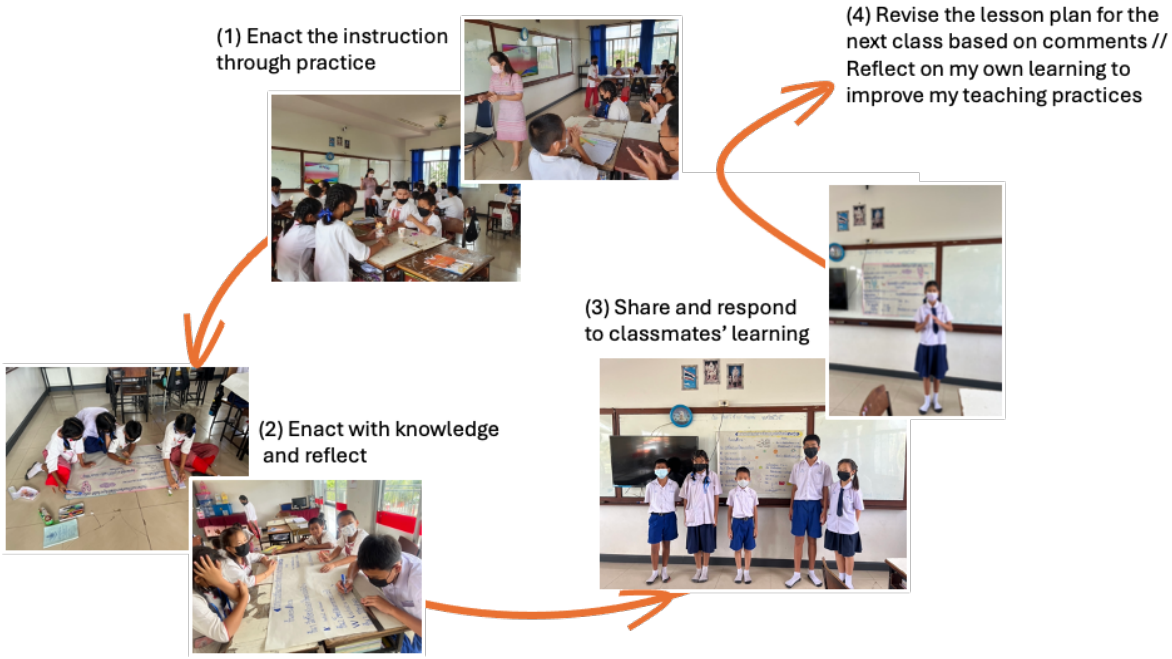


Figure 37: Classroom observation of the PA process

> *In photos 1 and 2, taken by the observer committee, I primed the relevant idea and let pupils work on together with the assigned problem … After they had finished the assignment, they shared their answers and reasons in front of the classroom. One thing in the photo that made me feel*

> *accomplished was a few pupils who did not perform well actively engaged in the assignment and became a group presenter.*
>
> *The classroom observation committees …. asked me to reflect on my teaching, including both good and bad. The committee was impressed by using multiple intelligence results to group pupils and using real-life problems for engagement. This aligned with the school's focus on team teaching, student growth and teachers' learning.* (Grade 4–6 mathematics teacher, School C, Interviewee 2)

The principal also learned to improve his management and instructional leadership skills, under the school concept. His PA was to provide all teachers with academic and operational support to achieve the conditions of their own agreement, while keeping them aligned with the school directions. This forced him to provide ongoing encouragement to teachers, whether attending external training workshops based on their individual needs or promoting the transfer of knowledge and experience through monthly meetings.

> *Though I do not have my own classroom, my PA is still linked to all classrooms because of learning themes. Therefore, I learn and find new knowledge from outside sources. From my personal connections, I follow my master's degree supervisor's social media, where she always posts about new techniques for learning. I attend the professional network, both online and in-person events, and invite my teachers. Though I have not received feedback from the district leader, I learn and interact with teachers, professionals in the field, and most importantly, parents, who are the most influencing actor that affects my profession* (Principal, School C, Interviewee 1)

7.3 Network Effect

The teachers' learning worked consecutively across each wave. Despite dividing translations into three waves, it was difficult to see a clear line or pattern of each activity producing learning results because it was embedded in teachers' working

processes as everyday practices and the consecutive results of learning became essential materials in the next phase.

During the first wave, changing teachers' mindsets formed the first part of the professional learning journey, which tended to be the most difficult step, considering professional learning and school transformation. The STEAM design process, as a new active learning process, allowed teachers to try and quickly identify the result of their professional learning. This quick-win result as the effect leads to teachers' acceptance, which can push professional learning further. The academic lead teacher pointed out that the STEAM design process was not just about producing knowledge for classroom, but also holistically prepared teachers with the appropriate mindset and skills for school transformation. However, getting teachers on board with the school transformation can be challenging because those who refused to enrol in these practices could request to move to other public schools, as they may still retain the same academic status and salary without the added duties associated with such education reforms.

Improved mindsets and skills helped teachers to survive in the second wave of the pandemic situation, and to broaden their perception that learning happens at any time and anywhere. During this time, technology influentially changed the atmosphere of the school culture and learning, pushing cooperation between digital technology tools and teachers, which became a visible necessity for professional learning. An online template softened the seniority connection among teachers, which may be sustained when teachers continue to interact and share their experiences. This was the crucial effect that made the boundaries of seniority become gradually blurred through these cooperation practices.

In the third wave, it was demonstrated that the arrival of the new national policy does not have to be a negative force and cause extra work when the school has a clear direction, and when teachers know exactly what the goal means. The PA, as a mediator, made the learning of each individual teacher a part of pupils' learning and a transformative journey in school. The PA expanded teacher professional learning further to other activities beyond PLC, and also aligned the professional learning clearly and directly with the goal.

7.4 The next wave of translation

The arrival of the PA and the pandemic powerfully urged teachers to build on their active learning skills to co-create new ideas as solutions. Although there is a positive outcome in teacher professional learning, some struggle with the process. Some may initially agree but then disagree when new initiatives are introduced, making their roles more complex and burdensome. Some became lost but eventually aligned with the school's direction, while others had difficulty understanding which changes to implement professionally.

Therefore, an ongoing translation is needed. Interviewee 2 suggested that classroom observation should not be limited to the committee in the PA process but should invite teachers in the same field to join. While the principal addressed the critical connection between professional learning processes and the classroom implementation, the professional learning process needed high-quality classroom evidence to sustain teachers' interests in the precise discussion points. This is the challenge for management: to expand the classroom's territory and let classroom observations become part of teachers' professional learning routine. For now, the lack of classroom observation would be a barrier to successful professional learning, because the lack of clear evidence limits the provision of clear feedback and conversation among teachers.

7.5 Conclusion

The public school context was unique and static, but this may not have been the case in this school had the Sandbox Act not been implemented. This allowed the principal, and the mutual acceptance of school concepts, learning themes, and active learning, to work together in urging school members to rethink their traditional ways of doing things and the need for transformative change, leading to the effects of the assemblage of these actors and actor-networks that I observed. Several waves of change were problematised by having the principal, navigate these currents, but it was the collective work of various actors—learning themes, templates, lesson plans, and teachers—that made learning happen in situated ways. While meetings served as central passage points, the enactment differed: Grades 1–3 teachers aligned through shared plans, while Grades 4–6 teachers coordinated around integrated units.

Each wave also embodied different powers. The school concept and learning theme is a challenging wave that arrives on a sunny day and upon which teachers choose to surf in their own way, along with support from the coach or the principal. Technology can be likened to a tsunami of learning that forces everyone to learn without exclusion. Therefore, some may dislike and refuse to do this. Lastly, the introduction of the PA policy influenced everyone to be more committed to surfing by themselves, which made most of them feel confident and willing to take a chance and ride a higher wave for a better result. Therefore, to survive any situation, teachers connected themselves with things that they could lean on, whether the team, the curriculum, or technology, in order to achieve their PA. This illustrates how professional learning can be different for each individual, as is determining the most appropriate momentum.

Chapter 8 Retelling professional learning stories through ANT: Synthesis of the Stories

In this chapter, I take the 'told' stories from the three previous chapters to re-enact them in my narrative assemblage to 'retell' the stories, allowing me to reveal the multiple nuanced elements of the network and explore how the micro connections nudge and affect others, according to the concepts of translation. Here, following the three research questions, I shift my focus from exploring to synthesising the practice insights that produce the ANT-mediated key insights, illuminating the socio- and material elements, how they exercise their power and agency in each translation stage, and making visible the taken-for-granted events and mutualised actions.

8.1 How are school-based teacher professional learning practices enacted in Thai schools?

The big question of translation embodies several dimensions in how professional learning practices become established, and how some become stabilised. The pilot public school (School A) as the average Thai public school, relies on policy as a significant part of professional learning practice. The private school (School B) in the main study enacts a stable and unique set of professional learning practices. The public school (School C) in the main study has implemented its school-based professional learning practice over several years, in parallel with national policies. However, they are all complex webs containing things, ideas, people, and intra-actions. Therefore, the synthesis includes asking detailed questions according to the four translation stages, as mentioned in Sections 3.3 and 4.3.4.3.

8.1.1 The Problematisation Stage

To clarify how professional learning practice is problematised. I started answering these questions: *How have particular gatherings come to be and how do they maintain their connections? Who, or what, as a primary actor, starts an action? What is the problem defined to be? How does the starter create links with others?*

School improvement and law-abiding expectations could be forces for problematisation to form the origin of the professional learning practices. They allowed human actors to advocate for the essence of the school's function and the professional accountability

embedded in the school philosophy to visibly embody the goal of the professional learning practices. Professional learning practices can also be affected by out-of-school matters, as the school openly links with other external stakeholders. Leaders must adhere to the school plan while ensuring that new things, whether invited or invading current practices, will not cause professional learning to undergo unsuccessful implementation. To initiate professional learning in school is similar to the case of staff development organisational studies. The president and vice president (humans at the top of the organisational structure) and the innovative model (as a nonhuman actor) tend to be the initial supporters of enrolling an initiative into the network (González 2013).

I followed the problematisation route, beginning with the formation of obligatory passage points (OPPs) between school leaders and school functions and the professional accountability concept. Moreover, schools also dealt with several problematisations in different situations, such as the emergence of COVID-19.

8.1.1.1 Policy, school function, professional accountability, and moral obligation reshaping the OPPs

All the schools in the study are designated as Education Sandbox schools. As stated in Chapter 1, the Sandbox process highlights the concepts of distributed leadership and localised curriculum adaptation. The Sandbox concept, as a policy actor, is not implemented as a fixed template but affects local practice in complex, often unpredictable ways because of other familiar norms or policies. These reinforce and limit the potential of the Sandbox process, causing hesitation in problematising professional learning.

For example, the Sandbox process also supports the competency-based curriculum that compels schools to shift from passive to active learning environments, restructuring educational objectives and reshaping teachers' professional learning directions. Nonetheless, we can see the different ways in which the schools adapt: School A's hierarchy consolidates formal professional learning connections, while School C's curriculum reform moves teachers toward new pedagogical approaches. School B embeds professional learning into its working routines as part of its continuous improvement processes.

Then, COVID-19 disrupts these networks, forcing schools to transition from being in-person to digital spaces, while maintaining the same function as providing teaching and learning. The pandemic itself commands the acquisition of new skills for online teaching, assessment, and engagement. While School B and School C introduce new training initiatives in response, School A resists immediate adaptation. This crisis problematises professional learning, to reconfigure obligatory passage points (OPPs) of teacher learning beyond in-class teaching and learning. The disruption redefines professional trajectories, forcing teachers to be active in situated work practices in temporal and spatial shifts (Scanlon 2011). This is because sustained professional learning is not about static focus or activities but improving practice to produce better pupil outcomes.

Furthermore, professional accountability, as a legal force, is a duty of a profession's discipline and ethics, as Fenwick (2010b) suggests. All interviewees' perspectives aligned with Sims and Fletcher-Wood's (2021) notion that they need to be fully capable of determining how to help pupils to meet their personal needs and commit to learning and reflective inquiry to improve their professional capacity. This accountability politically shifts and enacts teachers' personal experiences, beliefs, and attitudes within their professional practice assemblage, whether to fulfil job standards and policy directives or to meet a normalised expectation. When accountability is mutually shared among the school members through a sense of continuous improvement, this leads to improved professional learning practices.

Linked with professional accountability, private school teachers described, "Teachers are givers and devotees." Similarly, public school teachers explicitly stated, "We are responsible for pupils' quality of life, not just their current learning situation." In one of my reflective notes, I wrote: "Teacher learning = student learning." These statements illustrate how constitution of discursive materials not only encapsulated the idea of professional accountability, mentioned in Section 1.3.2.3, but also moral obligation, as the Thai teachers adopt devotional characteristics, as discussed in Section 1.1.2.

In each case, the classroom is an assemblage where school functions, professional accountability, and moral obligation meet, and OPPs are later formed politically and morally. Although the OPPs are problematised in the classroom where integrated-subject learning or subject-based active learning is performed, the principal and the

management team are included as the controlling actors in order to steer the school's direction, while adjusting their interests with teachers through communication, persuasion and leadership. Enacting this assemblage of practices is crucial, as Rivera and Cox (2016) suggest, to ensure that the composite practices fit with the interests of the relevant actors, both human and non-human.

8.1.1.2 The OPPs mediate teachers' practices in different ways

The above enactments raised big questions for me about "how the school leader as a primary actor starts actions with nonhumans – the school's philosophy, vision, and mission, curriculum and learning themes, and the classroom and teaching routines" (Fieldnotes, School C). To answer, each school has different OPPs where communication is enacted. Leaders as the controlling actor have to perform multiple roles in the professional learning practice assemblage, not only to align with the policy, but also to initiate and improve actions locally in the school.

Under a hierarchical relationship, competency-based education (CBE) initiatives in School A politically forced the principal to handle these as the school gatekeeper and then distribute the ideas to a working team. However, the team then collaborated with external researchers through a flat relationship by enacting professional accountability and school functions to form the professional learning plan and official announcement for the process of interessement.

The leaders in School B worked as a pioneer team to (re)design professional learning practices under evolving teaching routines within the situated translation of the school's Yonisomanasikāra belief and by enrolling external matters, such as the needs of society and trends in education, into teaching practices. Having the Pre-While-Post model as a common message helped senior teachers and their grade-level instructional coaches to communicate more freely and informally with their colleagues than using official announcements.

In contrast, School C's principal had foreseen the importance of CBE before the policy endorsement, so he spent a few years earlier participating in active learning preparation and convincing teachers. This allowed the teachers to voice their concerns and become part of concrete school functions in a process of problematisation, as mentioned in Section 7.1. Aligning with Timperley et al.'s (2007) work-embedded professional

development concept, the principal used the revision of curriculum and learning themes as the first professional learning opportunity and then extended this to other areas by enrolling additional transformation processes.

I witnessed that the OPPs' communication practices included spelling out school functions, enrolling accountability as part of the problematisation process. However, each school communicated professional learning goals in diverse ways, enrolling different formalities through their enactments between leaders, written and obscured school materials, and teachers. Both of the public Schools (A and C) formally announced their goal through a written version; in contrast, School B endorsed the goal as a mutual agreement of the expectations and professional learning model and then communicated this through informal conversations. This urged me to revisit the durability of these material interactions, as mentioned in Section 3.3. I noticed that texts or written documents became more durable when enrolled in written form than in conversation because the more tangible nature of textual documents meant that the goal became more stable in the network (Law 1992) and could survive in the network in ways that the spoken word could not. However, in all of these cases, written and non-written communications assembled with the enactments of leadership practices to sustain professional learning in their respective actor-networks. Unexpectedly, enrolling dialogue led to widespread agreement among teachers. However, I also found that, conversely, for some teachers, dialogue, despite being a less tangible actor, was able to strongly affect their personal knowledge through the enactment of attitudes, which could be sustained in the network even longer than could the written agreement.

8.1.1.3 Epilogue and overflow to the interessement stage

Links between humans and nonhumans could present a prolonged problematisation stage when teachers mutually accept the defined problem. We cannot conclude which are the most appropriate strategies for creating such links; neither can we compare network problematisations between schools. However, the key to problematisation was not a solitary action by which leaders directed their teachers through one-way relations. Instead, leaders have to make allies with members of the management team and enrol conceptual materials to problematise reasons to perform professional learning together and to find the momentum to maintain those links. Therefore, they achieved this

through communication, whether through text or verbally, as this leads to the interessement stage.

8.1.2 The Interessement Stage

During interessement, we see multiple actors passing through different OPPs, such as the official announcement, the school's expectations and professional accountability. The nonhuman actors, such as LINE application, schedule, meeting topics, and classroom practices, intra-acted with spokespersons to draw teachers' attention to participate in the activity. Their relations assemble an actor-network of professional learning practices in a non-linear and work-embedded process. This implies that the professional learning interessement process was not a one-time and unexpected action, but instead, as illustrated in each of the cases, the iterative and regular process of those devices and spokespersons continue sustained attempts to ignite teachers' participation as allies. In the section below, I explore these questions: *Who is the spokesperson? What is the device for interessement? And how does one play the role of locking allies into place?*

8.1.2.1 The fluid network diversifies spokespersons

Spokespersons, either individuals or teams from the three cases, and the clear need for professional learning was enrolled when they began connecting with others. The academic lead teacher in School A was the main spokesperson responsible for the PLC meetings. She connected with the range of subject heads to convince them to implement the model with their colleagues. In each meeting, they also became spokespersons. The occasional attendance of the academic lead teacher and the vice principal is used to maintain teachers' participation.

In School C, every teacher became a spokesperson by using learning themes as an interessement device because professional learning could therefore spontaneously occur at any time and anywhere. Teachers in the same grade range who shared the same goal took turns to urge each other to informally communicate their teaching interests under the learning themes through classroom problems and teaching techniques. A monthly meeting led by the principal also maintains the teachers' interest and updates the dialogue topic, and ties with each teacher's individual PA; these practices made the monthly meeting become a moment of negotiation between the management team and

the teachers and prepared them for informal learning during the coming month. Not all teachers responded accordingly. Therefore, the principal responded and lessened the formality of meetings by enrolling the northern language, making the meeting environment more friendly and comfortable for all members. In this way, the introduction of the northern language, as an actant, kept the conversation flowing and worked to enrol teachers and get them on board for the professional learning activities.

Unlike the two public schools, School B had a specific spokesperson to ensure other members were on board due to its complex and unique organisational structure. The school management team, as the spokesperson, used the school break time to remind all teachers about the professional learning goal and the school's goal. During the semester, the senior teachers – coaches – on behalf of the school management team, took on the role to facilitate the BAR-AAR meeting following the schedule. As part of the reminder, the meeting schedule also acted as a material spokesperson to draw in teachers to participate in activities. The power of the meeting schedule was diluted when teachers became accustomed to attending activities, but this interessement process did not work with all teachers, particularly those who lacked interest in attending meetings. Therefore, the School B leaders also employed an open-door policy, allowing teachers to exchange ideas in private consultation, and this was further promoted by calling the seniors 'Kru' (ครู-teacher), followed by their nickname, which shortened the power distance between colleagues and also established conditions for a more personal and responsive conversation. As well as human spokespersons, other materials were concurrently used as interessement devices, described in Section 8.1.2.2 below.

In some urgent situations, such as the COVID-19 pandemic, school leaders could act as spokespersons. After the School B and C leaders reassessed the staff training needs, they immediately became spokespersons to initiate in-school discussions and adjust professional learning practices just in time. At the full discretion of the principal of School B, the management team was able to use political force through the one-way official announcement to inform all teachers. In contrast, School C's principal used the participatory approach to gain teachers' acceptance, so the computer teacher became the spokesperson, enacting the interessement process through the enrolment of the template design and the users' roles.

8.1.2.2 Devices to engage teachers' participation

A spokesperson cannot finish the interessement process without enrolling an interessement device that is of equal importance. In its bureaucratic setting, School A's academic lead teacher, by enrolling the official announcement, convinced teachers to join the PLC. The official announcement, endorsed by the principal, was legally effective, which was further translated into the PLC plan and schedule. This allowed teachers to follow the timetable and manage to join as part of their job.

This was not the case for School C, where the performance agreement (PA) was embedded into the school's professional learning activities as a learning-directive tool. The invitation of each teacher's written PA to align with the school goals engaged teachers in professional learning activities. The PA drafted ways to close the gap between the teachers' current professional skills and the school's high expectations, as they were enacted as being not too close but not too far away to achieve. The gap created the necessary zone for learning to allow teachers to use peer learning and job-embedded learning to co-produce learning because they could not wait for external support due to having limited resources.

School B used the BAR-AAR meeting and classroom observation schedule instead of the policy to engage teachers, as mentioned earlier. As well as schedules, observation itself was used to generate interessement to create conceptual materials that teachers could carry forward into the next BAR-AAR meeting, such as classroom observations, as connected spaces for teachers to reflect before joining the BAR-AAR meeting, and personal notes and written comments as connected objects enacted between teacher observers, including classroom video recordings or photographs.

Besides using the formal tools detailed above, all schools unconsciously include the LINE application, as a tool for maintaining and igniting teachers' interest during a week, specifically the interest drawn from the classroom setting. This informal device relates to the enrolment stage, discussed in Section 8.1.2.3, illustrating how the LINE group chat can accumulate photos and files, as well as text, as evidence of learning within a short period of time that allows teachers to engage an iterative process of interessement when they keep sending new messages to remind colleagues of the schedule and meeting topics or to ask questions.

8.1.2.3 Epilogue and overflow to the enrolment stage

Successful interessement confirmed the durability of the problematisation. Sarker and Sidorova (2006) explain that interessement is about drawing in the interests of actors and isolating those, whether humans or nonhumans, that may challenge the OPP. In all schools, when we consider interessment, nonhumans were not ignored because they worked with humans to maintain actors' interest in professional learning. For example, using linguistic devices such as 'Kru' followed by a nickname and the Northern language, political devices such as the national policy directives, and technological devices, such as the LINE app. In this situation, we may not be able to differentiate between the public and private schools' spokespersons and interessement devices, however, we can infer from this analysis that an ongoing interessement is necessary for the effective enrolment of professional learning practices.

8.1.3 The Enrolment Stage

In this stage, negotiations occur between the actors targeted for enrolment and those who could potentially threaten network stability (Rivera and Cox 2016). The enrolment and interessement processes could occur simultaneously, as the conversation jumped back and forth during the negotiation and identification of actors' roles. In this section, I will therefore describe: *how does the enrolment occur? What is the negotiation strategy? And what kinds of ordering or reordering can be discerned?*

Different cultures and routines were unavoidably invited into professional learning practice assemblages as actors and affected negotiations within all three cases. My synthesis shows three overlapping emergences of these enrolment patterns.

8.1.3.1 Group enrolment due to co-teaching practices

The group enrolments were also found to be enacted in different ways in the three schools. Co-teaching and classroom observation activities gathered teachers and materials together with mutual interests in order to find ways to improve. Negotiations may be initiated by some of the lead teachers to legitimately gather lesson plans and teachers for further work, such as co-teaching, which is an activity enrolled by all schools.

Lesson plans also act as material enrollers, for example, School A with its shared unit plans, School B with its project-based unit plan, and School C with its learning theme and integrated-learning plans. Such enrolments can be perceived as being a persuasive action in which co-teaching practices informally gather co-teachers to discuss their collaborative work in assemblage with the lesson plans. Group enrolment was primary used to complete their work, especially with the LINE application keeping photos and materials as an effective enroller, and to prepare teachers for the professional learning discussion. However, some teachers failed to enrol. Consequently, coercive enrolment is often seen, but in a more compromising, way, for example, the schedule and PLC plan mediated the process for teachers and objects gathering for School A's PLC activities. Kreng-jai and family-tie culture in School B also unintentionally engaged teachers who hesitated to join the meeting. Monthly meetings, facilitated by the principal, gathered teachers together in a shared enrolment process, to update their working and learning processes in School C.

This suggest that enrolling only the PLC or meetings for lesson planning may not allow the interessement process to be sustained all the way to the point of lesson plan revision, particularly when considering this in relation to the concept of lesson study. When understood through ANT sensibilities, this could lead to unstable enrolment. Interestingly, along with lesson planning, School B also included classroom observations as part of its co-teaching practices. Classroom observations enrolled teachers with a certain role as observers and the observee to enact and co-create classroom realities. The way in which they align their interests and enrol them into classroom implementation and observation, helps them to choose both hidden and unhidden classroom materials to bring back into the AAR-BAR meeting to create meaningful discussion and mobilise the professional learning that they enacted in the classroom.

8.1.3.2 One-on-one enrolment for professional dialogue

As well as enrolment through co-teaching practices, negotiations can take place among teachers in informal gathering as an organic process due to mutual interests in teaching situations, informal relations, and supportive policies. Such negotiations emerged once the teacher prompted the questions, and the others responded. Learning evolved through

this unexpected process in everyday interactions, within which professional knowledge was produced.

In this case, teachers tend to enrol their interest with colleagues in-person. In School A, informal relations brought teachers to the discussion through a buddy learning process. Enrolment for learning was also likely to be enacted in a small group or peer setting in School C. The role was not static; a grade 1 teacher with expertise in teaching Thai consulted a grade 2 teacher with expertise in teaching English and vice versa, regardless of their age and level of seniority. Such enrolments were effectively active among two or three teachers who resided within the same education range. Both schools showed how teachers symmetrically balanced their power to switch roles between prompting questions and responding in discussion in unintentional and natural ways.

Another effective and unique enrolment of School B was that enacted between leaders and teachers. When teachers enrolled in an open-door dialogue with either the headmaster or the school director, their informal enrolment allowed teachers and leaders to take their roles as consultees and consultants according to their unequal ranks. In enrolling seniority, negotiators introduced a modified status and took on a different role, showing how asymmetrical associations were also used to generate professional learning.

8.1.3.3 Political and moral materials enrolling teachers' expectations

It was important not to enrol only material things such as curriculum and lesson plans related to teachers' work because this would be effective only for a short time during a specific negotiation. Therefore, to maintain teachers' constant enrolment and interessement, their expectations toward their growth must also be enrolled to sustain their continuous professional learning practices.

In School C, the PA as an enroller clarified teachers' interests and influenced how teachers teach and learn professionally. The PA concretely served as a map to guide the professional dialogue in School C. However, School A did not utilise the PA semiotically as School C did. Instead, teachers' values and norms became important actors in mediating their professional learning practices. Similar to School B, without enrolling written expectations, the moral obligation, mentioned in Section 8.1.1.1, was a

power influence, as it reinforced the assumption that teachers must be devotees or sacrificers.

The teachers' expectations of the enrolment stage, whether political or moral materials, revealed tensions between using abstract and concrete concepts to sustain each personal intra-action. Abstract concepts may naturally sustain teacher participation but could also lead teachers to subjective mobilisation and learning effects, as school leaders aimed to enrol more concrete entities such as facts, data, and evidence of pupils' learning in teachers' expectations to increase the effectiveness of the dialogue in the mobilisation stage.

8.1.3.4 Epilogue and overflow to the mobilisation stage

The enrolment stage illustrated the diversity of co-performances that were enacted in planned and unplanned ways. Co-teaching practices allowed teachers and materials to re-align their interests and enrol themselves in a position where they could make negotiations. Such negotiations in professional learning practices were not just embodied in the humans' interconnections but also went beyond this to encompass the hidden and silent third-party nonhuman actors, such as the teachers' PA, and the teachers' norms and expectations, which intra-acted with negotiators during the conversations. Teachers could not otherwise facilitate a meaningful discussion without enrolling such things and relations. At the end of the enrolment stage, the readiness of an individual actor to know their role and position indicated their readiness to move on to the mobilisation stage.

8.1.4 The Mobilisation Stage

In scrutinising each school-based professional learning practice, when actors mobilised, their micro-interactions produced an effect that became an influential actor in other consecutive activities. This can be understood as a micro-practice. In this stage, I explore *how each particular practice seems stable, and how did that stability come about? What keeps the micro-practice in this mobilised state if it seems to be in flux?* I also rely on the concept of puctualisation to trace actors that become punctualised (Law 1992) as they formed and mobilised as actors to join another connected network.

8.1.4.1 Multiple micro-practices stabilise the process of professional learning

As mentioned in Section 3.3, micro connections are intertwined and influence the network. If we consider micro-practices as the minute interactions and connections constituting the network of professional learning, in three schools, PLC practice was similarly used to generate further organic professional dialogue outside the meeting through diverse interactions, such as classroom, observation, borrowing, modelling, and vice versa. Although there are always new incidents being enrolled in these interactions that influence professional learning practices, such interactions are stabilised as they are part of everyday activities while keeping the learning process stable by shaping the multiple roles of teachers in their professional learning.

Buddy teachers and the LINE application in School A co-create meaningful dialogue about project-based lesson plans, helping them solve problems during the week without waiting for a response from the PLCs (as discussed in Section 5.2.1.2). The LINE application became punctualised by acting as a central communication for buddy teachers. The School C teachers also interact with others to borrow learning materials and co-plan the lesson; these informal and micro connections mobilise knowledge and materials between two teachers and lead to the co-creation of learning in each other's classroom. Similarly, School B teachers also used informal dialogue with modelling and borrowing techniques from others; more importantly, they performed with connected objects as tangible mediators – classroom photos and personal notes – in collecting materials for the meeting dialogue. The connected object co-created points of reference in stabilising the dialogue and seamlessly mobilising learning across classrooms to meeting rooms. These micro-connections unintentionally occurred because of the co-teaching process.

Along with these informal micro-connections, School C's monthly meeting (described in Section 7.2.1.3) allows teachers to connect and review emerging learning over a week. This micro-activity stabilises flows of knowledge exchange or learning loops, where transformed knowledge is transported back and forth between the monthly meeting and informal discussions in a predictable rhythm. Furthermore, a one-time workshop of Schools B and C, described in Sections 6.2.1.2 and 7.2.2, as a school-based micro practice was specifically enrolled during the COVID-19 pandemic to mobilise a specific area of learning. The knowledge generated in these workshops was enrolled in

professional dialogue, where it became translated into practical techniques in lesson plans that extended the possibilities for implementation. Such knowledge mobilisation was seen to be effective if it was responsive to teachers' needs.

The enrolment process generated a flux in that such micro-practices mobilisations, especially to re-intra-act with materials, could either speed up or slow down the professional learning process. Learning materials and ideas that mobilise through a LINE chat box, borrowing and modelling, and one-time workshops create everyday small triangulated but complex and iterative connections between the teacher, others, and conceptual or tangible objects.

From these cases, chatting in the LINE application or attending the monthly meeting mobilised learning in a more structured way than borrowing materials and ideas that have an immediate effect on teachers' learning and classroom implementation. Whether in a structural or nonstructural way, teachers individually re-engaged with dialogue and learning materials for their own specific purposes. Furthermore, and more importantly, their professional learning process may not develop further if they do not interact with others in several micro-practices and perform diverse roles as givers and receivers to ensure ongoing learning.

8.1.4.2 When humans and objects work as stabilisers in distributing information

We cannot say what strategy is the most suitable approach to sustain the mobilisation of professional learning practices. Given the different networks, the mobilisation of professional learning practices needs the distribution of things through space and the networks of humans and nonhumans to connect to teachers (Mitchell 2017). In professional learning practices, objects such as the curriculum, student records, templates, textbooks, and unit plans can direct the distribution of knowledge and allow connections to be made through points of translation. As connected objects, these materials actively work to engage teachers in professional learning through work-based conversations.

Regarding PLC practices, the KSP template as the potential stabiliser for School A, framed the PLC dialogue. The template included a set of questions and the note template, as shown in Section 5.2; this stabilised the enactment of these practices in the network. However, the template may not be able to nudge creativity in the PLC's

dialogue as it shaped teachers to focus on completing the form, which is legally associated with them. Without linking the dialogue with the PA, as illustrated in the example presented in Section 5.2.2, or enriching the conversation as the academic lead teacher and external researchers did, the KSP template may be associated with teachers' workload rather than teachers' professional growth. This is because teachers' concerns around workload can affect their ability to implement new learning into their classrooms.

Unlike School A, School C, as a public school, did not enrol the exact KSP template, but instead enrolled the online template of student learning assessment results, pupils' work, the learning theme, teachers' PA, and the local language as mobilisers. Through explicit communication by the principal, these stabilisers created both legal and moral links between teachers and professional learning at a practical level that can be performed within professional learning practices. They diversely provided a clear focus to allow teachers to enact the discourse directly. Specifically, the collectiveness represented by the northern language embodied a commonality that performed as the symbolic material that shaped the relationships among teachers and sustained professional collaboration. Such mobilisation produced hands-on knowledge that they could enrol in their classroom, without forcing orders but by producing professional learning through their intra-actions with multiple stabilisers.

School B enrolled abstract Yonisomanasikāra concepts for dialogue generation that allowed senior teachers to enact their tacit knowledge to improvise cooperatively as co-stabilisers. The dialogue discussed in Section 6.2.2 became extensive, allowing teachers to freely reflect by themselves, possibly linking the dialogue to BAR-AAR meetings. The director indicated that, without a reflective template, the dialogue tended to be more preference-based rather than evidence-based, especially when completed by the senior-level teachers. This mobilisation then became challenging for junior teachers, leading to tension in bringing new knowledge into the classroom. Some teachers could become lost in the flux of information intra-action in that they dwell in the ambiguity of the abstract concept and multiple enactments with seniors, as discussed in Section 8.1.2.1. Therefore, it is important to continually re-examine the connections that mobilise professional learning and acknowledge that material enactments should exist across and within dialogues because this would allow teachers to overcome the learning paradox of

passive absorption as the process of self-realisation, as discussed in Chapter 1, by inviting things to be part of the dialogue.

Each school emphasised different reasons for strengthening mobilisation, such as continuous improvement or following government policy, so they necessarily enrolled different strategies. Debatably, this affects the degree of durability of the professional learning practices within each school's assemblage.

8.1.4.3 Epilogue and overflow to the translation

Whether humans and nonhumans are stabilisers, what works best, or what should be included or excluded, may not be firmly determined. However, the actor-network exploration showed that the mobilisation of professional learning did not rely on one sole actor but instead on a co-performance between humans and nonhumans. Several complex dimensions were related, such as how to sustain the process and how to re-mobilise to reproduce effects – thereby deepening the knowledge. As a final stage, it is necessary to consider how the network might be sustained to stabilise practices and prevent treason.

8.1.5 Translation epilogue and overflow to treason

Human and nonhuman connections were strategically formed in the problematisation stage, which later became mediators in several iterations between interessement and enrolment. Such processes provided a way to reassure and renegotiate interests in the relations between the leader and the conceptual materials. More importantly, the translation of the practices enacted in these negotiations was not singular, but multiple micro-practices emerged, showing the reoccurrence of multiple translations that kept the practices alive and adaptable within these established and durable work practices. I observed the end of this translation process enacted as two scenarios.

8.1.5.1 Smooth translation due to distributed roles among leaders and materials

It was difficult to group the processes and define them in a linear order because of the dynamic nature of the relations. Clear examples were 'the cooperation between leaders and materials' and 'the interconnected agency of abstract with concrete objects', which emerged differently in each stage, showing how they enacted in assemblage with one another to form persuasive communication entities that worked to enrol teachers by

aligning with their interests. Through ANT sensibilities, we can understand such circumstances in the sense of distributed agency, in that leadership is distributed across the assemblage from the leader to other persons and other things. The leader did not possess the power to make things happen; instead, it is the relation between the leader and other entities that did. Evidently, they work together to secure the process of translation, ensure that each professional learning practice is implemented, while inviting others to join by enrolling different strategies.

The bureaucratic structure shaped School A's principal's approach in appointing an academic lead teacher to be his representative as an initiator and spokesperson. Despite the bureaucratic structure, the school vision influenced School C's principal to be both the initiator and the spokesperson. This assemblage of the vision and the principal became cooperative actors, enrolling teachers and other materials to assemble to perform professional learning. Meanwhile, during the pandemic, the role of initiator was distributed to talented teachers. The School B director, in assemblage with the Yonisomanasikāra concept, initiated problematising to show the necessity of professional learning. The director, as a spokesperson, transferred the inspiring message to the headmaster, who was not only a coach for classroom teachers but also a coach for the senior teachers who were full-time spokespersons for the BAR-AAR meeting.

For another crucial actor, the interconnected agency of abstract to concrete objects locally affected teachers' expectations, for example, for Schools B and C teachers. Intra-actions of abstract concepts –such as thinking frameworks and collectiveness – and tangible evidence of performance – such as lesson plans, pupils' work, and video recordings – significantly produced a practical and helpful dialogue that became knowledge for the following translation in each local classroom. Both actualised and increased the potential of learning for each teacher through meaningful dialogue and feedback shared among teachers, which continuously filled the fluid gap between the teachers' and school's expectations.

This demonstrated how the cooperation between leaders and materials cannot be static and linked to exact persons or things, but will vary between individual actors. However, enacting such a successful translation cannot guarantee success each time, as other actors in each stage of translation need to be enrolled and mobilised, too. Therefore, the smooth translation of professional learning required the constant evolution of actors.

Currently, in these three schools, the challenge was to overcome the tensions embodied in the paradox of enacting these creative professional learning practices while at the same time adhering to the rigid regulations embodied in providing evidence of these.

8.1.5.2 When translation is unsuccessful

When the translation process becomes unsuccessful, tensions are unravelled and become stable, producing a failure to mobilise professional learning. From the cases, several incidents show the relations between actors that assemble to strengthen the tension and block the mobilisation of learning. This unboxes the common Thai misconception that teachers alone, as the leading players, produce the success or failure of school improvement, so they can then be blamed because of their incompetence or not being good enough (Prapatnobol 2023). Instead, lack of success in teacher development stems from diverse relations in the actor-network, such as the misalignment between the school and teachers' expectations, and between seniority and decision-making and workload issues. These incidents require negotiations and material invitations to align teachers' interests.

First, the misalignment between teachers' expectations and school direction was the main cause of failed professional learning practices. This happened when the enactments fell into the space between the stability (immutability) side of the tension rather than the transformation (mobility) process. Most of the time, this happened with senior teachers whose interests are not aligned with the school's expectations, for example, some were not interested in the CBE policy, so School A teachers did not want to attend, whereas those in School C chose to be inactive during meetings. Such resistance might affect a single actor or a few connected actors through teachers' interactions and relationships. Therefore, a coach or a leader then has to approach and try to convince them again in another interessement process to prevent a collapse of the learning networks. Worse, if both interessment and enrolment are not successful, teachers without interests could be expelled from these professional learning networks. Severe punishment, such as employment termination from the school, leading to loss of income and advancement opportunities, had the worst effect in School B, a private school. Social sanctions might be used instead of termination in public Schools A and C due to public servant employment status, mentioned in Section 1.1.2 about ethical conduct. Harmony and collaboration may not be active in this situation, especially when

the perception of ‘you can’t teach an old dog new tricks’ becomes an excuse to ignore those who avoid participating in professional learning activities. If they are forced to attend, it is possible for them to subvert the network by making others perceive any changes in practice in the same way.

If teachers were enrolled for mobilisation, seniority, as part of both schools and Thai culture, was invited by teachers. This tended to limit the possibilities for the dialogue to be creative and critical when young teachers were unable to react to senior ideas with constructive reactions, as mentioned in Chapter 1. Although the mobilisation process continued, its outcomes in terms of professional learning could not be guaranteed. The School B director acknowledged this issue, suggesting that resolving it may not be as easy as introducing new materials, such as the template, and noting that this might also dilute the stability of seniority within both professional and informal relationships at the same time.

Thirdly, high workloads were identified as being another crucial problem for public school teachers who decided not to attend the meetings. School A had more severe problems in this regard than School C because it added the PLC practices to the teachers’ routines without reducing unnecessary work in other areas. School C readjusted its relevant routine as part of its transformative changes, such as integrating relevant duties and using technology to reduce paperwork, and using the same monthly meeting arrangement, but improving its processes.

To conclude, the unsuccessful translation from the case shows that teachers alone are not the cause of this; instead, the relations and tensions between actors. Therefore, the cases presented here could bring alternative understandings, especially to broaden our perspective that other actors and actor-networks significantly relate to teachers’ professional learning.

8.2 How do the assemblage of humans and nonhumans influence and mediate professional learning in Thailand?

The translation of professional learning carries with it power and relations, which can also be viewed as being an effect. In response to this question, I conceptualise power, relations, and tensions in the practices to reveal how they influence the network dynamic. As Scoles (2017) suggests, these relations enact learning as the mediating role

of objects in a network. I enrolled the concepts of discursive power, shared agency, and objects as mediators to identify emerging concerns and drew synthesis to answer these related questions: *What is entrenched? Who-what is excluded? What is made present? Absent? Do some actors seem more powerful or persuasive than others? If so, how is this happening?*

8.2.1 Entities' enactments shape relations and maintain power

Whether human or nonhuman, entities enrol others with their actions and exercise their power through negotiation. Within Thai schools, the interplay between hierarchy and Buddhist belief forms the collective senior and junior relations that further depict the one-way rote professional learning process as multiple enactments. Therefore, the way in which Thai teachers translate the concept of collaboration seems to differ from other contexts, by combining the multi-dimensions of collectiveness and seniority. Together with adopting micro-practices and technology, this may partially increase the chance of producing multiple ways of enacting and mobilising professional learning.

8.2.1.1 The hierarchy is entrenched through teachers' interactions

In the cases, hierarchical relationships occur through the interactions among those participating the practices. This hierarchical concept became entrenched in Thai schools in general but may perform differently in different settings. 'Tan' (discussed in Section 1.1.4) referred to a public school principal who occupied a more bureaucratic relationship within the school, while 'Kru' referred to a principal who adopted a less formal approach, treating colleagues as family members in the private school, School B. 'Kru' demonstrated how seniority and ranking were naturally translated in a more informal way. Interestingly, while hierarchical structures were still present, using 'Kru' instead of 'Tan' in the private school softened the degree of bureaucracy, translating it into a more collective relationship. Therefore, assumingly, it is possible that such a partnership style could emerge in the Thai hierarchical structure to transform the passive role of teachers to an active role in their professional learning practices. Among teachers, referring to colleagues as 'Pee and Nong' (as discussed in Section 1.14) also demonstrated a hierarchical relationship that was enacted in a more friendly manner. The emergence of the network happened through senior-junior relations, as demonstrated by the enrolment of such linguistic materials, which affected professional

dialogues in the mobilisation of professional learning, by being enacted as passive characteristics of the listeners enrolled by the junior teachers.

For those residing within the same age group, they may treat each other as friends, with less formal relations than with older colleagues. The friend collectiveness formed relations of *phuan-kru* (เพื่อนครู), meaning a buddy or friend. However, the cultural actant, Kreng-jai, is also enrolled in the network to maintain a respectful distance and harmony between colleagues. This also affects how collectiveness is interpreted as being united and getting along in moving in the same direction, which is applied in the way in which the dialogue in each micro-practice flows. Combined with the variety of linguistic materials, enacted by age and seniority in the actor-network, they, as symbols, strengthen the collectiveness and collaboratively create a subtle hierarchy.

8.2.1.2 Collectiveness shapes knowledge circulation

In Section 8.2.1.1, the senior-junior and friend relationships were highlighted because they affected professional learning, especially when admitting that professional learning comprises co-constitutive actions. In this section, I discuss collectiveness and how it persuaded and shaped knowledge circulation.

Collectiveness in the sense of active and passive actors, was demonstrated through the senior-junior relationships. Either 'Tan' or 'Pee and Nong', the older teachers, tended to dominate the conversation, whether from their facilitation, prompt questioning, or in providing feedback. Such incidents stem from seniority and *Kreng-jai* because juniors tend not to conflict with seniors (Hays 2014). Outside the in-person meetings, in the online chat space, the relationship of 'Pee and Nong' did not disappear, as the use of GIFs and emojis symbolised it (as discussed below in Section 8.2.2.2).

Amabile and Kramer (2011) further pointed that such collaboration could be a double-edged sword in that, when meeting, colleagues tend to avoid conflict, which blocks the diversity and creativity of the new knowledge that is produced through active collaborations. However, the relationship of Pee and Nong in School C was notable, as it, conversely, opened up possibilities for new ideas, particularly in enrolling those introduced from the University via student teachers.

Seniority seemed to be a more powerful actor than friendship partnerships. However, friendship could be found in different commonalities, regardless of age. In School C, the local Northern language became a meeting medium, where local sensibilities were emphasised over rank and seniority levels. The Northern language was specifically entrenched in any form of dialogue; this was not just the language spoken but also demonstrates how the focus on love and gratitude to others interacted with group unity, and love of their ethnicity (Pinchai 2020). Most importantly, it highlights the relationship of 'Phuan-kru', which facilitates the active role of junior teachers as equal partners with seniors. The teachers' common challenge is also another push for the friendship connection, such as the struggle with online assessment during the pandemic and the enrolment of technology. These shift the school's professional learning collectiveness from seniority to collaborative practice, as described below in Section 8.2.1.3.

8.2.1.3 Co-constitutive action of technology

Technology expands the scope of the learning network while affecting the relationship among teachers as mentioned above. The LINE application mediated learning and working in online spaces. It brought in-person work settings and professional learning into virtual practices by facilitating teachers' daily work and mimicking offline cultures, showing that the 'Pee and Nong' collectiveness is transported to an online setting, as explained earlier in 8.2.1.2. The same languages of Pee and Nong is translated into emojis or stickers representing the humbleness and respect between juniors and seniors (in Figure 38). The hierarchy in 8.2.1.1 was still included through the GIF or animated photos sent to the group. However, the coming of technology expand the learning boundary that is further discussed in 8.2.2.2.

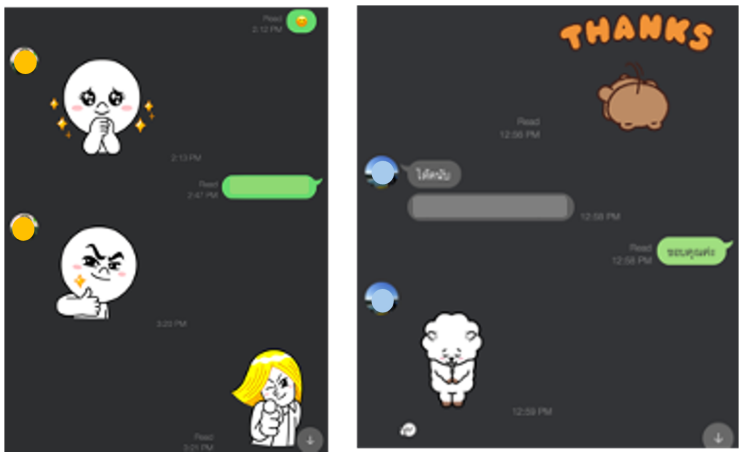


Figure 38: Aminated photos showing respect

As well as the LINE application, enrolling technology tools with teachers can also influence learning in a more collaborative way, especially when performing technology-related work or EdTech. This proved how junior teachers and technology co-constitutively shaped relations and disrupted the effects of seniority among teachers. After COVID-19, technology was included into the teachers' routine work, which became the junior teacher's strength in convincing other teachers to want to use it. Some teachers in School C exercised their technological skills as expert power, thus further diluting the seniority structure. The co-agency enacted between the technology and junior teachers changed the momentum of the professional network to form a more collaborative mode of working because everyone had to improve their technological skills. However, it is important to note that these practices were enacted without excluding the seniority culture or spoon-feeding the teacher-student relationship between juniors and seniors – instead, a collaborative culture emerged through the relationship between juniors as helpers and seniors as help seekers specifically because the teachers enrolled these Thai cultural concepts in their enactments of their professional learning practices. Such dependency remained and became a stable actor emerging in daily work, leading to a more frequent two-way professional dialogue after enrolling this technological support. This rebalanced talking and listening roles among juniors and seniors. The enrolment of EdTech increased the chance of successful negotiations, allowing young teachers to persuade others in a more collaborative professional relationship. A reciprocal relationship created a dynamic discussion flow. The assemblage of technology and young teachers as mediators explained how to weaken a learning paradox between being passive and active, which I mentioned in Chapter 1.

8.2.2 Materials embedded in professional learning

Although individuals learn from experience-sharing among humans, materials as essential actors make the learning visible and make other actors 'do' (Thompson 2015). Nonhuman mediators powerfully acted in different roles in shaping, selecting, and amplifying the ideas and sources of authority. By making sense of photos taken in the photo-elicitation exercise, we see human and nonhuman associations in conceptual aspects tying in with policy and curriculum, and spatial aspects through connected objects.

8.2.2.1 Conceptual association tying in with norms, policy and curriculum

Norms, policy and curriculum seem to be more powerful in persuading teachers to move through the translation process, as they affect teachers' transformation in several aspects, such as their work routine, their relationship with colleagues, and their professional learning and growth.

Teacher norms and teacher professional accountability

The discursive power of teacher norms and professional accountability is morally and politically associated with teachers as they participate in professional learning practices. Interestingly, their presence in the network relates to teachers when considering that teachers are nodes in the network who are shaped and reshaped by other actors, including norms and beliefs. This affects their actions and transformation.

Teacher norms and professional accountability inseparably worked to affect teachers' practices. Teachers in all three schools mentioned the idea of teachers-as-sacrificers, similar to the national psyche mentioned in Section 1.1.2; they believed in the idea that their ongoing development affects pupil development. Such norms were morally associated with their reasons for becoming teachers in the first place and acted as a reminder of their professional learning. For professional accountability, as discussed in Section 1.3.2.4, it was politically assembled with teachers' work commitments. Both teacher norms and professional accountability can be identified as belonging to the power of a hierarchical discourse that affects one-way decision-making (Wodak 2012).

The School B teachers expressed that the norms and spiritual commitment practised within Buddhist belief and the customer-based accountability that they held to pupils

and parents were addressed as being part of their professional obligation, one of the characteristics mentioned at the beginning of Chapter 6. Meanwhile, public school teachers also held 'teachers-as-sacrificers' norms, but, more importantly, they wielded governmental and intellectual power as public servants educating local children in public schools. Therefore, their accountability to the central government was also emphasised as it affected their career and working lives, especially in the enactment of their evaluation of the performance agreement (PA).

Norms and accountability interchangeably enact and exercise their discursive power; they were present in the leader's actions and legitimacy in convincing teachers. These interconnected concepts were also implicit in pushing and persuading teachers to attend professional learning activities. From the cases, we can see that some aimed to improve the quality of their active-learning teaching, while some wanted to solve pupils' problems, such as reading literacy.

Policy shapes teacher expectations and actions

Not only norms and professional accountability but also other national and school policies significantly shaped teachers' expectations and actions. In various ways, a policy created either alignment or misalignment between teaching practices and teaching philosophy, leading to either support for or pressure to perform professional learning.

In public schools, adhering to the centralised policy was entrenched as part of teachers' and principals' responsibility as public servants under the MOE. However, different enactments of the policy produced different effects. The School C leader strategically communicated the alignment of the PA policy to the school direction; this clarified teachers' understanding and allowed teachers to open up opportunities for collaboration and feedback to achieve their own PA. These conceptual materials further expanded innovation-learning opportunities and influenced specific professional dialogue, similar to what Wodak (2012) explains about the power of discourses that influence other representational actions. Some teachers, within their PA, made negotiations visible through professional dialogue, while other actors also enrolled things along with other human actors to participate in this dialogue.

Conversely, the School A teachers reached out to enrol the policy in their professional learning assemblages as it was a key influence of the political discourse. Some co-constituted their PA as part of their professional growth and learning, as the School C teachers did. However, others enacted their PA and professional learning separately. In this case, the PA was disconnected professional learning, which could demotivate teachers in attending everyday activities as part of their professional growth and learning.

In School B, the national policy did not affect teachers as much as the school policy and unwritten beliefs and philosophy did. The school policy strongly influenced teachers' careers, including their professional learning, with the consequences in one example moving from a warning to termination due to the fullest school management discretion being attached to the school leaders. This political force was distributed across the school policy and the management assemblage as it overlapped, aligning with Callon and Law's (1995) conceptualisation about agency not being mutually exclusive. Although these political associations cannot be defined as being either tangible or intangible entities, their co-constituted agency is visible in the effects that they produce. This emphasises the importance of making visible the policy associations in providing a clear and robust rationale for problematisation and interessement to enrol teachers into professional learning practices.

School Goal – Curriculum – Lesson Plan – Pupils' Work

When the policies were translated into school goals and concepts, they were then further translated into learning themes or the school roadmap, curriculum, and a unit and lesson plan. These became a strong message for all internal and external actors with discursive power (Meadows 2018) as a promise to deliver and improve teaching practices continuously; this implied the need for professional learning.

This was especially the case for a connecting mediator such as the 'curriculum', as it travelled across multiple school functions, such as school planning activities, lesson planning, and professional learning practices, to shape and to be shaped by each new translation. The School C teachers recreated the school curriculum, School A teachers rearranged the content and standards taught, and School B teachers freely translated the curriculum into their classrooms. When the curriculum was translated into units or

lesson plans, it carried the school's instructional identities and engaged with teaching practices and professional learning activities. Although the curriculum was well written, it was practically fluid and performative when it turned to teaching process reflecting on pupils' work. This object transformation as a co-performance with teachers unravelled curiosity and questions to be brought to the professional dialogue. This pushed teachers to learn as learners, while making teachers take further roles as instructional designers, collaborators, curriculum crafters, or gatekeepers, in diverse ways, depending on their situations.

8.2.2.2 Materials across classroom and online spaces

In terms of the spatial aspect, classrooms embodied a teacher's association with things, pupils, and lessons, and with questions, curiosity, and problems. While teachers used the same lesson plan to conduct classroom activities, they co-created multiple realities by demonstrating various enactments, results and outcomes. Classroom photos, pupil outcomes, and teacher after-class reflections gathered ideas and rationales for teacher improvement. These multiple realities, however, did not imply fragmentation (Mol 2002). Conversely, they widened the range of classroom effects as evidence of their mediated teaching performance.

Not only classrooms generated multiple materials and perspectives, the informal meeting rooms did, too. School A used the meeting room for PLCs, whereas School B used the classroom space for the BAR-AAR meeting, as did School C's teachers. Classroom spaces included teaching-and-learning-related materials that assisted teachers to creatively produce meaningful practices and dialogue more freely than being in a meeting room. The flow of connected objects made working and professional learning matters transfer seamlessly. In these cases, borrowing learning materials and material co-production emerged and fostered professional learning in unintentional and intentional ways.

Across the classroom in School C, the borrowing practices comprised the dynamic between teachers in the same grade range having informal professional dialogues when visiting each other's classrooms and finding practices, things or objects interesting. 'Borrowing materials' as a hidden practice allowed teachers to unconsciously learn from others' experiences through the gathering of other learning materials due to an

insufficient level of resources. The notion of 'sharing learning materials is sharing an idea' was taken for granted, because the focus of using learning materials is placed on teaching, not professional learning. The borrowed materials generated a giver-receiver interaction, but, later, it became a reciprocal activity as teachers were accustomed to asking for help.

When the objects and teachers co-performed in actor-networks, whether in producing learning materials, lesson plans, making suggestions, taking photos of the whiteboard, or observing the classroom activities, they increased the significance of the dialogue, which made the meetings more insightful and allowed teachers to implement these newly produced practice artefacts in their next teaching session. Another obvious example was the links between BAR – classroom observation – and AAR, which was visible in School B. This example further explained how observer teachers incorporated such materials by using pens, highlighters, and notebooks to generate notes for reference in dialoguing with others or in making their own reflections. Such connections helped them in recalling the fresh moments and feelings they experienced during the classroom observations.

In the implementation aspect, the connected objects across the spaces also produced feedback. This process became punctualised in ways that were taken for granted as being the effect of professional learning. While Schools B and C talked about the quality of the feedback, this surfaced the discussion of what and how the feedback was produced. Some feedback tended to be opinion-based as teachers deliberately intra-acted with their experiences and intuition rather than the evidence that emerged in the teaching moment. This could lead to misunderstanding among other teachers, as mentioned in the invitation of the Yonisomanasikāra concepts described in Section 8.1.4.2. Therefore, we cannot deny the effect of how materials powerfully shape the dialogues and the quality of the feedback.

While feedback travelled across the spaces, the LINE application was commonly used as a virtual assemblage for informal professional dialogue in the three schools. As Mol (2002) explains, it is unnecessary to mark boundaries between practices because this assemblage is not quite a physical network. Teachers continued to gather in the online group, where they posted their enquiries and provided new information for others. The online channel, with its chatting materials, powerfully included teachers as part of the

dialogue while overcoming the limitation of not having much time. However, the seniority culture of the onsite settings remained stable because the same members held the same ranks, as mentioned in Section 8.2.1.4.

8.3 What are the effects of these assemblages of professional learning practices?

After the COVID-19 pandemic, the perception of professional learning was broadened and has broadened even further, producing learning spaces beyond physical settings, as well as pupil topics beyond learning to also include their well-being. Thus, the successful translation of professional learning practice produced broader effects, such as increasing professional knowledge and expertise, developing teachers' characteristics, inventing innovative classroom practices, and increasing the pupils' success. To answer this research question, I articulated the network effects into two parts: knowledge and learning as effects, and the improvement of professional learning practice.

8.3.1 Knowledge and learning

I synthesised the insights relating to knowledge and learning, by enrolling the concept of the interconnected professional growth model (Clarke and Hollingsworth 2002) in my analysis practices. The model suggests that teacher changes are mediated by the processes of reflection and enactment in external, personal, practice, and consequence domains, which I conceptualised as actors influencing teachers' interactions and growth. The result of the model also shows the complexity of teacher growth in terms of new beliefs, new teaching practices, and implementation beyond pupil outcomes (ibid.).

8.3.1.1 Diverse professional learning knowledge

Each teacher's knowledge is situated and non-static because it travels to multiple networks; as Nespor (2003) describes, movement leads to learning and knowledge. Knowledge contains multiple change sequences of pedagogical knowledge, content knowledge, beliefs about pupils, and attitudes toward teaching. It can be accumulated or debunked as it moves back and forth between networks, and also emerged as immediate effects in teachers' beliefs, attitudes, knowledge, and skills.

From the cases, discussing lesson plan implementation challenged teachers' pedagogical knowledge, content knowledge, and beliefs about pupils to find practical solutions in

PLCs. Practical knowledge as an effect was mobilised with materials invited into the assemblage due to the situated flow of information in the specific place and time. The repetitive flow made teachers rethink, be critical of the idea, and closely examine the information within their current situation, whether in meetings or informal dialogue, with or without intentions. Such diverse dialogues in the network led to the production of pedagogical knowledge, content knowledge, and beliefs about pupils.

Additionally, School B's open-door private dialogue focused on abstract concepts and attitudes toward teaching, aligned with the school philosophy. School C's principal used the monthly meetings to generate dialogue about beliefs about pupils and attitudes toward teaching to make strong links with the school concept. Due to their durability (Law 2008a), attitudes take longer than practical knowledge to produce and are more durable when they are enacted in different forms. However, from the cases, we can see that producing attitudes may be more difficult than producing knowledge, because it is less concrete than practical knowledge that is situated in classrooms.

8.3.1.2 Professional experiments in teaching

Knowledge in a personal domain, as described in Section 8.3.1.1, was transformed into practical pieces of instructional delivery where it was embodied in classroom practices. The salient outcomes aligned with the school's expectations in the problematisation stage, in which the three schools aimed to develop active learning classrooms for pupils' learning and used professional learning as the means. From the cases, while School B's BAR-AAR meeting let teachers enact conversations by guiding the questions, the meeting sequences, as illustrated in Figure 14, assisted teachers to co-create ideas for their lesson plan improvement and increased possibilities for inviting new knowledge into classroom settings. Another interaction that emerged directly from the classroom was borrowing learning materials from public Schools A and C. This secured practice experiments as materials were needed in classrooms. Conversation, ideas, and learning materials as external stimuli, in assemblages with teachers, co-create learning through multidirectional connections across domains.

These regular events allowed the object and teachers' knowledge to be transformed and transported to the classroom in concrete ways. New approaches then allowed teachers to see new pupils' reactions and work, reflecting pupil learning outcomes, which further

became the actor that affected the next professional conversation. Therefore, the effect of teachers' knowledge and their application of knowledge tended to emerge together, possibly leading to salient outcomes with pupils. Although enacted differently in each school, Schools A and C prioritised the recovery of Thai literacy learning loss after the pandemic, according to the national policy. School B aimed to recover pupils' holistic development, in both their learning and their well-being, to ensure their capability within the post-COVID-19 time.

The salient outcomes for pupils may be detected quickly and via conventional professional learning activities. Therefore, we can see that teachers tended to show evidence of pupils' learning as part of their professional learning because classroom implementation was perceived to be explicit evidence of the effect of their knowledge implementation. This leads to an understanding that the salient outcomes, when considered though an ANT perspective, are not just teachers' changes in beliefs or skills, but the emergence of new socio-material configurations that stabilise particular teaching practices and affect pupils' learning.

8.3.2 Further network effects of teacher professional learning

The stronger professional relationship effects of the professional dialogue indirectly influenced teachers' routine practices, influencing them to be more collaborative. Such collaborative practices directly produced knowledge and learning, while collaborative relations continually improved themselves to sustain the translation of the professional learning practices in every week. An ongoing process of interaction and iteration in professional learning gradually accumulated change, specifically the movements and relations of actors across activities, which became an essential factor for other networks. For example, observable changes in routine practice, such as probing questions, lesson plan adjustments, and coaching policy revisions, occurred in between the first and second interviews for Schools B and C.

Considering that professional learning activities were not a process but an assemblage, where co-performance was enacted between teachers and things, this suggests that professional learning practices further expanded the learning network. As an overlooked effect, this should be recognised as an opportunity for teachers to practise their skills through their enactments with other actors. For instance, technology training programmes held by junior teachers shifted the collaborative practices from being a

one-way partnership to enacting multi-dimensional practices in an assemblage between junior and senior teachers and technological tools, without obviously eliminating the seniority culture among PLC. The co-performance between teachers and technological materials were focal points of their relations and teaching practices, producing new actors and mobilise knowledge in unpredictable ways. Teachers included technological materials such as tablets and smartphone cameras to help them in gathering pupils' data and making learning outcomes visible and salient.

Professional learning and knowledge, therefore, are not only outcomes in and of themselves, but they also embody the improved routine teaching and professional learning practices, which can be considered one of the major effects. In this way, they are therefore examples of what Law (2007b) calls 'material-semiotic relationality' (p.7), in that professional learning and knowledge are both effects of the teachers' practices and are *at the same time* made up of them. Through ANT's network effect concept, the transformation of routine and professional learning practices is identified as the results of interactions, or the relationality, among actors. Hargreaves and Fullan (2013) further state that such collaboration, regardless of the school boundary, will eventually encompass the whole profession.

8.4 Epilogue and overflow

The synthesis of the findings clarified how the analysis produced answers to the research questions. There was no single finding for each question, but, instead, multiple events occurred as actors performed across the networks. ANT's translation sensibilities revealed the broader scope and space of teachers' professional learning networks beyond typical training programmes to everyday interactions with actors such as colleagues, policies, things, languages and cultures. Their interconnections mediated knowledge production and circulation, which are considered to be effects of the actor-network. Furthermore, other effects relating to learning and practice also emerged. In the next chapter, I will perform a reconceptualisation of professional learning by retelling the story told in Chapter 8 within ANT sensibilities, principles and translations.

Chapter 9 Reconceptualising learning through ANT: Discussion of the Synthesis

This section offers empirical insights into the ANT translations of teacher professional learning. The key insights are presented separately, but it is important to acknowledge that these overlap and are entangled as they account for the three principles of agnosticism, generalised symmetry, and free association (Latour 1987; Callon 1986a). The key points are presented as the research questions are organised and ordered, as well as responding to the conditions of enacting professional learning practices, as follows:

- **Professional learning as a continuum of work and learning**: Learning is inseparable from daily teaching work. It emerges through fluid translations across classroom challenges, school reforms, goal-setting, and informal activities. Rather than being a fixed path, learning is shaped by the performative reconfiguration of roles, routines, and knowledge through ongoing interactions.
- **Negotiation and power as sociomaterial processes**: Learning is a negotiated process, in that policies, dialogue templates, and cultural norms support learning and significantly shape, and perhaps sometimes constrain it. Teachers' engagement in professional learning is translated through their negotiations with these sociomaterial forces.
- **Collaborative performances of humans and nonhumans:** Professional learning is co-produced through intra-actions among people, policies, tools, and spaces. Leaders, documents, LINE chats, and EdTech tools become co-performers (or co(a)gents), actively shaping professional knowledge. This distributed agency shows that learning is not owned but enacted across a network.
- **Unboxing hidden practices:** Informal and incidental practices—borrowing materials, hallway conversations, shared resources—are key to how learning travels. These fluid, often hidden acts reconfigure roles and knowledge, producing collateral realities. ANT reveals that learning emerges beyond formal agendas.

- **Countless network effects:** While PLC and dialogue affect professional learning and knowledge, they further create ripple effects that extend beyond dialogue. New practices affect classroom dynamics, pupils outcomes, institutional norms, and school direction.

9.1 Professional learning as a continuum of work and learning

Actor-networks, as identified in Chapter 8, drew attention to professional learning as a network effect rather than an individual acquisition. While I use the term 'continuum', this may lead to the risk of understanding that professional learning is a linear and progressive model of translation. However, the synthesis presented in Chapter 8 projected the continuum in the sense that it is enacted as a network of multiple forms of translation that reflect the relational and fluid nature of professional learning and working. This aligns with Law's (2009) insistence that translation is messy, iterative, and non-linear, with actors constantly (re)negotiating roles and meanings. Multiple translations within the continuum occurred in and across the networks, which challenged the idea of dichotomies separating knowledge and doing through performativity and multiplicity (Mulcahy 2016). Similar to what Mol (2002) rejects, I dismissed the assumption that successful translation is generated in a single coordinated network or a single coherent reality. Any such coherence should be called interconnected short-term momentary achievement if it happens at all. This aligns with Mol's (2002) concept of the body as being enacted in multiple practices, that is to say, theoretically, it can be viewed as a single entity, but, practically, the body is multiple, because of the many body practices that are enacted in multiple ways that lead to many bodies.

Relating to the job-embedded concept of learning discussed in Section 2.2.1, the continuum makes teachers co-create learning and achieve their work interests performatively; therefore, we cannot view learning networks as separate singular networks but a rhizomatic web of co-constitutive roles of actors that can never be completed as a closed system (Deleuze and Guattari 1987). Nonetheless, broadening the understanding of ordering beyond disordering and reordering could explain professional learning in the sense of its dynamic and fluid qualities. More importantly, this helps us to acknowledge any instability and contestations, that potentially happen during the translation process.

In exploring the cases, the professional learning and work continuum can be viewed through the degree of formality of the learning processes and the spatiotemporal dynamics of the teaching practices. This demonstrates that professional learning activities are made visible through multiple, often conflicting, perspectives and representations, that are split into many consecutive translations and occur altogether, and none exists without others (Zürcher 2015).

9.1.1 Teachers' routines, goal-setting, and professional learning

The first continuum occurs between teachers' routines and professional learning because professional learning is situated in daily workplace practices (Fenwick 2011; Mitchell 2017). Learning emerges because of the need to tackle these challenges in work, such as the high goals and expectations for pupils, as discussed in Chapters 6 and 7, the new policy implementation described in Chapter 5, and the COVID-19 pandemic disruption. Allen (2013) perceives these challenges as improvements and innovations, while Damrimungkit and colleagues (2022) view them as problems that disrupt current teaching practices. Whether improvements, innovations, or problems, these challenges keep professional practices evolving and varying in time and space in processes of translation that unravel teachers' skills gaps, such as the gap between passive learning and active learning, single-subject to integrated learning, and onsite to online and hybrid learning.

Such gaps are identified through negotiations and can be defined as "epistemic objects" (Knorr-Cetina 2016, p. 89) that are circulated and collectively recognised in the community. The emergence of epistemic objects affects professional practice and guides professionals to learn, in this way they envision knowledge and expertise in professional practices (Fenwick et al. 2016). Therefore, rather than seeing them as fixed entities, they are constantly translated and reinterpreted. This continuum makes professional practice and professional learning inseparable because they are inextricably connected (Fenwick and Nerland 2014).

From the cases, the obvious links between professional practice and professional learning are made through goal-setting activities or the mutual enactments of teachers and their current situation. Without the agenda of competency-based curriculum implementation for School A, ongoing improvement for School B, and transformative change for School C, professional learning practice would not exist. Goal-setting, as one

of the teachers' routine tasks makes the agenda become a controlling actor that aligns professional practices, the school goals, and teachers' expectations through a cooperative action (Butler 2017; Cheng 2017; Forte and Flores 2014). Zürcher (2015) explains this situation by insisting that none of these entities would exist without the others.

Nevertheless, these agendas are tangible in goal-setting and are actively shaped by the *power dynamics* surrounding their implementation in closing such epistemic gaps, and further affect lesson planning. For example, School C's problematisation and interessement using the teachers' PAs exemplifies a balanced and coherent goal-setting process between improving lesson planning, teaching practices, and career advancement. The negotiated relationship strengthens the need for professional learning, including distributed agency among teachers, pupils, and lesson plans (Fenwick 2015), and shared learning (Richter et al. 2014). This requires the incorporation of the social (negotiations of meaning and knowledge) and the material (spaces, things, and objects) to actualise instructional support (Mitchell 2017).

We can conclude that the continuum in professional learning is driven by distributed agencies in the network, where teachers, pupils, lesson plans, and even the physical spaces and digital tools, all actively shape the learning process through everyday practices. However, instead of a smooth continuum, we see a complex network where learning emerges from the ongoing reconfiguration of relationships and the multiple translations of knowledge. Therefore, focusing on the matters of concern, various types of learning emerge as micro-practices in three schools where knowledge is co-constituted, negotiated, and mobilised.

9.1.2 Formal and informal learning

As Fenwick (2010c) suggests, work and professional learning are hugely complex connections as they are hybrid, indeterminate, and deal with fluid spaces and messy objects. Consequently, professional learning practices cannot be explained through static and more-or-less subjective definitions of informal, non-formal, and formal learning. Due to the emergence of several practices, various strategies – standard training programmes, self-directed learning, practice-based learning, and co-constructions of knowledge – gather together in assemblages to form teachers' professional learning (Tang and Choi 2009).

Regardless of the general way of differentiating formal, nonformal, and informal learning, Zürcher (2010) proposed a re-interpretation of the learning process formalisation through ANT that is related to the number of options (or the degree of autonomy) that encourage more chances for new and unexpected enactments. Rejecting the categorisations of formal and informal learning, the number of options provides a broad explanation of learning and teaching conditions in specific contexts (Zürcher 2015), whether learning happens in meeting rooms, classrooms, during a brief encounter in a school hallway, at lunchtime in a school cafeteria, or online communication platforms, because different types of learning can concurrently happen within a specific space and time. The number of options conceptualisation aligns with the concept of participation, in that the emergence of new learning occurs through experimental participation, but, additionally, through human acquisition of knowledge (Fenwick et al. 2016). Nonetheless, from the cases, ANT translation also offers an alternative in explaining how translation and negotiation create different learning experiences and flows, beyond counting options.

If formality is considered in a traditional way, a formal meeting and a schedule leave teachers no choice but to join, which affects teachers' attendance in the meeting but not their participation. While formal settings stabilise learning through inscriptions of official announcements, schedules, and templates, they are not simply imposed but actively constituted and sustain this choice of learning. The seniority and hierarchy elements also culturally shape the interactions among actors as they reinforce the role of teachers; however, this may limit opportunities for multiple enactments because teachers align their interests and responses with senior colleagues, following the Thai concept of being obedient to seniors (Gunawan 2016) and the '*Kreng-jai*' concept of polite deference to others, particularly seniors (Selvarajah et al. 2013). Selvarajah and colleagues' (2013) findings show that strong Thai cultures, such as non-confrontation and deference to authority, mediate Thai employees' perceptions of being excellent employees, which benefits their career advancement. The situation of the vice principal in School A attending the PLC described in Section 5.2.2.1 can lead to the asymmetrical power dynamics shaping the network's configuration, in that actors with more seniority can enrol others and guide the network's direction (Latour 2005). This process makes learning become formal when teachers have few chances to participate in the dialogue, in situations where they would rather listen. This relates to the way in which Thai

schools enrol the teacher with the highest rank to make decisions in relation to school operations (Santrattana et al. 2015; Kulophas and Hallinger 2021).

However, following the actor (Latour 2005) unravelled unfinished conversations in formal meetings, while implementation curiosities transferred from the classroom were brought up in more friendly gatherings, where teachers perceive these as being a natural but influential informal learning network. This reflects how collegial relationships among teachers, as mentioned in Section 2.2.3, affected their professional learning. Beyond formal training or meetings, teachers continue to intra-act with their curiosity through their everyday classroom experiences. This shows that informal learning emerges among teachers in a broader manner when the number of options and participation is wider. Drew et al. (2016) offer the concept of *critical collaborative professional enquiry* (CCPE), which proposes collaboration as being a vehicle for effecting deeper change when teachers engage critically with one another and with materials. This supports the findings that learning emerges not only from structured PLCs but also from fluid, negotiated interactions between actors, particularly in the mobilisation of materials and dialogue during informal interactions.

As described in Chapter 8, several activities, such as private chats, taking personal notes, borrowing learning materials, and gathering a big group of teachers together, opens up options for teachers to participate in professional learning, which they enact in diverse ways, depending on their situation. Such interactions emphasise the contributions of materials, technologies, and physical spaces that produce different learning, knowledge, and identity effects, allowing teachers to reform knowledge as/in/for teaching (or, as Mulcahy (2012) proposes, “liquid knowledge” (p. 131)). Whether deepening and broadening knowledge, learning is situated and contextual in certain places and times (Jurasaite-Harbison and Rex 2013). This opens options for unpredictable learning and multiple translations, occurring between sites and across temporal and spatial contexts (Greenhough 2011).

9.1.3 Learning flows fluidly within and across the schools

Instead of viewing the professional learning network’s scope as being a container (Zürcher 2015), we can understand it through Latour’s (2005) lens of relational networks. This shift emphasises the dynamic interplay of actors and their activities, moving beyond a static notion of context. Professional learning, far from being confined

to specific locations such as classrooms or online groups, emerges as a series of movements and orderings through space (Law 1992).

Considering the cases as sites of emergent curiosities and problems, materials such as data – a photograph, a document, a post-reflection, a chatbox message – are not inert pieces of information, but are instead active participants travelling between classroom implementation and professional dialogue, to reshape knowledge. For instance, a message in the group chat presented in Chapter 5 acts upon the in-person conversation. Similarly, the photos, videos, and pupils' work discussed in Chapters 6–7 become co-agents in teachers' learning process. Even external experts, moving between schools in Chapters 5–6, act as mobile nodes, connecting and influencing different network configurations. The PA policy, behaving differently across Chapters 5 and 7, demonstrates how its enactment is contingent on the specific networks it encounters. Student teachers, transporting theoretical knowledge from the university to the school in Chapter 7, become crucial intermediaries, translating and enacting knowledge within a new school context.

The flow across these networks is often initiated and sustained by reflective questions. These questions, whether formalised in a template or arising organically, act as inscription devices to enrol actors. This illustrates the role of connected objects and how they influence other actors through intra-actions, extending the network's complexity (Bruni 2005). These connected actors dilute physical boundaries, producing learning beyond the school context, but also influence the dynamics and goals of any expanded network that they join. This interconnectedness, rather than being a pre-existing structure, is performed and reified through the movement of actor-networks, as seen in the transmission of practices from one school to another. This crucially highlights the performativity of actors and the inherent fluidity of the network itself. The across-school practice transmission exemplifies the interconnectedness of the educational landscape (Stein and Coburn 2008). This also implies that, although professional learning is enacted within a school, it is not an isolated practice, as it is actively shaped by and connected to practices situated outside its walls. The interconnectedness observed across the three cases emerges from the dynamic movement of entities – both human and nonhuman – across network boundaries through both planned and

unplanned actions. This dynamic interplay, which reveals hidden practices, is further explored in Section 9.4.

9.1.4 Summary

The professional learning and working continuum maintains its stability through ongoing negotiations and translations to improve professional practices. With or without expectations, tensions within the goal-setting process and making choices about learning activities, together with hierarchical influences, shape the learning network and affect the results. There is no smooth continuum in a linear manner, but the continuum of learning emerges in an unstructured way, enrolling both formal and informal learning practices as actors fluidly flow across the schools. Some schools may be ready to take on the new actor as prepared, and some may be disrupted and need time to find equilibrium before transforming professional learning to make it durable. Therefore, alternatively, we can conclude that continuums of working and professional learning can be understood as the *dynamic interplay of incoherence and ambivalence,* rather than the result of coherence.

9.2 Negotiation and power as sociomaterial processes

While professional learning practices undergo a process of translation to align with the improvement of work, the paradox of learning, as stated in Chapter 1, still exists as a symptom of the network with asymmetrical power. Written and unwritten materials are not just mediating information but also inscriptions of power that shape negotiations. While Thai collectivism and social norms act as negotiated constraints, limiting agency and enforcing conformity, professional accountability acts as a leverage in becoming a negotiating tool that controls and regulates professional practices. These powerful relations and tensions disclose the paradox of learning, as they significantly affect the processes and results of learning (Fenwick and Nimmo 2015).

In this section, I explore how teachers' engagement with professional learning is co-constituted through negotiations with performance agreements, reflective dialogues, cultural norms, and accountability discourses. I discuss how power does not reside in any one actor, but emerges relationally through the strategic mobilisation of templates, questions, goals, and cultural forms, because instead of viewing power as an individual

exerting force, power is instead a movement distributed within everyday practices (Kien 2024).

9.2.1 Power of written and unwritten materials: a tale of two dialogue worlds

Materials are durable, and some are more durable than others in maintaining and sustaining the relations in the network (Law 1992). From the cases, teacher goals and dialogue questions are necessary materials for maintaining teachers' interest and participation in professional learning activities. I discuss here how written and unwritten materials in an assemblage with teachers form relations and powers that affect learning.

9.2.1.1 Teacher development goal: performance agreement versus conceptual commitment

The formation of each teacher's development goal is a critical enrolment that is integral to the planning process. It is not a straightforward process, but there are hidden ways to force teachers to perform professional practices in particular ways. Goals, presented as career steps, force teachers to align with school rules. Legal documents, such as PAs, trap public school teachers in paperwork, climbing the career ladder by following orders. Similar to being aligned with the school's conceptual commitments, the school philosophy keeps the private school teachers tied to their expected characteristics and development with the school's growth.

For example, the PAs in School A and C are legally incorporated into public servant teachers' professional development through the performance evaluation agreement processes, and, as such, the written and mutually signed materials, as legal and binding material actors, may become more durable practices (Law 1992). In School C, the principal's mediation of the triangular PA connection illustrated in his map can be understood as a strategic act of power, where negotiation maps the school goals onto teachers' practices. This blending of interests shakes the asymmetrical power dynamics because of the mutually signed materials, inscribing the need for professional learning and support onto teachers' pathways. Conversely, PAs reveal the *resistance to enrolment* in School A, where goals become official top-down tasks of bureaucratic exercises, forcing professional learning to become a bureaucratic performance. However, the accidental alignment of the school's goals with teachers' goals can be witnessed where

the power struggles between central authority and local enactment are unresolved, for example, in the case of Interviewee 4 (discussed in Section 5.2.2.2).

In the private school (Chapter 6), the negotiations between leaders and teachers seem to be a *facade of collaboration, as the school leaders dominate in negotiations, while teachers are listening and accepting*. This is particularly so when school goals are imposed under the concept of self-realisation, one of the Thai learning paradoxes. This leads to uncertainty in interpretation, especially where the absence of written goals has the potential to leave teachers vulnerable to dismissal yet filled with curiosity. This is why having private chats with a leader are used for re-negotiation to maintain teachers' interest and to respond to their curiosity. The school director in School B also points out the need for written goals. This allows us to see the attempt at re-inscription to stabilise the network and align teachers with the school goals.

In sum, Law's (1992) concept of the durability of materials is worth deliberate consideration. Viewing durability in the sense of strategic deployment of inscriptions opens up the emergent possibility for network dynamics, relations and power. As we can see, written texts may last longer in the professional learning network than thoughts and speeches (ibid.). But we cannot conclude whether written or non-written statements better stabilise teachers' professional learning, if a casual chat works as "material" in mobilising actors effectively, such as a legal document. The interchangeable use of both written and non-written materials may not be pragmatic, but they can maintain flexibility in a constant shifting of power and within uncertain situations. We still cannot conclude that a lack of clear direction is not a flaw of the network, but it means that the network needs a deliberate strategy to maintain control in allowing teachers to be 'sure' about their situated role in the professional learning network.

9.2.1.2 Reflective questions and the power of dialogue

Wegerif (2019) describes how conversations which give space to uncertainty and multiplicity of perspectives give rise to dialogic space, aligning with the Narrative-Actor-network Theory (NA-ANT) discussed in Chapter 4 in the sense that, in understanding how dialogue themes are drawn into the network, conversations are problematised and performed. In dialogic spaces or meetings, new meanings and insights can emerge in conversations as intra-actions and different ideas or perspectives

are then held together (Wegerif et al. 2020). From the cases, these heterogeneous components, such as the various teachers, communication devices and objects, contents, group relations, and the underlying cultures, influence the PLC conversations. This aligns with ANT emphasis on the entry of multiple and heterogeneous elements into specific dialogues (Michael 2017). Each component contributes to the performative nature of dialogue and then becomes learning as a temporary network effect. This is associated with Latour's (2005) explanation that dialogue cannot grow without shared knowledge and resources, articulation, and reflection. Therefore, it is not enough to identify who or what is present in the dialogue to see the narrative as a simple description, but to trace how components interact, influence, or resist one another to lead to the changes and translation process of teachers' learning.

All three cases mention *a set of questions* used as the dialogue generator, but each enrols participants and directs their attention in different ways. School A adopted the unified PLC template, designed by the MOE, to enforce compliance and officially record the meeting. School B's probing questions by seniors are instruments of hierarchical power. School C's customised agenda, while seemingly flexible, is still institutionally framed, shaping dialogue and reflection.

The roles of initiator, facilitator, and sharer are not just assigned positions, but they also *co-work* to influence the direction of the dialogue. Dialogue cannot exist without the active role of the 'questions', curriculum and lesson plan materials, assessment tools and even spaces. These materialities shape the flow of information and power. To this end, dialogue is more than just the space in which the crystallised views of thinkers are enacted (Hepburn 2003). Instead, dialogue is situated where multiple enactments of humans and nonhumans emerge and become inscriptions, which are also traces of knowledge (Callon 1991). Dialogue can be enacted within diverse variety forms, such as structured notes, key summaries, self-lessons learned, and shared experiences.

Enacting the same processes across different spaces does not produce the same possibilities for learning in scope and scale. The paradox of learning, revealed by enrolling the PA template, emphasises the *tension between control and creativity*. Templates *constrain distributed agency among teachers, data, and materials*, limiting alternative enactments. Moreover, rigid senior-junior relations could lead to dialogue struggles. While flexible questions not only pull teachers' interests to engage in the

dialogue, they also push teachers to explore specific and new areas. Without enrolling the template, however, this may also convey cultural nuances and beliefs in deep articulation. However, rather than concluding that templates always limit agency, some interviewees recognise the need for a template. This lets us rethink the conditions under which teachers might be re-purposed or hacked to enable new forms of professional learning. Therefore, this discussion may not question the existence of the template, but the evolving nature of the template instead.

To answer this, it is unnecessary to determine whether written or unwritten materials work best as the material for the articulation and reflection process, but it is necessary to get into the flow of the dialogue to invite certain materials, meaningfully, to reduce tensions in learning, whether schools follow or go beyond the template. Through the concept of thingly gatherings and intra-actions, dialogues are not spaces of meaning-making. As Rainio and Hofmann (2021) suggest, conversations of more than one idea or perspective are discussed. Conversely, dialogue is enacted in arenas of power, where teachers and questions continuously engage in a dynamic struggle for influence. This concept is similar to Barad's (2007) suggestion that intra-actions act as mutual constructions of meaning that view the agency of reflective questions and teachers through a dynamic set of forces. Thus, to summarise the answer, the School B director said that "dialogue is about the ongoing conversation, and we never know what it is going to be in a few seconds, so it is necessary for those leading the dialogue to use the tools appropriately across space and time". Most importantly, the discussions also reflect that, although these are unpredictable, the moments where teachers' agency emerge are the moments that are mediated by materials such as questions (Watson 2014).

9.2.2 Collectiveness in the Community of Kalyānamitta

Treating cultures as actors, a collaborative learning culture creates collective wisdom, new ideas and new resources for formulating innovative and feasible learning plans (Cheng 2011, 2017). From these cases, culture-embedded dialogue is a site of negotiated power between teachers and things, particularly "collectiveness" acting in different roles, whether unity, harmony, hierarchy, or seniority. Besides the "Community of Kalyānamitta", I see other diverse actors – seniority and Pu-Yai, Sa-nook and Phuan-Kru, and the Northern local language – that also work as a *rhetorical device* to

legitimise hierarchical and professional relationships in shaping the flow of information as allies and rivals. They all challenge an interpretation of the Community of Kalyānamitta as an evolving humans and nonhumans collective.

Seniority is linguistically enacted through family ties in private schools and bureaucratic structures in public schools, by calling colleagues by family-linked titles based on their age and nickname, for example, 'Pee' (พี่) and 'Nong' (น้อง) and 'Maae' (แม่), and calling the principal 'Tan' (ท่าน), which contain a strong sense of hierarchy by reinforcing ranks and positions. 'Pu-Yai' (ผู้ใหญ่) further emphasises the concept of seniority through 'Pee' (พี่) and 'Tan' (ท่าน), in that superiors with the most power manage to make decisions and foster negotiation in a one-way direction associated with authority (Prasartkarnkar 2018). In contrast, younger teachers avoid anger and disagreement to keep harmony in the group (Wilson 2004). Through ANT, power, in this case, is an effect of the seniority performed between senior and junior, which leads to learning tensions, as discussed in Section 9.2.12.

While Sa-nook and Phuan-Kru symbolise balanced relations between school members in terms of their power, these cultural elements also worked to flatten the hierarchy through a sense of collaboration and shared responsibility. Such symmetry happened with teachers enacting the dialogue as partners in learning. In School A, 'teacher buddies' informally activated dialogue as teachers aimed to solve their mutual problems. Additionally, the working group of PLC formation under the culture of 'Sa-nook', having a happy time together while working. These lessened the formal relationship, allowing members to open up to more negotiation possibilities. In Chapters 6 and 7, the teachers mentioned their co-planning or co-teaching processes, and how these allow teachers to take both giver and taker roles in participating in professional dialogues.

Shared local identities, hometowns and languages, are culturally symbolic actors that influence collectiveness. Interestingly, in Chapter 7, although the formation of professional learning practices began through hierarchical leader-follower relationships, the bureaucratic dynamic was transformed into a more collaborative culture during the enrolment and mobilisation processes because the Northern local language assisted the teachers in turning their collectiveness into a mutual commitment to offering hope for local children. Group cohesion and members' openness strengthened these co-

production practices (Holtz 2004). Moreover, the use of technology, as discussed in Section 9.3.2, allowed them to overlook seniority and age and instead focus on the co-production of professional learning and pupil outcomes. These co-produced enactments of professional learning practices also weakened the degree of seniority and its effect in the network.

Collectiveness in the sense of establishing learning partners produced a more symmetrical power among teachers in that they reciprocally take turns intra-acting with questions, pupils' works, reflection, and feedback, and express their ideas and experiences in the dialogue, something that Thurlings and den Brok (2018) define as peer learning, and which aligns with the concept of collegial interaction mentioned in Section 2.2.2.3. Therefore, culture may not be active itself but it enrols other materials to perform in the network, such as hierarchy, role arrangement in the network, power relations, and information flow. This could be an alternative interpretation of the Community of Kalyānamitta, beyond a human assemblage but residing within the space of humans and nonhumans in assemblages that collectively make learning visible.

9.2.3 Social norms and accountability: discourse with power

The concepts of being a good teacher stem from several sources and motivate each teacher differently. We interpret the idea of 'get the best possible deal for our kids' differently (Quinlivan et al. 2008). Western teachers aim to cultivate their pupils based on humanistic thought with the ability to think practically and critically, while teachers in the East are more inclined to believe that educating children is the role of teachers, as classrooms belong to teachers who have been indoctrinated into certain expectations of education (Xu and Xie 2021). To this end, Thai society embraces various thoughts and social norms from both eastern and western beliefs (Sowat and Sosome 2020).

Teachers as public servants, commitment to the public interest, compassion, and self-sacrifice are significant attributes that influence their work in public schools (Supphipattanatorn 2017). This aligns with the collective responsibility and accountability for continuous improvement and success for all pupils (Hargreaves and Shirley 2008). As mentioned in Section 8.2.1.3, social norms and accountability are powerful, interconnected, and evolving discourses; their interplay influences teachers' decision-making practices and participation levels depending on the situation. School leaders in all three schools may not have talked about social norms explicitly, but they

did refer to internal and external professional accountabilities as being leverage to communicate with teachers and to convince them to attend professional learning activities (Fullan et al. 2015).

We can understand that social norms and accountability are *strategic tools* that can be used to enrol teachers in professional learning activities by highlighting the moral and political association attached to teachers' professional obligations. Nevertheless, between social norms and accountability, there is an ambiguous strategy that creates a tension between teachers' behaviours in teaching and professional learning practices. In Thailand, teachers tend to move between decisions about adopting either child-centred or chalk-and-talk learning approaches (Phuaphansawat 2017). This also affects their roles in professional learning about whether they should listen or be critical in PLC dialogues.

In the three cases, mixed links between social norms and professional accountabilities flow over the network through negotiation. They are not accidental, but the effects of power and negotiations. Social norms and professional accountability are used at any time to keep teachers interested and encourage them to join the network productively. Through the leaders, the emphasis on norms and accountability can be a mechanism of orderings, and through the colleagues, it can be a mechanism of empowering.

Regardless of who, over-emphasising cannot ensure teachers' enrolment in professional learning networks, and the norm of viewing teachers as sacrificers can particularly sabotage teachers' participation, or the accountability element can push the pressure towards teachers. This shows us that these abstract concept are not mere discourses, but material regimes that bring teachers into negotiations to maintain their active participation in professional learning activities, even within the tension of conflicting ideologies.

9.3 Collaborative performances of humans and nonhumans

Fenwick (2010c) describes how, through ANT, teachers' professional learning moves beyond individual forces from human intention and consciousness. Learning is rendered by the cooperation between social and material connections between humans and nonhumans (Mulcahy 2016). Nevertheless, we have to recognise that co-production does not always imply equality. It can be acknowledged that technologies or policies

may reinforce hierarchies or marginalise certain voices. Linking to Mol's (2002) notion of "multiple realities", with co-performance, certain actors may gain or lose legitimacy through such enactments.

In this section, my discussion unravels distributed agency and power by borrowing the term, intra-action (Barad 2007), to reveal the connections among teachers, leaders, technologies, policies, and classroom artefacts. Bruni (2005) also reminds us that objects are not passive carriers of meaning but connected agents that mediate and transform professional interactions. Likewise, Michael (2004) introduces the notion of co(a)gents that share agency and co-direct outcomes. These guide us to see distributed co-agencies of things, bodies, discourses, and cultures that co-constitute the co-production of professional learning.

9.3.1 Distributed leadership among a leader, teachers, and materials

All the cases show how the school leaders strategically connect with the school's directions and the idea of professional learning practices. School leaders do not exert absolute control over the network but act as 'orchestrators' (Bennett 2010). Their attempts to enrol others are strategic movements of persuasion rather than collaboration. In shaping the landscape of learning, they determine what is valued, rewarded, and justified (Webster-Wright 2009). Active learning, competency-based education, and integrated pedagogies align with both school directions and national goals, rendering them the legitimate knowledge (Alvesson 2004) that structures professional learning.

School leaders enact these discourses through multiple roles: as messengers in School A, interpreters in School C, and inspirers in School B. While their roles can demonstrate distributed leadership, this is framed through social learning theory and communities of practice with the engagement of multiple stakeholders (Nadeem 2024). However, leaders cannot perform their role without active materials. In School A, policies serve as instruments of persuasion, reinforcing the strategic goals. School B and C's leaders, in contrast, embed professional learning within the materiality of the school itself – securing resources, reconfiguring infrastructure, and translating policies into everyday practices. Therefore, we can extend Nadeem's (2024) idea that the stakeholders go beyond individuals to include policies, technologies, and school structures that intra-act

with teachers. This provides us with an alternative explanation for how leaders and materials shape teachers' participation and understanding.

These co-productions explain the complex web of power, enrolled through distributed leadership, while revealing how the high-power distance in Thai schools can be shortened. Leaders and policies intra-act to translate the discourse and enact the sociomaterial actions differently to sustain professional learning while softening hierarchy in the following ways:

- Resource Mobilisation: The co-productions between leaders and resources to support professional learning constitute securing funding, technology, and experts for professional development practices, related to what Fierro-Evans and Fortoul-ollivier (2021) describe about the leadership role. Interestingly, leadership does not merely allocate resources but also reframes scarcity as opportunity, mediating a shift in other actors' roles, such as a computer teacher in School C, transforming the individual into a professional learning resource as an in-house expert. Another example is how School A incorporates external researchers to facilitate knowledge exchange.
- Building relationships and negotiating power dynamics: As I discussed in Section 9.2.2, within the constraints of seniority, trust must be strategically curated. Flattening the hierarchy is also not a genuine effort of the actors' connections, but a space in which an effort to co-produce consensus around professional learning emerges. Not only leaders and discourses, but also the invitation of concrete material are required for building relationships and maintaining engagement.

To conclude, distributed leadership influences their school's professional learning assemblage in the co-production of actors, ideas, discourses and practices. Although this might be a temporary alignment, it is continually re-negotiated, sometimes breaking down under new pressures in the endless activities of translations, as Latour's (2005) emphasis on 'keeping the network alive' through continual maintenance illustrates. Leaders then need to reassess the situations, maintain the stability of the networks and decide to exclude or include certain actors to stabilise the links between professional learning and school improvement (Cheng and Ko 2012). Leaders also need to be flexible in terms of their roles and interactions, as Latour (1996b) stresses, focal actants

who can transform the actants with which they interact are always translating and moving.

9.3.2 Various relations between technology and humans

As Orlikowski (2005) suggests, technology becomes mangled with social practices, as do teachers' working and learning routines, as technology is an indispensable part of life. The coming of digital technology became more accepted during the COVID-19 pandemic, and online and technological tools became actively involved and shaped new routines of work and professional learning. In this section I discuss the diverse roles of technology based on the notions of intermediaries and mediators, mentioned in Section 3.4.1, that facilitate and co-produce learning with humans.

9.3.2.1 The LINE application: background relations

All interviewees used technology to support their routine work and increase teacher professional communication. Ihde (1990) defines this kind of connection as the background relationship between humans and technology. This became more visible due to the COVID-19 pandemic when teachers increasingly used the LINE application to communicate with colleagues for both work and non-work purposes. The LINE application on the smartphone was concurrently admitted as being our 33rd organ – the Thai metaphor for the necessity of a smartphone, suggested several years before the pandemic arrived (Mahidol University 2017). It contains a diverse range of user-friendly functions to support verbal and non-verbal communication, such as text, emotional stickers, voice messages, file sending, polls for voting, and data storage (Sounthornwiboon 2019).

Adams and Thompson (2016) describe such background relations as 'interpassivity', which involves outsourcing humans' work to a device. This is similar to the definition of an intermediary provided by Callon (1991), suggesting that such socio-techno assemblage may lack the power to make others do things but they are still necessary as they transport actions from elsewhere. Although teachers could manage without them, LINE and smart phones enhance the flow of communication and resources, scripting actions and subtly guiding interactions through outsourced interactivity (Van Oenen 2011). A School C lead teacher designated the role of gathering teachers to attend the PLC dialogues to the LINE group chat, which allowed teachers to share and talk about

ideas for learning materials. School B's teachers also used the group chat for sharing classroom photos for supporting dialogue in meetings. School A's teachers use the 'Keep' function to submit their lesson plans and gain feedback. This explains how technology even when working in the background relationships, can shift the agency from teachers acting on their learning to the LINE application, opening up opportunities for even further informal learning enrolments.

9.3.2.2 EdTech: embodiment relations strengthen expert power

Beyond the LINE application, other EdTech tools are increasingly evolving in teacher professional learning networks in their embodiment of the relations that reshape teachers' learning experiences through the digital device (Giambastiani 2021). Verbeek (2011) describes these embodied relations as technologies merging with humans. Pens, tablets, and EdTech fall into this relational category as they extend the human's corporal self and become part of the bodily experience (Adams and Thompson 2016). The maximised co-production of human and technology somehow increases their expert power, which could influence the collaborative culture described in Section 9.2 to be more professional and less senior.

Technology added to the chain of interactions as a mediator that lets new modes of action happen, as mentioned in Section 3.4.1. The school-invented learning assessment tool in School C (see Figure 36 in Section 7.2.2), demonstrates how EdTech indispensably became part of teaching practices during the COVID-19 pandemic, and, most importantly, it differs from other online or technology tools because it becomes embedded in teachers' chain of daily work and this affects professional learning. Online learning forces the assessment approach to be more authentic and work-based, making the assessment framework more complex. While junior teachers quickly embraced the tool, embodying its use effortlessly and subsequently becoming sources of expertise, they transferred their embodied technological skills to senior colleagues through informal in-house workshops. This exchange significantly challenges traditional seniority hierarchies and reshapes a professional community built on expertise rather than status, facilitated through the collaborative interplay between teachers and the online tools.

Similarly, at School B, one teacher's evolving relationship with his tablet and notebook demonstrated technology's profound impact on professional roles. Initially, these devices complemented his role as a classroom observer and knowledge curator, but, upon transitioning into a leadership role, his interactions with these tools deepened significantly. Integrating digital and physical note-taking allowed him to effectively transport and mediate knowledge referred to in his thoughts in a notebook, and classroom photos or new teaching ideas on his tablet. His devices thus became co-performers, actively shaping his effectiveness as a leader and facilitating collaborative interactions among teachers to shift teaching practices.

As Giambastiani (2021) states, the embodied artefacts and humans change their relations to others and sometimes even transform them profoundly. The embodiment relation between work-embedded technology and young teachers generates expert knowledge that increases acceptance and trust among teachers, whereby negotiation and learning with seniors occurs more effectively. Even a simple tool can turn on a teacher's professional power. However, such perfect embodiment with technology may not sustain the status quo. Technology resists full incorporation, either due to the introduction of newer tools or evolving professional practices (Adams and Thompson 2016). This significantly emphasises the idea that professional learning, enacted through an assemblage with technology, remains a fluid and ongoing narrative by the continuous adaptation of actors.

9.3.3 Classroom co-productions

According to the concepts of actor-network and assemblage described in Section 3.4.2, a classroom can be considered as being one of multiple dynamic actor-networks where professional learning is co-produced through rich interactions among human and nonhuman actors. Within this network, classroom materials – texts, technologies, bodies, actions, and tools – materially and socially interact (Fenwick et al. 2012). Not only inputs from instructional delivery but also classroom observation happens within the same space and time to co-produce inputs as the connecting materials for professional dialogue, shaping realities and influencing teachers' professional dialogues and practices.

Teachers engage differently with classroom materials depending on their roles as observers, observees, or independent instructors. Captured moments, such as photos, videos, and pupils' work, become essential materials that vividly recreate instructional events during professional dialogues. These materials enable teachers to revisit specific teaching moments, triggering memories, emotions, and reflections that make their discussions more specific, extended, and emotionally involved. Horn (2010) reaffirms that such materials help teachers clearly articulate teaching problems, allowing their colleagues to engage more deeply by offering tangible solutions grounded in authentic experiences. Specifically, in School B, the flow of the practical solutions of the AAR in the first half of the meeting travels to the BAR, and the latter half spontaneously enacts the lesson plan that is anticipated to be implemented in the future.

Thus, we can notice that classroom materials act as powerful intermediaries, transporting ideas and actions between reflective dialogues and practical implementations. The tangible materials, such as photographs or video recordings, provide clarity and accuracy that reinforce the dialogue, while teachers' personal stories offer intangible emotional insights. This demonstrates how these mutual actions with shared agency are not restricted to teachers but, significantly, extend to nonhumans (Boylan et al. 2018). Nonetheless, balancing these tangible and intangible materials is crucial for effective engagement and dialogue, to prevent an imbalance that could lead to tensions, particularly influenced by seniority dynamics. To mitigate this, teachers strategically use reflective questions, classroom observations, pupil responses, and personal notes, integrating diverse materials to create holistic perspectives and to expand possibilities for learning. In order to minimise this risk, the co-production of classroom materials should relate to the reflective and dialogue questions presented in Section 9.2.1.2, including personal notes, and pupils' learning evidence. The mixture of co-production classroom materials creates holistic perspectives and expands possibilities for learning (Horn 2010).

In sum, productive professional learning conversations involve using rich meaningful materials – concrete examples (Popp and Goldman 2016; Horn 2010) and pupils' perspectives and experiences (Horn and Kane 2015) – that have been generated in the classroom. The co-production of professional learning realities can provide teachers with lived experiences and also expand teachers' sense of the possibility of trying new

things (ibid.). However, such professional conversations may not often look like this, especially because of the overemphasis on seniority in Thai culture, which could limit the potential of the conversation to co-produce classroom materials. I discuss this further in Section 9.4.2.

9.4 Unboxing the hidden practices

Through the process of translation, hidden professional learning practices are revealed by following materials to make the connections between the objects distributed across sites and actors more visible (Röhl 2015). Learning emerges not only from planned training sessions but also from incidental encounters: a borrowed worksheet pinned to a wall, a casual observation through an open classroom door, or a LINE message shared at the end of the day. These seemingly small acts are not peripheral; they are central to how knowledge is enacted, circulated, and transformed.

In this section, I discuss how professional learning is co-produced across schools through fluid and performative networks and how learning travels in multiple directions. Its impact is shaped not by singular actions, but by the entangled and evolving relationships. By paying attention to these practices-in-motion, we gain insight into how professional learning actually works – not as a fixed outcome, but as a living network of ongoing translations.

9.4.1 Borrowing materials and modelling

Regarding Law's (2009) notion of collateral realities, these unpicked translations embody other collateral professional learning realities produced coincidentally and usually unintentionally through teachers' daily practices. Interaction among actors led to unanticipated learning activities – borrowing materials (May et al. 2020) and modelling (Doppelt et al. 2009).

Borrowing emerges as an unintended yet crucial practice, because of limited resources, unfamiliarity with subjects, or the time constraints. Teachers from Schools A and C casually recount instances where they borrowed instructional materials from colleagues, creating spontaneous moments of collaboration. For School A teachers, borrowed materials instantly solve lesson plan preparation challenges. The connections between

the materials, the teacher and the teaching practices become clearer when the materials are used in the classroom as an inscription process.

Meanwhile, in School C, materials attached to classroom walls quietly invite borrowing, as teachers, visiting after school hours, point, discuss, and later critically examine the materials together – establishing unexpected pathways to deeper reflection and dialogue. Materials become even more influential in School C, where the principal consistently introduces new ideas and resources through the LINE application. LINE becomes an invisible yet effective intermediary, quietly reshaping teaching practices through indirect exchanges and shared resources, even though it cannot dissolve the power distance between teachers and principals, as mentioned in Section 9.3.2.1. This passive interaction could be understood as silent censorship in that teachers may not critically ask questions in the group, although they may have them. This resonates with ANT's idea that technologies can come with politics, and that their affordances are shaped by alliances and constraints. Similarly, in School B, teachers subtly borrowed effective techniques and attributes from colleagues, implicitly adapting others' successful practices into their own teaching, as discussed in Section 6.3.3. This can be considered as borrowing practice.

Within the interactions between materials or models and a teacher who borrows, the idea of improving learning materials and using them in each classroom is unravelled. Several interviewees explained this process as 'Tor-Yod' (ต่อยอด), which means a re-design process (Suwapanit 2024). The interaction of Tor-Yod co-generates new knowledge by the active enactments between information and teachers in everyday practices. Borrowing helps teachers to produce better classroom practices (May et al. 2020), while helping in the re-allocation and re-formation of knowledge (Adam et al. 2014). Beyond the practical solution, such associations create a shortcut to connect with other experience-directed learning. While borrowing enables agility in learning through the Tor-Yod process, it may sometimes limit broader engagement with conceptual underpinnings, as discussed in Section 9.5.1.2, or reinforce uneven or limited access to new and high-quality materials if teachers do not intra-act with these materials in the broader area.

Furthermore, ANT offers an alternative explanation of borrowing as professional learning that is associated with Buddhist self-realisation. Rather than focusing on

building a strong self as self-realisation (Hanh 1999), the interaction of borrowing is a relational and dynamic process of de-centring the self, not as a fixed individual but as part of the network that is enacted with the surrounding entities. It highlights an interconnected web where teachers continuously shape and reshape their practices through relational interactions with materials and colleagues. Borrowing critically opens up opportunities for post-borrowing dialogue, where two teachers intra-act, sharing materials with different experiences. Therefore, borrowing is not an act of sharing resource, but a complex process of translation and transformation. To conclude, the idea of self-realisation is not about building a strong, isolated self, but about recognising the interconnectedness of the self with the world, aligning with the Pratītyasamutpāda concept, as mentioned in Chapter 1.

9.4.2 Tensions in classroom observation

Classroom observations unfold as powerful storytelling events of humans and nonhumans co-constituting and negotiating multiple realities of professional learning, while producing feedback as an important element of professional learning as explored in Section 2.2.6. Each classroom emerges as a unique actor-network, comprising teachers, pupils, checklists, instructional tools, and captured materials such as photos and videos. Together, these actors shape the purpose, scope, potential dialogues and feedback for professional learning through their interactions and tensions. Ideally, shared discourses from different perspectives, either as observers or observees, should align teachers' interests and understanding because this is the key to mobilising professional dialogue.

In Schools A and C, classroom observations became entangled with the formal PA performance evaluations, which contradicts the definition of classroom observation suggested by Chayaban and colleagues (2021), which is that it is designed to support teachers to improve, not judge their teaching practices. Observers, with checklists, enter classrooms to judge teaching performance, imposing an evaluative reality. As mentioned in Section 2.3.2 in relation to the Thai saving-face culture, teachers perceive these observations as high-stakes assessments, so they prompt preparation, rehearse for flawless implementation, and conceal imperfections. The classroom observation, with its evaluation culture, may discourage teachers from risk-taking practices, while materials gathered during these kinds of sessions are carefully curated instructional

evidence and tend to restrict rather than enrich dialogue because of tensions that arise from an asymmetrical power of observers holding significant influence over observed teachers. This shapes them in becoming entirely passive; their teaching styles, interactions with pupils, and classroom management co-create the observed realities in constrained conditions. Nevertheless, they should not be seen as passive, because, in another way, they also shape the observation through their teaching style, classroom management technique, and interactions with pupils by being active observees who co-create realities in the classroom, as mentioned in Section 9.3.3.

In contrast, School B demonstrates an alternative reality through open-door classroom observations explicitly tied to professional learning. Teachers fluidly move between observers and observees, freely entering colleagues' classrooms. The presence of observers is welcomed and it is perceived as being respectful if they are coming for support, not to judge. Therefore, they are also welcome to gather diverse materials – photos, videos capturing live moments, and reflective notes. These materials enhance conversations, creating a shared, vibrant narrative that supports reflective practice and collaborative growth, particularly as such materials travel seamlessly into AAR and BAR meetings. The network of observers, observees, and nonhumans creates trust, reduces power imbalances, and prioritises shared professional growth over evaluation. This makes the classroom observation become the necessary actor-network for professional dialogue in meetings.

As Chayaban and colleagues (2021) stress, classroom observation should be conducted collaboratively to create a space for shared learning and growth, not just for evaluation purposes. School B's open-door classroom observation practice seems to provide an insightful perspective of lessening any observation tension. The co-creation of classroom evidence and recordings for post-observation dialogue may, however, face another tension, brought to the dialogue be seniority, especially when moments of resistance or hesitancy exist and affect the way in which such materials are enrolled in the dialogue.

9.4.3 Connectivity of actors across the schools

After reviewing my reflective notes, I accidentally found associations between the three schools, as discussed in Section 9.1.3, showing the fluidity of the actors, elements, and

professional learning processes. As Mol (2002) explains, boundaries need not be marked because of the fluid nature of the space, not its physical scope. From the cases, if I had not cut the network, the professional learning connectivity may have expanded more than expected through mediators and intermediaries, as they transport the practices from one space to another. It was observed that they do not perform in the same ways that they did in the previous space because of their re-inscription in another localised space (Latour 1987), the different interests of the actors (Twum-Darko and Harker 2017), and the imbalance of power dynamics between spaces as a giver and receiver (Arnaboldi and Spiller 2011).

9.4.3.1 Interconnectedness through nonhumans

From the cases, we can see the same materials travelling across the schools. In Thai schools, national policies, together with standardised templates and protocols, reach the school through a top-down approach, as mentioned in Section 1.1.3, with the aim of guiding teachers' ways of thinking, learning, and working (Nakyam and Vichit-Vadakan 2018). International educational practices are also welcomed in Thai schools, including education systems and cultural orientations (Farrelly 2016). Within the diverse actor-networks of Thai schools, these foreign educational models enter as powerful actors, each uniquely reshaping the professional learning networks they join. Yet, as ANT illustrates, the same actors – in this case, the national policy and the foreign model – do not affect different networks identically. Each school uniquely translates and re-inscribes the policy within its local context, giving rise to diverse realities shaped by interconnected actors.

For the first example, public schools A and C would invite and implement the CBE under the Sandbox Act and the PA in the same way as guidelines would, but these activities embody a different translation process. The School C principal approached the national policy as an actor deeply intertwined with the school's ongoing phase of transformation. He strategically invoked a sense of local community and collective belonging among teachers, situating the policy within the school's environment. This intentional translation process led teachers to adapt the policy authentically, acknowledging and addressing local conditions while embedding it into their shared professional culture. In contrast, the principal of School A acted predominantly as a messenger, transferring national policies through formal orders with minimal

reinterpretation. Minor practical adjustments were made by academic leads to ensure accuracy in implementation, yet the essence of the policy remained firmly controlled by the original inscriptions.

Another actor is educational practices influenced by foreign counties. Foreign influence entered School B's professional learning practices through lesson study experts from Japan, whose clear guidance and structured support seamlessly integrated with local practices. Additionally, the U.S. reflective dialogue practices and Singaporean PLC also indirectly blended with the school's Buddhist-based environment, creating a unique professional learning approach. In contrast, School A took a more cautious approach to engaging with foreign models, due to the consideration of government policies. Moreover, when external researchers are enrolled in the school actor-network, they acted in similar ways to School B's Japanese lesson study experts. But the school's translation still remained shallow. As such, we can see that the school's emphasis was placed on visible compliance rather than on deep integration, such as labelling the practice as 'lesson study-integrated PLC', due to the Kreng-jai offered to external researchers and the fear of the government. This tension might have been reduced by the effect of sharing materials from various actors.

Discussing these examples win the context of the three reasons mentioned above, we can see that the way in which the policy or foreign model materials were re-inscribed in different local spaces, the persons who actively enact the policy, in assemblage with their interests, affect the way in which the policy becomes translated and further influences professional learning practices at each school. The connections between the school practices and those adopting the policies or the foreign models differ in strength and durability (Latour 2005), even when sharing the same purpose to support professional learning. They do not act as context but as actors; they influence the trajectory of learning effects. Top-down reforms or shifting policy agendas, or foreign model adoption may amplify, redirect, or even stop localised translations of professional learning. This emphasises the need for the critical role that local adaptations and translations play, shaped by the interactions and negotiations among leaders, teachers, policies, and institutional cultures. Therefore, school leaders have to oversee the network dynamic (Hallinger and Kantamara 2001). In this case, we can see various

invitations of experts or materials into the actor-network to leverage those connections and to ensure the constant translation of professional learning.

9.4.3.2 The fluid role of external experts

I identified the link between Schools A and B, through the Lighthouse School Network, as a professional knowledge sharing model (Sasiwuttiwat and Sulukkam 2018). School A received professional learning support from external researchers who are also the School B academic partners.

The external researchers fluidly navigate the roles of intermediaries and mediators. Initially, they served as intermediaries, transmitting professional knowledge from School B to School A with apparent neutrality, carrying concepts and practices across school boundaries. At first, they, as intermediaries, transmitted one school's knowledge to another and then attended School A's PLC meeting as mediators to provide practical recommendations. External researchers' roles were fluid, similar to what Goodchild and Ferrari (2024) found in their study, that actors such as communicative technology also act as both an intermediary and mediator and switch their roles accordingly during the implementation of practices.

As the network matures, repeated interactions may either build legitimacy and trust or create dependencies. Time, in this sense, becomes a crucial actor in shifting the role of external researchers. When they became mediators, they no longer delivered generic knowledge, but still shaped its meaning because their presence influenced how discussions unfolded, guiding professional learning along new trajectories. As Latour (2005) explains, they were leading "multiple directions where passions, opinions, and attitude bifurcate at every turn" (p. 39). The researchers' shifting roles created ripple effects throughout the network, from changing teachers' practices, shifting expectations, and reshaping power dynamics within the schools.

9.5 Countless network effects

Professional learning is rarely a neat, linear process. Instead, it unfolds through entangled networks of people, practices, and materials, each co-constituting the effects of learning in unpredictable ways. As Rivera and Cox (2016) state, the translation process is never complete, it will modify when its equilibrium fluctuates. Therefore,

when circumstances change, relations in the network change, and the network reproduces these effects. Once these effects are produced, they affect classrooms, teachers' routines, and broader institutional structures, continually shifting the professional landscape. In this section, I trace how teachers' learning, once translated into action, generates diverse and far-reaching impacts across networks – impacts that are often subtle, sometimes unintended, and always relational. These ripple effects help us rethink professional learning as not being as an isolated event, but as a living, dynamic process of translation and transformation.

9.5.1 The interconnected effects between teachers' knowledge and implementation

Learning effects from the cases cannot be defined in an orderly and linear way; the effects are instead distributed and concurrently enacted. Therefore, we cannot know the effects in order, but we do know that they affect one another. We might consider professional learning as a narrative woven from multiple threads – dialogues, borrowed materials, and spontaneous interactions – each actively influencing the others. The effect is a dynamic, ever-evolving story that brings new possibilities and new understandings.

9.5.1.1 Teachers' learning, the first effect during dialogue

Learning relies on teachers' dialogue or an ongoing event where knowledge comes alive through interactions. The professional dialogue from the cases shows that knowledge is not something waiting to be discovered, but it is instead connected to other pieces of information, ideas, recipients, and givers. Therefore, we can see from the cases that knowledge is constantly being created, shaped, or redefined by multiple enactments in dialogue. We see how knowledge changes and grows, especially the movement of knowledge such as pedagogical insights, refined content knowledge, shifts in beliefs about pupils, and evolving attitudes toward teaching. As Fenwick (2010c) states, no knowledge has an essential existence outside a network, but knowledge enacts itself and is thereby enacted into existence.

Examining learning in dichotomies may not allow for the timely detection of professional learning results, especially in complex network relationships. Through ANT sensibilities, the dynamic, uncertain, and multiple and constantly moving agencies

of the actors can be examined and bring networks to learning (Suarez Estrada 2017). The COVID-19 pandemic vividly demonstrated this dynamic, requiring teachers to deconstruct and reconstruct their knowledge collaboratively, adapting continuously within rapidly evolving teaching networks.

In some networks, control over the enrolment of new knowledge might be taken by senior experts who introduce their preferred materials. The aim may not be to place greater value on a human's contribution, but to show that such materials significantly affect decision-making, not as facilitators, but by influencing what is seen, understood and shared. As Sørensen (2009) suggests, "objects become what they are because of socio-material relations" (p. 57). Thus, the materials enrolled by the senior experts enrol other objects to shape actions. For example, training programmes in psychology brought by seniors allow School B teachers to rethink pupils' beliefs, well-being, health and learning. In School C, senior and junior teachers worked together to enact the materials they all invited to the network in the school-invented tool workshop.

However, enrolling new knowledge is not the only way learning ripples through these networks. Borrowing materials also dramatically expands learning possibilities. Materials, brought into one classroom from another, enact new realities by inspiring teachers to experiment and innovate. For instance, in School B, when senior teachers introduced psychological insights into teaching, they not only expanded teachers' views on student well-being but also shifted the professional dialogue, enriching learning in other aspects. This movement among diverse sets of knowledge stems from collaborations, conflicts, interactions, and distances in a network, which aligns with Wagner (2011), who states that these relations co-create learning. Such knowledge can be metaphorical, in being described as the iceberg beneath the water, or being halfway through learning, because it becomes the actor in the close network of classrooms to co-produce outcomes for pupils.

Dialogue tends to produce learning through actors' interactions. However, it is noted that we might not be able to expect or predict certain learning outcomes, because of the fluidity that can broaden or deepen conversation at any scale and space (Law 2008a). Therefore, learning outcomes should be reassessed and rebalanced in order to ensure that teachers' professional learning is responsive to the changing education context.

9.5.1.2 New or revised teaching practices: ripple effects and network expansions

New or revised teaching practices often stand as visible and anticipated outcomes of professional learning. These practices are materialised through a chain of relational enactments – dialogues, shared stories, and material exchanges. As ANT reminds us, learning does not always travel along a singular, linear route, but it flows through informal paths – shortcuts such as borrowing materials – which bypass conceptual discussion but still produce tangible results.

Translating knowledge into action: the networked route

Within a professional dialogue, teachers' learning often begins in the early moments of conversation, where pedagogical knowledge, beliefs, and attitudes are explored, and then deepens into practical implementation. A critical ripple effect emerges when knowledge circulates and shapes the new form of lesson plans, classroom management strategies, assessment methods, and responses to broader concerns such as learning loss or pupils' well-being.

In School B, this ripple effect is particularly evident. As discussed in Section 9.5.1.1, teachers' reflections on knowledge are gradually transformed into actionable plans, through the flow of their dialogue from the after-action to the before-action review cycle. These practical effects are considered relational effects that emerge through those enactments (Mitchell 2017). Furthermore, those practical effects could affect actors in other networks, expanding and connecting with other actors, such as pupils, materials, and future discussions.

Interestingly, this chain of effects seems to be a loop, but it is more complex, iterative and multidirectional because teachers continue these conversations informally through hallway chats, casual moments with leaders, and spontaneous exchanges. These multiple stops accumulate knowledge and refine practice, creating spiralling effects that influence professional learning over time. We can see that once the relational effect is activated, it keeps expanding, drawing in new elements and adapting to new challenges.

Borrowing materials: The shortcut through the network

Borrowing materials is associated with both explicit and implicit interactions among teachers. It represents a shortcut – an accelerated way of producing practical knowledge.

While it may lack the richness of concept-building or collaborative reflection (as stated in Section 9.5.1.1), it quickly mobilises ready-to-use resources, often through implicit or informal interactions. As discussed in Section 9.4.1, this method bypasses the longer journey of enacting the four knowledge elements, offering teachers a practical solution grounded in their day-to-day needs.

This shortcut reflects the fluid nature of professional learning that is situated beyond structured workshops or scheduled training. It happens in the moment, in the context of everyday practice (Bobis and Tripet 2023). While borrowing can be efficient, it risks reinforcing asymmetrical power dynamics, particularly when senior teachers could dominate the sharing of materials and it may limit deeper learning if critical reflection is skipped. As such, while shortcuts serve an important purpose, they should be complemented to support a deeper network engagement.

9.5.2 Ripple effects: changes in other actors and networks

When new practical knowledge enters a classroom, it initiates a ripple effect, which is an interconnected sequence of transformations, affecting not only individual practices but also a broader classroom environment. Each new teaching practice introduced into the network reshapes interactions among pupils, teachers, and classroom materials. We can see from the cases that active learning in the classroom allows pupils to intra-act with their sociomaterial surroundings to expand their learning possibilities. As we trace back through the classroom, the student engagement in their process of learning is illustrated in the photos of pupils working cooperatively to create the pieces of work.

This ripple effect becomes especially evident in the visible outcomes of pupils' learning. For instance, School C teachers proudly showcased photographs of pupil-created projects as tangible evidence of the effectiveness of newly implemented teaching methods. In School B, the "water-drop day" served as a culminating event where pupils presented their learning journeys to teachers and parents, enrolling families into the reflection process. Their feedback became a valued, swift response, validating the embodied effects of teachers' professional growth.

Whether student learning or parent response, the final relational effect of the professional learning activities is likely to evolve and become the key actors in the next

round of professional learning network translation. However, not all feedback reinforces growth, especially when it is not contextually related or too generic. Therefore, it is important to highlight both successes and areas needing improvement. This could make ripple effects became extended and even deeper, as teachers witness that they have to take pedagogical risks and further explore innovative approaches. Through ANT sensibilities, the improvement of work and professional learning is activated by the actor-networks in cyclical and spiral patterns; this allows the leaders or teachers to reexamine the holistic view of teacher professional learning and restart the translation of professional learning again with different problematisations. As actors in the continuous work-embedded process, teachers enact pupils' better results, positive parent responses, and better performance evaluation results to maximise their efficacy in their teaching practices (Davey and Bredemeyer 2011). Thus, the network continually expands, spiralling outward from initial classroom changes to broader institutional shifts.

The ongoing translation process produces institutions (Law 1992). In discussing the cases, the institutional shifts in these cases are visible as the changes in professional learning practices and other relevant working processes, aligning with the continuum of work and professional learning discussed in Section 9.1. Work and school management are connected through co-agency as an effect of professional learning. This co-agency then makes teachers to be more confident in joining the school decision-making process in renewing the school direction and improvement plan. This demonstrates that the ripple effect of network-building extends beyond any physical boundaries, such as a classroom or cultural boundary. Once they become dynamic, teachers' professional learning practices then must be situated and this does not happen in isolation (Lave and Wenger 1991). Furthermore, professional learning keeps translating itself through the non-linear process of reflection, dialogue, and interaction.

However, the strength and reach of these ripple effects can vary, shaped by power dynamics and tensions. Positive transformation can diminish due to instabilities (Spillane and Coldren 2011), or the benefits of ripple effects may not be equally experienced by all actors. From the cases, it is evident that seniority or some actors may sometimes limit these effects. This highlights the important role of distributed leadership as stabilisers to maintain the flow of positive change. Furthermore, without cutting the network, we can witness that external influences (such as policy shifts,

technological advancements) could significantly impact the direction and continuity of ripple effects, by either amplifying or disrupting them (Coburn and Russell 2008).

9.6 Epilogue and overflow

The five key insights presented here demonstrate that teacher professional learning practices are not static but keep evolving while new actors are enrolled in the network, whether invited or uninvited. We may see the professional learning process as being situated in certain situations, but connected with others. Within the continuum of working and professional learning, negotiation is used to align teachers' interests, while power emerges when teachers and other things – tangible or intangible – enact to perform and achieve the goal cooperatively. This could be defined as the sociomaterial process of creating matters of learning. While focusing on the clearly visible processes, the hidden sub-practices arise unconsciously. This mix of unhidden and hidden processes, when assembled with teacher, classroom, and school management routines, expand the effect of these translations beyond teachers' knowledge.

Chapter 10 Conclusion

10.1 Revisiting the research aim

This study aimed to explore teachers' professional learning practices in Thailand with actor-network theory through ethnographic case studies. In Chapter 1, I depicted how teacher professional learning practice has traditionally been performed in Thai schools, and how significant trends such as technology, a more collaborative working practice, and professional accountability may affect professional learning. I also highlighted the gap in the research methodology used to explore such practices in Thailand. Despite plenty of conventional education research studies being conducted in Thai schools, the knowledge contributed may not be fully utilised for further study or in school contexts.

Therefore, I explored alternative means of exploring teachers' professional learning practices, and this led me to the socio-material concepts presented in Chapters 2 and 3. I adopted an actor-network theory approach, specifically the 'sociology of translation', to understand the relationship processes of knowledge production and negotiation in which something constantly changes or is mediated through a process of translation. I also drew on other relevant concepts such as the ANT principles of agnosticism, generalised symmetry, and free association, performativity, multiplicity, and fluidity, as they methodologically imply reality-making (Callon 1986b). These sensibilities align with Law's (1999b) suggestions about translation, in that it is always performative, and actors in a network are always involved in reality-making. I, as an ANT researcher, have adhered to this critical point and have been cautious of network exploration and description, not only as a reflection of the performativity of actor-networks, but also as the consequences of their translations, which involve (un)intentional attempts to stabilise emerging realities.

Taking this matter into account, I addressed the following three research questions:

1) How are school-based teacher professional learning practices enacted in Thai schools?
2) How do the assemblage of humans and nonhumans influence and mediate professional learning in Thailand?
3) What are the effects of these assemblages of professional learning practices?

I then conducted an ethnographic case study, in which I followed four school leaders and twelve teachers in three school, including following nonhumans. As indicated in Chapter 4, I enrolled several data types – written, audio, and visual materials – in an iterative way to become familiar with the data, as this allowed me to trace relations between actors in professional learning practices and understand their everyday activities in which professional learning emerged. Interviewing each interviewee twice also illustrated how teachers and objects constituted complex gatherings, helping me to reveal the sociomaterial understanding of continuous performativity. I took the opportunity to understand each school practice through translation, the role of actors and their power and agency, and network effects. Open to any possibilities, I told the stories in Chapters 5–7 based about what worked in school: how the practices were set, elaborating on the process of embedding the practices, unfolding unhidden practices, and identifying the effects of the translation. To digest the stories and revisit my research aim, I synthesised the findings of the three schools in Chapter 8, which led to the analysis presented in Chapter 9.

This chapter summarises my theoretical contributions to education research and highlights the practical implications of these findings. Building on the key insights presented in Chapter 9, I shall provide practical recommendations for three dimensions: teacher professional learning, schools, and policy. I then suggest potential areas for further research into school-based teacher professional learning that could have a significant impact on educational practices. I also reflect on my Interview Toolkit and analysis strategies and offer methodological recommendations for other researchers. Lastly, I provide closure for my study.

10.2 Contribution to the affairs of teacher professional learning

Based on the five key insights presented in Chapter 9, I propose how school-based teacher professional learning practices could be assembled, specifically through everyday practices. This grounds the concept of teaching and professional learning as being boundaryless and leads to practical points for practices, schools, and policy.

10.2.1 Recommendations for teacher professional learning practices

In Thailand, the evolution of professional learning in recent years has involved a wide range of practices, from using one-shot training sessions, which often makes learning

fragmented and noncumulative (Ball and Cohen 1999, pp. 3-4), to a more constant and responsive approach to addressing teachers' needs in learning programmes, whether single workshops or professional learning communities, even in centralised situations (Erawan 2015). Beyond training or workshops, this research unravels a wider range of practices, especially informal interactions. Instead of viewing the professional learning practices within a linear explanation, ANT revealed how the professional learning journey is boundaryless between professional learning and teaching.

The professional learning and work continuum breaks the limitations of classifying the number of workshops attended and the location where the training is held, as indicated in Section 9.1, but also highlights how it should be about choosing to interact with others humans and nonhumans. This expands possibilities for learning, as professional learning represents a "patchwork of opportunities—formal and informal, mandatory and voluntary, serendipitous and planned" (Wilson and Berne 1999, p. 174). The co-production of sociomaterial entities illustrates the cooperation between humans and nonhumans as the connecting mediators, as illustrated in Section 9.3, that reveal how power and agency are an effect of these co-production activities.

Through the ANT perspective, learning is about moving that change over time and space, and moving to be job-embedded; this might speak to the nature of the professional practices to encourage a more holistic understanding of the professional learning practice, especially the establishment of a coherent infrastructure for supporting professional development (Wilson and Berne 1999), most importantly, the recognition of abstract infrastructures such as culture, or non-written materials, as described in Section 9.2. Moving between seniority and collaboration seems to be challenging and affects the mobilisation of professional learning. However, once this connection is recognised, the hidden relevant practices, as described in Section 9.4, tend to be unravelled, whether borrowing materials, classroom observation tensions, or the active role of transporting actors. This signifies that these organic effects should not be formalised, but instead, that their contribution to professional learning practices must be valued. It is worth mentioning the tension of immutability and changes as it was enacted in several connecting points among teachers, especially in the dialogue, because dialogues link to relevant micro-practices, such as lesson planning and classroom implementation, to professional learning. The interconnected links between micro-

practices lead to learning outcomes, which are broader than individual teacher results, such as improved knowledge and changes in teaching practices (Erawan 2015).

The stories that educators tell urge others to project the teachers' professional learning practices through sociomaterial co-productions incorporated with nonhuman actors. These include curriculum development and implementation, borrowing materials for practices, dialogue about pupils' learning and outcomes, co-teaching practices, the relationship between technology and professional learning, technology and seniority, and the school's ongoing improvement activities.

10.2.2 Recommendations for schools

Teacher professional learning relates to diverse actors acting to maintain successful translations, especially those with positions in making change, whether in or outside of the school. Here, I consider how the physical, virtual, and dialogic spaces of the school affect teachers' professional learning.

In the school, school leaders take the primary role in aligning other actors to support teachers and foster a friendly and collaborative learning environment while maintaining stability in the learning-embedded working network. They therefore need to be attuned to the everyday practice implementations because professional learning practices are not just enacted in the learning process itself but, most importantly, are embodied within other supportive micro-practices that sustain the learning process. Adopting an open-door policy, as described in Chapter 6, or gathering for monthly meetings, as described in Chapter 7, acts as a negotiation process for leaders and teachers to discuss their everyday practices.

The LINE application is the second, virtual, school space which embodies the same atmosphere as the school. The LINE application, with its background relations, enhances communication and expands space for co-performance toward learning. However, the LINE application may not disrupt the power and dynamics in the network, nor balance the sense of seniority and collaboration, in the same way that the EdTech tool does. The recommendation of embracing other alterative technologies in everyday work and using these as a shared tool among teachers is highlighted, as this affects a collaborative practice in working and professional learning.

Besides spatial settings, nonhuman actors, such as Thai culture and Buddhism, visibly affect the dialogue whereas the dialogic space is filled with network dynamics and actors' relations. Collectiveness, along with strong seniority and Buddhism, co-perform in conflicting ways that demonstrate how learning can encompass both passive and active approaches. The recommendation to unlock this tension is to reduce seniority by adding a sense of shared agency that reciprocally leads to the creativity and criticality of the dialogue to open up possibilities for professional learning in both physical and virtual settings.

Without cutting the network too soon, expanding the exploration broadens the understanding of the role of leaders and other actors through a process of enacting distributed leadership. The cases reveal an important point about how to shift from making a collective and centralised decision to a more distributed decision and agency by acknowledging that learning is relationship-centred. Therefore, it is necessary to value what teachers as learners relate to, particularly the human and nonhuman entities in the school. The concrete recommendation from Anantatmula and Shrivastav (2012) is that juniors prefer to build trust and be treated equally and with respect rather than be directed by authoritarian seniors; this is the key link to their success as a team, whether for work or professional learning. Although the recommendations for schools directly refer to the school leader, across the three spaces, a sense of supportiveness and amicability is required to engage all actors to build opportunities for teachers to enact and enrich their learning.

10.2.3 Recommendations for policy

Further out-of-school connections, according to the key insight about connectivity revealed in Section 9.4.3, and out-of-school actors matter to teachers' learning in specific ways. Policymakers and policy intervention are essential in transporting the message to teachers, and this affects teachers' learning routines. Although policy formation is arranged in a rather top-down than bottom-up manner, it is important to leave room for customisation in allowing school members to take part in policy translations, because this is a crucial problematisation affecting the translation of their professional learning practices. The arrival of new actors requires a school leader to consider and handle them cautiously, because they all affect current practices to be transformed, including teachers' relationships with things. If these actors, such as the PA

or the external expert, enter the network without tuning into the network's interest, they cannot connect with school actors to support professional learning. Thus, not only providing collaborative space for policy customisation, but also supporting materials for the professional learning practice are recommended. Empowerment and support upon request could be the enrolment that teachers need for their learning mobilisation; although they may not change the way policy is formed, any support and empowerment obtained from policy actors will increase the chance for meaningful interactions and actors' connectivity between the practice and policy settings.

10.3 Reflections on the Interview Toolkit, the tell-listen-retell strategy and suggestions

Having the Interview Toolkit and the analytical strategy, comprising practical guidelines and ANT sensibilities, helped me to perform an exploration and analysis of teachers' professional learning networks. The concept of translation and other ANT concepts removed my dualist lenses while instilling in me an agnostic mind that opened up new possibilities for understanding professional learning practices. To take on the role of being an ANT researcher, I needed to embrace a new way of thinking and observing school practices, although I was comfortable being in the school environment and amongst teachers.

10.3.1 Speaking ANT-ish language

In preparing myself for the ANT research assemblage, as Edwards (2012) suggests, it was important to unlearn familiar representation habits and learn in different ways. Relearning to speak an ANT-ish language helped me to be aware of things that I previously took for granted but that also affected my research.

My first relearn – the impact of linguistic material, cultural behaviours and expectations on teachers' professional learning – related to my positionality and subjectivity. The translation of conceptual materials can be difficult due to language and cultural differences. Language influences how the story is analysed and told, for example, the terms 'translation' or 'actor-network theory' are conceptualised differently in Thai, as mentioned in Section 3.6. This challenged me in following the actors and in the analysis. Another example is the concept of seniority that was reflected through symbolic and structural aspects of the hierarchical context, revealing the different levels

of seniority and power. I relearned to overcome this concept by exploring the performativity enacted in the network, which helped me to truly understand power as an effect of multiple relations, actions and enrolments of actors. Beyond power, the ANT sensibility of performativity also widened my perspective about shared leadership, shifting my understanding of leadership from it being a collective to being a form of distributed leadership.

My positivist background is another significant re-learn. In embracing a set of ANT sensibilities, I had to disregard any pre-existing conditions and dualistic oppositions (Murdoch 2017) while instilling a relational ontology and sociomaterial approach that equally privileges humans and nonhumans. As I started by becoming familiar with ANT-ish language, vocabulary, and visual materials, by the time I explored the network through ethnographic data collection techniques and translated the re-learn materials mentioned above to form an Interview Toolkit with open-ended ANT-based questions and using a storytelling technique to depict the flow of professional learning.

10.3.1.1 Conducting an interview

In my research assemblage, the Interview Toolkit and I become the actor-networks during the interview where we invited the interviewee in the meeting to share their sociomaterial experiences and invite nonhumans according to the questions without concern about micro-macro and school-national levels. I consciously chose specific words to describe both human and nonhuman actors' experiences in conversation, such as 'connect', 'perform', 'align', 'interest', and 'shape'. Moreover, visual materials such as photos and relational maps, essentially broadened my ethnographic-ANT experience, by having the objects speak through teachers' interview to disclose connections between them and the teachers. This also enriched the sociomaterial dialogue in that the process allowed the interviewees to invite nonhuman actors into their interviews to mobilise learning about a certain translation event.

The Toolkit helped me to understand the complex and sociomaterial processes enacted within the practices; it produced the enquiry and the dialogue, and the images and maps that brought out the dynamic nature and the materialities of the stories. However, during the interviews, a significant reflection was that I did not treat the human-centric bias as a flaw to hide strictly, but instead, I considered this as being part of the methodological

story that revealed the difficulty and messiness of doing symmetrical ethnographic exploration. I then used an iterative process to tell, listen, and retell the story in an ANT-ish way, as described in the next section.

10.3.1.2 Tell-listen-retell storytelling

After the first round of interviews, I reflected on the depth and breadth of the data collected from the daily report and the transcripts that shaped data collection in the next round. In nesting performative stories, I explored the data I enacted in the assemblage, not only the story told by the interviewees but also the objects through photos and maps brought the performativity among and between actors alive through co-production, as described in Section 9.3. While traditional storytelling techniques may view humans as occupying the leading role in the plot, the NA-ANT story unpacks the complex details about the network. This opened up my perspectives on appreciating nonhumans in terms of the cultures, objects, and languages used.

In the 'tell' part, I adapted the first two steps of NA-ANT to narrate the story, starting from identifying human and nonhuman actors. I then began to notice how they became connected, showing how they relate to co-exercise their powers in specific events. I captured a wide range of specific events in each step of translation, from the formal whole-school event to unexpected micro-events. Before moving to the 'listen' part, I re-read the story in order to identify connections among objects as they form hidden practices, for example, I found the hidden relations in the borrowing material conversations. I used ANT sense-making, drawing on ANT sensibilities, which linked events and connections into meaning sequences through a process of translation.

Allegory expresses the double meaning of what appears at the surface and points out what happens beneath (Copeland and Struck 2010). Through my sense-making, I used allegory in each story differently, but they all disclosed hidden messages. For example, the metaphor of 'wave' in Chapter 7 shows the mobility of things that get enrolled into the network, whether expected or unexpected. Family ties in Eastern cultures is another allegory that illustrates the collectiveness of social groups while emphasising seniority and respect, revealing the complex attributes of the school culture. I also borrowed the allegory of 'teachers as sacrificers', commonly used to explain teaching professions, to clarify how teachers' workload situations affect their professional learning. Such

allegories made the story more interactive, reflecting the way in which translation is enacted, especially when I re-read it to listen to my stories for revision.

Later, I stepped back from each story to see and connect with it from a broader perspective. I synthesised and retold the story through my translation in the 'retell' part. I started unravelling the translation again to show the multiplicity of the practices and identified power and relations among actors. The retold story also highlights how nonhumans affect the dynamic and teachers' learning journey as the mediator. From the ANT perspective, my understanding of teachers' professional learning effects also broadens the way in which it enlarges and extends my view of the learning process.

Although my reflections on the research strategy are expressed in an orderly manner, the process of following the study design in practice was enacted iteratively. I found that nesting the school's version of the story with my version in Chapter 8 produced the effect of swinging me from one network to another at all times. I concluded that the story might be further changed if I came back to revise it again because of the uncertainties that I could bring to the network. Therefore, the story is situated in space and time.

10.3.2 Embracing the network

10.3.2.1 Following the actor

I decided to follow the actor to gather data and understand the practices in the online setting. I found network exploration difficult when flattening everything and seeing everything as local, especially as the school members traditionally share their experiences within a hierarchical culture. Additionally, if the actor I chose to follow did not perform and left the research assemblage, their absence was not able to depict the translation of the practices. For example, at times, school members may not attend professional learning activities for personal reasons, or those relating to policy, workloads, etc. Sometimes interviewees presented me with non-related answers or short answers without providing any explanation. These, however, provided me with essential questions and learnings about how to revise the research strategy.

To deal with uncertainty and be prepared for emerging incidents, I practised my skills in following the actor in the pilot study and customised several techniques to ensure that I

could capture the important moments, in both unhidden and hidden practices. I gathered photographs, relational maps, observation notes, and daily reports, along with performing semi-structured interviews. Such customised techniques allowed me to immerse myself in the fluidity, while accepting the messiness and non-coherence within the network. Although I started from humans, those materials I gathered concurrently revealed networks of influence that included objects, technologies, and policies—as actors that shaped or interrupted professional learning.

In following the actors via the Interview Toolkit, I additionally observed their relations and powers in the network through non-verbal communication, which is beneficial for the idea of analysis. I noticed interviewees tend to be aware of how they share their opinions about seniors. For example, in the first interview, they positively mentioned the role of principal and use 'Tan' as the pronoun each time they mentioned the principal. They still used 'Tan' in the second interview, but their opinion was offered in a more straightforward manner, providing a more holistic perspective of their professional learning practices when photo elicitation was invited into the research assemblage. However, the sense of respect in the seniority culture was also transported to our research dialogues. The term 'Ajarn'[18] unexpectedly influenced my positionality toward my interviewees, especially those who are teachers. In calling me Ajarn, this could have the potential to make the dialogue become static and distant. Therefore, it was important to make them feel safe when expressing their experiences.

Enrolling ANT sensibilities revealed that not only verbal and non-verbal conversations but also objects are worth including in research observations of professional learning practices to produce rich analysis, particularly as the interviewees took a photo of important technological tools and talked about their essential contributions to the process. Without being able to see all of the materials at once, the relationship between the sense of seniority through the discourses and the technological artefacts may be obscured, as well as their leverage, affecting teachers' relations. Tracing both spoken

[18] Ajarn is a formal pronoun for someone with expertise in a specific field (Office of The Royal Society's Dictionary 2011). Ajarn's meaning differs from 'Kru' or teacher regarding a level taught. Ajarn refers to the one who teaches at the university level, while Kru teaches kindergarten to high school (STKC 2023). This could imply the different distances between negotiators, in that positioning me as Ajarn tended to create a greater distance between us.

and unspoken actors provided practical hints to broaden my perspective beyond a traditional and static view to see the dynamic movements within the network.

After deciding to follow a particular actor, it was possible to lose others. This challenge intrigued me, and I decided to strengthen my commitment to flatten the network. Without privileging any actors at any level, I was able to assess what/who to follow in order to gain holistic pictures of the translation while not missing any hidden practices. Although I explored teachers' professional learning, I had my eye on other assemblages as well. For example, exploring the water drop day as a form of evidence of pupils' interactive learning highly influenced teachers' inquiry and dialogue. This highlighted cooperation between the pupils and the teachers' practices and helped to unravel hidden practices and clarify the translations. Performing two interviews increased the chance for me to flatten the network further and map the story piece by piece to reveal a more complex set of relationships.

10.3.2.2 Being part of the network

In the research assemblage, as a researcher, I created this network through the translation process. I started by problematising my questions and clarifying my interest about understanding teacher professional learning practices through ANT. I then approached my interviewees as the interessement stage, asking them for permission to enter the research assemblage. Without an informal introduction, some interviewees called me Ajarn, as mentioned in Section 10.3.2.1; this may not make them feel safe and open to sharing their experiences in an interview. So, I decided to straightforwardly tell my interviewees about my background and experience as a curriculum and instructional designer and education policy researcher. This allowed them to actively approach me to engage in professional conversations as they expected to exchange new and fresh ideas to improve their skills. This might also be a way of 'giving back' that benefited the interviewees, who gave their time for the research. I therefore neither took the role of the outsider nor the participant in their professional learning activities, but I acknowledged my role as one of the actors who used a question to probe my interviewees to share the experiences, while they performed with other actors to affect relationships and cause effects in the network. However, I also wanted to be unbiased and open to any analysis possibilities.

Thus, I expanded the length of my interviews with 6 or 7 interviewees and decided to perform two interviews with each. I also included the element of self-reflection to the research assemblage in order to help me maintain my subjectivity and positionality. Although I made every effort to prevent the effects of bias and assumption from being enrolled in my analysis, I was not able to prevent these from entering the research assemblage when the interviewees may have transported them to their school assemblage. Some took the useful recommendations revealed in the interview translating process forward into their own professional learning practices, as these became part of the continuous improvement ethos. This illustrates how the translation of such effects from one actor-network to another is not always detrimental.

10.3.2.3 Cutting the network

As an ANT ethnographer, I did not set a particular space and time for exploring each case of professional learning practice because each school uniquely implements its own practices. Instead, I let the actor take me to other relevant networks, although this revealed the challenge that I may become lost in translation and drown in the vast amount of data that I generated.

Although each school's practices may contain a similar approach to dialogue and feedback as the core of the learning process, they have different translations, especially each interviewee's own experiences. Some only talked about training programmes or workshops outside the school assigned by their principal, not the informal activities enacted in schools. Some took me to their professional learning beyond the school space, such as personal connections with college friends. Identifying a clear obligatory passage point of schools' professional learning involving everyday practices made cutting the network easier.

More importantly, my decision to offer two separate interviews was an advantage in helping me to focus on particular practices, especially when enrolling the relational maps drawn by the interviewees. The space in which the practices were formed, enrolled both overlapping and non-overlapping parts. Regarding the dimension of time, the interviewees shared their experiences based on their working experiences and positions. For example, junior teachers discussed orientation, buddies and instructional supports, while senior teachers discussed the feedback process. Their responses were

co-performed as missing jigsaw pieces to be assembled to depict the translation, powers, forces, and effects of the professional learning practices.

Attuning to school-based teacher professional learning practice could be challenging, so I connected teachers' experiences with objects that they invited and their relational maps through storytelling within an iterative process.

10.4 Implications for further study

My early review of the literature revealed a lack of qualitative empirical studies in educational settings, especially those using a sociomaterial approach. This gap may limit opportunities for educators to understand and improve their work-based professional learning. In this study, the online ethnographic case study was chosen as a suitable approach due to the interviewees' convenience, travel restrictions, and the transitional period after COVID-19. However, future research would benefit from adopting a combined online and offline approach to explore the full complexity of actor-networks (Sade-Beck 2004).

In terms of theoretical implications, the idea of professional learning should be further explored as it is broader than professional development. To do so, Watson's (2014) framework intersects with the findings by focusing on agency, while Drew et al. (2016) provide the perspective to understand professional dialogue in conjunction with policy materials. These aspects warrant further exploration, especially in using ANT, the Interview Toolkit, and NA-ANT to deepen our professional learning in culturally specific contexts. Together with the Interview Toolkit, future research can build on these tools to explore the discursive and material dimensions of professional learning. NA-ANT also offers an analytical lens to trace how narratives and material actors mutually shape learning practices over time. Applying these to reveal the dialogue within the translation process would allow us to understand how storytelling, reflective dialogue, and documentation function as both material discursive and narrative devices that stabilise or disrupt an actor-network of dialogue.

The challenges of Thai teacher working situations are becoming more complex nowadays, influenced by the arrival of online and active learning, particularly within the unresolved conflicting ideas of passive and active learning, and the Thai cultural ideals of hierarchy and seniority. This is further complicated by the notion that 'inside-out' or

self-realisation is still the mainstream approach to personal development within Thai Buddhist society and one that urges Thai researchers to focus their questions on acquiring inner mental matters with moral habits and actions (Parkay et al. 1999).

While the paradox tend to be formed by a few Buddhist concepts with single explanation, Payutto's (1988) speech on culture and development alternatively suggests that Som-ta (สมตา) or Middle Way (มัชฌิมาปฏิปทา), another of Buddhism's core approaches, can be practically used to explain how culture and development are interconnected and eventually merge and evolve to maintain the balance of power created to strengthen the development process. Banruji (2012) alternatively suggests the concept of Pratītyasamutpāda, or dependent origination, as an inquiring method of believing that all things are connected and influenced by relationships in a complex web. Both Buddhist concepts place an emphasis on humans and the understanding that all things are relational beings in interwoven and interactive processes and energies.

Therefore, continuing to use ANT along with these alternative concepts unravels this paradox to have a more profound understanding in professional learning, without using the foreign models. Additionally, it can be used to explore other relevant networks, such as human resource management policy, school curriculum development, and professional development for leaders. Further research in this area will strengthen our understanding of teacher professional learning practices and reveal how they affect and co-create teachers' professional learning in schools. Such explanation discloses that the learning paradox is not a mystery, but a *symptom of the network with asymmetrical power*. Therefore, it is worthwhile to include other actors to reshape the network.

10.5 Closing remarks

At the end of my research, ANT accidentally took me to the serendipity of the study, especially as an ANT researcher and educator. As Law (2004) suggests, we need to find ways to live in complexity because the gold standards are no longer enough for us in uncertainty. Being part of the complex assemblage, I had a chance to explore that uncertainty with a tailor-made Interview Toolkit and strategy.

At the beginning, I took time to delve into chaos in the methodology to find the missing piece of my curiosity since I had started working as a policy researcher. The ANT

theoretical approach addresses the value of all entities, not only humans, which fits my belief that humans, objects and systems have the potential to change education. Although this approach radically challenged my interviewees as it was not their familiar traditional mainstream research approach, having them in my research assemblage not only helped me to achieve my study but also allowed them to reassess their practices through a new approach, especially revealing hidden practices and tracing the process of their practices and finding the impactful cooperations between actors. The approach broadens our view by not simply admitting the involvement of things in professional learning but, more crucially, analysing connections, power and relations between actors.

I strived to survive the flooding in each research assemblage by using narrative ANT (NA-ANT) storytelling, rather than trying to categorise things, but instead open up and reveal any possible events. This strongly provoked me to exercise ANT sensibilities such as fluidity and performativity. Rather than seeing a single explanation with a fitted outline, the story depicted the imagery and flow of professional learning practices as they are distributed and emerging learning, produced in a rhizomatic way.

While stepping back to see my whole assemblage, I can see that reconceptualising professional learning through ANT is an interconnected discovery arising from each story's connection with others. The unique continuum in professional learning among cultures, curriculums, and daily work is the critical explanation of professional learning embedded in the everyday teaching profession. Therefore, if I were asked to conduct an ethnographic case study again, my answer would be yes, and I would expect to find new serendipities in the network.

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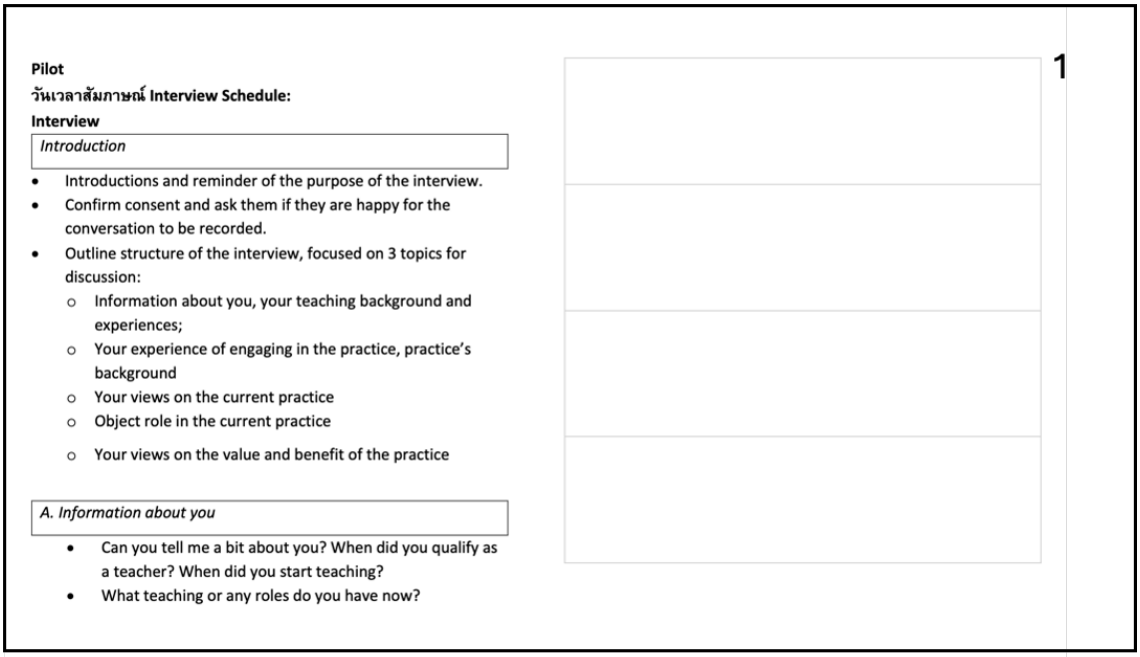
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Appendices

Appendix A: Interview Toolkit

- Pilot



Pilot

วันเวลาสัมภาษณ์ Interview Schedule:

Interview

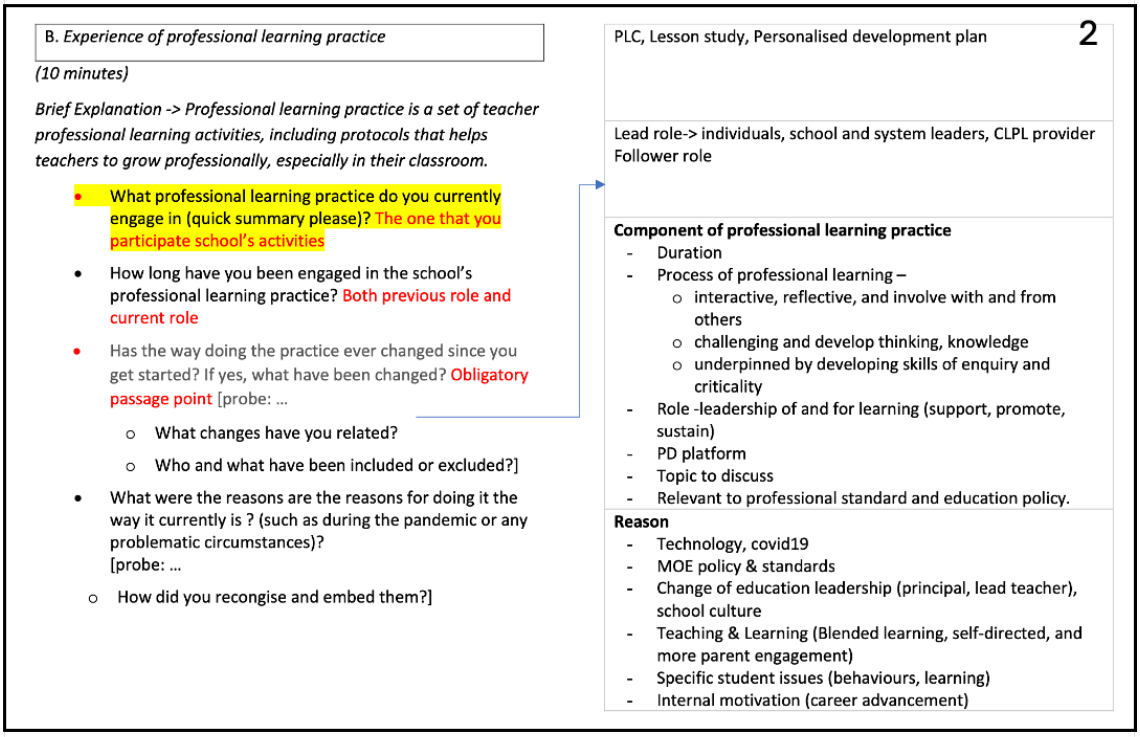
Introduction

- Introductions and reminder of the purpose of the interview.
- Confirm consent and ask them if they are happy for the conversation to be recorded.
- Outline structure of the interview, focused on 3 topics for discussion:
  - Information about you, your teaching background and experiences;
  - Your experience of engaging in the practice, practice's background
  - Your views on the current practice
  - Object role in the current practice
  - Your views on the value and benefit of the practice

A. Information about you

- Can you tell me a bit about you? When did you qualify as a teacher? When did you start teaching?
- What teaching or any roles do you have now?

1



B. *Experience of professional learning practice*

(10 minutes)

Brief Explanation -> Professional learning practice is a set of teacher professional learning activities, including protocols that helps teachers to grow professionally, especially in their classroom.

- What professional learning practice do you currently engage in (quick summary please)? The one that you participate school's activities
- How long have you been engaged in the school's professional learning practice? Both previous role and current role
- Has the way doing the practice ever changed since you get started? If yes, what have been changed? Obligatory passage point [probe: …
  - What changes have you related?
  - Who and what have been included or excluded?]
- What were the reasons are the reasons for doing it the way it currently is ? (such as during the pandemic or any problematic circumstances)?
  [probe: …
  - How did you recongise and embed them?]

PLC, Lesson study, Personalised development plan

2

Lead role-> individuals, school and system leaders, CLPL provider
Follower role

Component of professional learning practice

- Duration
- Process of professional learning –
  - interactive, reflective, and involve with and from others
  - challenging and develop thinking, knowledge
  - underpinned by developing skills of enquiry and criticality
- Role -leadership of and for learning (support, promote, sustain)
- PD platform
- Topic to discuss
- Relevant to professional standard and education policy.

Reason

- Technology, covid19
- MOE policy & standards
- Change of education leadership (principal, lead teacher), school culture
- Teaching & Learning (Blended learning, self-directed, and more parent engagement)
- Specific student issues (behaviours, learning)
- Internal motivation (career advancement)

3

C. Experience of the current practice

Rational Map exercise: (15 minutes)

- Let's walk me through who and what is in the practice, can you draw a map depicting all people and objects? Start from the centre and expanding to people and then object.
- Referring to your map, can you point out who leading the practice happened? And how did they do that? (any new tools, new rules, new tasks, new ways of doing things being introduced?) The one who are more powerful or persuasive than others.

Interview to the double: (15 minutes)

- What if you get promoted and I will replace your position, can you give me suggestion how I should take your role in the practice, referring to your map.
  - What was your role in the practice?, where are you in the map?
  - Can you explain the steps while you are doing and interacting with anyone or anything in the activities? The arrow that relates to other?
  - Where and when do those interaction take place?
- Before we finish, is there anything else about your experience of the current practice that you would like to share?

- Actors-> Individuals, school and system leaders, CLPL provider
- Objects -> Tools to audit and support supervision, guide for a planning professional learning provision and policies, while subjective matters such as culture, leadership, are considered as objects.

Who ....
How?
- Ways of doing things: power, top down, vertical or horizontal collaboration
- new tools and rules
- new task: assign, cooperatively plan and delegate

Role (explain the arrows)
Where (each arrow)
When (each arrow)

4

A. Object role in the current practice

Object appreciation: (15 minutes)

- Referring to the map, can you pick the 3 objects in the map that you think it is the most important to help you achieve the goal of the practice?
  - How does the thing play its role in the practice?, How does it interact with you?
  - When does it happened?

ลองถามว่า ถ้าให้คนถ่ายรูป แล้วเล่าจากรูปดีมั้ย หรือว่า อ้างถึงmap ก็พอ

B. Your views on the value and benefit of the practice

Outcome of professional learning practices (15 minutes)

- What has been your experience so far in terms of engaging in this practice?
  - Is there any teaching-related knowledge you know better?
  - Have you made any changes of your teaching? If yes, could you share some examples?
  - Have you draw any lessons or new teaching strategies from that?
  - Any other benefits/values this practice has provided to you?
- *Is there any adjustment of the practice you would like to make to improve it? (5 minutes) you can refer to the map*

Concluding Remarks

- Thank you
- Ask them if they are happy to be contacted again in future, if necessary.

- Main

Interview Question (Phase 1)

Interview Schedule:

Interview

Introduction

- Introductions and reminders of the purpose of the interview.
- Confirm consent and ask them if they are happy for the conversation to be recorded.
- Outline structure of the interview focused on three topics for discussion:
  - Information about you, your teaching background and experiences;
  - Your experience of engaging in the practice, practice background
  - Your views on the current practice

A. Information about you

- Can you tell me a bit about yourself? When did you qualify as a teacher? When did you start teaching? ประวัติศาสตร์ก่อนรับตำแหน่ง ตั้งแต่ปีไป
- What teaching or any roles do you have now?
  ↳ รร. นี้อยู่กี่ปี และ ตำแหน่งอื่นๆ นอกจากครู

B. Experience of professional learning practice

(10 minutes)

- What professional learning practice do you currently engage in (quick summary, please)? Can you tell me the goal? เป้าหมายทั่วไป เช่น PA PLC กิจกรรมพัฒนาวิชาชีพ
- How long have you been engaged in the school's professional learning practice?
- Has the way of doing the practice ever changed since you got started? If yes, what has been changed? [probe: ...
  - What changes have you related? เล่ายกตัวอย่างอันที่นึกได้ก่อน อย่างเช่น OK กับเก่า
  - Who and what has been included or excluded?]
- What were the reasons for having professional learning practice this way? (such as during the pandemic or any difficult circumstances)?
  [probe: ...
  - How did you recognise and embed them?]

C. Experience of the current practice

Relational Map Exercise (15 minutes)

- Let's walk me through who and what is in practice. Can you draw a map depicting all people and objects? Start from yourself at the centre and expand to other people and objects
- Referring to your map, can you point out who led the practice happened? (Do they lead by order or by collaboration?) And how did they do that? (any new tools, rules, tasks, or ways of doing things being introduced? (Would it be top-down or bottom-up?)

Interview to the double: (15 minutes)

- What if you get promoted, and I will replace your position. Can you give me suggestions on how I should take your role in the practice, referring to your map?
  - What was your role in the practice? Where are you on the map?
  - Can you explain the steps while you are doing and interacting with anyone or anything in the activities? คุยกับใคร ทำอะไร
  - Where and when do those interactions take place?
- Before we finish, is there anything else about your current practice experience that you would like to share?

Concluding Remarks

- Thank you
- Ask them about scheduling the following interview and mention what to do before the interview
  - Take 3-5 photos of anything (not people) that help you get your role done in practice.
  - You can email me before the following interview or show me during our following interview หรือ ทางไลน์ก็ได้

Interview Question (Phase 2)

Interview Schedule:

Pre-Interview

- Remind interviewees of the photo taken → ติดต่อเมื่อส่งรูปมาให้ เพื่อนัดสัมภาษณ์รอบ2
- Review the transcription of the 1st interview
- Read the topic guide several times

Interview

Introduction

- Introductions and reminders of the purpose of the interview.
- Confirm consent and ask them if they are happy for the conversation to be recorded.
- Outline structure of the interview focused on two topics for discussion:
    - Object role in the current practice
    - Your views on the value and benefit of the practice

A. Object role in the current practice (revised)

Object appreciation: (15 minutes)

- As you are asked to take a photo of things necessary for you to do the professional development activity. Could you explain
    - Why it is important, and
    - What is its role in the activity, and how does it connect with you?

B. Challenge of the current practice (revise + add)

(15 minutes)

- Since I participated, how often has the activity become unsuccessful? In what way has the activity been unsuccessful?
- What might be the reason for unsuccessful activity? (such as idle, passively participation etc.)
    - What might teachers not engage with the practice?
    - What might the result not be as expected?
- Is there any adjustment of the practice you would like to make to improve it? (such as add or reduce human or non-human roles; you can refer to your rational map)

C. Your views on the value and benefit of the practice

The outcome of professional learning practices (10 minutes)

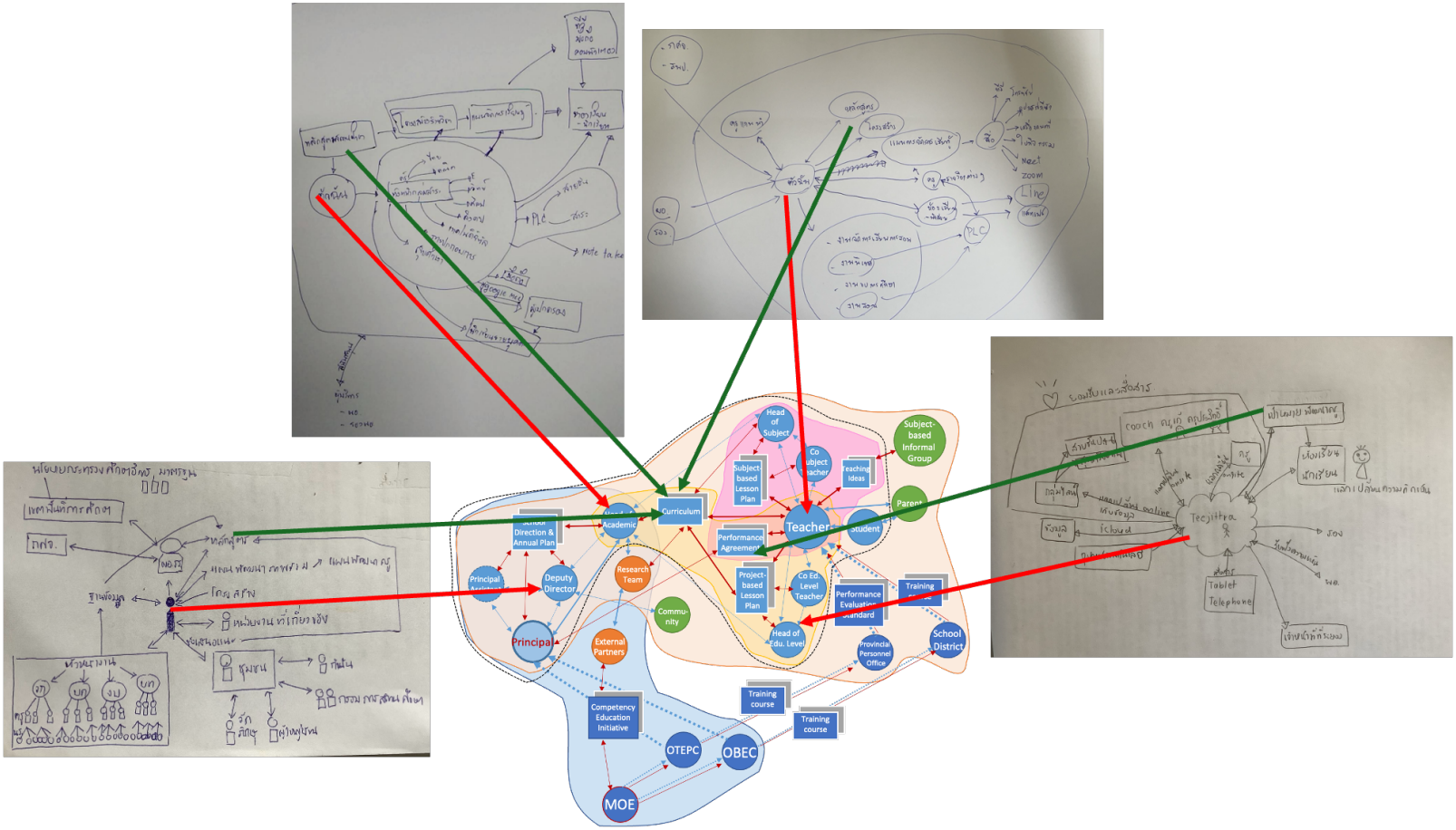
- What has been your experience so far in terms of engaging in this practice?
    - Is there any teaching-related knowledge you know better?
    - Have you made any changes to your teaching? If yes, could you share some examples? (Is it about the pedagogy or subject content?)
    - Have you drawn any lessons or new teaching strategies from that?
    - Any other benefits/values this practice has provided to you?
      This part will be skipped if interviewees mention this in the previous question.
- Are there other reasons shaping your learning besides the current practice?
  E.g. Students, after-work conversations, social networks, and so on.
    - How does it shape you? And does it connect with the current practice?

Concluding Remarks

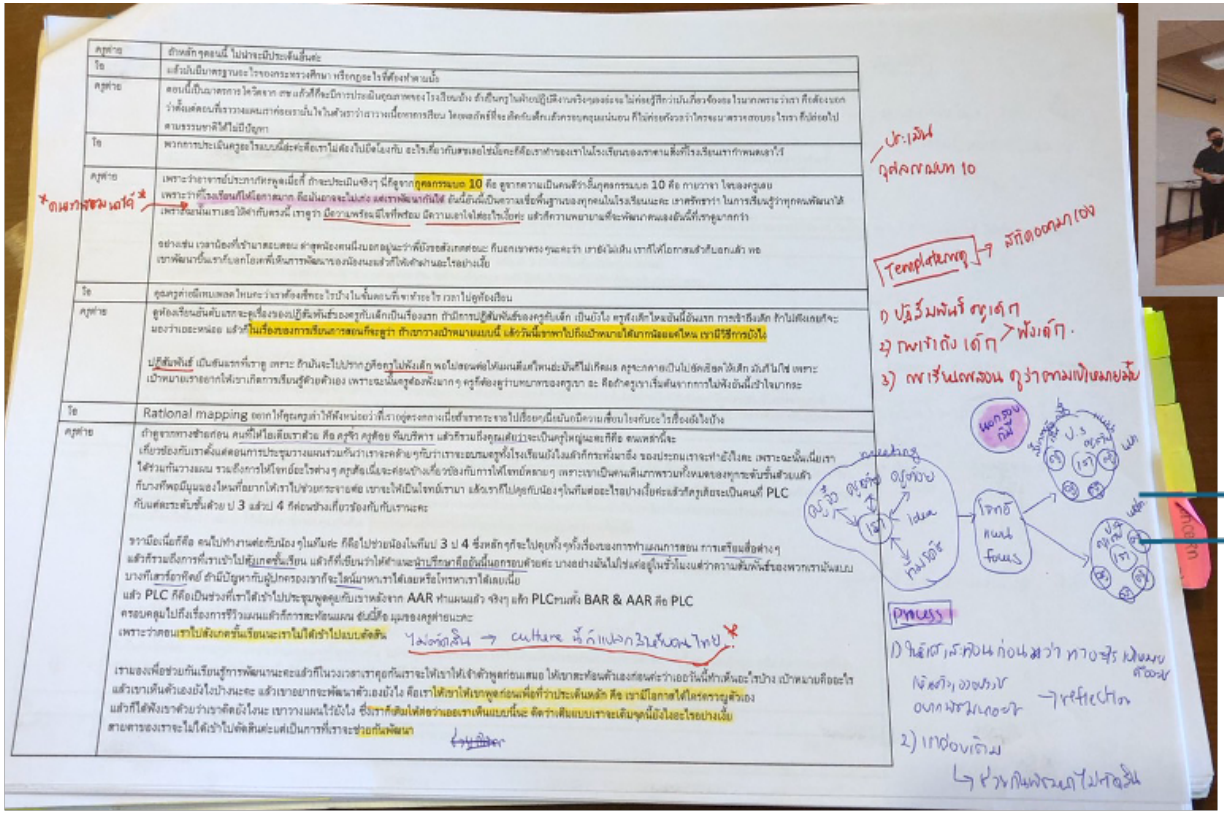
- Thank you
- Ask them if they are happy to be contacted again in future, if necessary.

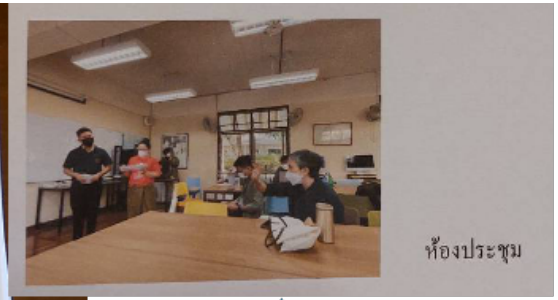
Appendix B: Example of photomontage

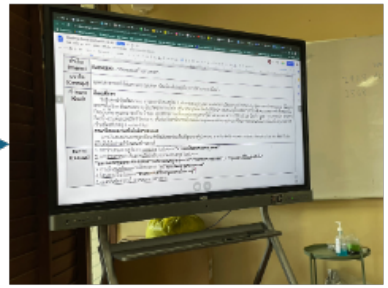
From relational maps

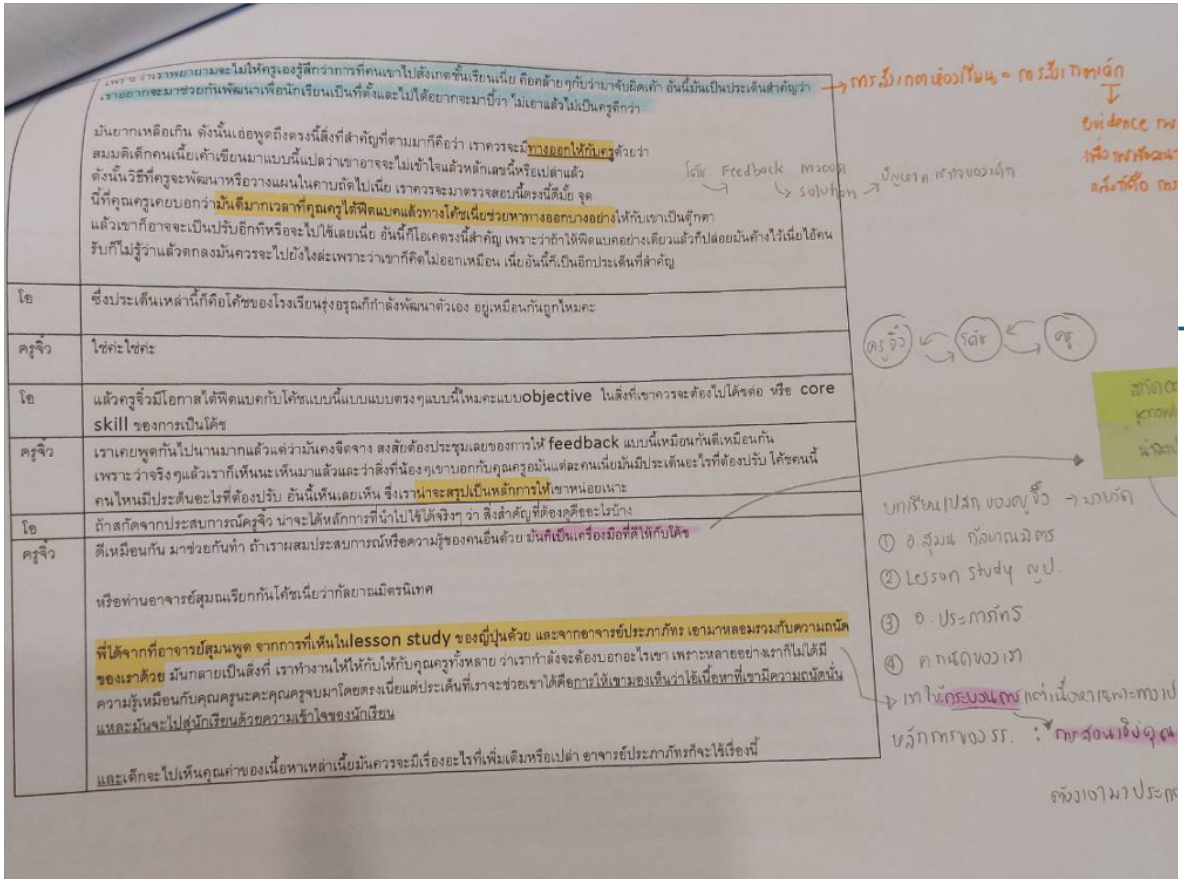


From transcripts and photos

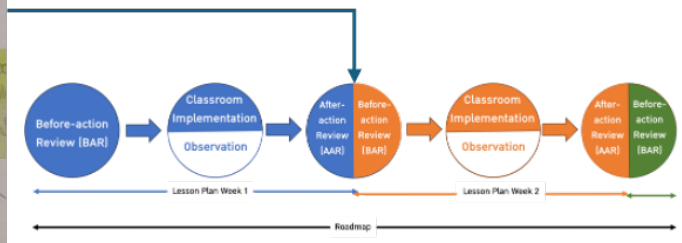


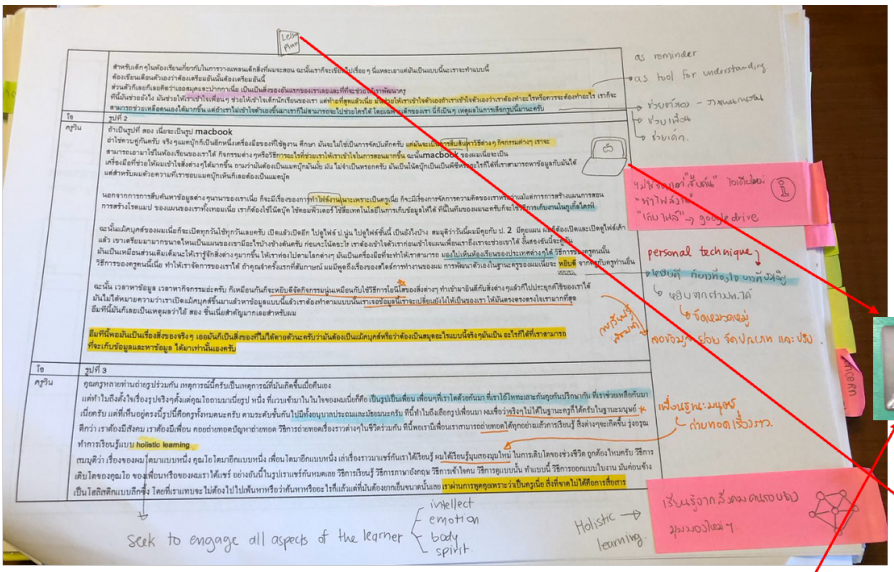


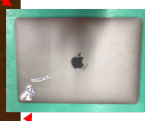




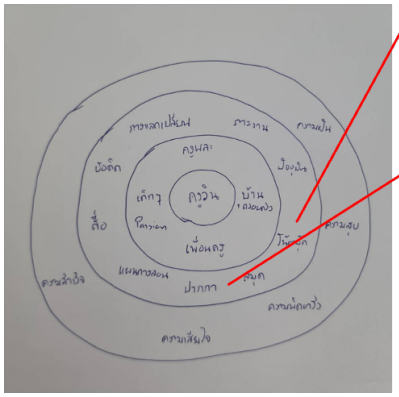
โอ	ซึ่งประเด็นเหล่านี้ก็คือโค้ชของโรงเรียนรุ่งอรุณก็กำลังพัฒนาตัวเอง อยู่เหมือนกันถูกไหมคะ
ครูจิ๋ว	ใช่ค่ะใช่ค่ะ
โอ	แล้วครูจิ๋วมีโอกาสได้ฟีดแบคกับโค้ชแบบนี้แบบแบบตรงๆแบบนี้ไหมคะแบบobjective ในสิ่งที่เขาควรจะต้องไปโค้ชต่อ หรือ core skill ของการเป็นโค้ช
ครูจิ๋ว	เราเคยพูดกันไปนานมากแล้วแต่ว่ามันคงจืดจาง สงสัยต้องประชุมเลยของการให้ feedback แบบนี้เหมือนกันดีเหมือนกัน เพราะว่าจริงๆแล้วเราก็เห็นนะเห็นมาแล้วและว่าสิ่งที่น้องๆเขาบอกกับคุณครูอ่ะแต่ละคนเนี่ยมันมีประเด็นอะไรที่ต้องปรับ โค้ชคนนี้คนไหนมีประเด็นอะไรที่ต้องปรับ อันนี้เห็นเลยเห็น ซึ่งเราน่าจะสรุปเป็นหลักการให้เขาหน่อยเนาะ
โอ	ถ้าสกัดจากประสบการณ์ครูจิ๋ว น่าจะได้หลักการที่นำไปใช้ได้จริงๆ ว่า สิ่งสำคัญที่ต้องดูดีอะไรบ้าง
ครูจิ๋ว	ดีเหมือนกัน มาช่วยกันทำ ถ้าเราผสมประสบการณ์หรือความรู้ของคนอื่นด้วย มันก็เป็นเครื่องมือที่ดีให้กับโค้ช หรือท่านอาจารย์สุมณเรียกกันโค้ชเนี่ยว่ากัลยาณมิตรนิเทศ พี่ได้จากที่อาจารย์สุมนพูด จากการที่เห็นในlesson study ของญี่ปุ่นด้วย และจากอาจารย์ประภาภัทร เอามาหลอมรวมกับความถนัดของเราด้วย มันกลายเป็นสิ่งที่ เราทำงานให้ให้กับให้กับคุณครูทั้งหลาย ว่าเราทำดังจะต้องบอกอะไรเขา เพราะหลายอย่างเราก็ไม่ได้มีความรู้เหมือนกับคุณครูนะคะคุณครูจบมาโดยตรงเนี่ยแต่ประเด็นที่เราจะช่วยเขาได้คือการให้เขามองเห็นว่าไอ้เนื้อหาที่เรามีความถนัดนั่นแหละมันจะไปสู่นักเรียนด้วยความเข้าใจของนักเรียน และเด็กจะไปเห็นคุณค่าของเนื้อหาเหล่านี้ยมันควรจะมีเรื่องอะไรที่เพิ่มเติมหรือเปล่า อาจารย์ประภาภัทรก็จะได้เรื่องนี้




as tool for understanding
personal technique
Seek to engage all aspects of the learner
intellect
emotion
body
spirit
Holistic learning






ครูวิน
เพื่อนครู
บ้าน
ปากกา

Appendix C: Information sheet

Version date: January 2019 **[ESSENTIAL: Ensure the information sheet is dated and has a version number]**
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Participant Information Sheet

1. **Research Project Title**
   Exploring In-service School-based Teacher Professional Learning Practices in Thailand through the lenses of Actor-Network Theory and Cultural Historical Activity Theory

2. **Background, aims of project**
   We would like to invite you to take part in an ethnographic study about professional development practice. This study will investigate school-based professional learning practice in terms of how professional knowledge can be shared among co-teaching teams amid the Covid-19 situation that technological tools and materials become more integrated in the practice. This project will use sociomaterial perspectives, particularly Actor-Network Theory (ANT) for the practice's process and Cultural Historical Activity Theory (CHAT) for practice's background and outcome.

3. **Why have I been invited to take part?**
   You have been invited because your school has been implemented school-based professional learning practice that recognise the use of technology and materials as part of the practice. Evidently, your school practice is an asset for Thai schools which aims to strengthen their school-based professionalism. Lessons Learned from your perspectives will be a valuable contribution to other schools, including school districts to initiate concrete supports for their school teachers' professional development.

4. **Do I have to take part?**
   If you do decide to take part, you can withdraw your participation at any time without needing to explain and without penalty by advising the researcher of this decision. If you withdraw we will not collect any more data from you. However, any data collected up until the point that you withdraw will be kept and used in the data analysis.

5. **What will happen if I take part?**
   For participants from the pilot project, you will join one session of interview during May-June 2022. The session should take approximately 1.5 hours. Another 1-hour session is in December 2022. Before an interview, you will receive a guideline of interview question. You may prepare some of your documents relating to teaching (such as lesson plan, sample of student works) that you would like to share during the interview. Alternatively, you may send it to us by email after the session. There will be an interview of professional learning practice of your school and your feedback toward the interview questions.

1

For participants from the main project, you will need to complete 2 phases of interviews, which is in the beginning of the 1st semester and the end of the 1st semester, the 2022 academic year. Each time should take approximately 1 hour. While interviewing, you may also refer to your teaching materials or any documents you would like to share. Alternatively, you may send it to us by email. There will be an interview of professional learning practice of your school.

An interview setting, it will be held one-on-one through the online platform via Microsoft Teams or any applications you are familiar. So you will need digital devices to access to an application. To schedule an interview, there will be a timetable for you to select available time.

6. **Are there any potential risks in taking part?**
   There are no foreseeable risks in taking part.

7. **Are there any benefits in taking part?**
   There will be no payment for taking part in this project.

8. **What will happen to any samples I give?**
   We will use your samples or evidence of works as references supporting data analysis and interpretation. Your sample or evidence of works will be shown pseudonymously and will be translated into English, if they are part of an analysis.

9. **ESSENTIAL IF COLLECTING PERSONAL INFORMATION: Legal basis for processing personal data**
   There will be no personal information collection for this research.

10. **What happens to the data I provide?**
    The research data (such as interview recordings and teaching materials) will be kept anonymously to information sheets for minimum 10 years. Data will be securely stored in the University OneDrive account. The data may be used for further analysis. To do so, we will ask all participants for their permission to use direct quotes.

11. **Recorded media**
    Participant's permission must be obtained to record their activities on audio or video media. Due to a nature of practice, a professional learning practice session is usually recorded either digitally or paper-based as the protocol of school operation. We may ask to access those meeting records as another source of data for further analysis. Records will not be directly used or released as part of a publication.

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12. Future uses of the data

Due to the nature of this research, it is very likely that other researchers may find the data to be useful in answering other research questions. We will ask for your explicit consent for your data to be shared in this way and, if you agree, we will ensure that the data collected is untraceable back to you before letting others use it.

13. Will the research be published?

Data collected in both pilot and main projects can potentially be used in the authoring and publication of research articles that will be targeted to an academic audience in recognised, high quality peer reviewed journals. The research may be published in education journals or publicly accessible through our online open access repository STORRE. You will not be identifiable in any report/publication.

14. Who has reviewed this research project?

The ethical approaches of this project have been approved via General University Ethics Panel, the University of Stirling.

15. ESSENTIAL IF COLLECTING PERSONAL INFORMATION: Your rights

You have the right to request to see a copy of the information we hold about you and to request corrections or deletions of the information that is no longer required.
You have the right to withdraw from this project at any time without giving reasons and without consequences to you. You also have the right to object to us processing relevant personal data however, please note that once the data are being analysed and/or results published it may not be possible to remove your data from the study.

16. Who do I contact if I have concerns about this study or I wish to complain?

If you would like to discuss the research with someone, you can reach me at phusima.pinyosinwat@stir.ac.uk. In case of complaint, you can contact Dr.Gary Husband by gary.husband@stir.ac.uk.

You will be given a copy of this information sheet to keep.

Thank you for your participation.

Appendix D: Example of the consent form (English-Thai)

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Electronic Consent Form for studies

where no personal data are collected

We recommend you use this electronic consent form if you do not require any personal identifying information. You must provide participants with a copy of the information sheet and a unique identifying number to allow them to withdraw data should they wish to.

Research Project Title: *Exploring In-service School-based Teacher Professional Learning Practices in Thailand through the lenses of Actor-Network Theory*

[GUEP]/ [NICR] Approval Number [4406]

	Please tick box
I confirm that I have read and understood the information sheet explaining the research project and I have had the opportunity to ask questions about the project.	
I understand that my participation is voluntary and that I am free to withdraw at any time during the study without giving a reason, and without any penalty. I understand that if I withdraw no more data will be collected from me. However, any data collected up until the point that I withdraw may be kept and used in the data analysis.	
I understand that my responses will be kept anonymous and I give permission for members of the research team to have access to my anonymised responses.	
I agree for research data collected in the study to be made available to researchers, including those working outside the EU to be used in other research studies. I understand that any data that leave the research group will be fully anonymised so that I cannot be identified.	
I agree to take part in this study	

Name of Participant **Signature:**

Date: Click here to enter a date

Name of Researcher **Signature:**

Date: Click here to enter a date

แบบฟอร์มยินยอมทางอิเล็กทรอนิกส์สำหรับการวิจัย

ไม่มีการเก็บข้อมูลส่วนบุคคล

หัวข้อการวิจัย: การศึกษาแนวปฏิบัติการพัฒนาวิชาชีพครูประจำการโดยใช้โรงเรียนเป็นฐานในประเทศไทย ผ่านมุมมองของทฤษฎีเครือข่าย-ผู้กระทำ (Actor Network Theory)

ข้อมูลติดต่อนักวิจัย
นางสาวภูษิมา ภิญโญสินวัฒน์
นักศึกษาระดับปริญญาเอก (PhD. Candidate)
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ดร.แกรรี่ ฮาสเบิร์น
Joint Subject Group Lead for Education,
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Visiting Professor of Education,
University of Sunderland
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โปรดอ่านทำความเข้าใจข้อตกลง ก่อนทำเครื่องหมายในช่อง	
ฉันยืนยันว่า ฉันได้อ่านและเข้าใจข้อมูลในเอกสารเกี่ยวกับข้อมูลการเข้าร่วมการวิจัยที่อธิบายเกี่ยวกับรายละเอียดงานวิจัยและฉันมีโอกาสได้สอบถามเกี่ยวกับงานวิจัยนี้แล้ว	✓
ฉันเข้าใจว่า การเข้าร่วมงานวิจัยนี้ เข้าร่วมได้ตามความสมัครใจและสามารถจะปฏิเสธการเข้าร่วมได้ตลอดเวลาระหว่างกระบวนการวิจัย โดยไม่ต้องบอกเกตุผล และไม่มีบทลงโทษใดๆ ฉันเข้าใจว่า หากฉันเลิกการเข้าร่วมงานวิจัย ฉันไม่ต้องให้ข้อมูลใดๆอีก อย่างไรก็ตามข้อมูลที่เก็บไว้ก่อนหน้านี้จะถูกบันทึกและนำไปในการวิเคราะห์ต่อไป	✓
ฉันเข้าใจว่า ความเห็นและคำตอบของฉันจะถูกเก็บไว้โดยไม่เปิดเผยตัวตน และ ฉันยินยอมกับคณะผู้วิจัยในการเข้าถึงความเห็นและคำตอบที่ไม่เปิดเผยตัวตนของฉันได้	✓
ฉันยินยอมให้นำข้อมูลการวิจัยที่เก็บรวบรวมในการศึกษานี้เผยแพร่ต่อนักวิจัย รวมถึงนักเรียนที่อยู่นอกสหภาพยุโรปเพื่อใช้ในการศึกษาวิจัยอื่นๆ ฉันเข้าใจว่าข้อมูลใดๆ สำหรับกลุ่มนักวิจัยจะถูกปกปิดโดยสมบูรณ์ เพื่อไม่ให้ระบุตัวตนของฉันได้	✓
ฉันตกลงที่จะเข้าร่วมงานวิจัยนี้	✓

นาย[redacted]	3/6/65	[redacted]
ชื่อ สกุล ผู้เข้าร่วม	วันเดือนปี	ลายเซ็นต์
ภูษิมา ภิญโญสินวัฒน์	3/6/22	
ชื่อ สกุล ผู้วิจัย	วันเดือนปี	ลายเซ็นต์

สำเนาฉบับหนึ่งให้กับผู้เข้าร่วมและอีกฉบับให้กับผู้วิจัย

งานวิจัยนี้ได้รับการอนุมัติจากคณะกรรมการจริยธรรมของมหาวิทยาลัยสเตอริ่งเป็นที่เรียบร้อยแล้ว