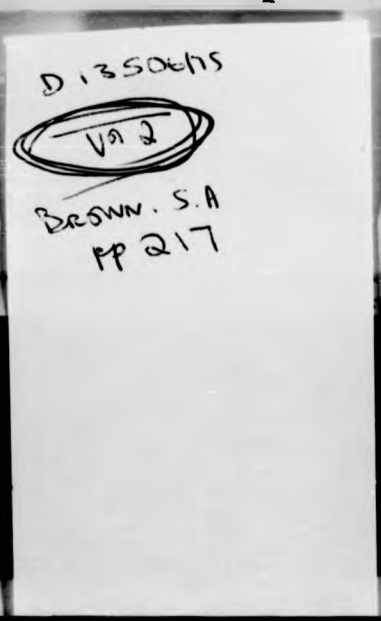

AFFECTIVE OBJECTIVES
IN
AN INTEGRATED SCIENCE CURRICULUM
(APPENDICES)

SARA A BROWN

Thesis submitted in fulfillment
of the
requirements for the degree
of
Doctor of Philosophy
of the
University of Stirling

Department of Education
April 1975

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APPENDIX A

Tests, Questionnaires, Instructions,
List of Schools, Lists of Items *etc.*

APPENDIX A - 1A

INSTRUCTIONS FOR ITEM JUDGEMENT - FEBRUARY 1971

To all 'item' judges

The 'items' in these envelopes are being used in the construction of an attitude scale for SI and SII pupils. Some 'items' were collected from discussions with SI and SII pupils; the remainder were constructed using vocabulary that was used in these discussions. We would be grateful if you would agree to judge the attitude that is indicated by each 'item'.

Procedure for 'item' judgement

Please deal with the contents of one envelope at a time and return them to that envelope before starting on the next one. In each envelope you will find two large cards. On each card there is a position statement corresponding to a particular attitude. One card is marked "A" and one "B". You will also find several small numbered cards. Each of these has on it an 'item'. Please read the 'item' carefully and make your decision as to whether it indicates an attitude corresponding to:

i)	the "A" position statement	(A)
ii)	the "B" position statement	(B)
iii)	neither "A" nor "B" position statements	(X)
iv)	both "A" and "B" position statements	(AB)

DO NOT WRITE ON THE CARDS. Enclosed in the envelope is a sheet with the 'item' numbers. Please put your name at the top and indicate on the appropriate line your decision for each 'item'.

For example:

Item No.	Attitude indicated (A, B, AB, or X)	This represents decisions that:
1	A	item 1 represents an "A" position
2	AB	item 2 represents both "A" and "B"
3	X	item 3 represents neither "A" nor "B"
4	X	item 4 represents neither "A" nor "B"
5	B	item 5 represents a "B" position

If you have a comment on a particular item (e.g. ambiguity, inappropriate vocabulary) please insert it in the right hand column.

Thank you for your help.

APPENDIX A

TABLE 2A

'ATTITUDE TO SCIENCE' SCALE-SCORING PROCEDURE

(Developed for comparison of group mean scores of S1 and S2 pupils on scales corresponding to five attitude objectives laid down for this age-group in Curriculum Paper 7, 1969, HMSO Edinburgh)

There are five subscales corresponding to each of the attitude objectives laid down in Curriculum Paper Seven. Each subscale consists of five 'positive' and five 'negative' items. The pupil's score on each subscale is simply the difference between his 'positive' and 'negative' totals. The following key indicates the item numbers corresponding to each subscale:

Subscale	'Positive' item numbers	'Negative item numbers
1. 'inter-relationship of different science disciplines'	19, 22, 27, 32, 50, 59	2, 8, 17, 25, 54, 55
2. 'relationship of science to other school disciplines'	3, 5, 7, 12, 23, 53	9, 15, 37, 42, 43, 60
3. 'Social & economic implication of science for community'	20, 38, 49, 51, 56, 58	11, 14, 21, 26, 44, 45
4. 'interest and enjoyment'	4, 30, 33, 36, 47, 57	18, 24, 31, 35, 39, 41
5. 'objectivity'	1, 16, 28, 34, 46, 48	6, 10, 13, 29, 40, 52

APPENDIX A - 3A

ATTITUDES TO SCIENCE QUESTIONNAIRE

This is not a test. Your teachers will not see these papers. We just want to know how you feel about SCIENCE. There are no right or wrong answers.

The questionnaire contains a large number of statements. We want to know whether you agree with them or not. On this page there are some practice statements. Place this booklet slightly over your answer sheet so that the spaces for the answers are exactly opposite the statements. You will see there is a number 4 in the answer box opposite statement A. The answer 'Agree' has been chosen here.

If your answer was 'Agree' you would also write a 4.
If you felt more strongly than that you would write 5 for 'Strongly Agree'.
If you disagreed you would write 2 or 1 for 'Disagree' or 'Strongly Disagree'.
If you did not know how you felt or if you were undecided you would write 3 for 'Don't know'.

Now try the other practice statements yourself:

PLEASE DO NOT WRITE ON THIS PAPER

A. Mathematics is an interesting subject.	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
B. Girls do not need to learn mathematics.	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
C. Many people find mathematics difficult.	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
D. Mathematics is no use to me at home.	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

In the booklet you will find 60 statements. Read each statement carefully, decide which answer best describes how you feel about the statement and put the number of the answer in the correct box. Please choose only one answer for each statement. Rub out or cross out clearly any answer you wish to change.

WORK AS QUICKLY AS YOU CAN. DO NOT MISS OUT ANY OF THE STATEMENTS.

APPENDIX A - 3A

PLEASE DO NOT WRITE ON THIS PAPER

1. "Scientists should criticize each others' work".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
2. "Chemical reactions are of interest only to those who learn chemistry".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
3. "A knowledge of acids and alkalis is useful in cooking".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
4. "I would enjoy doing scientific work when I leave school".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
5. "Mathematics is a great help to science".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
6. "If the teacher and I do the same experiment but get different results, the teacher's result is the right one".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
7. "Science is very useful to several of my other school subjects".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
8. "Biologists studying plants and animals do not need to know anything about electricity".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
9. "Science is of no use to anyone who is going to be a physical education teacher".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
10. "If a famous scientist and an unknown scientist disagree we accept the opinion of the famous scientist".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree

APPENDIX A - 3A

PLEASE DO NOT WRITE ON THIS PAPER

1. "Scientists should criticize each others' work".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
2. "Chemical reactions are of interest only to those who learn chemistry".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
3. "A knowledge of acids and alkalis is useful in cooking".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
4. "I would enjoy doing scientific work when I leave school".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
5. "Mathematics is a great help to science".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
6. "If the teacher and I do the same experiment but get different results, the teacher's result is the right one".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
7. "Science is very useful to several of my other school subjects".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
8. "Biologists studying plants and animals do not need to know anything about electricity".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
9. "Science is of no use to anyone who is going to be a physical education teacher".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree
10. "If a famous scientist and an unknown scientist disagree we accept the opinion of the famous scientist".	5	Strongly Agree
	4	Agree
	3	Don't know
	2	Disagree
	1	Strongly Disagree

APPENDIX A - 3A

PLEASE DO NOT WRITE ON THIS PAPER

11. "Scientists do nothing for me".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
12. "Geography provides examples of things we learn about in science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
13. "Science teachers know the scientific truths".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
14. "Only people who are going to do scientific work should have to learn science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
15. "Science does not help someone to learn geography".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
16. "A good scientific theory does not supply the final answer to scientific questions".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
17. "Biologists, chemists and physicists work in quite different ways from each other".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
18. "Science is only for brainy folk".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
19. "If you were interested in studying animals' eyes you would need to know some physics".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
20. "Everyone can help to prevent science endangering our lives".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree

APPENDIX A - 3A
PLEASE DO NOT WRITE ON THIS PAPER

21. "Space research is no use to ordinary people".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
22. "Energy is important to the study of biology and chemistry as well as physics".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
23. "Science would be very difficult if we had no mathematics".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
24. "I am not interested in science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
25. "There are very clear boundaries separating physics, chemistry and biology".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
26. "Science is so difficult that only highly trained scientists can understand it".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
27. "To study pond life you have to work like a physicist, chemist and biologist all combined".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
28. "Experiments which give answers that disagree with what the teacher expects are useful".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
29. "If a good scientist says that a theory is true all other scientists will believe him".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
30. "I enjoy science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree

PLEASE DO NOT WRITE ON THIS PAPER

31. "I would not like to be a scientist".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
32. "To understand the human body a biologist must know a lot of chemistry".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
33. "I would rather be a famous scientist than the Prime Minister".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
34. "Lots of information we get from science now will be changed in the future".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
35. "Scientists are boring people".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
36. "I wish we had more science in school".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
37. "Science does not help you to learn anything about music".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
38. "Science needs the understanding and support of ordinary people".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
39. "Science is boring for me".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
40. "Scientific theories supply the true answers to scientific questions".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree

PLEASE DO NOT WRITE ON THIS PAPER

41. "I hate science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
42. "Science lessons are no use to an athlete".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
43. "Science does not help us to understand weather and climate that we learn about in Geography".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
44. "Science does not affect my daily life at home".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
45. "Science should be left to those who are scientists or who are going to be scientists".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
46. "Science teaches us not to believe everything we are told".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
47. "Scientists are very interesting people".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
48. "A useful scientific theory may not be entirely correct".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
49. "New discoveries in science are important to everyone".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree
50. "Physics, chemistry and biology are all part of the same subject".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagree

PLEASE DO NOT WRITE ON THIS PAPER

51. "I make use of science every day".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
52. "Good scientists know the true laws of science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
53. "People who plan school dinners need to know a lot of science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
54. "Biology, chemistry and physics are all called science but are not connected in any other way".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
55. "Chemistry is no help to physics".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
56. "Science can help man to live more comfortably".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
57. "Science is one of my favourite subjects".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
58. "Everyone in the modern world needs to learn science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
59. "Chemical energy is important to physics".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre
60. "An artist has no need to learn science".	5 Strongly Agree 4 Agree 3 Don't know 2 Disagree 1 Strongly Disagre

APPENDIX A - 4A

INSTRUCTIONS FOR ADMINISTRATION OF THE ATTITUDE TO SCIENCE QUESTIONNAIRE

Please read through the instructions for administration and the questionnaire itself before it is given to the pupils so that you are familiar with the procedure and method of recording answers.

Preliminaries

The formal instructions should be prefaced by a few introductory remarks. These should aim:

a) to set the pupils at ease as far as possible,
b) to impress on them that this is not a test and there are no right or wrong answers,
c) to emphasise that it is their opinions that are wanted and not those of their teacher or best friend,
d) to assure them that their teachers will not see their answers.

No set rules can be laid down for this since the explanation will depend on the particular circumstances in which the questionnaire is given. Instructions should be given at a speed which suits the slowest members of the group. Minor changes to the wording are unimportant.

Materials needed

The tester should have:

1. a copy of these instructions,
2. an envelope containing the appropriate number of "Attitude to Science Questionnaires",
3. an envelope containing answer sheets,
4. a supply of spare pencils and erasers.

Supervision

One administrator can give the instructions and supervise up to about 30 pupils. For each additional 30 pupils an assistant supervisor should be available. The questionnaire may be completed in a classroom or suitable hall. A formal, rigid examination atmosphere is not desirable. However, a minimum of noise and distractions should be aimed for. Supervisors should walk round to see that answer sheets are being filled in correctly and that pupils are not copying each other's answers, but they should make no effort to see what answers the pupils are giving.

APPENDIX A - 4A

Timing

There is no time limit for this questionnaire. Thirty-five minutes should be enough time for all the pupils to answer the questionnaire. Many will finish in less time and should be encouraged to read a book while the others finish. Any pupil who is exceptionally slow should be encouraged to continue until he has finished, if this is at all possible administratively.

Procedure

Give out one copy of the questionnaire and one answer sheet to each pupil. Make sure each pupil has a sharpened pencil. Say:

"PLEASE LOOK AT YOUR ANSWER SHEET" (indicate answer sheet) "FILL IN THE NAME OF THE SCHOOL, YOUR NAME, AND YOUR DATE OF BIRTH. TODAY'S DATE IS ..... GIRLS, PUT A TICK IN THE BOX OPPOSITE THE WORD 'GIRL', BOYS, TICK THE BOX OPPOSITE 'BOY'. Pause. Circulate among the pupils to see that they are following the directions. Make sure their names are clearly written. Give help where necessary. When everyone has finished say:

"NOW LOOK AT YOUR QUESTIONNAIRE" (indicate questionnaire) "DO NOT WRITE ANYTHING ON THIS QUESTIONNAIRE, I WILL READ THE DIRECTIONS WITH YOU BEFORE YOU START. THIS IS NOT A TEST. YOUR TEACHERS WILL NOT SEE THESE PAPERS. WE JUST WANT TO KNOW HOW YOU FEEL ABOUT SCIENCE. THERE ARE NO RIGHT OR WRONG ANSWERS.

THE QUESTIONNAIRE CONTAINS A LARGE NUMBER OF STATEMENTS. WE WANT TO KNOW WHETHER YOU AGREE WITH THEM OR NOT. ON THIS PAGE THERE ARE SOME PRACTICE STATEMENTS. PLACE THIS BOOKLET SLIGHTLY OVER YOUR ANSWER SHEET SO THAT THE SPACES FOR THE ANSWERS ARE EXACTLY OPPOSITE THE STATEMENTS". (Demonstrate). "YOU WILL SEE THERE IS A NUMBER 4 IN THE ANSWER BOX OPPOSITE STATEMENT A. THE ANSWER "AGREE" HAS BEEN CHOSEN HERE."

IF YOUR ANSWER WAS "AGREE" YOU WOULD ALSO WRITE A 4.
IF YOU FELT MORE STRONGLY THAN THAT YOU WOULD WRITE 5 FOR "STRONGLY AGREE".
IF YOU DISAGREED YOU WOULD WRITE 2 OR 1 FOR "DISAGREE" OR "STRONGLY DISAGREE".
IF YOU DID NOT KNOW HO YOU FELT OR IF YOU WERE UNDECIDED YOU WOULD WRITE 3 FOR "DON'T KNOW".

NOW TRY THE OTHER PRACTICE STATEMENTS YOURSELF":

APPENDIX A - 4A

Go round to see that all questionnaires and answer sheets are correctly placed, rearrange where necessary. If you find a pupil writing a word instead of a number, say aloud to the whole group "DON'T WRITE THE WORD. WRITE THE NUMBER THAT'S PRINTED BESIDE IT". Give help where necessary. Make sure the quicker pupils do not turn over to the next page at this stage. When all have finished the practice statements continue reading the directions:

"DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO. IN THE BOOKLET YOU WILL FIND 60 STATEMENTS. READ EACH STATEMENT CAREFULLY, DECIDE WHICH ANSWER BEST DESCRIBES HOW YOU FEEL ABOUT THE STATEMENT AND PUT THE NUMBER OF THE ANSWER IN THE CORRECT BOX. PLEASE CHOOSE ONLY ONE ANSWER FOR EACH STATEMENT. RUB OUT OR CROSS OUT CLEARLY ANY ANSWER YOU WISH TO CHANGE.
WORK AS QUICKLY AS YOU CAN. DO NOT MISS OUT ANY OF THE STATEMENTS".
"ARE THERE ANY QUESTIONS? IF YOU ARE NOT CLEAR ABOUT ANYTHING ASK NOW".
(Pause) "ALL READY? YOU SHOULD WORK THROUGH ALL THE STATEMENTS, DO NOT MISS ANY OUT. PLACE EACH PAGE OVER THE ANSWER SHEET SO THAT THE STATEMENTS AND ANSWER SPACES ARE OPPOSITE EACH OTHER AS FOR THE PRACTICE STATEMENTS. WHEN YOU HAVE FINISHED PUT YOUR PENCIL DOWN. BEGIN NOW".

After a pause go round to see that all pupils have started and are entering their answers correctly. Make further rounds every three or four minutes. Be sure pupils are not copying from their neighbours.

Give help on procedure where necessary. If a pupil does not know the meaning of a word such as 'theory' or 'physicist' do not tell him the meaning; the appropriate response is probably 'Don't know'. Tell the pupil not to worry if he doesn't understand a statement, several statements are likely to be unfamiliar to children of late primary or early secondary school age.

As pupils finish and put down their pencils go to them and say:

"CHECK THROUGH TO SEE THAT YOU HAVEN'T MISSED ANY STATEMENTS OUT, THEN READ A BOOK UNTIL THE OTHERS HAVE FINISHED".

APPENDIX A - 4A

Pupils should be discouraged from going over their papers and changing their original responses. When all pupils have finished say:

"RIGHT, PASS YOUR ANSWER SHEETS DOWN TO THE FRONT ROW. _____ _____(Insert name of responsible pupil). PLEASE COLLECT ALL THE SHEETS FROM THE FRONT ROW AND PUT THEM IN THIS ENVELOPE."

Make sure that the full quota is collected. Seal the envelope in front of the pupils.

COLLECT ALL UNMARKED QUESTIONNAIRES

Please return ANSWER SHEETS immediately in the envelope provided and questionnaires at your convenience.

APPENDIX A

TABLE 5A

NAME OF SCHOOL _____

TOWN _____

To all Science Departments in Scottish Secondary Schools.

The Scottish Education Department is planning a study comparing integrated and non-integrated science courses in SI and SII. For this purpose we need to know what types of science courses will be offered in Scottish Secondary Schools in Years I and II in 1971-73. In addition some information on the organization of the classes is needed. We would be grateful if all the Principal Teachers of Science subjects in your school would jointly supply the information requested on the form below.

Please complete Table I. If all your pupils will follow the same course fill in two boxes only. If more than one form of course will be offered fill in as many boxes as are appropriate.

Example Suppose you estimate a total of 100 pupils in SI 1971-72 and 100 pupils in SII 1972-73. If you expect to teach a fully integrated science course, with each class taught exclusively by one teacher, for two full years you should insert the number 100 in each of the boxes in row 1. If, however, after a first year of integrated science, 50 will follow integrated science in the second year while 50 will change to Physics, Chemistry and Biology taught as separate subjects, you should insert 100 in the left hand box of row 1, 50 in the right hand box of row 1 and 50 in the right hand box of row 3.

Table I

COURSE TYPE	Estimate of Number of Pupils entering SI Sept 1971	Estimate of Number of Pupils entering SII Sept 1972
1. Integrated Science (A) Each class follows science in integrated form, taught by one teacher.		
2. Integrated Science (B) Each class follows Science in integrated form, under more than one teacher. Each teacher responsible for part of the course only.		
3. Physics, Chemistry, Biology Taught as three separate subjects.		
4. Physics/Chemistry - Biology Physics and Chemistry taught as a combined subject. Biology taught as a separate subject.		
5. Physics/Chemistry No Biology taught at this stage.		
6. Other type (Please specify)		

APPENDIX A - 5A

In the Table II please insert the number of periods you expect to be allocated to Science in your school for SI and SII in 1971-73

TABLE II

	SI 1971-72	SII 1972-73
1. Integrated Science		
2. Physics/Chemistry as combined subject		
3. Physics		
4. Chemistry		
5. Biology		

6. Other (please specify)

What is the average length of a period in your school? _____ minutes

Please indicate, by a tick in the appropriate box in Table III, the type of pupils in the SI intake in your school in September 1971.

Table III

	Unselected	Selected Certificate	Selected Non-certificate
SI intake 1971			

Please indicate, by ticks in the appropriate boxes in Table IV, the form of ability grouping you expect to use in your science classes in SI 1971-72 and in SII 1972-73.

Table IV	Mixed Ability (all pupils)	Mixed Ability (excluding remedial)	Broad ability banding	Streamed Classes
SI intake 1971				
SII intake 1972				

Any other information about your SI and SII science classes or courses that you consider relevant to this enquiry should be included in a separate page.

Thank you. Please return the form in the enclosed reply-paid envelope by 26th February.

APPENDIX A - 6A

AH4

AH 4
QUESTION BOOK
(1968 REVISION

INSTRUCTIONS

Below are some examples of the test. Do them now.
Write your answers on the answer sheet. Write the number, not the word.
Some of the examples are already done for you.

DO NOT WRITE ANYTHING ON THIS PAPER

PART 1. EXAMPLES

Q 1	1, 2, 3, 4, 5, 6, 7, 8, 9. Write down the largest of these figures.	Q 1
Q 2	1, 2, 3, 4, 5, 6, 7, 8, 9. Write down the middle one of these figures.	Q 2
Q 3	*Late* means the opposite of... 1 appointment, 2 early, 3 behind, 4 postponed, 5 immediate.	Q 3
Q 4	*Big* means the opposite of... 1 tall, 2 large, 3 place, 4 small, 5 high.	Q 4
Q 5	1, 4, 7, 10, 13... What number comes next?	Q 5
Q 6	2, 4, 8, 16, 32... What number comes next?	Q 6
Q 7	*Fish* is to *swim* as *bird* is to... 1 man, 2 fly, 3 walk, 4 aeroplane, 5 sparrow.	Q 7
Q 8	*Low* is to *high* as *bad* is to... 1 evil, 2 red, 3 try, 4 good, 5 right.	Q 8
Q 9	Here are three figures: 325. Add the largest two figures together and divide the total by the smallest figure.	Q 9
Q 10	Here are three figures: 594. Subtract the smallest figure from the biggest and multiply the result by the figure printed immediately before the biggest figure.	Q 10
Q 11	*Young* means the same as... 1 youthful, 2 ancient, 3 vigorous, 4 hot, 5 baby.	Q 11
Q 12	*Gift* means the same as... 1 parcel, 2 toy, 3 birthday, 4 buy, 5 present.	Q 12

If there is anything you do not understand, please ask the tester *now*.

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

APPENDIX A - 6A

DO NOT WRITE ANYTHING ON THIS PAPER

Q 1	1, 2, 3, 4, 5, 6, 7, 8, 9. Multiply the middle one of these figures by 2.	Q 1
Q 2	*Easy* means the opposite of... [1] problem, [2] simple, [3] difficult, [4] always, [5] cannot.	Q 2
Q 3	15, 35, 55, 75, 95... What number comes next?	Q 3
Q 4	*Seed* is to *plant* as *egg* is to... [1] tree, [2] bird, [3] pollen, [4] oats, [5] potato.	Q 4
Q 5	Here are three figures: 234. Divide the biggest figure by the smallest and add the result to the figure printed immediately after the smallest figure.	Q 5
Q 6	*Rich* means the same as... [1] poor, [2] wealthy, [3] high, [4] new, [5] lucky.	Q 6
Q 7	1, 2, 3, 4, 5, 6, 7, 8, 9. Write down the fourth figure to the left of 7.	Q 7
Q 8	*Right* means the opposite of... [1] action, [2] good, [3] careless, [4] wrong, [5] motive.	Q 8
Q 9	1, 2, 4, 8, 16... What number comes next?	Q 9
Q 10	*Foot* is to *leg* as *hand* is to... [1] body, [2] finger, [3] tall, [4] limb, [5] arm.	Q 10
Q 11	Here are three figures: 327. Subtract the smallest figure from the biggest and multiply the result by the figure printed immediately before the biggest figure.	Q 11
Q 12	*Old* means the same as... [1] decaying, [2] tired, [3] aged, [4] youth, [5] mended.	Q 12
Q 13	1, 2, 3, 4, 5, 6, 7, 8, 9. Add the first five figures together and subtract them from the sum of the last four.	Q 13
Q 14	*Lost* means the opposite of... [1] winning, [2] draw, [3] found, [4] alone, [5] mislaid.	Q 14
Q 15	3, 3, 7, 7, 11... What number comes next?	Q 15

GO ON TO THE NEXT PAGE

APPENDIX A - 6A

DO NOT WRITE ANYTHING ON THIS PAPER

Q 16	*Army* is to *navy* as *soldier* is to... [1] airman, [2] sea, [3] service, [4] sailor, [5] uniform.	Q 16
Q 17	Here are three figures: 132. Divide the biggest figure by the smallest and add the result to the figure printed immediately after the smallest figure.	Q 17
Q 18	*Portion* means the same as... [1] some, [2] whole, [3] part, [4] any, [5] cake.	Q 18
Q 19	If a castle is bigger than a cottage, write down the second of these figures: 1, 2, 3, 4, 5, 6, 7, 8, 9. If it is not, write down the sixth.	Q 19
Q 20	*Up* means the opposite of... [1] short, [2] small, [3] low, [4] down, [5] young.	Q 20
Q 21	$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$... What number comes next?	Q 21
Q 22	*Seeing* is to *picture* as *hearing* is to... [1] sight, [2] sculpture, [3] ear, [4] song, [5] deaf.	Q 22
Q 23	Here are three figures: 189. Subtract the smallest figure from the biggest and multiply the result by the figure printed immediately before the biggest figure.	Q 23
Q 24	*Ill* means the same as... [1] health, [2] fever, [3] dirty, [4] mumps, [5] sick.	Q 24
Q 25	Write down the number of letters in the fourth word of this sentence.	Q 25
Q 26	*Near* means the opposite of... [1] close, [2] road, [3] speed, [4] far, [5] distance.	Q 26
Q 27	2, 3, 5, 8, 12... What number comes next?	Q 27
Q 28	*Legs* are to *running* as *teeth* are to... [1] chattering, [2] walking, [3] eating, [4] biting, [5] arms.	Q 28
Q 29	Here are three figures: 672. Add the largest two figures together and divide the total by the smallest figure.	Q 29
Q 30	*Scarce* means the same as... [1] unobtainable, [2] lack, [3] unique, [4] rare, [5] frightened.	Q 30

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APPENDIX A - 6A

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Q 31	If Z is the last letter of the alphabet and if B does not come before A, write down the fifth of these figures: 1, 2, 3, 4, 5, 6, 7, 8, 9. Otherwise, write down the last one.	Q 31
Q 32	*Never* means the opposite of... 1 rarely, 2 always, 3 now, 4 will, 5 forget.	Q 32
Q 33	1, 2, 4, 5, 7... What number comes next?	Q 33
Q 34	*Sky* is to *ground* as *ceiling* is to... 1 roof, 2 down, 3 floor, 4 rug, 5 high.	Q 34
Q 35	Here are three figures: 823. Divide the biggest figure by the smallest and add the result to the figure printed immediately after the smallest figure.	Q 35
Q 36	*Odd* means the same as... 1 strange, 2 even, 3 one, 4 man, 5 number.	Q 36
Q 37	If 8 is more than 3, write down 7, unless 3 is more than 7, in which case write 8.	Q 37
Q 38	*War* means the opposite of... 1 suffering, 2 joy, 3 dictatorship, 4 inflation, 5 peace.	Q 38
Q 39	11, 12, 10, 13, 9... What number comes next?	Q 39
Q 40	*When* is to *where* as *time* is to... 1 how, 2 why, 3 space, 4 length, 5 relativity.	Q 40
Q 41	Here is a row of figures: 1, 2, 3, 4, 5, 6, 7, 8, 9. Write down the figure from this row which, when added to another number smaller than it, would make 17.	Q 41
Q 42	*Backwards* means the same as... 1 upside-down, 2 reversed, 3 stop, 4 forwards, 5 gear.	Q 42
Q 43	If 20 is more than 3 times 5, write down the figure 2, unless 14 is less than 16, in which case write 7.	Q 43
Q 44	*Multiplication* is the opposite of... 1 subtraction, 2 addition, 3 mathematics, 4 figures, 5 division.	Q 44
Q 45	0·9, 1·1, 1·3, 1·5, 1·7... What number comes next?	Q 45

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APPENDIX A - 6A

DO NOT WRITE ANYTHING ON THIS PAPER

Q 46	*Autumn* is to *Winter* as *October* is to... 1 April, 2 July, 3 Spring, 4 rain, 5 January.	Q 46
Q 47	Here are three figures: 456. Subtract the smallest figure from the biggest and multiply the result by the figure printed immediately before the biggest figure.	Q 47
Q 48	*Prevent* means the same as... 1 avoid, 2 cure, 3 allow, 4 deter, 5 help.	Q 48
Q 49	Write down the total number of letters contained in the words in this sentence.	Q 49
Q 50	*Permanent* means the opposite of... 1 part-time, 2 ever, 3 changing, 4 temporary, 5 stable.	Q 50
Q 51	100, 81, 64, 49, 36... What number comes next?	Q 51
Q 52	*Fact* is to *fiction* as *historian* is to... 1 history, 2 book, 3 novelist, 4 teacher, 5 story.	Q 52
Q 53	Here are three figures: 934. Divide the biggest figure by the smallest and add the result to the figure printed immediately after the smallest figure.	Q 53
Q 54	*Industrious* means the same as... 1 busy, 2 hard-working, 3 energetic, 4 overworked, 5 happy.	Q 54
Q 55	If G is the seventh letter of the alphabet and Wednesday is not a month of the year, divide 63 by 7. Otherwise subtract 3 from 5. Write down your answer.	Q 55
Q 56	*Dangerous* means the opposite of... 1 brave, 2 cowardly, 3 situation, 4 safe, 5 bravado.	Q 56
Q 57	0·1, 1·3, 2·5, 3·7, 4·9... What number comes next?	Q 57
Q 58	*Motive* is to *method* as *why* is to... 1 wherefore, 2 reason, 3 how, 4 because, 5 where.	Q 58
Q 59	Here are three figures: 847. Divide the biggest figure by the smallest and add the result to the figure printed immediately after the smallest figure.	Q 59
Q 60	*Flat* means the same as... 1 straight, 2 level, 3 uneven, 4 oblique, 5 inclined.	Q 60

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APPENDIX A - 6A

DO NOT WRITE ANYTHING ON THIS PAPER

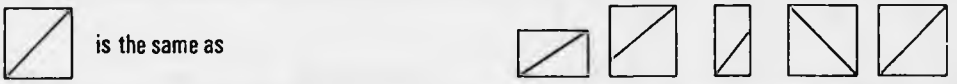
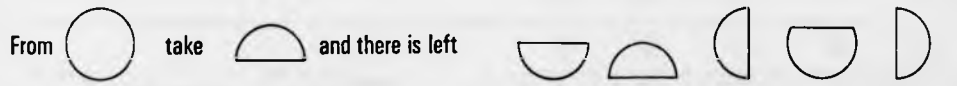
Q 61	0, 2, 8, 26, 80... What number comes next?	Q 61
Q 62	*Doubt* means the opposite of... [1] wonder, [2] certainty, [3] correct, [4] dubious, [5] indefinite.	Q 62
Q 63	130, 118, 107, 97, 88... What number comes next?	Q 63
Q 64	*The day after tomorrow* is to *the day before yesterday* as *Wednesday* is to [1] Friday, [2] Saturday, [3] Sunday, [4] Monday, [5] Tuesday.	Q 64
Q 65	Here are three figures: 948. Divide the biggest figure by the smallest and add the result to the figure printed immediately after the smallest figure.	Q 65

END OF PART I

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO

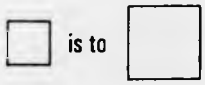
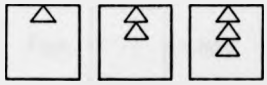
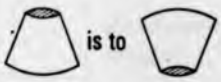
APPENDIX A - 6A

PART II EXAMPLES. DO NOT WRITE ANYTHING ON THIS PAPER

Q.No.			Q.No.
1			1
2			2
3			3
4			4
5			5
6			6
7			7
8			8
9			9
10			10

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

APPENDIX A - 6A

Q.No.	DO NOT WRITE ANYTHING ON THIS PAPER							O.N
1		1 	2 	3 	4 	5 		1
2		1 	2 	3 	4 	5 		2
3		1 	2 	3 	4 	5 		3
4		1 	2 	3 	4 	5 		4
5		1 	2 	3 	4 	5 		5
6		1 	2 	3 	4 	5 		6
7		1 	2 	3 	4 	5 		7
8		1 	2 	3 	4 	5 		8
9		1 	2 	3 	4 	5 		9

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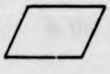
APPENDIX A - 6A

DO NOT WRITE ANYTHING ON THIS PAPER

Q.No.		1	2	3	4	5	Q.No.
10	 placed exactly on top of  gives the following outline						10
11	 is to  as  is to						11
12	 is the same as						12
13	From  take  and there is left						13
14	   Which of the following comes next?						14
15	 placed exactly on top of  gives the following outline						15
16	 is to  as  is to						16
17	 is the same as						17
18	From  take  and there is left						18

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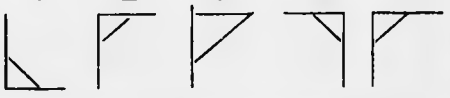
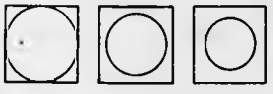
APPENDIX A - 6A

Q.No.	DO NOT WRITE ANYTHING ON THIS PAPER	Q.No.
19	 Which of the following comes next? 	19
20	 placed exactly on top of  gives the following outline 	20
21	 is to  as  is to 	21
22	 is the same as 	22
23	From  take  and there is left 	23
24	 Which of the following comes next? 	24
25	 placed exactly on top of  gives the following outline 	25
26	 is to  as  is to 	26
27	 is the same as 	27

GO ON TO THE NEXT PAGE

APPENDIX A - 6A

Q.No.	DO NOT WRITE ANYTHING ON THIS PAPER	Q.No.
28	From  take  and there is left  (1 2 3 4 5)	28
29	 Which of the following comes next?  (1 2 3 4 5)	29
30	 placed exactly on top of  gives the following outline  (1 2 3 4 5)	30
31	 is to  as  is to  (1 2 3 4 5)	31
32	 is the same as  (1 2 3 4 5)	32
33	From  take  and there is left  (1 2 3 4 5)	33
34	 Which of the following comes next?  (1 2 3 4 5)	34
35	 placed exactly on top of  gives the following outline  (1 2 3 4 5)	35
36	 is to  as  is to  (1 2 3 4 5)	36

GO ON TO THE NEXT PAGE

APPENDIX A - 6A

Q.No.	DO NOT WRITE ANYTHING ON THIS PAPER						Q.No.
37	 is the same as	1 	2 	3 	4 	5 	37
38	From  take  and there is left	1 	2 	3 	4 	5 	38
39	 Which of the following comes next?	1 	2 	3 	4 	5 	39
40	 placed exactly on top of  gives the following outline	1 	2 	3 	4 	5 	40
41	 is to  as  is to	1 	2 	3 	4 	5 	41
42	 is the same as	1 	2 	3 	4 	5 	42
43	From  take  and there is left	1 	2 	3 	4 	5 	43
44	 Which of the following comes next?	1 	2 	3 	4 	5 	44
45	 placed exactly on top of  gives the following outline	1 	2 	3 	4 	5 	45
46	 is to  as  is to	1 	2 	3 	4 	5 	46

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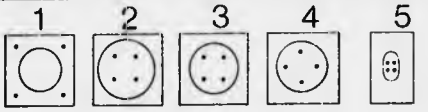
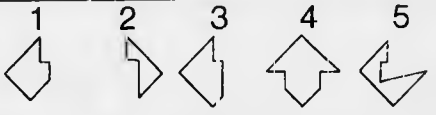
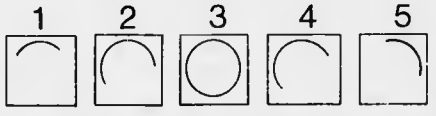
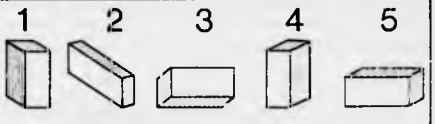
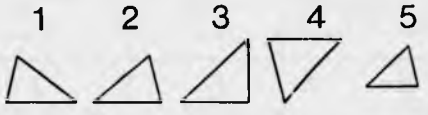
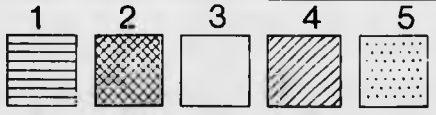
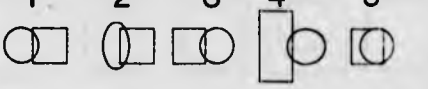
APPENDIX A - 6A

DO NOT WRITE ANYTHING ON THIS PAPER

Q.No.		Q.No.
47	 is the same as  (1 2 3 4 5)	47
48	From  take  and there is left  (1 2 3 4 5)	48
49	 Which of the following comes next?  (1 2 3 4 5)	49
50	 placed exactly on top of  gives the following outline  (1 2 3 4 5)	50
51	 is to  as  is to  (1 2 3 4 5)	51
52	 is the same as  (1 2 3 4 5)	52
53	From  take  and there is left  (1 2 3 4 5)	53
54	 Which of the following comes next?  (1 2 3 4 5)	54
55	 placed exactly on top of  gives the following outline  (1 2 3 4 5)	55
56	 is to  as  is to  (1 2 3 4 5)	56

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Q.No.	DO NOT WRITE ANYTHING ON THIS PAPER						Q.No.
57	 is the same as	1 	2 	3 	4 	5 	57
58	From  take  and there is left	1 	2 	3 	4 	5 	58
59	 Which of the following comes next?	1 	2 	3 	4 	5 	59
60	 placed exactly on top of  gives the following outline	1 	2 	3 	4 	5 	60
61	 is to  as  is to	1 	2 	3 	4 	5 	61
62	 is the same as	1 	2 	3 	4 	5 	62
63	From  take  and there is left	1 	2 	3 	4 	5 	63
64	 Which of the following comes next?	1 	2 	3 	4 	5 	64
65	 placed exactly on top of  gives the following outline	1 	2 	3 	4 	5 	65

END OF PART II

APPENDIX A - 7A

ADMINISTRATION OF TEST OF CONVERGENCY (A.H.4)

Introduction

A.H.4 is designed as a group test of general intelligence, for use with a cross section of the population. Part I consists of 65 questions which have a verbal or numerical bias. Part II consists of 65 questions which have a diagrammatic bias.

There are a group of examples provided for Part I and also for Part II. Each principle involved in the test is illustrated by an example. Please read through the instructions for administration of the test and the test itself before it is given to the pupils so that you are familiar with the procedure and method of recording answers.

Preliminaries

Important: no one but the tester should have access to the test papers, answer sheets, or instructions either before or after the test.

The formal instructions should be prefaced by a few introductory remarks. These should aim:

1) to set the pupils at ease as far as possible,
2) to assure them that they will be given preliminary examples to ensure that they understand the test procedure.

Materials needed

The tester should have:

1) a stop watch or clock
2) a copy of these instructions
3) an envelope containing the appropriate number of A.H.4 test booklets
4) an envelope containing the appropriate number of A.H.4 answer sheets
5) a supply of spare pencils and erasers

Supervision

One tester can administer the test to groups up to 30 in size. For each additional 30 pupils an assistant supervisor should be available. The test may be carried out in a classroom or suitable hall. Noise and

APPENDIX A - 7A

distractions should be at a minimum but a rigid examination atmosphere is not desirable. Minor alteration to the instructions to be spoken aloud are unimportant providing they are heard and understood by all pupils. Instructions should be given at a speed which suits the slowest members of the group. Supervisors should walk round to make sure that the answer sheets are being filled in correctly, but they should make no effort to see what answers the pupils are giving.

Timing

The time limit for each 'Part' is 10 minutes exclusive of the preliminary examples. No time limit is imposed for the completion of these examples. The overall testing time varies between 30 minutes and 45 minutes. Nothing should be said about speed of work other than stating the time limit for each section. No indication of 'half-time' or 'one minute to go' should be given.

Procedure

Give every pupil an answer sheet, with the side which has a space for name etc upwards. Make sure every pupil has a sharpened pencil. Say:

"FILL IN THE FORM ON THE ANSWER SHEET. TODAY'S DATE IS _____
PLEASE WRITE CLEARLY".

(Pause). Circulate among the pupils to see that they are following the directions correctly. Make sure their names are clearly written. Give help where necessary. Distribute question booklets towards the end of this time, page 1 upwards. When everyone has finished say:

"TURN OVER YOUR ANSWER SHEET TO THE OTHER SIDE. PLEASE DO NOT WRITE ANYTHING ON THE QUESTION BOOKLETS, THEY ARE TO BE USED AGAIN. ANSWERS SHOULD BE MARKED ON THE ANSWER SHEET ONLY. NOW READ THE INSTRUCTIONS ON THE QUESTION BOOKLET, TRY THE FIRST PAGE OF EXAMPLES AND FILL IN YOUR ANSWERS IN THE FIRST COLUMN OF YOUR ANSWER SHEET."

(Pause)

"THE EASIEST WAY IS TO PLACE THE QUESTION BOOK SLIGHTLY OVER THE ANSWER SHEET - LIKE THIS".

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Demonstrate. Pause, then go round looking at each pupil, rearranging the papers of any whose answer sheet is wrongly placed. If you find a pupil writing the word instead of the number, say aloud to the whole group:

"DON'T WRITE THE WORD. WRITE THE NUMBER THAT'S PRINTED OVER IT"

Give help with the examples where necessary. The tester's aim should be to induce the pupil to solve the problem correctly and to his own satisfaction. In no circumstances should the pupil be given the answer without any explanation. As the pupils complete the examples say:

"TAKE YOUR TIME AND WHEN YOU'VE FINISHED THE EXAMPLES WILL YOU PUT DOWN YOUR PENCILS SO THAT I CAN SEE WHEN YOU ARE READY. DO NOT TURN OVER TO THE NEXT PAGE IN THE TEST BOOKLET YET".

When all pupils have completed the examples say:

"CORRECT ANSWERS TO THE EXAMPLES YOU'VE BEEN DOING ARE AS FOLLOWS: 5, 4, 64, 4, 25, 5. ANY QUESTIONS? THE EXAMPLES ARE TO GIVE YOU AN IDEA OF WHAT THE TEST IS LIKE. NOW YOU ARE GOING TO WORK THROUGH THE QUESTIONS IN ORDER. TRYING NOT TO LEAVE ANY OUT. IF YOUR PENCIL BREAKS LET ME KNOW. IF YOU MAKE A MISTAKE RUB IT OUT OR CROSS IT OUT AND WRITE YOUR ANSWER AT THE SIDE. ROUGH WORK SHOULD BE DONE ON THE ANSWER SHEET - REMEMBER DO NOT MARK THE BOOKLET.

THE TEST WILL BE IN TWO PARTS. THE FIRST PART HAS FIVE PAGES, AND LASTS TEN MINUTES. IF ANYONE SHOULD FINISH BEFORE THAT THEY MUST NOT TURN ON TO PART II. ARE THERE ANY QUESTIONS? IF YOU ARE NOT CLEAR ABOUT ANYTHING ASK NOW".

(Pause)

"ALL READY? THEN TURN TO PAGE 3, FOLD THE PAGE BACK LIKE THIS AND PLACE IT OVER THE ANSWER SHEET".

Demonstrate. Pause.

"BEGIN NOW".

Start stop-watch. After a pause go round and see that all pupils are entering their answers correctly, are not marking the question books, and are not copying from their neighbours. When the fastest pupils are reaching the bottom of page 3 say:

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"IF YOU FINISH ONE PAGE, GO STRAIGHT ON TO THE NEXT".

At the end of 10 minutes say:

"RIGHT, THAT'S THE END OF THE FIRST PART. DON'T WORRY IF YOU HAVEN'T FINISHED - PEOPLE VERY RARELY DO. THE SECOND PART IS THE SAME SORT OF THING BUT THIS TIME YOU'LL BE DEALING WITH DRAWINGS AND SHAPES INSTEAD OF WORDS. TURN TO PAGE 9 WHERE YOU WILL SEE EXAMPLES FOR PART II AND FILL IN YOUR ANSWERS IN THE FOURTH COLUMN OF YOUR ANSWER SHEET. TAKE YOUR TIME AND WHEN YOU HAVE FINISHED PUT DOWN YOUR PENCIL. DON'T TURN OVER".

Administer Part II examples in the same way as Part I examples. When the examples are completed say:

"CORRECT ANSWERS TO THE EXAMPLES YOU HAVE BEEN DOING ARE AS FOLLOWS: 2, 3, 3, 2, 1. ANY QUESTIONS?".

(Pause)

"AS BEFORE YOU HAVE TEN MINUTES, AND WHEN YOU COME TO THE BOTTOM OF A PAGE GO ON TO THE NEXT. THERE ARE SEVEN PAGES THIS TIME. NOW TURN OVER TO PAGE 10, FOLD IT BACK, AND PLACE IT IN POSITION".

(Pause)

"BEGIN NOW"

Start stop watch. Go round at intervals as before. At the end of 10 minutes say:

"RIGHT, THAT'S THE END OF THE SECOND PART. PASS YOUR ANSWER SHEETS DOWN TO THE FRONT ROW. _____" (insert name of responsible pupil) "PLEASE COLLECT ALL THE ANSWER SHEETS FROM THE FRONT ROW AND PUT THEM IN THIS ENVELOPE".

Make sure that the full quota is collected. Seal the envelope in front of the pupils. When this is completed say:

"NOW PASS YOUR QUESTION BOOKLETS TO THE FRONT ROW"

Collect <u>all</u> question booklets.

Please send answer sheets to: Mrs Sally Brown, Department of Education, University of Stirling, Stirling, as soon as possible, and retain the question booklets for the time being. It is essential that the booklets are not available to the pupils.

APPENDIX A - 8A

DIVERGENCY TEST 1

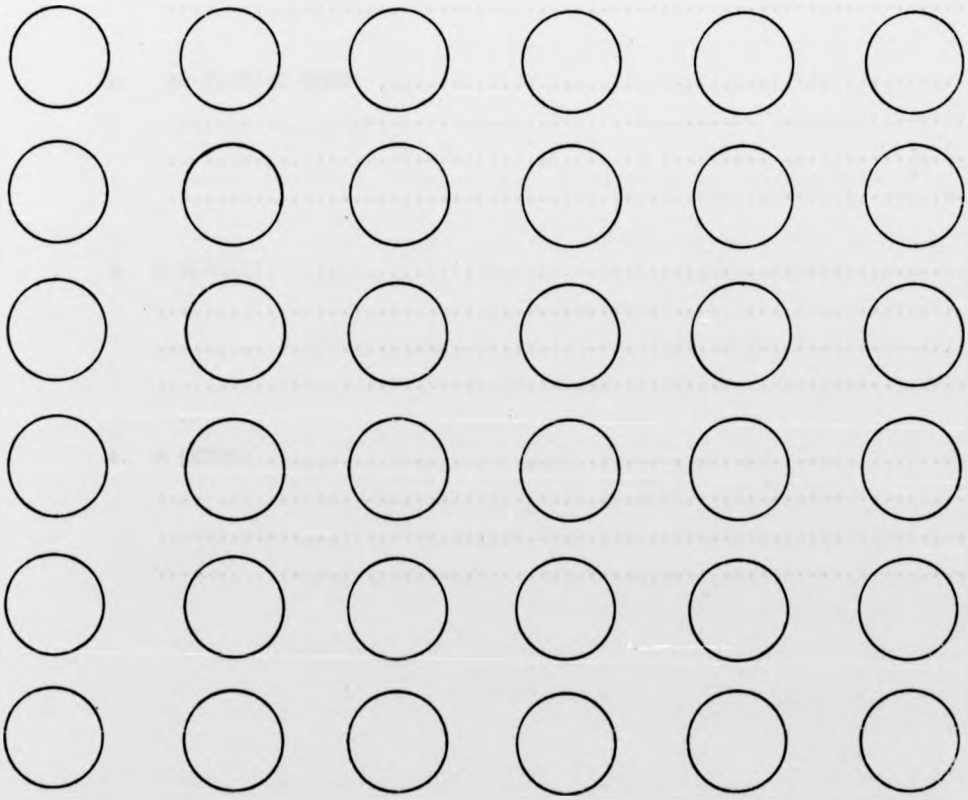
CIRCLES

In 10 minutes see how many objects you can make from the circles below. A circle should be the main part of whatever you make. With a pencil add lines to the circles to complete your picture. Your lines can be inside the circle, outside the circle, or both inside and outside the circle. Try to think of things that no one else in the class will think of. Make as many different things as you can and put as many ideas as you can into each one. Add labels or titles if you do not think it is clear what the object is supposed to be.

For example:

face

football



APPENDIX A - 9A

DIVERGENCY TEST 2

USES FOR THINGS

Listed below are four everyday objects. You have to think of as many different uses as you can for each one. Write down anything you can think of no matter how strange it may seem.

For example:

JAM JAR: to put jam in, to draw circles with, to use as a small greenhouse, to use as a fishing net, to use as a magnifying glass.

You have 10 minutes. Work quickly and be sure to write down some uses for each object.

1. A BARREL: .....
.....
.....
.....

2. AN ELASTIC BAND: .....
.....
.....
.....

3. A BLANKET: .....
.....
.....
.....

4. A BRICK: .....
.....
.....
.....

APPENDIX A - 10A

DIVERGENCY TEST 3

MEANINGS OF WORDS

Each of the eight words below has more than one meaning. In the space following each word write down as many of the meanings as you can. For example:

ARM: part of a man, arm of chair, to give weapons to, arm of the law, with open arms.

You do not need to write the meanings out in full, just enough for us to recognise them. You have 10 minutes.

1. BAR: .....
.....

2. POST: .....
.....

3. SET: .....
.....

4. TERMS: .....
.....

5. FORM: .....
.....

6. BOX: .....
.....

7. LEAD: .....
.....

8. STATE: .....
.....

APPENDIX A - 11A

ADMINISTRATION OF TESTS OF DIVERGENCY

Please read through these instructions and look at the test papers before they are given to the pupils so that you are familiar with the procedure and method of recording the answers.

Preliminaries

It is desirable to preface the formal instructions below by a few preliminary remarks designed:

1. to set the pupils at their ease,
2. to present their tasks as 'puzzles' rather than tests.

It is requested that all schools follow the same order in administration of the tests of divergency, i.e.

1) "Uses for things"
2) "Circles"
3) "Meanings of words"

If the tests of divergency and the test of convergency (AH4) are to be administered to the pupils consecutively please ensure that the tests of divergency are administered first.

No one but the tester should have access to the test material, used or unused. After the test papers are completed they should be placed in envelopes and the envelopes sealed before the pupils leave the room.

No advance information on the nature of the tests or examples of the exercise should be given to the pupils.

Materials needed

The tester should have:

1) a copy of these instructions
2) three envelopes marked "Uses for things", "Circles", and "Meanings of Words"
3) a stop clock or watch
4) a supply of spare pencils and erasers

Timing

Each of the three tests has a 10 minute time limit. Handing out papers and giving instructions should take a further 10 minutes, i.e. 40 minutes total.

APPENDIX A - 11A

Supervision

One administrator can give out the instructions and supervise up to about 30 pupils. For each additional 30 pupils an assistant supervisor is desirable. The tests may be completed in a classroom or suitable hall. A formal rigid examination atmosphere is not wanted. However, a minimum of noise and distractions should be aimed for. Supervisors should walk round to see that pupils names have been filled in correctly and that pupils are not copying each others answers, but this should be kept to a minimum. It is requested that supervisors make no effort to see what answers the pupils are giving.

Procedure

"USES FOR THINGS"

Give every pupil a "Uses for Things" sheet face down. Make sure they all have sharpened pencils. Say:

"PLEASE TURN OVER YOUR SHEETS AND FILL IN THE NAME OF THE SCHOOL AND YOUR NAME CLEARLY"

(Pause)

"I WILL READ THROUGH THE DIRECTIONS WITH YOU BEFORE YOU START: LISTED BELOW ARE FOUR EVERYDAY OBJECTS. YOU HAVE TO THINK OF AS MANY DIFFERENT USES AS YOU CAN FOR EACH ONE. WRITE DOWN ANYTHING YOU CAN THINK OF, NO MATTER HOW STRANGE IT MAY SEEM. FOR EXAMPLE: JAM JAR - TO PUT JAM IN, TO DRAW CIRCLES WITH, TO USE AS A SMALL GREENHOUSE, TO USE AS A FISHING NET, TO USE AS A MAGNIFYING GLASS. YOU HAVE 10 MINUTES. WORK QUICKLY AND BE SURE TO WRITE DOWN SOME USES FOR EACH OBJECT. THE OBJECTS YOU ARE GIVEN ARE: A BARREL, AN ELASTIC BAND, A BLANKET AND A BRICK."

(Pause)

"ARE THERE ANY QUESTIONS? IF YOU ARE NOT CLEAR ABOUT ANYTHING ASK NOW" (Pause). When there are no more questions say:

"ALL READY? REMEMBER TO WRITE DOWN SOME USES FOR EACH OBJECT, DON'T SPEND ALL YOUR TIME ON ONE. YOU HAVE 10 MINUTES. BEGIN NOW".

After a pause go round to see that all pupils have started. You should not give any further examples of 'uses'. Be sure that pupils are not copying from their neighbours. At the end of 10 minutes say:

"RIGHT, PUT DOWN YOUR PENCILS, THAT'S THE END OF THE FIRST PART. PASS YOUR ANSWER SHEETS DOWN TO THE FRONT ROW. _____"

(insert name of responsible pupil) "PLEASE COLLECT ALL THE SHEETS FROM THE FRONT ROW AND PUT THEM IN THIS ENVELOPE."

Make sure you collect the full quota. Seal the envelope in front of the pupils.

APPENDIX A - 11A

"CIRCLES"

Give every pupil a "Circles" sheet face down. Make sure everyone still has an unbroken pencil. Say:

"PLEASE TURN OVER YOUR SHEETS AND FILL IN THE NAME OF THE SCHOOL AND YOUR NAME CLEARLY".

(Pause)

"I WILL READ THROUGH THE DIRECTIONS WITH YOU BEFORE YOU START: IN 10 MINUTES SEE HOW MANY OBJECTS YOU CAN MAKE FROM THE CIRCLES BELOW. A CIRCLE SHOULD BE THE MAIN PART OF WHATEVER YOU MAKE. WITH A PENCIL ADD LINES TO THE CIRCLES TO COMPLETE YOUR PICTURE. YOUR LINES CAN BE INSIDE THE CIRCLE, OUTSIDE THE CIRCLE, OR BOTH INSIDE AND OUTSIDE THE CIRCLE. TRY TO THINK OF THINGS THAT NO ONE ELSE IN THE CLASS WILL THINK OF. MAKE AS MANY DIFFERENT THINGS AS YOU CAN AND PUT AS MANY IDEAS AS YOU CAN INTO EACH ONE. ADD LABELS OR TITLES IF YOU DO NOT THINK IT IS CLEAR WHAT THE OBJECT IS SUPPOSED TO BE. THERE ARE TWO EXAMPLES GIVEN - A FACE AND A FOOTBALL".

(Pause)

"ARE THERE ANY QUESTIONS? IF YOU ARE NOT CLEAR ABOUT ANYTHING ASK NOW".

(Pause). Pupils may ask if they can draw another face or football. There is nothing against this but draw their attention to the instructions which specify different things. More than one circle at a time may be used for a picture and pupils should be told this if they ask. No further examples other than the two provided should be given. When there are no more questions say:

"ALL READY? YOU HAVE 10 MINUTES. BEGIN NOW".

After a pause go round to see that all pupils have started. Be sure that pupils are not copying from their neighbours. At the end of 10 minutes say:

"RIGHT, PUT DOWN YOUR PENCILS, THAT'S THE END OF THE SECOND PART. DO NOT WORRY IF YOU HAVEN'T USED ALL THE CIRCLES, VERY FEW PEOPLE DO. PASS YOUR ANSWER SHEETS DOWN TO THE FRONT ROW. _____" (insert name of responsible pupil) "PLEASE COLLECT ALL THE SHEETS FROM THE FRONT ROW AND PUT THEM IN THIS ENVELOPE."

Make sure you collect the full quote. Seal the envelope in front of the pupils.

APPENDIX A - 11A

"MEANINGS OF WORDS"

Give every pupil a "Meanings of Words" sheet face down. Make sure they all still have unbroken pencils. Say:

"PLEASE TURN OVER YOUR SHEETS AND FILL IN THE NAME OF THE SCHOOL AND YOUR NAME CLEARLY".

(Pause)

"I WILL READ THROUGH THE DIRECTIONS WITH YOU BEFORE YOU START: EACH OF THE EIGHT WORDS BELOW HAS MORE THAN ONE MEANING. IN THE SPACE FOLLOWING EACH WORD WRITE DOWN AS MANY OF THE MEANINGS AS YOU CAN. FOR EXAMPLE: ARM: PART OF A MAN, ARM OF A CHAIR, TO GIVE WEAPONS TO, ARM OF THE LAW, WITH OPEN ARMS. YOU DO NOT NEED TO WRITE THE MEANINGS OUT IN FULL, JUST ENOUGH FOR US TO RECOGNISE THEM. YOU HAVE 10 MINUTES".

(Pause)

"ARE THERE ANY QUESTIONS? REMEMBER YOU ARE LOOKING FOR DIFFERENT MEANINGS. IF YOU ARE NOT CLEAR ABOUT ANYTHING ASK NOW".

Pupils may ask whether the meanings of words which sound the same as the test word but are spelt differently are acceptable (e.g. BEAR and BARE). They are not. Only meanings relating to the word as spelt on the test will be accepted. Meanings do not have to be written out in full, one word will often do: for example: BARK - dog, tree, seal, boat. The score will depend on the number of different meanings (3 here since 'dog' and 'seal' both refer to noise made by an animal).

"ALL READY? YOU HAVE 10 MINUTES. BEGIN NOW".

After a pause go round to see that all pupils have started. You should not give any further examples of "Meanings". Be sure that pupils are not copying from their neighbours. At the end of 10 minutes say:

"RIGHT, PUT DOWN YOUR PENCILS, THAT'S THE END OF THE THIRD AND FINAL PART. PASS YOUR ANSWERS SHEETS DOWN TO THE FRONT ROW. _____" (insert name of responsible pupil) "PLEASE COLLECT ALL THE SHEETS FROM THE FRONT ROW AND PUT THEM IN THIS ENVELOPE".

Make sure you collect the full quote. Seal the envelope in front of the pupils.

APPENDIX A - 12A

Pupil Questionnaire (administered autumn 1971)

Directions

Please answer all the following questions. If you have difficulty in understanding any question ask your teacher for help.

1. Name of your school: _____

2. Your Name: _____

3. Date of your birth: _____

4. What class are you in at this school?: _____

5. What school (or schools) did you attend last school year 1970-1971,

_____

_____

6. What school (or schools) did you attend the school year before last 1969-1970,

_____

7. What is your Father's occupation? (If you do not have a Father, give the occupation of the main wage-earner in your home. For example your Mother). If he is unemployed write "UNEMPLOYED" and put his usual occupation when working.

_____

8. Describe as clearly as you can what he does and what kind of place he works in. For example if he is a "baker" say whether he mixes the dough, or bakes the bread, or packs the loaves, or delivers the bread, or sells the bread; also explain where he does his work - in the bakery, driving a van, in a shop.

_____

_____

_____

_____

_____

APPENDIX A - 13A

Administration of Pupil Questionnaire

1. Give each pupil a copy of the Pupil Questionnaire.
2. Make sure everyone has a sharpened pencil.
3. Ask the pupils to read through the directions on the questionnaire and then to fill it in.
4. Tell them that if there are any questions or difficulties they should seek help from you.
5. After a pause go round to see that everyone has started and is filling in the questionnaire correctly.
6. Give help where necessary.
7. When everyone has finished collect all the sheets.
8. Make sure you have all the questionnaires that were given out; put them back into the envelope provided.

Notes

Question 1	address of school not needed
Question 2	surname and Christian name that is normally used. If two children have same name give full names for identification.
Question 4	the 'name' of the class should be given here, e.g. 1A, S1, 1M.
Questions 5 & 6	if a child has spent a very short time (less than a month) in some school this need not be recorded.
Questions 7 & 8	individual help should be given here where needed. The name of the firm where the father is employed is not important. However, it is important to state what the firm does e.g. a glass-making factory, a coal mine, an insurance company, a ship building concern.

APPENDIX A - 14A

TABLE 14A

SAMPLE POPULATION OF SECONDARY SCHOOLS - ATTITUDE STUDY

CO-ORDINATORS	SCHOOL
Mr Turner	St Peter's R C Secondary School, Nelson Street, Aberdeen AB2 3EQ
H R Dobie Esq MA	Headmaster, St Patrick's R C Secondary School, Kilsyth, Stirlingshire
Mr Flood	St Brendan's School, Moss Road, Linwood, Renfrewshire
H McShane Esq MA	Headmaster, St Patrick's R C Secondary, Coronation Road East, New Stevenston, By Motherwell, Lanarkshire
Mr O'Gorman and Mr John Duffy	Dept of Chemistry, St Leonard's Secondary School, 62 Lochend Road, Glasgow E4
H McCusker Esq	Rector, St Mary's R C Academy, Bathgate, West Lothian
J P McKinley Esq	St Michael's Academy, Winton Place, Kilwinning, Ayrshire
C Davidson Esq	Principal Teacher of Science, St Columba's R C School, Clydebank, Dunbartonshire
J Macmillan Esq MA	Headmaster, St David's RC High School, Abbey Road, Dalkeith, Midlothian
Miss Susan McMonagle	Principal Teacher of Biology, St Modan's High School, St Ninians, Stirling
J McDonagh Esq BSc	Lourdes Secondary School, 47 Kirriemuir Avenue, Glasgow SW2
J Braidwood Esq	Principal Teacher of Physics, St Columba of Iona R C Secondary School, Callander Street, Glasgow N W
Mr Doherty	Science Dept St Aidan's R C High School, Wishaw, Lanarkshire
S Sutherland Esq	Middle & Frederick Street Secondary School, Frederick Street, Aberdeen AB2 1HY

APPENDIX A - 14A

CO-ORDINATORS	SCHOOL
I A McDonald Esq BSc	Headmaster, Old Aberdeen Secondary School, King Street, Aberdeen AB2 1UE
Mrs S M Humberstone	Westbourne School for Girls, 1 Winton Drive, Glasgow W2
Miss M Robertson and D J Harvey Esq	Science Dept. City Public Secondary School, St James's Road, Glasgow G4 ONT
A M C Thorburn Esq	Deputy Headmaster, Broughton Secondary School, McDonald Road, Edinburgh EH7 4NT
Mr Grant	Bellahouston Academy, 30 Gower Terrace, Glasgow S1
A Grant Esq	Principal Teacher of Science, Stobswell Secondary School, Melrose Terrace, Dundee DD3 7QX
J MacRae Esq	Deputy Rector, Hazlehead Academy, Groat's Road, Aberdeen AB9 1FJ
T H M Hawthorn Esq	Physics Department, Shawlands Academy, Moss-side Road, Glasgow S1
W Brodie Esq BSc	Rector, Trinity Academy, Craighall Avenue, Leith, Edinburgh EH6 4RT
I Dow Esq	Principal Teacher of Physics, Portobello Secondary School, Duddingston Road, Portobello, Edinburgh 15
T K Barclay Esq BSc	Headmaster, Cranhill Secondary School, 40 Startpoint Street, Glasgow E3
W M Duncan Esq	Linlathen High School, Forfar Road, Dundee DD4 8AX
A Webster Esq	Principal Teacher of Chemistry, Nairn Academy, Nairn
V MacDonald Esq	Principal Teacher of Science, Brora High School, Brora, Sutherland
R Steven Esq	Principal Teacher of Science, Pitlochry High School, Pitlochry, Perthshire.
P Cook Esq BSc	Rector, Kirkcudbright Academy, Kirkcudbright
Mrs Matheson	Beauly J S School, Beauly, Inverness-shire
C Y Myles Esq	Principal Teacher of Physics, The Academy, Montrose, Angus
B R Mitchell Esq	Principal Teacher of Physics, Oban High School, Oban, Argyll

APPENDIX A - 14A

CO-ORDINATORS	SCHOOL
A Curtis Esq	Principal Teacher of Chemistry, Balwearie School, Kirkcaldy, Fife
A Fleming Esq	Principal Teacher of Chemistry, The High School, Blinkbonny Road, Falkirk, Stirlingshire
Mr Cattanach	Principal Teacher of Science, Preston Lodge High School, Prestonpans, East Lothian
J Williams Esq	The Berwickshire High School, Duns, Berwickshire
D Sutherland Esq	The Grammar School, Station Road, Uddingston, Lanarkshire
D M Robertson Esq	Principal Teacher of Biology, Beath Junior High School, Cowdenbeath, Fife
Mrs M Sydserff	Dumfries High School, Marchmount, Dumfries

APPENDIX A - 15A

LIST OF SCHOOLS TAKING PART IN THE VARIOUS ASPECTS OF PILOT WORK

Co-ordinator	School
T. Snaddon Esq. Depute Rector	Alva Academy, Alva, Clackmannanshire.
R. Peacock Esq. Depute Rector	Beath Junior High School, Cowdanbeath, Fife.
Mrs. McAree	Bridge of Allan Primary School, Bridge of Allan, Stirlingshire.
Mr. Gorskie and Mr. Gilmartin	Craigbank Primary School, Sauchie, Clackmannanshire.
T. Hamilton Esq. Assistant Rector	McLaren High School, Callander, Perthshire.
J. Cowan Esq., Dr. J. King and J. Pickering Esq.	Wallace High School, Stirling.
D.L. Cochrane Esq. Rector	Lornshill Academy, Alloa.

APPENDIX A - 16A

TABLE 16A

QUESTIONNAIRE TO SCHOOL CO-ORDINATORS JUNE 1972 (or JUNE 1973)

SI SCIENCE GROUPS - INTEGRATED SCIENCE

1. Please assign a number 1, 2, 3, 4 ... to each of your SI (or SII) science teaching groups for August 1971 - June 1972 (or August 1972 - June 1973) and fill in details for each group on the attached Sheet A (some examples are shown below).

Group Number	Name of science teacher	Ability group	Girls/boys only or mixed sex group	Number of pupils in group
1	Mr A F MacDonald	Mixed ability	mixed	15
2	Mrs R Jamieson	3rd stream	girls	22
3	Miss F Mackay	2nd band	boys	8
4	Mr J Alexander	1st stream	boys	22

2. Sheet B gives a list of those pupils in your school involved in this study. Please indicate the SI science groups to which each pupil belongs by putting the appropriate science group numbers in the first column. For example:

SHEET B

	SI Science Group number
Baker Valerie	1
Bond, John P	4

ASSESSMENT

1. Please indicate the type of assessment you have been using for your SI science teaching groups this term at the bottom of Sheet A, e.g. monthly tests, one examination in November, objective tests at the end of each section.

2. We would be grateful if each teacher of an SI science group would agree to rate their pupils for the interest and enjoyment they have in science, and their academic ability in science. Instructions for this are given on Sheet C and the ratings should be inserted in columns 2, 3, and 4 of Sheet B.

APPENDIX A - 16A

TABLE 16A

QUESTIONNAIRE TO SCHOOL CO-ORDINATORS (Contd)

SHEET A

Name of school: _____

AUGUST 1971-JUNE 1972 (or AUGUST 1972-JUNE 1973)

S1 (or S2) Science Groups - Integrated Science (or Biology, Chemistry, Physics)

Group Number	Name of science teacher	Ability group	Girls/boys only or mixed sex group	Number of pupils in group
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Type of assessment used for S1 science groups:

_____

_____

_____

APPENDIX A - 17A

INSTRUCTIONS TO TEACHERS ON THE RATING OF PUPILS FOR INTEREST, ACADEMIC ABILITY, AND ACHIEVEMENT IN SCIENCE

SHEET C

RATING OF PUPILS AUGUST 1971 - JUNE 1972 (or AUGUST 1972 - JUNE 1973)

I would be grateful if you would agree to rate the SI pupils in your science teaching group according to (1) the interest and enjoyment they have in science, and (2) their academic ability in science. Please make your assessments without reference to other teachers and enter them on Sheet B. (Sheet B consisted of a list of pupils from that school participating in the study, and 4 columns appropriately headed).

1. Please check that the Sheet B you use is for the science subject (biology, chemistry, physics) for which you are rating the pupils.

2. Please check that the pupils in your science teaching group all have the same group number against their names in column (1).

3. In column (2) you are asked to answer the question:

   "What level of interest and enjoyment in science do you consider this pupil has attained relative to the other members of his teaching group?"

   Indicate your answer for each pupil in your teaching group by putting a number opposite the pupil's name according to the following scheme:

   5 - very high level (approximately 10% of your teaching group)

   4 - high level (approximately 20% of your teaching group)

   3 - moderate level (approximately 40% of your teaching group)

   2 - low level (approximately 20% of your teaching group)

   1 - very low level (approximately 10% of your teaching group)

   PLEASE MAKE SURE THAT THE NUMBERS OF PUPILS IN EACH OF THE CATEGORIES 1-5 ARE IN ACCORDANCE WITH THE PERCENTAGES SHOWN

4. In column (3) you are asked to answer the question:

   "What level of academic ability in science do you consider this pupil has attained relative to the other members of the teaching group?"

   This is your assessment and you are free to use any criteria you wish. Indicate your answer in the same way as in column (2).

APPENDIX A - 17A

5. In column (4) please insert any overall assessment mark that has been given to the pupil for this term. This may be an 'examination' mark, or a 'term' mark, or an average of test marks, or a grade for end-of-term report. We are looking for the mark that acts as an indicator to the pupil of his level of achievement in this subject. You may enter more than one mark if you wish.

APPENDIX A - 18A

'CIRCLES' - PROVISIONAL SCORING RULES - JANUARY 1973

If one pupil has two or more pictures that come under one heading this counts as one on the frequency count.

If more than one circle is used for one idea this counts as one for the frequency count.

If pupil uses the examples given on the sheet (a face and a football) these shall count as one response each.

Examples of responses that may have different labels but which may be considered for our purposes as being the same response:

1) All animal (non human) faces or heads front view shall be considered as same response.

2) Full animal bodies shall be categorized as human, birds, mammals, other, and only the first example in each category shall count as one.

3) Parts of body (e.g. 'Fat Lady backend') showing original 'thought' shall be treated as separate response.

4) Badges and Brooches

5) All sports balls

6) Hot air balloons and balloons

7) Banjos and Guitars

8) All bells

9) Racquets and bats

10) Binoculars and field glasses

11) Cakes and tarts

12) Chairs and stools

13) Cups and glasses

14) Dumbells and weights

15) Discs and records

16) All eggs (Easter and hens')

17) All human faces

18) Globe, earth, planet

APPENDIX A - 18A

19) Sun, moon, stars

20) Hollow tubes and rolls of paper

21) Lights and lamps

22) Locks and keyholes

23) Man, woman, snowman

24) All versions of 'Mexican riding a bicycle seen from above'

25) Necklace and pendant

26) Orange, apple, pear, cherry, etc.

27) Ring and bracelet

28) Saucer and plate

29) Saucepan, cooking pot, frying pan

30) All vehicles with wheels (tractor, car, train etc.)

(This will probably have to be expanded. In general ideas are grouped together if

(a) a one-word description would be the same for both; or

(b) they repeatedly appear next to each other indicating a single thought process.)

APPENDIX A - 19A

'USES FOR THINGS' - PROVISIONAL SCORING RULES - JANUARY 1973

If the response is illegible it shall be given no score.

If a response is judged impossible as a use by the scorer it shall be given no score (N.B. during reliability tests please keep a note of such responses).

If a response is judged to be too general (e.g. "use it in the home") by the scorer it shall be given no score. (N.B. during reliability tests please keep a note of such responses).

Two responses shall be considered as different if, in the scorer's judement, two different thought processes have led to two different ideas.

Example: Uses for a Barrel

1. To store beer in
2. To keep water in
3. To use as a rain water butt
4. To make wine in

(1) and (2) would be scored as identical responses i.e. both refer to storage of liquids. (3) would be scored as a different response since there is a collection of water as well as storage implied. (4) would also be scored as a different response since making is distinct from storing.

APPENDIX A - 20A

PUPILS' ATTITUDES TO SCIENCE PROJECT

TEACHER QUESTIONNAIRE RATING EFFECTIVE SCIENCE TEACHING*

Directions

The following statements are related to Effective Science Teaching and have been developed after discussion with science teachers. Will you please read each statement and give your opinion on the extent to which a statement is an attribute of an Effective Science Teacher.

Give your opinion by using the following scale:

1 = Not relevant in science teaching

2 = Unimportant

3 = Important

4 = Very important

5 = Extremely important

Please place a circle around the appropriate number at the end of each statment.

For example:

Can adjust the pace of his lesson to the needs and abilities of his pupils. 1 2 3 4 5

PLEASE CHECK THAT YOU HAVE RATED EVERY STATEMENT

* This questionnaire is a shortened version of an instrument developed by P. H. Taylor, T. Christie and C. V. Platts, School of Education, University of Birmingham.

APPENDIX A - 20A

TEACHER QUESTIONNAIRE RATING EFFECTIVE SCIENCE TEACHING

1 = Not relevant in science teaching
2 = Unimportant
3 = Important
4 = Very important
5 = Extremely important

						'Taylor' Factor Number
1. Is consistently fair and emotionally calm when enforcing rules	1	2	3	4	5	VIII
2. Teaches for understanding rather than reproduction of learned material	1	2	3	4	5	VI
3. Has personal respect for each pupil as an individual	1	2	3	4	5	V
4. Has a genuine interest in science and believes in the academic and practical use of the subject	1	2	3	4	5	IX
5. Relates new learning to natural phenomena within the experience of the pupil in order to develop meaningful association	1	2	3	4	5	IX
6. Gives pupils some responsibility for the care of laboratory equipment and materials	1	2	3	4	5	I
7. Encourages pupils to set themselves goals according to their abilities	1	2	3	4	5	I
8. Can interpret the results of diagnostic instruments used in schools (I.Q., aptitude and achievement tests)	1	2	3	4	5	III
9. Affects his pupils so that they wish to take more advanced courses in science	1	2	3	4	5	II
10. Has useful information in subjects other than, but related to, his teaching subject	1	2	3	4	5	III
11. Uses laboratory equipment to show pupils how to verify facts and principles	1	2	3	4	5	VIII
12. Can devise experiments which involve pupil participation in learning	1	2	3	4	5	I
13. Willingly consults colleagues in case of professional difficulties.	1	2	3	4	5	VII

APPENDIX A - 20A

						'Taylor' Factor Number
14. Uses audio-visual materials in his teaching	1	2	3	4	5	VII
15. Makes tests that require known principles to be applied in new situations	1	2	3	4	5	IX
16. Tries to stimulate pupils to think for themselves about science	1	2	3	4	5	VI
17. Can help pupils differentiate between hypothesis, facts, superstition and theory as well as encourage pupils to suspend judgement when faced with inadequate scientific evidence	1	2	3	4	5	IX
18. Uses pupils to carry out routine duties such as giving out books, cleaning the blackboard etc.	1	2	3	4	5	II
19. Has patience in his dealing with pupils	1	2	3	4	5	VII
20. Can evaluate benefits derived from field trips or visits to industry	1	2	3	4	5	I
21. Helps pupils to develop an appreciation of the benefits and misuses of science	1	2	3	4	5	IX
22. Uses various methods of evaluating pupils	1	2	3	4	5	III
23. Can evaluate text books and laboratory manuals	1	2	3	4	5	V
24. Can locate sources for free and inexpensive science teaching materials	1	2	3	4	5	III
25. Is clear and unequivocal in his personal relationship with pupils	1	2	3	4	5	VI
26. Takes refresher courses in his science subjects	1	2	3	4	5	II
27. Frequently revises earlier work	1	2	3	4	5	II
28. Is skilful in the use of apparatus in the school laboratory	1	2	3	4	5	III
29. Changes curriculum and methods to keep up to date with developments in his subject and methods for teaching it	1	2	3	4	5	VII
30. Encourages pupils to bring appropriate materials and specimens to class	1	2	3	4	5	I

APPENDIX A - 20A

						'Taylor' Factor Number
31. Sees that there is an adequate supply of text-books, laboratory manuals, reference materials and the common tools of science for use in his teaching	1	2	3	4	5	VI
32. Assesses the work of pupils regularly	1	2	3	4	5	VIII
33. Helps pupils to prepare for a career in science or technology	1	2	3	4	5	V
34. Can apply his knowledge of the psychology of learning to the teaching of his subjects	1	2	3	4	5	VII
35. Invites pupils to help in practical demonstrations	1	2	3	4	5	II
36. Is confident and at ease when teaching	1	2	3	4	5	VIII
37. Knows how to proceed if there is a serious problem of discipline	1	2	3	4	5	III
38. Has studied the philosophy and psychology of education	1	2	3	4	5	V
39. Can point out links between his subject and related subjects	1	2	3	4	5	IX
40. Develops interests in science in his pupils	1	2	3	4	5	V
41. Encourages a pupil's self-initiated work	1	2	3	4	5	I
42. Is a competent performer of any skill which is needed in teaching	1	2	3	4	5	VII
43. Is willing to change an opinion or conclusion because of later evidence	1	2	3	4	5	V
44. Is constructive and helpful in his criticism of pupils	1	2	3	4	5	VI

APPENDIX A - 21A

EXAMPLES OF ITEMS IN EACH CATEGORY OF THE MODEL UNDERLYING 'PERCEPTIONS OF EFFECTIVE SCIENCE TEACHING'

A. TEACHER'S CLASSROOM BEHAVIOUR

Organisation

31. Sees that there is an adequate supply of text-books, laboratory reference materials and the common tools of science for use in his teaching.

Teaching

2. Teaches for understanding rather than reproduction of learned material.

Discipline and Control

1. Is consistently fair and emotionally calm when enforcing rules.

Personal Relationships

25. Is clear and unequivocal in his personal relationship with pupils.

Evaluating

15. Makes tests that require known principles to be applied in new situations.

B. TEACHER'S PREPARATORY BEHAVIOUR

Lesson Planning and Preparation

24. Can locate sources for free and inexpensive science teaching material.

APPENDIX A - 21A

Within School: Activities and Relationships

9. Affects his pupils so that they wish to take more advanced courses in science.

Out of School: Activities and Relationships

No item in this category from the 106-item questionnaire had a high enough loading on any of the eight factors to be included in the 44-item questionnaire.

Co-operation with Other Teachers

39. Can point out links between his subject and related subjects.

C. STANDING REQUIREMENTS OF TEACHING

Qualifications and Training

38. Has studied the philosophy and psychology of education.

Attitudes, Values, Interests

4. Has a genuine interest in science and believes in the academic and practical use of the subject.

Competence

28. Is skilful in the use of apparatus in the school laboratory.

Professionalism

13. Willingly consults colleagues in case of professional difficulties.

APPENDIX A - 22A

TABLE 22A

STABLE FIRST ORDER FACTORS WITH ITEMS HAVING LOADINGS > .5 AFTER ROTATION WITH (a) 15 factors extracted; (b) 19 factors extracted

	Varimax loading (15 factors)	Varimax loading (19 factors)	Promax loading (15 factors)
Factor 1			
36. Is confident and at ease when teaching	-.83	-.76	-.94
37. Knows how to proceed if there is a serious problem of discipline	-.80	-.81	-.98
Factor 2			
34. Can apply his knowledge of the psychology of learning to the teaching of his subject	.82	.83	.93
38. Has studied the philosophy and psychology of education	.84	.86	.92
Factor 3			
9. Affects his pupils so that they wish to take more advanced courses in science	-.59	-.73	-.90
33. Helps pupils to prepare for a career in science or technology	-.72	-.72	-.85
Factor 4			
27. Frequently revises earlier work	-.70	-.68	-.79
32. Assesses the work of pupils regularly	-.50	-.62	-.74
Factor 5			
7. Encourages pupils to set themselves goals according to their abilities	.78	.85	1.09
39. Can point out links between his subject and related subjects	-.51	-.55	-.56
Factor 6			
1. Is consistently fair and emotionally calm when enforcing rules	.73	.72	.90
29. Changes curriculum and methods to keep up to date with developments in his subject and methods for teaching it	-.53	-.67	-.81

APPENDIX A - 23A

UNIVERSITY OF STIRLING

PREFERENCES IN SCIENCE

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

This is not a factual test and there are no wrong answers. It is designed to find out how you think and feel about different areas of science.

Each item in this test begins with a statement or diagram followed by four choices lettered A to D. Each of the choices is related to the statement and each one is factually correct.

Read each item carefully. Select from the four choices the one which you find *most appealing* or *satisfying*, that is, the one which seems to you to be related to the introductory statement or diagram in the most appealing or most satisfying way. Write the letter of this choice in the appropriate space on the answer sheet.

Then select the choice which appeals to you *least* of all and write the letter of this choice in the appropriate space on the answer sheet.

The decisions may be difficult, but it is important that you complete all the items as thoughtfully as possible.

HERE IS AN EXAMPLE FOR YOU TO TRY

Scientists have observed that in towns in which traces of fluoride occur naturally in the drinking water, there is a lower incidence of dental cavities than in similar towns whose water supply contains no fluoride.

A The presence of fluoride in drinking water reduces dental decay.

B In some towns, fluoride is added to the water supply in controlled amounts.

C Fluoride in drinking water reduces the susceptibility of tooth enamel to decay which results from the production of acids in the mouth by bacterial action.

D Large quantities of fluoride in drinking water can be poisonous.

This questionnaire is compiled from items developed by Dr L D Mackay, Monash University, and Dr R Kempa, University of East Anglia.

APPENDIX A - 23A

(* indicates item used in final form of test.)

* 1 When a small amount of water is placed in the palm of the hand and allowed to evaporate, the hand is cooled.

A This effect is used to cool water in water bags hung on the front of cars.

B Heat must be applied to a substance to change its state from liquid to vapour.

C No cooling effect would be felt if the water were to evaporate very slowly.

D The evaporation of a liquid produces a cooling effect.

2 A pure liquid may be separated from a solution by the process of distillation.

A By evaporating a solution and recondensing the resulting vapour in a separate vessel we can separate a pure liquid from a solution.

B Some solutions such as ethanol-water cannot be completely separated by distillation.

C The refining of petroleum involves the distillation of crude oil into its principal fractions.

D Distillation is a method of purification frequently used in organic chemistry.

3 The Following table lists some of the features of each group of animals with backbones.

ANIMALS WITH BACKBONES

FISH	AMPHIBIANS	REPTILES	BIRDS	MAMMALS
Body covered with scales. Possess fins and gills. No legs.	Skin damp and naked with no scales. Four legs.	Body covered with hard scales.	Body covered with feathers Two wings, two legs.	Body covered with fur.

A The information in the table could be used to classify an animal with a backbone into one of five groups.

B Mammals are the only animals with backbones whose bodies are covered with fur.

C In addition to sorting out animals with backbones into groups, the table may help to understand some problems in evolution.

D In the table, animals are grouped together according to their appearance and the way they live for ease of recognition and identification.

APPENDIX A - 23A

* 4 Green plants take in carbon dioxide and water vapour from the air and convert them into starch. This process is called photosynthesis and only occurs in the presence of light.

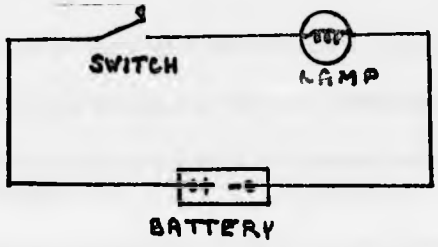
A During photosynthesis a plant takes in carbon dioxide and gives out oxygen.

B Not all cells in a green plant exposed to light carry out photosynthesis.

C The chlorophyll in green plants takes in energy from the light and some of this energy is made available to the plant in the form of chemical energy as a result of photosynthesis.

D Carbohydrates produced during photosynthesis provide energy in the form of food for plants and for animals who eat the plants.

* 5



When the switch is closed in this circuit, the lamp lights up.

A Electrical energy is supplied to the circuit by the battery and part of this energy is converted to light energy in the lamp.

B An electric current flows in the circuit when the switch is closed.

C A flat battery would not light the lamp as brightly as a fresh battery would.

D The circuit of a headlight in a car is similar to the above circuit.

6 When crystals of hydrated copper sulphate are heated, they lose their water of crystallisation.

A In crystalline copper sulphate the water is chemically bonded to the copper sulphate forming part of the crystal structure.

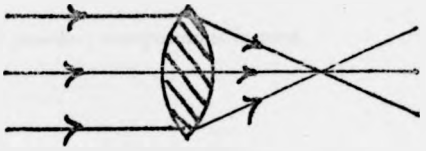
B The hydrated copper sulphate is blue before heating, then turns a chalky white after heating.

C Since anhydrous copper sulphate is non-crystalline, it would appear that the water molecules are responsible for the crystalline nature of hydrated copper sulphate.

D Anhydrous copper sulphate may be used to test for the presence of water; it turns blue in contact with water.

APPENDIX A - 23A

7 The diagram on the right represents the passage of light through a glass lens.



A Lenses like this are used in cameras, microscopes and some telescopes.

B The point of focus for red light may be different from that for blue light.

C A lens of this type can focus light rays to a point.

D This effect occurs because light travels faster in air than in glass.

*8 A large amount of heat is produced when sulphuric acid is added to water.

A Reactions in which heat is released are said to be exothermic.

B The statement fails to indicate that the heat is produced only if concentrated sulphuric acid is used.

C The heat evolved may be sufficient to make the water boil, thereby producing a potently dangerous situation.

D The release of heat when mixing sulphuric acid and water shows that a chemical reaction is taking place.

9 The leaves of flowering plants have many small openings through which water vapour and other gases pass.

A A continuous interchange of gases is essential for the processes of photosynthesis, and respiration in flowering plants.

B The cells guarding the stomata are very sensitive to the presence of light and the size of the opening changes in response to changes in the amount of light falling on them.

C These openings are called the stomata and occur chiefly on the undersurface of the leaves.

D These openings open and close, thus regulating the passage of gases to and from the leaves.

*10 When copper turnings are heated in air, a black powdery compound is formed.

A The compound is copper oxide.

B If all the copper is to be completely changed into copper oxide, an excess of air must be supplied.

C This reaction can be used to determine the percentage of oxygen in air.

D When two elements combine to form a product that is quite different from the elements we started with, we say they have reacted together to form a compound.

11 The chemical reactions in a living cell are controlled by substances which are produced in the cell and are known as enzymes.

A Enzymes are rendered inactive at high temperatures.

B The presence of enzymes enables the chemical reactions to proceed more rapidly than they otherwise would, but the enzymes are not used up in the process.

C The action of enzymes is used to change starch to sugar in the malt house during the production of beer.

D All enzymes are proteins.

* 12 Ammonia gas is extremely soluble in water.

A The statement does not consider the fact that the solubility will vary greatly with temperature.

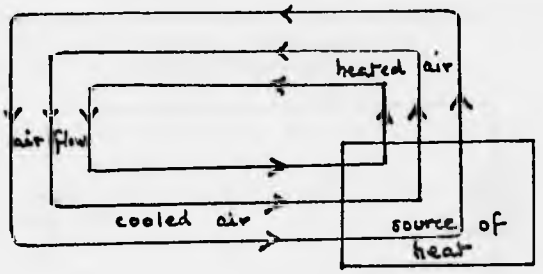
B When ammonia gas dissolves in water, heat is evolved. This shows that a chemical reaction takes place between ammonia and water molecules.

C The solution of ammonia gas in water is alkaline and is known as ammonium hydroxide.

D This fact finds application in soil fertilisation. Liquid ammonia is sprayed directly into moist soil to increase its nitrogen content.

APPENDIX A - 23A

13



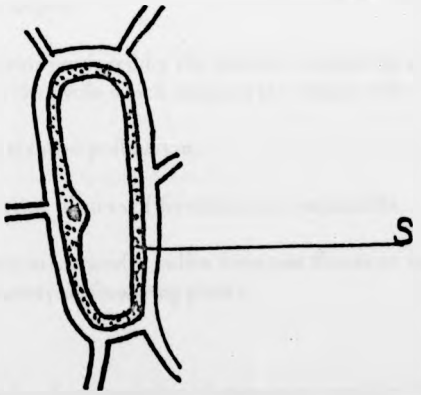
A The diagram illustrates the principle on which the effective operation of radiators in central heating systems depends.

B The effect illustrated is caused by the decrease in density of a gas when heated.

C The diagram illustrates convection.

D The effect illustrated could be observed with liquids as well as gases, but not with solids.

14 The figure represents an elongated cell from a growing root.



A The structure labelled S is termed the cytoplasm.

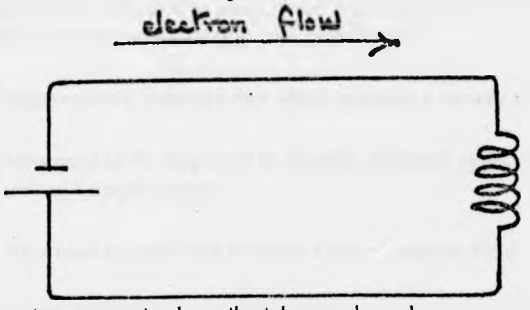
B The structure labelled S regulates the flow of some substances into and out of the cell.

C The figure is not drawn to scale as structure S is actually a very thin layer lining the much thicker cell wall.

D During the growth of the root, most of the increase in size of the elongated cells is due to the absorption of a considerable amount of water through structure S.

APPENDIX A - 23A

*15 When an electric current flows through a coil, the coil can attract iron filings placed near it.



A An alternating current in the coil might not show the same magnetic effect.

B Coils carrying electric currents are used extensively as magnets in industry because of the great magnetic force that can be obtained, and the fact that the magnetism can be controlled.

C A magnetic field is produced near a current-carrying conductor.

D The coil acts as an electro-magnet.

* 16 In order for fertilization to occur in flowering plants, pollen must be transferred from the stamens to the stigma.

A The pollen grains produced by the stamens contain the male cells while the stigma is attached to the ovule which contains the female cells.

B This transfer is called pollination.

C In most flowering plants self-fertilization is impossible.

D Growers frequently transfer pollen from one flower to another by hand to produce the desired variety of flowering plants.

* 17 A gas can be thought of as consisting of many tiny particles which collide with one another and with the walls of its container. The higher the temperature the greater the average speed of the particles.

A If the pressure is very high, the particles will be pushed close together and their size cannot be neglected.

B This is a description of the molecular model of a gas.

C Odours travel through the air from room to room more rapidly on hot days than on cold days.

D The forces exerted on the wall by particles during collisions determine the "pressure of a gas".

APPENDIX A - 23A

18 Simple chemical tests can be used to identify the presence of the main groups of foodstuffs carbohydrates, proteins and fats in particular foods.

A Human beings require a balanced diet which contains a variety of foodstuffs.

B Different tests need to be employed to identify different types of carbohydrates such as starch and simple sugars.

C These tests are used to assess the nutritive value of various foods.

D These tests are normally referred to as food tests.

*19 The rate at which a given quantity of a solid dissolves in a fixed volume of liquid varies with the size of the solid particles.

A This suggests that when making a copper sulphate solution it is better to use fine copper sulphate crystals, rather than large ones.

B As a rule, the smaller the particles of solid, the faster they dissolve.

C The rate at which large solid particles dissolve can often be increased by heating and vigorous stirring.

D The reason for this is that by decreasing the particle size of the solid one increases the surface area in contact with the liquid.

20 When smoke particles are suspended in air and observed through a microscope, they can be seen to carry out an irregular zigzag movement.

A The movement is caused by the bombardment of smoke particles by the rapidly moving air molecules.

B This irregular movement of fine particles is called Brownian motion.

C This motion can be used to illustrate the random movement of the molecules of a gas.

D The mass, size and temperature of the particles are all factors which affect this motion.

APPENDIX B

Factors Emerging from Analysis of Pupils' Responses to Attitude Items

APPENDIX B

TABLE 1B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 1

Attitude Scale	Item Number	Item	Loading (x 100)
-1	17	"Biologists, chemists and physicists work in quite different ways from each other"	66
-1	25	"There are very clear boundaries separating physics, chemistry and biology"	64
-1	54	"Biology, chemistry and physics are all called science but are not connected in any other way"	61
-1	55	"Chemistry is no help to physics"	59
1	50	"Physics, chemistry and biology are all part of the same subject"	-57
1	59	"Chemical energy is important to physics"	-42
1	22	"Energy is important to the study of biology and chemistry as well as physics"	-36
1	32	"To understand the human body a biologist must know a lot of chemistry"	-32

APPENDIX B

TABLE 2B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 2

Attitude Scale	Item Number	Item	Loading (x 100)
-2	37	"Science does not help you to learn anything about music"	-62
-2	60	"An artist has no need to learn science"	-55
-2	15	"Science does not help someone to learn geography"	-54
-2	42	"Science lessons are no use to an athlete"	-51
+2	53	"People who plan school dinners need to know a lot of science"	50
-2	9	"Science is of no use to anyone who is going to be a physical education teacher"	-41
-2	43	"Science does not help us to understand weather and climate that we learn about in Geography"	-33
+2	12	"Geography provides examples of things we learn about in science"	32
-3	44	"Science does not affect my daily life at home"	-31
+2	7	"Science is very useful to several of my other school subjects"	30

APPENDIX B

TABLE 3B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 3

Attitude Scale	Item Number	Item	Loading (x 100)
+4	57	"Science is one of my favourite subjects"	88
+4	36	"I wish we had more science in school"	87
+4	30	"I enjoy science"	85
-4	39	"Science is boring for me"	-83
-4	41	"I hate science"	-80
-4	24	"I am not interested in science"	-80
+4	4	"I would enjoy doing scientific work when I leave school"	80
-4	31	"I would not like to be a scientist"	-64
+4	47	"Scientists are very interesting people"	51
+4	33	"I would rather be a famous scientist than the Prime Minister"	49
-4	35	"Scientists are boring people"	-43
-3	45	"Science should be left to those who are scientists or who are going to be scientists"	-35

APPENDIX B

TABLE 4B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 4

Attitude Scale	Item Number	Item	Loading (x 100)
-5	52	"Good scientists know the true laws of science"	-62
-5	13	"Science teachers know the scientific truths"	-59
-5	40	"Scientific theories supply the true answers to scientific questions"	-58
-5	6	"If the teacher and I do the same experiment but get different results, the teacher's result is the right one"	-50
-5	29	"If a good scientist says that a theory is true all other scientists will believe him"	-45
-5	10	"If a famous scientist and an unknown scientist disagree we accept the opinion of the famous scientist"	-44
+5	16	"A good scientific theory does not supply the final answer to scientific questions"	42
+5	48	"A useful scientific theory may not be entirely correct"	30

APPENDIX B

TABLE 5B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 5

Attitude Scale	Item Number	Item	Loading (x 100)
+5	34	"Lots of information we get from science will be changed in the future"	57
+3	38	"Science needs the understanding and support of ordinary people"	46
+5	28	"Experiments which give answers that disagree with what the teacher expects are useful"	45
+5	1	"Scientists should criticize each other's work"	44
+5	48	"A useful scientific theory may not be entirely correct"	39
+3	49	"New discoveries in science are important to everyone"	38
+5	46	"Science teaches us not to believe everything we are told"	36
+3	20	"Everyone can help to prevent science endangering our lives"	33

APPENDIX B

TABLE 6B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 6

Attitude Scale	Item Number	Item	Loading (x 100)
-4	18	"Science is only for brainy folk"	69
-3	26	"Science is so difficult that only highly trained scientists can understand it"	60
-3	14	"Only people who are going to do scientific work should have to learn science"	47
-3	21	"Space research is no use to ordinary people"	44
-4	35	"Scientists are boring people"	34
-3	45	"Science should be left to those who are scientists or who are going to be scientists"	34
+1	32	"To understand the human body a biologist must know a lot of chemistry"	32

APPENDIX B

TABLE 7B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 7 FACTORS EXTRACTED: FACTOR 7

Attitude Scale	Item Number	Item	Loading (x 100)
+2	5	"Mathematics is a great help to science"	90
+2	23	"Science would be very difficult if we had no mathematics"	84
+2	12	"Geography provides examples of things we learn about in science"	34

APPENDIX B

TABLE 8B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 5 FACTORS EXTRACTED FACTOR 1

Attitude Scale	Item Number	Item	Loading (x 100)
-1	17	"Biologists, chemists and physicists work in quite different ways from each other"	55
-1	25	"There are very clear boundaries separating physics, chemistry and biology"	54
-1	54	"Biology, chemistry and physics are all called science but are not connected in any other way"	51
+1	50	"Physics, chemistry and biology are all part of the same subject	-47
-1	55	"Chemistry is no help to physics"	44
+1	32	"To understand the human body a biologist must know a lot of chemistry"	-40
+1	19	"If you were interested in studying animal's eyes you would need to know some physics"	-34
+1	59	"Chemical energy is important to physics"	-33
+1	27	"To study pond life you have to work like a physicist, chemist and biologist all combined"	-31

APPENDIX B

TABLE 9B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 5 FACTORS EXTRACTED FACTOR 2

Attitude Scale	Item Number	Item	Loading (x 100)
-2	15	"Science does not help someone to learn geography"	-62
-2	42	Science lessons are no use to an athlete"	-60
-2	37	"Science does not help you to learn anything about music"	-59
-2	60	"An artist has no need to learn science"	-51
-2	9	"Science is of no use to anyone who is going to be a physical education teacher"	-50
-2	43	"Science does not help us to understand weather and climate that we learn about in Geography"	-44
-3	14	"Only people who are going to do scientific work should have to learn science"	-44
-3	44	"Science does not affect my daily life at home"	-42
-1	8	"Biologists studying plants and animals do not need to know anything about electricity"	-41
+2	7	"Science is very useful to several of my other school subjects"	37
+2	12	"Geography provides examples of things we learn about in science"	36
+2	53	"People who plan school dinners need to know a lot of science"	36
-3	45	"Science should be left to those who are scientists or who are going to be scientists"	-34
-3	21	"Space research is no use to ordinary people"	-33
-1	2	"Chemical reactions are of interest only to those who learn chemistry"	-31
+3	51	"I make use of science every day"	31

APPENDIX B

TABLE 108

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 5 FACTORS EXTRACTED FACTOR 3

Attitude Scale	Item Number	Item	Loading (x 100)
+4	30	"I enjoy science"	87
-4	39	"Science is boring for me"	-87
+4	57	"Science is one of my favourite subjects"	86
+4	36	"I wish we had more science in school"	85
-4	41	"I hate science"	-84
-4	24	"I am not interested in science"	-83
+4	4	"I would enjoy doing scientific work when I leave school"	76
-4	31	"I would not like to be a scientist"	-61
+4	47	"Scientists are very interesting people"	58
-4	35	"Scientists are boring people"	-53
+4	33	"I would rather be a famous scientist than the Prime Minister"	50
-3	45	"Science should be left to those who are scientists or who are going to be scientists"	-43

APPENDIX B

TABLE 11B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 5 FACTORS EXTRACTED FACTOR 4

Attitude Scale	Item Number	Item	Loading (x 100)
-5	40	"Scientific theories supply the true answers to scientific questions"	-56
-5	6	"If the teacher and I do the same experiment but get different results, the teacher's result is the right one"	-54
-5	52	"Good scientists know the true laws of science"	-53
-5	29	"If a good scientist says that a theory is true all other scientists will believe him"	-53
-3	10	"If a famous scientist and an unknown scientist disagree we accept the opinion of the famous scientist"	-52
-5	13	"Science teachers know the scientific truths"	-52
+5	16	"A good scientific theory does not supply the final answer to scientific questions"	38
+5	48	"A useful scientific theory may not be entirely correct"	36

APPENDIX B

TABLE 12B

FACTOR ANALYSIS OF PUPIL ATTITUDE RESPONSES

PROMAX: 5 FACTORS EXTRACTED FACTOR 5

Attitude Scale	Item Number	Item	Loading (x 100)
+2	23	"Science would be very difficult if we had no mathematics"	52
+3	56	"Science can help man to live more comfortably"	49
+3	49	"New discoveries in science are important to everyone"	45
+2	5	"Mathematics is a great help to science"	45
+5	48	"A useful scientific theory may not be entirely correct"	44
+5	28	"Experiments which give answers that disagree with what the teacher expects are useful"	40
+3	38	"Science needs the understanding and support of ordinary people"	40
+3	20	"Everyone can help to prevent science endangering our lives"	39
+5	34	"Lots of information we get from science now will be changed in the future"	35
+1	22	"Energy is important to the study of biology and chemistry as well as physics"	33
+5	46	"Science teaches us not to believe everything we are told"	32
+2	3	"A knowledge of acids and alkalis is useful in cooking"	30

APPENDIX C

Distributions of Intelligence and Social Class Among the Sample of Pupils

APPENDIX C - 1C

TABLE 1C

DISTRIBUTION OF PUPILS IN THE SAMPLE FROM VARIOUS SOCIAL CLASSES AMONG SCHOOLS OF VARIOUS SIZES AND DENOMINATIONS

School Denomination - Roman Catholic

	Social Class					
	1	2	3	4	5	
Size of School						Totals
Large	4	23	183	37	9	256
Medium	8	35	311	80	18	452
Small	2	17	132	26	9	186
Totals	14	75	626	143	36	894

School Denomination - Non-denominational (cities)

	Social Class					
	1	2	3	4	5	
Size of School						Totals
Large	4	26	177	51	12	270
Medium	36	142	300	39	12	529
Small	29	43	156	45	9	282
Totals	69	211	633	135	33	1081

School Denomination - Non-denominational (outwith cities)

	Social Class					
	1	2	3	4	5	
Size of School						Totals
Large	18	53	179	37	9	296
Medium	25	86	267	85	20	483
Small	10	46	155	54	8	273
Totals	53	185	601	176	37	1052

APPENDIX C - 2C

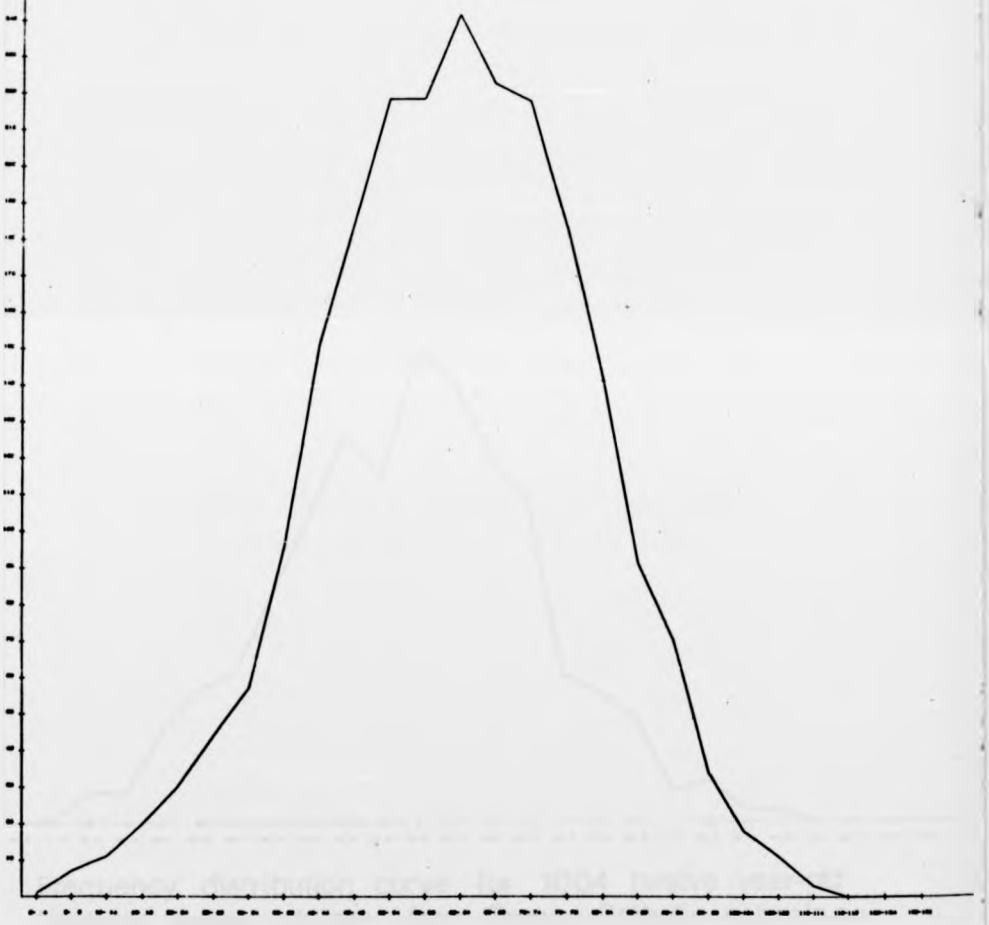
TABLE 2C

MEAN AH4 SCORES AND STANDARD DEVIATIONS FOR INDIVIDUAL SCHOOLS

SCHOOL NO	MEAN AH4 SCORE	STD. DEV.
1	53.78	19.93
2	55.31	19.19
3	45.66	13.21
4	46.98	15.47
5	56.34	17.44
6	57.63	14.91
7	55.35	16.38
8	56.00	17.50
9	59.00	15.04
10	56.06	19.70
11	60.84	16.62
12	48.37	17.08
13	60.98	14.76
14	62.94	18.68
15	53.71	17.10
16	66.31	15.06
17	52.03	17.33
18	76.58	11.93
19	58.51	16.50
20	59.97	14.79
21	62.48	17.46
22	45.23	12.39
23	82.52	10.66
24	54.59	17.74
25	57.75	26.20
26	55.79	17.58
27	56.16	17.38
28	58.73	12.00
29	67.31	12.99
30	65.03	19.02
31	55.27	11.62
32	61.93	19.32
33	59.63	18.15
34	54.26	16.55
35	56.84	15.67
36	71.29	15.25
37	63.61	15.02
38	63.89	17.86
39	63.11	14.35
40	61.57	15.67

APPENDIX C

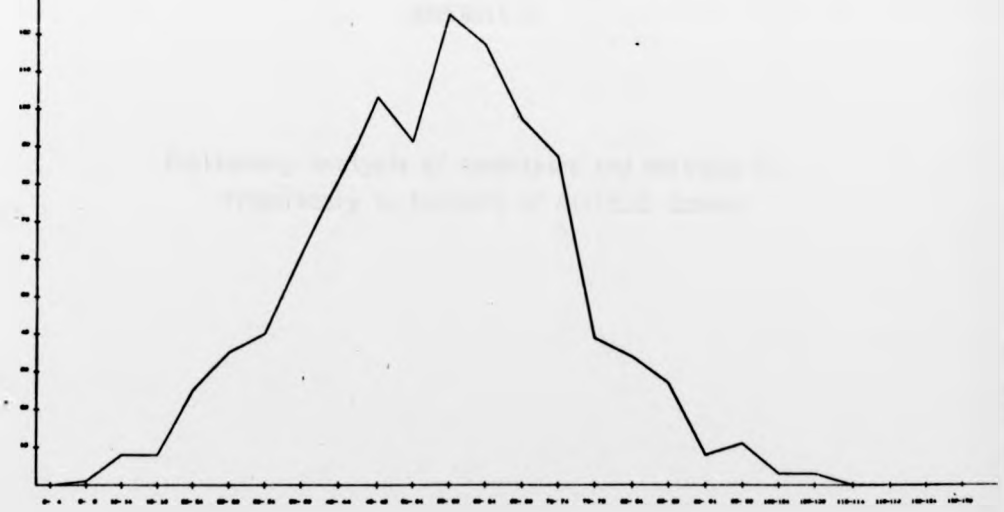
FIGURE 3C



Frequency distribution curve for 2269 twelve-year-old Scottish school children from non-denominational schools on A H 4 total score.
Mean score - 61·047; standard deviation - 18·417

APPENDIX C

FIGURE 4C



Frequency distribution curve for 1004 twelve-year-old Scottish school children from Roman Catholic schools on AH4 total score
Mean score - 55·668; standard deviation - 17·435

APPENDIX D

Preliminary Analysis of Covariates and Multiple R's Preparatory to Analysis of Attitude Scores

APPENDIX D

TABLE 1D

ANALYSIS OF VARIANCE TABLE FOR AH4 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	133188.50	1	133188.50		
A	339.13	2	169.56		
B	14.06	1	14.06		
C	9.71	1	9.71		
AB	69.06	2	34.53		
AC	43.66	2	21.83		
BC	0.56	1	0.56		
ABC	37.67	2	18.83		
S(AB)	2033.63	12	169.46	19.48	0.001
SC(AB)	104.34	12	8.69		

APPENDIX D

TABLE 2D

MEAN AH4 SCORES FOR MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

			A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
			S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys		60.8	56.8	56.1	74.0	59.1	60.7	62.9	59.5	57.7
	C_2 Girls		53.9	60.2	52.8	78.8	58.4	58.4	61.2	60.7	51.6
B_2 Separate Sciences	C_1		56.9	63.7	58.8	60.9	47.3	82.7	54.2	72.0	60.1
	C_2		53.8	55.2	52.4	64.0	43.8	82.5	61.8	69.4	66.6

APPENDIX D

TABLE 3D

ANALYSIS OF VARIANCE TABLE FOR AH4, SCHOOLS OF VARIOUS SIZE FOLLOWING INTEGRATED SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	187749.87	1	187749.81	-	-
A	394.52	2	197.26	3.60	0.05
B'	58.14	2	29.07	-	-
C	0.93	1	0.93	-	-
AB'	435.14	4	108.78	-	-
AC	1.67	2	0.83	-	-
B'C	31.60	2	15.80	-	-
AB'C	46.66	4	11.66	-	-
S(AB')	983.89	18	54.66	2.58	0.05
SC(AB')	380.22	18	21.12	-	-

APPENDIX D

TABLE 4D

MEAN AH4 SCORES FOR VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	64.0	52.2	38.6	61.5	53.7	52.7	55.7	70.1	59.9
	C_2 Girls	47.6	58.1	53.0	63.8	54.3	52.7	63.8	66.4	69.8
B_2' Medium	C_1	60.8	56.8	56.1	74.0	59.1	60.7	62.9	59.5	57.7
	C_2	53.9	60.2	52.8	78.8	58.4	58.4	61.2	60.7	51.6
B_3' Large	C_1	59.7	49.2	59.9	56.1	57.2	55.7	68.7	64.2	61.8
	C_2	64.1	50.9	62.1	55.4	58.3	54.3	61.4	62.4	61.2

APPENDIX D

TABLE 5D

ANALYSIS OF VARIANCE TABLE FOR SOCIAL CLASS VARIABLE 1

MEDIUM SIZED SCHOOLS FOLLOWING TWO SCIENCE COURSES

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1.57	1	1.57		
A	0.31	2	0.15	12.24	0.005
B	0.03	1	0.03		
AB	0.05	2	0.02		
S(AB)	0.15	12	0.01		

TABLE 6D

ANALYSIS OF VARIANCE TABLE FOR SOCIAL CLASS VARIABLE 2

MEDIUM SIZED SCHOOLS FOLLOWING TWO SCIENCE COURSES

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1.12	1	1.12		
A	0.11	2	0.05	7.03	0.01
B	0.03	1	0.03	4.29	0.10
AB	0.00	2	0.000		
S(AB)	0.10	12	0.008		

APPENDIX D

TABLE 7D SOCIAL CLASS VARIABLE 1: PROPORTION OF SCHOOL GROUP IN SOCIAL CLASSES 1 and 2 - MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

	A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	.054	.081	.104	.362	.238	.045	.262	.298	.125
B_2 Separate Sciences	.047	.109	.135	.381	.416	.405	.113	.238	.304

$\Sigma A_1 = 0.530$

$\Sigma A_2 = 1.847$

$\Sigma A_3 = 1.350$

APPENDIX D

TABLE 8D SOCIAL CLASS VARIABLE 2: PROPORTION OF SCHOOL GROUP IN SOCIAL CLASSES 4 and 5 - MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

	A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	.270	.161	.298	.048	.138	.218	.226	.250	.271
B_2 Separate Sciences	.210	.109	.279	.059	.044	.067	.162	.119	.258

$\Sigma A_1 = 1.327$

$\Sigma A_2 = 0.574$

$\Sigma A_3 = 1.286$

$\Sigma B_1 = 1.880$

$\Sigma B_2 = 1.307$

APPENDIX D

TABLE 9D

ANALYSIS OF VARIANCE TABLE FOR SOCIAL CLASS VARIABLE 2 - VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	2.20	1	2.20		
A	0.00	2	0.00		
B'	0.00	2	0.00		
AB'	0.06	4	0.01		
S(AB')	0.26	18	0.01	69.23	0.001

TABLE 10D

ANALYSIS OF VARIANCE TABLE FOR SOCIAL CLASS VARIABLE 1 - VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1.42	1	1.42		
A	0.09	2	0.04	3.65	0.05
B'	0.02	2	0.01		
AB'	0.07	4	0.01		
S(AB')	0.23	18	0.01	3.22	0.01

APPENDIX D

TABLE 11D SOCIAL CLASS VARIABLE 1: PROPORTION OF SCHOOL GROUP IN SOCIAL CLASSES 1 AND 2 - VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

	A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1^1 Small	.179	.088	.064	.143	.066	.054	.172	.265	.164
B_2^1 Medium	.054	.081	.104	.362	.238	.045	.262	.298	.125
B_3^1 Large	.102	.050	.128	.222	.068	.088	.212	.160	.311

APPENDIX D

TABLE 12D SOCIAL CLASS VARIABLE 2: PROPORTION OF SCHOOL GROUP IN SOCIAL CLASSES 4 AND 5 - SCHOOLS OF VARIOUS SIZES FOLLOWING THE INTEGRATED SCIENCE COURSE

	A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
	S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1^1 Small	.273	.158	.149	.143	.197	.280	.103	.177	.345
B_2^1 Medium	.270	.161	.298	.048	.138	.218	.226	.250	.271
B_3^1 Large	.256	.234	.088	.143	.189	.338	.062	.187	.197

APPENDIX D

TABLE 13D

KEY TO PREDICTOR VARIABLES IN MULTIPLE REGRESSION EQUATIONS FOR 40- AND 23-SCHOOL ANALYSIS

A	Sex
B	Sex + social class (2 variables)
C	Sex + social class + AH4
D	Sex + social class + AH4 + pretest attitudes (5 variables)
E	Sex + social class + AH4 + pretest attitudes + city/non-city
F	Sex + social class + AH4 + pretest attitudes + city/non-city + Roman Catholic/Non-Denominational
G	Sex + social Class + AH4 + pretest attitudes + city/non-city + Roman Catholic/Non-Denominational + size (2 variables)
H	Sex + social class + AH4 + pretest attitudes + city/non-city + Roman Catholic/Non-Denominational + size + Integrated Science/ separate science

APPENDIX D

TABLE 14D

COMPARISON OF MULTIPLE R's OBTAINED FROM BETWEEN-SCHOOLS ANALYSIS OF 40 AND 23 SCHOOLS

Figures Indicate Range of R ± 2σ for Each School Sample *i.e.* 95% Confidence Limits
See Table 13D for Key to Regressions

	Attitude 1		Attitude 2		Attitude 3		Attitude 4		Attitude 5	
	40 Schools	23 Schools	40 Schools	23 Schools	40 Schools	23 Schools	40 Schools	23 Schools	40 Schools	23 Schools
A	.00 - .26	.00 - .41	.00 - .40	.00 - .58	.08 - .40	.00 - .53	.31 - .64	.20 - .66	.00 - .33	.00 - .41
B	.45 - .75	.56 - .85	.22 - .60	.07 - .61	.26 - .63	.23 - .70	.31 - .66	.35 - .76	.39 - .71	.39 - .79
C	.52 - .78	.63 - .88	.30 - .66	.24 - .70	.27 - .64	.25 - .71	.34 - .68	.35 - .76	.56 - .80	.63 - .88
D	.64 - .84	.74 - .92	.50 - .77	.61 - .88	.57 - .81	.56 - .86	.62 - .83	.66 - .90	.67 - .86	.74 - .93
E	.64 - .84	.74 - .92	.59 - .82	.78 - .94	.58 - .82	.58 - .87	.64 - .84	.70 - .92	.67 - .86	.74 - .93
F	.65 - .85	.74 - .92	.59 - .82	.78 - .94	.58 - .82	.58 - .87	.65 - .85	.70 - .92	.68 - .87	.74 - .93
G	.64 - .86	.78 - .94	.64 - .85	.77 - .94	.57 - .83	.60 - .89	.64 - .86	.70 - .92	.67 - .87	.75 - .93
H	.74 - .90	.80 - .95	.64 - .86	.80 - .95	.58 - .83	.60 - .89	.64 - .86	.70 - .92	.70 - .88	.78 - .94

APPENDIX E

Correlations Among Criterion and Predictor Variables in Regression Analyses

APPENDIX E

TABLE 1E

KEY TO PREDICTOR VARIABLES IN VARIOUS MULTIPLE REGRESSION EQUATIONS FOR BETWEEN-SCHOOLS ANALYSIS

Label	Predictor Variables
A	Sex
B	Sex + social class
C	Sex + social class + AH4
D	Sex + social class + AH4 + pretest attitudes
E	Sex + social class + AH4 + pretest attitudes + city/non-city
F	Sex + social class + AH4 + pretest attitudes + city/non-city + RC/ND
G	Sex + social class + AH4 + pretest attitudes + city/non-city + RC/ND + size of school
H	Sex + social class + AH4 + pretest attitudes + city/non-city + RC/ND + size of school + integrated science/not
I	Sex + social class + AH4 + divergency
J	Sex + social class + AH4 + pretest attitudes + divergency
K	Sex + social class + AH4 + pretest attitudes + divergency + city/non-city + RC/ND + size of school + integrated science/not

APPENDIX E

TABLE 2E

INTERCORRELATIONS OF PREDICTOR AND CRITERION VARIABLES FOR BETWEEN-SCHOOLS ANALYSIS (40 SCHOOLS, n = 79)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Sex	1.00	0.15	-0.01	-0.01	0.01	-0.01	0.02	0.01	0.02	-0.04	-0.03	-0.05	-0.26	-0.07	-0.16	-0.21	-0.29	-0.49	-0.12
2. Social Class 2 & above/not		1.00	-0.41	-0.39	0.18	-0.06	-0.09	-0.20	0.40	0.28	0.32	0.29	0.09	0.54	0.53	0.33	0.28	0.01	0.52
3. Social Class 4 & below/not			1.00	0.20	-0.05	0.07	0.02	0.26	-0.29	-0.17	-0.17	-0.23	-0.04	-0.41	-0.43	-0.26	-0.32	-0.15	-0.37
4. RC/ND				1.00	-0.16	0.00	-0.01	-0.00	-0.36	-0.06	-0.01	-0.01	0.09	-0.22	-0.19	-0.06	0.06	0.19	-0.24
5. Town/country					1.00	0.15	-0.08	0.09	0.03	-0.07	0.05	0.17	0.39	0.09	-0.12	-0.15	0.06	0.10	-0.04
6. Large/not large						1.00	-0.37	0.30	-0.01	-0.17	-0.05	-0.04	0.07	-0.01	-0.09	-0.14	-0.05	0.02	-0.02
7. Small/not small							1.00	0.37	-0.20	-0.08	0.04	-0.14	-0.12	-0.19	-0.18	0.24	-0.01	0.02	-0.08
8. Int. Sc./Sep. Sc.								1.00	-0.16	-0.28	-0.05	-0.15	0.06	-0.34	-0.58	0.04	-0.02	0.11	-0.11
9. A.H.4									1.00	0.35	0.41	0.39	0.24	0.58	0.48	0.38	0.23	-0.08	0.60
10. Attitude 1 pretest										1.00	0.76	0.66	0.42	0.50	0.44	0.50	0.46	0.16	0.39
11. Attitude 2 pretest											1.00	0.68	0.41	0.44	0.37	0.56	0.57	0.28	0.43
12. Attitude 3 pretest												1.00	0.66	0.51	0.33	0.47	0.51	0.23	0.43
13. Attitude 4 pretest													1.00	0.32	0.04	0.39	0.49	0.48	0.21
14. Attitude 5 pretest														1.00	0.59	0.35	0.34	-0.06	0.72
15. Attitude 1 post test															1.00	0.42	0.34	0.07	0.57
16. Attitude 2 post test																1.00	0.76	0.54	0.48
17. Attitude 3 post test																	1.00	0.73	0.42
18. Attitude 4 post test																		1.00	0.06
19. Attitude 5 post test																			1.00

APPENDIX E

TABLE 3E

INTERCORRELATIONS OF PREDICTOR AND CRITERION VARIABLES INCLUDING THOSE DESCRIBING ORGANIZATION OF SCIENCE CLASSES FOR BETWEEN-SCHOOLS ANALYSIS (38 schools, n = 75)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Sex	1.00	0.11	-0.01	-0.01	0.02	-0.01	0.02	0.01	0.03	-0.04	0.00	-0.04	-0.27	-0.06	-0.14	-0.21	-0.28	-0.50	-0.09	-0.01	-0.01	-0.01	0.01
2. Social Class 2 & above/not		1.00	-0.40	-0.39	0.19	-0.08	-0.13	-0.25	0.40	0.27	0.36	0.34	0.13	0.54	0.56	0.35	0.32	0.06	0.51	-0.12	0.11	0.25	0.00
3. Social Class 4 & above/not			1.00	0.20	-0.05	0.08	0.04	0.28	-0.29	-0.16	-0.18	-0.25	-0.06	-0.41	-0.44	-0.26	-0.34	-0.17	-0.37	0.14	0.12	-0.19	0.05
4. RC/ND				1.00	-0.11	0.02	0.00	0.08	-0.35	-0.08	-0.04	-0.05	0.06	-0.22	-0.23	-0.11	0.02	0.16	-0.24	-0.02	-0.62	-0.21	-0.07
5. Town/country					1.00	0.16	-0.08	0.04	0.02	-0.04	0.07	0.19	0.42	0.09	-0.10	-0.12	0.09	0.13	-0.04	0.19	-0.03	-0.21	-0.27
6. Large/not large						1.00	-0.40	0.29	-0.02	-0.19	-0.05	-0.03	0.10	-0.02	-0.10	-0.15	-0.03	0.04	-0.05	-0.02	-0.23	-0.32	-0.01
7. Small/not small							1.00	0.37	-0.21	-0.10	0.05	-0.12	-0.09	-0.20	-0.19	0.24	0.01	0.04	-0.11	-0.04	-0.08	-0.15	-0.22
8. Int. Sc./Sep. Sc.								1.00	-0.19	-0.28	-0.03	-0.12	0.12	-0.37	-0.59	0.10	0.03	0.18	-0.16	0.10	-0.09	-0.69	-0.14
9. A.H.4									1.00	0.36	0.42	0.41	0.26	0.57	0.49	0.39	0.25	-0.07	0.61	0.07	0.32	0.36	0.14
10. Attitude 1 pretest										1.00	0.80	0.70	0.46	0.50	0.44	0.49	0.47	0.17	0.38	-0.06	-0.02	0.17	-0.12
11. Attitude 2 pretest											1.00	0.69	0.41	0.45	0.36	0.56	0.57	0.26	0.45	-0.02	-0.02	0.05	-0.27
12. Attitude 3 pretest												1.00	0.65	0.53	0.33	0.47	0.50	0.20	0.47	0.14	0.03	0.09	-0.23
13. Attitude 4 pretest													1.00	0.35	0.04	0.40	0.48	0.46	0.26	0.08	-0.06	-0.10	-0.22
14. Attitude 5 pretest														1.00	0.59	0.36	0.36	-0.04	0.73	-0.11	0.07	0.31	0.18
15. Attitude 1 post test															1.00	0.41	0.32	0.05	0.57	-0.17	0.10	0.45	0.03
16. Attitude 2 post test																1.00	0.76	0.54	0.50	-0.17	-0.01	0.04	-0.19
17. Attitude 3 post test																	1.00	0.73	0.44	-0.15	-0.08	-0.01	-0.33
18. Attitude 4 post test																		1.00	0.09	-0.19	-0.18	-0.22	-0.35
19. Attitude 5 post test																			1.00	-0.13	0.20	0.21	0.09
20. Mixed ability or not																				1.00	0.23	-0.02	-0.04
21. Mixed sex or not																					1.00	0.30	0.12
22. Number of periods of science																						1.00	0.12
23. Size of class																							1.00

APPENDIX L

TABLE 4L

INTERCORRELATIONS OF PREDICTOR (INCLUDING DIVERGENCY) AND CRITERION VARIABLES FOR BETWEEN-SCHOOLS ANALYSIS (23 SCHOOLS, n = 46)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Sex	1.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.03	-0.03	0.04	-0.04	-0.27	-0.05	-0.14	-0.22	-0.29	-0.46	-0.15	-0.03	0.13	0.07
2. Social Class 3 or above/not	1.00	-0.57	-0.39	0.33	-0.31	-0.30	-0.51	0.51	0.34	0.33	0.39	0.20	0.74	0.73	0.29	0.28	0.05	0.60	0.33	0.41	0.51	
3. Social Class 4 or below/not		1.00	0.05	-0.23	0.05	0.34	0.30	-0.26	0.27	-0.23	-0.39	-0.25	-0.50	-0.42	-0.23	-0.40	-0.33	-0.39	-0.26	-0.18	-0.38	
4. RC/ND			1.00	-0.25	-0.02	0.17	0.12	-0.29	-0.19	-0.10	-0.18	-0.13	-0.26	-0.26	0.02	0.02	0.11	-0.31	0.04	-0.24	-0.19	
5. Town/County				1.00	0.18	-0.12	0.01	0.01	-0.05	0.08	0.20	0.40	0.15	0.03	-0.16	0.11	0.11	0.06	0.12	-0.03	-0.10	
6. Size: Large/not					1.00	-0.31	0.35	-0.10	-0.32	-0.24	-0.16	-0.03	-0.23	-0.16	-0.20	-0.10	0.02	-0.17	0.11	-0.17	-0.19	
7. Size: Small/not						1.00	0.39	-0.20	0.11	0.24	0.08	0.16	-0.17	-0.30	0.24	0.00	0.11	-0.14	-0.01	0.09	-0.02	
8. Integrated Science/Sep. Sub.							1.00	-0.18	-0.22	0.01	-0.02	0.25	-0.40	-0.62	0.18	0.09	0.23	-0.12	-0.01	-0.11	-0.16	
9. A.H.4								1.00	0.36	0.42	0.44	0.28	0.61	0.60	0.43	0.24	-0.07	0.72	0.52	0.59	0.66	
10. Attitude 1 pretest									1.00	0.83	0.70	0.49	0.53	0.41	0.63	0.51	0.17	0.46	0.28	0.36	0.54	
11. Attitude 2 pretest										1.00	0.71	0.44	0.42	0.30	0.65	0.57	0.25	0.49	0.43	0.49	0.56	
12. Attitude 3 pretest											1.00	0.63	0.52	0.29	0.53	0.50	0.17	0.51	0.36	0.36	0.43	
13. Attitude 4 pretest												1.00	0.26	0.05	0.59	0.57	0.53	0.28	0.26	0.06	0.20	
14. Attitude 5 pretest													1.00	0.70	0.38	0.31	-0.05	0.77	0.40	0.53	0.68	
15. Attitude 1 post test														1.00	0.29	0.23	-0.03	0.59	0.44	0.47	0.57	
16. Attitude 2 post test															1.00	0.79	0.58	0.53	0.48	0.26	0.52	
17. Attitude 3 post test																1.00	0.78	0.40	0.42	0.18	0.38	
18. Attitude 4 post test																	1.00	0.06	0.28	-0.10	0.07	
19. Attitude 5 post test																		1.00	0.48	0.57	0.71	
20. Divervency 'Circles' fluency																			1.00	0.62	0.69	
21. Divergency 'Uses' fluency																				1.00	0.82	
22. Divergency 'Meanings' fluency																					1.00	

APPENDIX E

TABLE 4E

APPENDIX E

TABLE 5E

KEY TO PREDICTOR VARIABLES IN MULTIPLE REGRESSION EQUATIONS CARRIED OUT ON INDIVIDUAL SCHOOL SCORES AND 'COMBINED' REGRESSION OF WITHIN-SCHOOL ANALYSIS. THE FOLLOWING ORDER OF PREDICTORS CORRESPONDS TO THE ORDER IN WHICH THE VARIANCE ACCOUNTED FOR IS LISTED ON TABLES

A	Sex
B	Sex + social class (2 variables)
C	Sex + social class + AH4
D	Sex + social class + AH4 + Pretest attitudes (5 variables)
E	Sex + social class + AH4 + Divergency fluency (3 variables)
F	Sex + social class + AH4 + Divergency fluency + Divergency uniqueness (2 variables)
G	Sex + social class + AH4 + Pretest Attitudes + Divergency

(Figures for variance accounted for corresponding to E and F are given in brackets on all tables)

APPENDIX E

TABLE 6E

COMBINED r MATRIX OF INTERCORRELATIONS OF PREDICTOR AND CRITERION VARIABLES FOR WITHIN-SCHOOLS ANALYSIS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Sex	1.00	-0.06	0.01	0.06	0.07	0.04	0.03	0.05	0.01	-0.09	-0.01	0.02	0.05	0.08	-0.07	-0.06	0.01	-0.03	-0.05	-0.19	-0.05
2. Social Class (a)		1.00	-0.21	0.12	0.10	0.12	0.11	0.04	0.04	0.03	0.12	0.04	0.06	0.09	0.04	0.09	0.14	0.10	0.12	0.10	0.12
3. Social Class (b)			1.00	-0.09	-0.10	-0.07	-0.03	-0.04	-0.12	-0.05	-0.09	-0.05	-0.05	-0.10	-0.07	0.00	-0.09	-0.07	-0.10	-0.09	-0.07
4. A.H.4 Total				1.00	0.90	0.93	0.19	0.14	0.24	0.12	0.32	0.30	0.37	0.51	0.19	0.18	0.26	0.22	0.24	0.12	0.31
5. A.H.4 Part 1					1.00	0.67	0.18	0.13	0.26	0.13	0.31	0.26	0.34	0.52	0.17	0.17	0.26	0.22	0.26	0.13	0.32
6. A.H. Part 2						1.00	0.17	0.12	0.18	0.10	0.27	0.29	0.33	0.42	0.18	0.15	0.20	0.18	0.19	0.09	0.26
7. Attitude 1 pretest							1.00	0.43	0.36	0.23	0.18	0.11	0.17	0.16	0.09	0.14	0.28	0.25	0.18	0.09	0.19
8. Attitude 2 pretest								1.00	0.46	0.22	0.20	0.06	0.12	0.08	0.13	0.06	0.20	0.30	0.19	0.11	0.21
9. Attitude 3 pretest									1.00	0.49	0.19	0.14	0.18	0.21	0.16	0.16	0.26	0.32	0.40	0.23	0.22
10. Attitude 4 pretest										1.00	0.08	0.13	0.12	0.06	0.11	0.15	0.16	0.19	0.27	0.28	0.07
11. Attitude 5 pretest											1.00	0.11	0.20	0.28	0.11	0.09	0.18	0.19	0.20	0.07	0.47
12. Divergency 'Circles' fluency												1.00	0.40	0.29	0.41	0.28	0.09	0.09	0.07	0.03	0.12
13. Divergency 'Uses' fluency													1.00	0.45	0.24	0.49	0.15	0.16	0.17	0.10	0.23
14. Divergency 'Meanings' fluency														1.00	0.21	0.27	0.21	0.14	0.19	0.09	0.31
15. Divergency 'Circles' Uniqueness															1.00	0.23	0.09	0.13	0.13	0.14	0.12
16. Divergency 'Uses' Uniqueness																1.00	0.13	0.11	0.09	0.11	0.18
17. Attitude 1 - post test																	1.00	0.47	0.42	0.33	0.26
18. Attitude 2 - post test																		1.00	0.58	0.43	0.25
19. Attitude 3 - post test																			1.00	0.61	0.21
20. Attitude 4 - post test																				1.00	0.0[illegible]
21. Attitude 5 - post test																					1.00

APPENDIX F

Tables Relating to Analysis of Attitude Scale 1 Scores

APPENDIX F

TABLE 1F

ATTITUDE 1: MEAN POST-TEST SCORES FOR BOYS AND GIRLS IN MEDIUM-SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	1.58	3.10	3.04	6.62	3.71	3.97	5.09	5.26	4.43
	C_2 Girls	2.12	3.67	0.43	4.52	2.97	3.43	3.35	5.43	2.60
B_2 Separate Sciences	C_1	6.66	8.24	4.78	6.50	5.05	9.23	4.89	4.22	8.09
	C_2	3.64	8.18	4.54	7.50	5.27	8.35	5.56	5.76	6.03

$\Sigma B_1 = 65.32$

$\Sigma B_2 = 112.58$

APPENDIX F

TABLE 2F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1, MEDIUM-SIZE SCHOOLS
(2 TYPES OF SCIENCE COURSE)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	878.33	1	878.33	-	-
A	12.50	2	6.25	-	-
B	61.78	1	61.78	16.25	0.01
C	3.42	1	3.42	-	-
AB	7.96	2	3.98	-	-
AC	0.16	2	0.08	-	-
BC	0.82	1	0.82	-	-
ABC	1.65	2	0.82	-	-
S(AB)	45.65	12	3.80	3.75	0.025
SC(AB)	12.50	12	1.04	-	-

APPENDIX F

TABLE 3F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (5 FACTOR)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1078.72	1	1078.72	-	-
A	7.27	2	3.63	-	-
B	47.58	1	47.58	12.2	0.01
C	3.29	1	3.29	-	-
D	82.24	1	82.24	37.6	0.001
AB	10.65	2	5.33	-	-
AC	1.85	2	0.92	-	-
AD	5.49	2	2.74	-	-
BC	1.06	1	1.06	-	-
BD	17.79	1	17.79	7.9	0.025
CD	0.64	1	0.64	-	-
ABC	2.22	2	1.11	-	-
ABD	0.73	2	0.36	-	-
ACD	0.74	2	0.37	-	-
BCD	0.06	1	0.06	-	-
ABCD	0.12	2	0.06	-	-
SWAB	46.93	12	3.91	11.00	0.001
SCWAB	10.89	12	0.91	-	-
SDWAB	27.06	12	2.25	6.32	0.01
SCDWAB	4.26	12	0.35	-	-

MEAN SCORES PRETEST ATTITUDE 1: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	2.54	2.26	2.84	4.41	2.24	0.65	2.84	3.75	2.74
	C_2 Girls	2.12	1.55	2.00	3.18	2.00	2.00	2.18	2.85	1.60
B_2 Separate Sciences	C_1	3.41	4.82	3.41	1.26	3.86	3.84	3.95	2.30	1.49
	C_2	1.85	3.96	2.66	2.55	4.38	4.61	4.38	2.27	1.15

	A_1	A_2	A_3
C_1	19.28	16.26	17.07
C_2	14.14	18.72	15.43

APPENDIX F

TABLE 5F

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 1, MEDIUM SIZED SCHOOLS, TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	282.80	1	282.80	-	-
A	0.26	2	0.13	-	-
B	3.61	1	3.61	-	-
C	0.52	1	0.52	-	-
AB	3.43	2	1.71	-	-
AC	2.41	2	1.20	5.5	0.025
BC	0.29	1	0.29	-	-
ABC	0.69	2	0.34	-	-
S(AB)	28.26	12	2.35	10.68	0.001
SC(AB)	2.63	12	0.22	-	-

TABLE 6F

ATTITUDE 1: MEAN POST-TEST SCORES FOR BOYS AND GIRLS IN SCHOOLS OF VARIOUS SIZES FOLLOWING THE INTEGRATED SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1	3.95	4.73	3.70	4.42	3.53	1.98	4.88	6.71	4.50
	C_2	2.74	3.21	3.57	2.67	2.38	3.35	4.38	4.92	4.15
B_2' Medium	C_1	1.58	3.10	3.04	6.62	3.71	3.97	5.09	5.26	4.43
	C_2	2.12	3.67	0.43	4.52	2.97	3.43	3.36	5.43	2.60
B_3' Large	C_1	4.40	2.98	4.15	4.49	4.30	3.98	4.71	5.50	5.46
	C_2	4.38	4.32	4.43	4.26	2.64	2.29	2.91	5.39	5.45

$\Sigma A_1 = 60.50$ $\Sigma A_2 = 65.51$ $\Sigma A_3 = 85.13$

$\Sigma C_1 = 115.17$

$\Sigma C_2 = 95.97$

APPENDIX F

TABLE 7F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	825.56	1	825.56	-	-
A	18.83	2	9.41	7.71	0.01
B'	3.22	2	1.61	-	-
C	6.83	1	6.83	10.73	0.01
AB'	12.29	4	3.07	-	-
AC	1.11	2	0.56	-	-
B'C	0.56	2	0.28	-	-
AB'C	1.78	4	0.45	-	-
S(AB')	22.08	18	1.23	-	-
SC(AB')	11.49	18	0.64	-	-

APPENDIX F

TABLE 8F

MEAN SCORES PRETEST ATTITUDE 1: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	3.35	3.13	2.15	3.15	1.78	1.84	0.19	6.50	2.35
	C_2 Girls	1.11	2.57	1.65	2.57	1.00	1.48	0.77	4.53	3.48
B_2' Medium	C_1	2.54	2.26	2.84	4.41	2.24	0.65	2.84	3.75	2.74
	C_2	2.12	1.55	2.00	3.18	2.00	2.00	2.18	3.85	1.60
B_3' Large	C_1	3.14	2.21	0.00	1.21	1.76	2.00	2.26	1.83	1.92
	C_2	2.59	2.41	3.66	1.79	2.81	1.21	2.35	2.54	3.44

	B_1'	B_2'	B_3'
C_1	24.44	24.27	16.33
C_2	19.16	20.48	22.80

APPENDIX F

TABLE 9F

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 1, VARIOUS SIZED SCHOOLS FOLLOWINC INTEGRATED SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	300.95	1	300.95	-	-
A	4.15	2	2.07	-	-
B'	0.98	2	0.49	-	-
C	0.12	1	0.12	-	-
AB'	1.38	4	0.34	-	-
AC	0.15	2	0.07	-	-
B'C	4.55	2	2.27	3.28	0.10
AB'C	1.47	4	0.37	-	-
S(AB')	40.42	18	2.24	3.27	0.01
SC(AB')	12.36	18	0.69	-	-

APPENDIX F

TABLE 10F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (SCHOOL MEANS)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	515.04	1	515.04	-	-
A	7.12	2	3.56	-	-
B'	0.08	2	0.04	-	-
D	25.15	1	25.15	48.50	0.001
AB'	4.69	4	1.17	-	-
AD	1.04	2	0.52	-	-
BD	0.73	2	0.36	-	-
AB'D	1.60	4	0.40	-	-
S(AB')	22.13	18	1.23	2.36	0.05
SD(AB')	9.38	18	0.52	-	-

APPENDIX F

TABLE 11F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (BOYS)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	601.40	1	601.40	-	-
A	10.03	2	5.01	-	-
B'	1.27	2	0.63	-	-
D	46.54	1	46.54	69.5	0.001
AB'	4.85	4	1.21	-	-
AD	4.23	2	2.11	-	-
B'D	4.06	2	2.03	-	-
AB'D	2.64	4	0.66	-	-
S(AB')	39.17	18	2.18	3.24	0.01
SD(AB')	12.11	18	0.67	-	-

APPENDIX F

TABLE 12F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (GIRLS)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	464.70	1	464.70	-	-
A	9.34	2	4.67	3.59	0.05
B'	3.13	2	1.56	-	-
D	20.82	1	20.82	32.60	0.001
AB'	8.44	4	2.11	-	-
AD	0.64	2	0.32	-	-
B'D	0.84	2	0.42	-	-
AB'D	0.99	4	0.25	-	-
S(AB')	23.51	18	1.31	-	-
SD(AB')	11.52	18	0.64	-	-

APPENDIX F

TABLE 13F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (ROMAN CATHOLIC)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	287.75	1	287.75	-	-
B'	5.90	2	2.95	6.10	0.05
C	0.62	1	0.62	-	-
D	10.26	1	10.26	16.1	0.01
B'C	5.55	2	2.78	-	-
B'D	4.48	2	2.24	-	-
CD	0.02	1	0.02	-	-
B'CD	0.26	2	0.13	-	-
S(B')	2.90	6	0.48	-	-
SC(B')	5.52	6	0.92	-	-
SD(B')	3.83	6	0.64	-	-
SCD(B')	4.93	6	0.82	-	-

APPENDIX F

TABLE 14F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (NON-DENOMINATIONAL 1)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	292.35	1	292.35	-	-
B'	4.06	2	2.03	-	-
C	2.50	1	2.50	-	-
D	22.45	1	22.45	50.90	0.001
B'C	0.02	2	0.01	-	-
B'D	1.11	2	0.55	-	-
CD	1.56	1	1.56	-	-
B'CD	0.96	2	0.48	-	-
S(B')	15.06	6	2.51	7.70	0.025
SC(B')	4.85	6	0.81	-	-
SD(B')	2.66	6	0.44	-	-
SCD(B')	1.95	6	0.32	-	-

APPENDIX F

TABLE 15F

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 1 (NON-DENOMINATIONAL 2)

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	500.64	1	500.64	-	-
B'	0.87	2	0.43	-	-
C	1.60	1	1.60	-	-
D	36.02	1	36.02	22.60	0.01
B'C	1.27	2	0.64	-	-
B'D	1.44	2	0.72	-	-
CD	1.92	1	1.92	16.60	0.01
B'CD	0.29	2	0.14	-	-
S(B')	28.49	6	4.75	41.00	0.001
SC(B')	5.86	6	0.98	8.45	0.025
SD(B')	9.56	6	1.59	13.80	0.01
SCD(B')	0.69	6	0.11	-	-

APPENDIX F

TABLE 16F BETWEEN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS
ATTITUDE 1 Figures shown are for (a) 40 schools and (b) 23 schools (in brackets).
(For key to multiple regressions see Table 1E Only those F-values significant at the 5% or better are shown)

Number of schools in sample	Sample Size N	Regression differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N - m_1 - 1)}{(1 - R_1^2)(m_1 - m_2)}$	df_1 $(m_1 - m_2)$	df_2 $(N-m_1-1)$	Significance Level
40 (23)	79 (46)	A	0.03 (0.02)	0 (0)	1 (1)	0 (0)				
		B - A	0.39 (0.59)	0.03 (0.02)	3 (3)	1 (1)	22.1 (29.2)	2 (2)	75 (42)	0.001 (0.001)
		C - B	0.45 (0.62)	0.39 (0.59)	4 (4)	3 (3)	8.09 (3.24)	1 (1)	74 (41)	0.01 (0.05)
		D - C	0.58 (0.74)	0.45 (0.62)	9 (9)	4 (4)	4.3 (3.32)	5 (5)	69 (36)	0.01 (0.025)
		E - D	0.58 (0.74)	0.58 (0.74)	10 (10)	9 (9)				
		F - E	0.59 (0.75)	0.58 (0.74)	11 (11)	10 (10)				
		G - F	0.60 (0.78)	0.59 (0.75)	13 (13)	11 (11)				
		H - G	0.70 (0.81)	0.60 (0.78)	14 (14)	13 (13)	21.3 (4.89)	1 (1)	64 (31)	0.001 (0.05)
		G - D	0.60 (0.78)	0.58 0.74	13 (13)	9 (9)				
		I - C	- (0.64)	- (0.62)	- (7)	- (4)				
		J - D	- (0.78)	- (0.74)	- (12)	- (9)				
		K - H	- (0.82)	- (0.81)	- (17)	- (14)				

R_1 - multiple R with larger number of predictor variables m_1 - larger number of predictor variables

R_2 - miltiple R with smaller number of predictor variables m_2 - smaller number of predictor variables

APPENDIX F

TABLE 17F

Attitude 1 - % variance accounted for by modified stepwise regression on individual schools (for key see Table 5E) - 12 school sample

	Roman Catholic	non-Denominational 1	non-Denominational 2
Small	B 12 C 17 D 34 E (23) F (29) G 38	3 5 14 (8) (9) 18	3 15 33 (19) (20) 41
Medium (Integrated)	1 2 16 (5) (8) 20	12 21 39 (23) (29) 41	11 21 44 (29) (30) 51
Medium (separate Science)	3 16 26 (17) (18) 28	4 6 19 (11) (16) 29	7 9 19 (9) (12) 26
Large	9 11 21 (13) (15) 24	2 7 8 (9) (15) 18	7 16 20 (23) (23) 25

APPENDIX F

TABLE 18F WITHIN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 1

(For key to multiple regressions see Table 5E. Only those F-values significant at the 5% or better are shown)

No. of pupils in sample N	Regression Differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N-m-1-24)}{(1 - R^2)(m_1 - m_2)}$	df_2 $(N-m_2-1-24)$	df_1 $m_1 - m_2$	Significance Levels
885	A	0	0	1	0		859	1	
	B	0.02	0	3	0	6.40	857	3	0.001
	B - A	0.02	0	3	1	8.75	857	2	0.001
	C - B	0.08	0.02	4	3	5.60	856	1	0.001
	D - C	0.15	0.08	9	4	14.00	851	5	0.001
	E - C	0.09	0.08	7	4	3.10	853	3	0.05
	F - E	0.09	0.09	9	7		851	2	
	G - D	0.16	0.15	14	9		846	5	
	G - F	0.16	0.09	14	9	14.00	846	5	0.001

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX G

Tables Relating to Analysis of Attitude Scale 2 Scores

APPENDIX G

TABLE 1G

MEAN SCORES ATTITUDE 2: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	3.75	6.58	5.37	9.79	5.22	4.28	7.04	5.50	7.17
	C_2 Girls	3.24	4.24	2.35	5.93	4.59	3.43	5.70	5.00	4.00
B_2 Separate Sciences	C_1	7.84	5.97	5.76	5.69	4.81	7.40	3.02	6.43	2.97
	C_2	6.50	7.41	5.41	5.14	4.35	5.92	3.78	4.24	2.49

$\Sigma C_1 = 104.59$

$\Sigma C_2 = 83.72$

	A_1	A_2	A_3
B_1	25.53	33.24	34.77
B_2	38.82	33.31	22.93

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TABLE 2G

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 2, MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	985.02	1	985.02	-	-
A	3.87	2	1.94	-	-
B	0.11	1	0.11	-	-
C	12.10	1	12.10	12.87	0.01
AB	25.75	2	12.88	4.16	0.05
AC	0.12	2	0.06	-	-
BC	3.72	1	3.72	-	-
ABC	0.39	2	0.20	-	-
S(AB)	37.05	12	3.09	3.28	0.025
SC(AB)	11.30	12	0.94	-	-

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TABLE 3G

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 2 (5 FACTOR)
MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F Value	Significance level
MEAN	1190.80	1	1190.80	-	-
A	9.66	2	4.83	-	-
B	0.51	1	0.51	-	-
C	15.15	1	15.15	30.30	0.001
D	97.55	1	97.55	65.50	0.001
AB	29.31	2	14.65	-	-
AC	0.10	2	0.05	-	-
AD	1.31	2	0.65	-	-
BC	5.38	1	5.38	10.7	0.01
BD	0.06	1	0.06	-	-
CD	1.05	1	1.05	-	-
ABC	0.09	2	0.04	-	-
ABD	3.11	2	1.55	-	-
ACD	0.58	2	0.29	-	-
BCD	0.16	1	0.16	-	-
ABCD	1.03	2	0.51	-	-
SWAB	46.83	12	3.90	6.50	0.01
SCWAB	6.02	12	0.50	-	-
SDWAB	17.84	12	1.48	-	-
SCDWAB	7.19	12	0.59	-	-

APPENDIX G

TABLE 4G

MEAN SCORES PRETEST ATTITUDE 2: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	2.83	2.48	2.47	5.45	2.84	3.97	2.93	4.15	3.04
	C_2 Girls	1.82	1.15	1.39	4.64	2.28	1.54	1.75	3.72	1.73
B_2 Separate Sciences	C_1	4.02	4.30	3.10	2.00	3.58	4.65	3.63	1.78	1.11
	C_2	3.34	3.14	2.21	2.68	3.08	5.55	3.56	1.68	0.91

$\Sigma C_1 = 58.33$

$\Sigma C_2 = 46.17$

	B_1	B_2
C_1	30.16	28.17
C_2	20.02	26.15

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TABLE 5G

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 2, MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	303.34	1	303.34	-	-
A	7.11	2	3.55	-	-
B	0.48	1	0.48	-	-
C	4.11	1	4.11	25.68	0.001
AB	6.68	2	3.34	-	-
AC	0.56	2	0.28	-	-
BC	1.83	1	1.83	11.43	0.01
ABC	0.73	2	0.37	-	-
S(AB)	27.62	12	2.30	14.37	0.001
SC(AB)	1.91	12	0.16	-	-

TABLE 6G

MEAN SCORES ATTITUDE 2: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	9.50	5.17	5.04	7.04	6.06	1.65	8.19	13.63	4.45
	C_2 Girls	4.68	3.86	4.48	6.14	3.69	1.88	6.31	9.23	6.79
B_2' Medium	C_1	3.75	6.58	5.37	9.79	5.22	4.28	7.04	5.50	7.17
	C_2	3.24	4.24	2.35	5.93	4.59	3.43	5.70	5.00	4.00
B_3' Large	C_1	5.14	4.66	3.81	3.31	5.73	2.56	4.13	6.83	7.55
	C_2	5.67	5.82	5.46	6.09	4.32	1.44	3.05	6.02	7.00

$\Sigma C_1 = 159.15$

$\Sigma C_2 = 130.4$

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TABLE 7G

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 2, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1552.69	1	1552.68	-	-
A	37.89	2	18.94	-	-
B'	11.17	2	5.58	-	-
C	15.30	1	15.30	8.84	0.01
AB'	23.87	4	5.97	-	-
AC	0.31	2	0.15	-	-
B'C	9.78	2	4.89	-	-
AB'C	3.75	4	0.94	-	-
S(AB')	117.22	18	6.51	3.76	0.01
SC(AB')	31.14	18	1.73	-	-

MEAN SCORES PRETEST ATTITUDE 2: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	4.90	2.77	1.89	2.27	1.41	1.65	1.25	7.13	2.26
	C_2 Girls	1.95	4.04	2.87	2.81	1.53	2.13	1.69	5.50	3.24
B_2' Medium	C_1	2.83	2.48	2.47	5.45	2.84	3.97	2.93	4.15	3.04
	C_2	1.82	1.15	1.39	4.64	2.28	1.54	1.75	3.72	1.73
B_3' Large	C_1	4.51	3.72	0.85	1.07	0.21	2.16	3.39	1.46	2.84
	C_2	3.64	3.27	4.25	2.71	2.08	4.00	2.37	3.02	4.18

	B_1'	B_2'	B_3'
C_1	25.53	30.16	20.21
C_2	25.76	20.02	29.52

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TABLE 9G

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 2, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	423.36	1	423.36	-	-
A	3.31	2	1.66	-	-
B'	0.07	2	0.04	-	-
C	0.01	1	0.01	-	-
AB'	15.97	4	3.99	-	-
AC	0.71	2	0.36	-	-
B'C	10.52	2	5.26	5.78	0.025
AB'C	0.92	4	0.23	-	-
S(AB')	46.82	18	2.60	2.85	0.025
SC(AB')	16.39	18	0.91	-	-

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TABLE 10G

ANALYSIS OF VARIANCE TABLE ATTITUDE 2 (SCHOOL MEANS)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	891.41	1	891.41		
A	13.02	2	6.51		
B'	1.95	2	0.97		
D	84.62	1	84.62	71.5	0.001
AB'	15.57	4	3.89		
AD	4.83	2	2.41		
B'D	2.33	2	1.16		
AB'D	1.09	4	0.27		
A(AB')	45.33	18	2.51		
SD(AB')	21.27	18	1.18		

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TABLE 11G

ANALYSIS OF VARIANCE TABLE ATTITUDE 2 (BOYS ONLY)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1023.12	1	1023.12		
A	19.87	2	9.93		
B'	17.38	2	8.69		
D	128.34	1	128.34	58.5	0.001
AB'	20.67	4	5.16		
AD	5.83	2	2.91		
B'	4.65	2	2.32		
AB'D	1.88	4	0.47		
S(AB')	109.37	18	6.07	2.77	0.025
SD(AB')	39.33	18	2.18		

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TABLE 12G

ANALYSIS OF VARIANCE TABLE ATTITUDE 2 (GIRLS ONLY)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	783.64	1	783.64		
A	11.70	2	5.85	25.30	0.001
B'	8.51	2	4.25		
D	56.24	1	56.24	47.70	0.001
AB'	19.33	4	4.83		
AD	4.79	2	2.39		
B'D	0.98	2	0.49		
AB'D	2.61	4	0.65		
S(AB')	41.64	18	2.31		
SD(AB')	21.21	18	1.17		

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TABLE 13G

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 2 (ROMAN CATHOLIC)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	541.49	1	541.49		
B'	9.83	2	4.91		
C	3.52	1	3.52		
D	40.15	1	40.15	36.50	0.001
B'C	10.66	2	5.33		
B'D	0.72	2	0.36		
CD	1.43	1	1.43		
B'CD	2.19	2	1.09		
S(B')	10.33	6	1.72		
SC(B')	15.62	6	2.60	5.85	0.025
SD(B')	6.62	6	1.10		
SCD(B')	2.67	6	0.44		

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TABLE 14G

ANALYSIS OF VARIANCE TABLE ATTITUDE 2 (NON DENOMINATIONAL (1))

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	454.40	1	454.40		
B'	16.31	2	6.15		
C	0.82	1	0.82		
D	40.96	1	40.95	9.70	0.025
B'C	9.05	2	4.52	5.32	0.05
B'D	0.50	2	0.25		
CD	3.25	1	3.25		
B'CD	0.56	2	0.28		
S(B')	39.52	6	6.58	6.15	0.025
SC(B')	5.11	6	0.85		
SD(B')	25.29	6	4.21		
SCD(B')	6.41	6	1.06		

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TABLE 15G

ANALYSIS OF VARIANCE TABLE ATTITUDE 2 (NON DENOMINATIONAL (2))

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	833.66	1	833.66		
B'	17.77	2	8.88		
C	4.43	1	4.43		
D	106.57	1	106.57	40.7	0.001
B'C	2.26	2	1.13		
B'C	5.92	2	2.96		
CD	2.85	1	2.85		
B'CD	0.22	2	0.11		
S(B')	66.54	6	11.09	17.40	0.01
SC(B')	13.88	6	2.31		
SD(B')	15.71	6	2.61		
SCD(B')	3.81	6	0.63		

APPENDIX G

TABLE 16G BETWEEN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 2 Figures shown are for (a) 40 schools and (b) 23 schools (in brackets).
(For key to multiple regressions see Table 1E. Only those F-values significant at the 5% or better are shown)

Number of schools in sample	Sample Size N	Regression differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N - m_1 - 1)}{(1 - R_1^2)(m_1 - m_2)}$	df_1 $(m_1 - m_2)$	df_2 $(N-m_1-1)$	Significance Level
40 (23)	79 (46)	A	0.04 (0.05)	0 (0)	1 (1)	0 (0)				
		B - A	0.19 (0.14)	0.04 (0.05)	3 (3)	1 (1)	6.95	75	2	0.01
		C - B	0.25 (0.026)	0.19 (0.14)	4 (4)	3 (3)	5.90 (6.65)	74 (41)	1 (1)	0.025 (0.025)
		D - C	0.44 (0.60)	0.25 (0.26)	9 (9)	4 (4)	4.70 (6.12)	69 (36)	5 (5)	0.01 (0.001)
		E - D	0.52 (1.77)	0.44 (0.60)	10 (10)	9 (9)	11.30 (25.80)	68 (35)	1 (1)	0.01 (0.001)
		F - E	0.52 (0.77)	0.52 (0.77)	11 (11)	10 (10)				
		G - F	0.60 (0.78)	0.52 (0.77)	13 (13)	11 (11)	6.50	65	2	0.01
		H - G	0.60 (0.81)	0.60 (0.78)	14 (14)	13 (13)	(4.90)	(31)	(1)	(0.05)
		G - D	0.60 (0.78)	0.44 (0.60)	13 (13)	9 (9)	6.50 (6.54)	65 (32)	4 (4)	0.001 (0.001)
		I - C	- (0.45)	- (0.26)	- (7)	- (4)	(4.38)	(38)	(3)	(0.01)
		J - D	- (0.69)	- (0.60)	- (12)	- (9)	(3.29)	(33)	(3)	(0.05)
		K - H	- (0.87)	- (0.81)	- (17)	- (14)	(4.30)	(28)	(3)	(0.025)

R_1 - multiple R with larger number of predictor variables m_1 - larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables m_2 - smaller number of predictor variables

APPENDIX G

TABLE 17G

Attitude 2 - % variance accounted for by modified stepwise regression on individual schools (for key see Table 5E) - 12 school sample

		Roman Catholic	non-Denominational 1	non-Denominational 2
Small	B	2	2	5
	C	23	12	11
	D	37	32	28
	E	(27)	(16)	(15)
	F	(29)	(21)	(17)
	G	44	40	33
Medium (Integrated)		5	5	6
		13	9	18
		31	28	26
		(15)	(10)	(21)
		(17)	(19)	(21)
		37	35	30
Medium (Separate Science)		5	3	3
		10	3	3
		17	24	20
		(12)	(8)	(9)
		(17)	(20)	(14)
		25	32	27
Large		10	3	1
		17	4	1
		33	16	14
		(20)	(5)	(8)
		(22)	(6)	(9)
		34	19	20

APPENDIX G

TABLE 18G WITHIN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 2

(For key to multiple regressions see Table 5E. Only those F-values significant at the 5% or better are shown)

No. of pupils in sample N	Regression Differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)\ (N-m-1-24)}{(1 - R^2)\ (m_1 - m_2)}$	df_2 $(N-m_2-1-24)$	df_1 $m_1 - m_2$	Significance Levels
885	A	0	0	1	0		859	1	
	B	0.01	0	3	0	2.90	857	3	0.05
	B - A	0.01	0	3	1	4.30	857	2	0.25
	C - B	0.06	0.01	4	3	45.00	856	1	0.001
	D - C	0.17	0.06	9	4	22.50	851	5	0.001
	E - C	0.06	0.06	7	4		853	3	
	F - E	0.07	0.06	9	7	4.60	851	2	0.025
	G - D	0.17	0.17	14	9	.	846	5	
	G - F	0.17	0.07	14	9	20.50	846	5	0.001

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX H

Tables Relating to Analysis of Attitude Scale 3 Scores

APPENDIX H

TABLE 1H

MEAN SCORES ATTITUDE 3: MEDIUM SIZED SCHOOLS FOLLOWING 2 DIFFERENT SCIENCE COURSES

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	6.67	8.93	7.67	10.41	7.82	6.45	6.76	6.60	8.52
	C_2 Girls	3.35	4.27	5.74	6.54	7.85	6.79	5.02	6.45	6.60
B_2 Separate Sciences	C_1	9.93	7.45	6.37	7.45	7.00	9.58	6.12	6.62	4.38
	C_2	6.68	7.96	6.64	6.79	6.31	6.47	6.73	5.43	3.22

$\Sigma C_1 = 134.73$

$\Sigma C_2 = 108.81$

APPENDIX H

TABLE 2H

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 3 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1647.81	1	1647.81		
A	12.09	2	6.04		
B	0.04	1	0.04		
C	18.63	1	18.63	14.22	0.01
AB	10.89	2	0.99		
BC	2.03	1	2.02		
ABC	3.01	2	1.50		
S(AB)	23.20	12	1.94		
SC(AB)	15.17	12	1.31		

APPENDIX H

TABLE 3H

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 3 (5 FACTOR)
MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F Value	Significance level
MEAN	2791.16	1	2791.16	-	-
A	31.25	2	15.62	-	-
B	0.22	1	0.22	-	-
C	8.79	1	8.79	7.05	0.025
D	20.94	1	20.94	18.30	0.01
AB	15.74	2	7.87	-	-
AC	3.48	2	1.74	-	-
AD	0.92	2	0.46	-	-
BC	3.24	1	3.24	-	-
BD	0.61	1	0.61	-	-
CD	9.84	1	9.84	10.8	0.01
ABC	2.71	2	1.35	-	-
ABD	0.48	2	0.24	-	-
ACD	0.41	2	0.20	-	-
BCD	0.04	1	0.04	-	-
ABCD	0.66	2	0.33	-	-
SWAB	63.45	12	5.28	5.78	0.01
SCWAB	16.44	12	1.37	-	-
SDWAB	13.76	12	1.14	-	-
SCDWAB	10.98	12	0.91	-	-

MEAN SCORES PRETEST ATTITUDE 3: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	3.96	5.10	6.80	8.14	6.49	5.90	5.60	5.23	4.13
	C_2 Girls	5.35	2.88	4.87	7.25	6.13	5.96	4.32	5.68	5.90
B_2 Separate Sciences	C_1	7.50	6.64	3.86	5.69	6.33	8.35	5.85	4.86	1.57
	C_2	6.51	7.65	4.79	3.55	7.12	9.29	7.47	4.92	3.09

APPENDIX H

TABLE 5H

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 3 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1164.28	1	1164.28		
A	20.08	2	10.04		
B	0.79	1	0.79		
C	0.01	1	0.01		
AB	5.34	2	2.67		
AC	1.89	2	0.94		
BC	1.26	1	1.26		
ABC	0.35	2	0.17		
S(AB)	53.93	12	4.49	4.62	0.01
SC(AB)	11.64	12	0.97		

MEAN SCORES ATTITUDE 3: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	9.25	6.47	6.56	7.19	5.91	4.02	6.69	11.13	3.29
	C_2 Girls	7.47	6.36	5.13	6.48	5.56	3.06	6.69	9.77	3.97
B_2' Medium	C_1	6.67	8.93	7.67	10.41	7.82	6.45	6.76	6.60	8.52
	C_2	3.35	4.27	5.74	6.54	7.85	6.79	5.02	6.45	6.60
B_3' Large	C_1	7.05	7.30	5.96	6.41	7.70	5.07	7.24	7.11	6.90
	C_2	7.67	7.81	6.00	5.94	6.47	4.82	4.79	6.88	6.69

	B_1'	B_2'	B_3'
C_1	60.51	69.83	60.74
C_2	54.49	52.61	57.34

APPENDIX H

TABLE 7H

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 3, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	2337.08	1	2337.08	-	-
A	1.34	2	0.67	-	-
B'	1.57	2	0.78	-	-
C	13.41	1	13.41	19.70	0.001
AB'	17.73	4	4.43	-	-
AC	0.80	2	0.40	-	-
B'C	5.83	2	2.91	4.27	0.05
AB'C	5.65	4	1.41	-	-
S(AB')	83.52	18	4.64	6.82	0.001
SC(AB')	12.28	18	0.68	-	-

MEAN SCORES PRETEST ATTITUDE 3: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	7.15	5.37	4.00	5.23	5.38	3.82	4.75	8.38	6.45
	C_2 Girls	4.42	6.04	5.35	5.14	2.97	3.85	2.85	6.54	7.09
B_2' Medium	C_1	3.96	5.10	6.80	8.14	6.49	5.90	5.60	5.23	4.13
	C_2	5.35	2.88	4.87	7.25	6.13	5.96	4.32	5.68	5.90
B_3' Large	C_1	6.30	5.85	5.11	5.10	5.27	3.98	5.74	3.94	4.00
	C_2	6.74	6.41	6.18	4.88	4.81	4.24	5.05	5.76	5.65

	A_1	A_2	A_3
B_1'	32.33	26.39	36.06
B_2'	28.96	39.87	30.86
B_3'	36.59	28.28	30.14

APPENDIX H

TABLE 9H

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 3, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1551.83	1	1551.83	-	-
A	0.34	2	0.17	-	-
B'	0.85	2	0.43	-	-
C	0.44	1	0.44	-	-
AB'	25.25	4	6.31	4.04	0.025
AC	0.62	2	0.31	-	-
B'C	3.35	2	1.67	-	-
AB'C	1.98	4	0.50	-	-
S(AB')	28.15	18	1.56	-	-
SC(AB')	17.57	18	0.98	-	-

APPENDIX H

TABLE 10H

ANALYSIS OF VARIANCE TABLE ATTITUDE 3 (SCHOOL MEANS)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1913.28	1	1913.28		
A	1.09	2	0.54		
B'	1.38	2	0.69		
D	19.38	1	19.38	10.7	0.01
AB'	17.23	4	4.30		
AD	0.14	2	0.07		
B'	0.02	2	0.01		
AB'	0.94	4	0.23		
S(AB')	32.74	18	1.81		
SD(AB')	17.91	18	0.99		

APPENDIX H

TABLE 11H

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 3 (BOYS ONLY)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	2118.76	1	2118.76		
A	0.76	2	0.38		
B'	6.61	2	3.30		
D	35.70	1	35.70	33.00	0.001
AB'	14.63	4	3.65		
AD	0.73	2	0.36		
B'	2.06	2	1.03		
AB'	3.61	4	0.90		
S(AB')	63.85	18	3.54	3.25	0.01
SD(AB')	19.40	18	1.07		

APPENDIX H

TABLE 12H

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 3 (GIRLS ONLY)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1739.44	1	1739.44		
A	1.34	2	0.67		
B'	1.92	2	0.96		
D	8.84	1	8.84	5.85	0.05
AB'	32.01	4	8.00	4.65	0.01
AD	0.25	2	0.12		
B'	0.99	2	0.49		
AB'	0.35	4	0.08		
S(AB')	31.02	18	1.72		
SD(AB')	27.24	18	1.51		

APPENDIX H

TABLE 13H

ANALYSIS OF VARIANCE TABLE ATTITUDE 3 (ROMAN CATHOLIC)

SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1314.54	1	1314.54		
B'	6.95	2	3.47		
C	5.03	1	5.03		
D	13.17	1	13.17	15.00	0.01
B'C	10.57	2	5.28		
B'D	0.59	2	0.29		
CD	3.15	1	3.15		
B'CD	1.73	2	0.86		
S(B')	14.03	6	2.33		
SC(B')	6.92	6	1.15		
SC(B')	5.27	6	0.87		
SCD(B')	4.72	6	0.78		

APPENDIX H

TABLE 14H

ANALYSIS OF VARIANCE TABLE ATTITUDE 3 NON-DENOMINATIONAL SCHOOLS (1) OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1213.70	1	1213.70		
B'	33.75	2	16.87		
C	3.70	1	3.70		
D	11.05	1	11.05	18.4	0.01
B'C	0.27	2	0.13		
B'D	0.27	2	0.13		
CD	0.31	1	0.31		
B'CD	0.33	2	0.16		
S(B')	22.33	6	3.72	6.86	0.025
SC(B')	4.86	6	0.81		
SD(B')	3.60	6	0.60		
SCD(B')	3.25	6	0.54		

APPENDIX H

TABLE 15H

ANALYSIS OF VARIANCE TABLE ATTITUDE 3 NON-DENOMINATIONAL SCHOOLS (2) OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1322.04	1	1322.04		
B'	3.02	2	1.51		
C	1.26	1	1.26		
D	16.05	1	16.05		
B'C	0.60	2	0.30		
B'D	0.80	2	0.40		
CD	1.77	1	1.77		
B'CD	3.26	2	1.63		
S(B')	38.78	6	6.46	18.0	0.01
SC(B')	7.94	6	1.32		
SD(B')	27.64	6	4.60	12.9	0.01
SCD(B')	2.15	6	0.35		

APPENDIX H

TABLE 16H BETWEEN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 3 Figures shown are for (a) 40 schools and (b) 23 schools (in brackets).
(For key to multiple regressions see Table 1E. Only those F-values significant at the 5% or better are shown)

Number of schools in sample	Sample Size N	Regression differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N - m_1 - 1)}{(1 - R_1^2)(m_1 - m_2)}$	df_1 $(m_1 - m_2)$	df_2 $(N-m_1-1)$	Significance Level
40 (23)	79 (46)	A	0.08 (0.08)	0 (0)	1 (1)	0 (0)	6.7	77	1	0.025
		B - A	0.22 (0.25)	0.08 (0.08)	3 (3)	1 (1)	7.3 (4.75)	75 (42)	2 (2)	0.01 (0.025)
		C - B	0.24 (0.27)	0.22 (0.25)	4 (4)	3 (3)				
		D - C	0.51 (0.56)	0.24 (0.27)	9 (9)	4 (4)	7.9 (6.40)	69 (36)	5 (5)	0.001 (0.001)
		E - D	0.52 (0.58)	0.51 (0.58)	10 (10)	9 (9)				
		F - E	0.52 (0.58)	0.52 (0.58)	11 (11)	10 (10)				
		G - F	0.52 (0.60)	0.52 (0.58)	13 (13)	11 (11)				
		H - G	0.53 (0.61)	0.52 (0.60)	14 (14)	13 (13)				
		G - D	0.52 (0.60)	0.51 (0.56)	13 (13)	9 (9)				
		I - C	- (0.37)	- (0.27)	- (7)	- (4)				
		J - D	- (0.60)	- (0.56)	- (12)	- (9)				
		K - H	- (0.65)	- (0.61)	- (17)	- (14)				

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX H

TABLE 17H

Attitude 3 - % variance accounted for by modified stepwise regression on individual schools (for key see Table 5E) - 12 school sample

	Roman Catholic	non-Denominational 1	non-Denominational 2
Small	B 6	0	11
	C 15	16	31
	D 40	32	40
	E (25)	(16)	(34)
	F (33)	(19)	(35)
	G 52	36	43
Medium (Integrated)	15	4	6
	24	13	8
	46	35	26
	(26)	(14)	(12)
	(27)	(15)	(15)
	51	37	38
Medium (Separate Science)	4	5	8
	19	6	8
	24	30	18
	(27)	(7)	(8)
	(31)	(24)	(13)
	38	39	22
Large	5	5	4
	9	6	4
	28	30	15
	(20)	(7)	(12)
	(20)	(24)	(13)
	36	39	21

APPENDIX H

TABLE 18H WITHIN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 3

(For key for multiple regressions see Table 5E. Only those F-values significant at the 5% or better are shown)

No. of pupils in sample N	Regression Differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N-m-1-24)}{(1 - R^2)(m_1 - m_2)}$	df_2 $(N-m_2-1-24)$	df_1 $m_1 - m_2$	Significance Levels
885	A	0	0	1	0		859	1	
	B	0.02	0	3	0	6.40	857	3	0.001
	B - A	0.02	0	3	1	8.75	857	2	0.001
	C - B	0.08	0.02	4	3	56.00	856	1	0.001
	D - C	0.21	0.08	9	4	28.00	851	5	0.001
	E - C	0.09	0.08	7	4	3.10	853	3	0.05
	F - E	0.09	0.09	9	7		851	2	
	G - D	0.21	0.21	14	9		846	5	
	G - F	0.21	0.09	14	9	25.80	846	5	0.001

R_1 - multipls R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX I

Tables Relating to Analysis
of Attitude Scale 4 Scores

MEAN SCORES ATTITUDE 4: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	5.42	8.65	10.06	11.48	9.51	7.03	9.36	7.50	9.87
	C_2 Girls	5.00	0.73	4.57	1.77	6.72	3.46	4.02	1.94	-2.03
B_2 Separate Sciences	C_1	10.89	6.70	3.65	9.31	5.84	7.86	5.46	7.62	-1.54
	C_2	10.55	4.98	1.98	5.57	6.08	-0.41	-0.28	-0.03	-3.80

$\Sigma C_1 = 134.67$

$\Sigma C_2 = 50.86$

APPENDIX I

TABLE 2I

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 4 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	955.73	1	955.73		
A	70.49	2	35.24		
B	16.85	1	16.85		
C	195.30	1	195.30	33.9	0.001
AB	32.40	2	16.20		
AC	18.18	2	9.09		
BC	12.90	1	12.90		
ABC	1.40	2	0.70		
S(AB)	149.00	12	12.41		
SC(AB)	69.09	12	5.75		

APPENDIX I

TABLE 3I

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 4 (5 FACTOR)
MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F Value	Significant level
MEAN	3594.24	1	3594.24	-	-
A	167.68	2	83.84	4.70	.05
B	24.83	1	24.83	-	-
C	155.61	1	155.61	28.8	0.001
D	263.46	1	263.46	47.5	0.001
AB	32.56	2	16.28	-	-
AC	11.73	2	5.86	-	-
AD	4.07	2	2.03	-	-
BC	11.51	1	11.51	-	-
BD	0.67	1	0.67	-	-
CD	53.13	1	53.13	29.8	.001
ABC	2.36	2	1.18	-	-
ABD	13.82	2	6.91	-	-
ACD	7.47	2	3.73	-	-
BCD	2.84	1	2.84	-	-
ABCD	0.74	2	0.37	-	-
SWAB	213.42	12	17.78	10.00	.001
SCWAB	64.76	12	5.39	3.04	.05
SDWAB	66.63	12	5.55	3.12	.05
SCDWAB	21.36	12	1.78	-	-

APPENDIX I

TABLE 41

MEAN SCORES PRETEST ATTITUDE 4: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	10.42	6.58	13.22	14.14	12.09	10.45	9.98	6.13	9.52
	C_2 Girls	9.65	6.70	8.91	12.09	11.74	10.86	8.16	5.47	4.33
B_2 Separate Sciences	C_1	12.30	10.21	8.29	6.55	10.51	12.77	8.02	9.11	2.32
	C_2	11.91	8.65	7.82	5.11	11.00	10.88	6.09	7.89	3.35

$\Sigma C_1 = 172.61$

$\Sigma C_2 = 150.61$

$\Sigma A_1 = 114.66$ $\Sigma A_2 = 128.19$ $\Sigma A_3 = 80.37$

APPENDIX I

TABLE 5I

ANALYSIS OF VARIANCE TABLE PRETEST ATTITUDE 4 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F Value	Signicicance Level
Mean	2901.97	1	2901.97		
A	101.26	2	50.63	4.63	0.025
B	8.66	1	8.66		
C	13.44	1	13.44	9.53	0.01
AB	13.98	2	6.99		
AC	1.02	2	0.51		
BC	1.45	1	1.45		
ABC	1.70	2	0.85		
S (AB)	131.05	12	10.92	7.69	0.001
SC (AB)	17.02	12	1.41		

MEAN SCORES ATTITUDE 4: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	10.50	5.57	7.74	10.08	5.78	1.84	3.50	13.00	-3.42
	C_2 Girls	9.84	0.21	8.13	3.38	1.28	-2.58	3.23	7.92	-4.91
B_2' Medium	C_1	5.42	8.65	10.06	11.48	9.51	7.03	9.36	7.50	9.87
	C_2	5.00	0.73	4.57	1.77	6.72	3.46	4.02	1.94	-2.03
B_3' Large	C_1	8.21	8.09	8.15	2.90	11.27	3.92	6.53	10.09	7.66
	C_2	6.92	6.91	0.55	1.62	6.15	2.97	-3.33	4.00	6.31

$\Sigma C_1 = 200.29$

$\Sigma C_2 = 84.78$

APPENDIX I

TABLE 7I

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 4, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1504.91	1	1504.91	-	-
A	35.59	2	17.79	-	-
B'	17.23	2	8.61	-	-
C	247.08	1	247.08	45.94	0.001
AB'	36.76	4	9.19	-	-
AC	8.44	2	4.22	-	-
B'C	18.02	2	9.01	-	-
AB'C	17.55	4	4.39	-	-
S(AB')	444.02	18	24.67	4.56	0.01
SC(AB')	97.26	18	5.40	-	-

MEAN SCORES PRETEST ATTITUDE 4: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	13.6	12.7	6.78	8.35	11.91	7.47	4.44	13.88	9.61
	C_2 Girls	9.79	7.71	8.17	5.19	6.50	7.63	6.15	9.62	9.79
B_2' Medium	C_1	10.42	6.58	13.22	14.14	12.09	10.45	9.98	6.13	9.52
	C_2	9.65	6.70	8.91	12.09	11.74	10.86	8.16	5.47	4.33
B_3' Large	C_1	13.79	10.68	7.15	9.34	14.79	8.79	9.63	9.63	7.48
	C_2	11.97	9.73	7.14	8.79	11.26	4.59	6.79	5.83	8.16

$\Sigma C_1 = 272.55$

$\Sigma C_2 = 222.72$

APPENDIX I

TABLE 9I

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 4, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	4542.45	1	4542.45	-	-
A	35.03	2	17.52	-	-
B'	3.47	2	1.74	-	-
C	45.98	1	45.98	16.02	0.001
AB'	56.54	4	14.13	-	-
AC	0.38	2	0.19	-	-
B'C	0.37	2	0.18	-	-
AB'C	8.35	4	2.09	-	-
S(AB')	180.73	18	10.04	3.49	0.01
SC(AB')	51.76	18	2.86	-	-

APPENDIX I

TABLE 10I

ANALYSIS OF VARIANCE TABLE ATTITUDE 4 (SCHOOL MEANS)

SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	2745.33	1	2745.33		
A	40.19	2	20.09		
B'	9.32	2	4.66		
D	219.73	1	219.73	37.0	0.001
AB'	27.04	4	6.76		
AD	6.68	2	3.34		
B'D	0.62	2	0.31		
AB'D	11.61	4	2.90		
S(AB')	194.91	18	10.82		
SD(AB')	106.93	18	5.94		

APPENDIX I

TABLE 11I

ANALYSIS OF VARIANCE TABLE ATTITUDE 4 (BOYS ONLY)

SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	4140.32	1	4140.32		
A	15.62	2	7.81		
B'	21.92	2	10.96		
D	96.69	1	96.69	14.9	0.01
AB'	24.23	4	6.05		
AD	8.52	2	4.26		
B'	11.68	2	5.84		
AB'	16.05	4	4.01		
S(AB')	306.80	18	17.04	2.64	0.025
SD(AB')	116.26	18	6.45		

APPENDIX I

TABLE 12I

ANALYSIS OF VARIANCE TABLE ATTITUDE 4 (GIRLS ONLY)

SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1751.04	1	1751.04		
A	47.17	2	23.58		
B'	2.61	2	1.30		
D	352.36	1	352.35	47.00	0.001
AB'	66.05	4	16.51		
AD	8.11	2	4.05		
B'D	2.85	2	1.42		
AB'D	12.85	4	3.21		
S(AB')	218.19	18	12.12		
SD(AB')	132.49	18	7.36		

APPENDIX I

TABLE 13I

ANALYSIS OF VARIANCE TABLE ATTITUDE 4 ROMAN CATHOLIC SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	2335.14	1	2335.14		
B'	5.76	2	2.88		
C	55.45	1	55.45	10.2	0.025
D	98.14	1	98.14	14.3	0.01
B'C	1.89	2	0.94		
B'D	1.17	2	0.58		
CD	5.74	1	5.74		
B'CD	5.50	2	2.75		
S(B')	108.32	6	18.05	4.80	0.05
SC(B')	32.81	6	5.46		
SD(B')	41.24	6	6.87		
SCD(B')	22.54	6	3.75		

APPENDIX I

TABLE 14I

ANALYSIS OF VARIANCE TABLE ATTITUDE 4 NON-DENOMINATIONAL (1)

SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1944.22	1	1944.22		
B'	82.95	2	41.47		
C	92.54	1	92.54	23.7	0.01
D	212.18	1	212.18	29.4	0.01
B'C	3.11	2	1.55		
B'D	0.73	2	0.36		
CD	11.51	1	11.51	6.18	0.05
B'CD	9.40	2	4.70		
S(B')	115.87	6	19.31	10.4	0.01
SC(B')	23.44	6	3.90		
SD(B')	43.30	6	7.21		
SCD(B')	11.18	6	1.86		

APPENDIX I

TABLE 15I

ANALYSIS OF VARIANCE TABLE ATTITUDE 4 NON-DENOMINATIONAL (2)

SCHOOLS OF VARIOUS SIZES FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1416.76	1	1416.76		
B'	1.61	2	0.80		
C	110.04	1	110.04	12.3	0.025
D	111.51	1	111.51		
B'C	19.48	2	9.74		
B'D	21.74	2	10.87		
CD	26.59	1	26.59	29.5	0.01
B'CD	4.86	2	2.43		
S(B')	190.91	6	31.81	35.4	0.001
SC(B')	53.62	6	8.93	9.9	0.01
SD(B')	125.08	6	20.84	23.1	0.001
SCD(B')	5.40	6	0.90		

APPENDIX I

TABLE 16I BETWEEN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 4 Figures shown are for (a) 40 schools and (b 23 schools (in brackets)

(For key to multiple regressions see Table 1E. Only those F-values significant at the 5% or better are shown)

Number of schools in sample	Sample Size N	Regression differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N - m_1 - 1)}{(1 - R_1^2)(m_1 - m_2)}$	df_1 $(m_1 - m_2)$	df_2 $(N-m_1-1)$	Significance Level
40 (23)	79 (46)	A	0.28 (0.21)	0 (0)	1 (1)	0 (0)	25.7 (11.7)	77 (44)	1 (1)	0.001 (0.001)
		B - A	0.26 (0.34)	0.25 (0.21)	3 (3)	1 (1)	(4.12)	(42)	(2)	(0.025)
		C - B	0.28 (0.35)	0.26 (0.34)	4 (4)	3 (3)				
		D - C	0.57 (0.66)	0.28 (0.35)	9 (9)	4 (4)	8.65 (6.58)	69 (36)	5 (5)	0.001 (0.001)
		E - D	0.58 (0.70)	0.57 (0.66)	10 (10)	9 (9)	(4.66)	(35)	(1)	(0.05)
		F - E	0.59 (0.70)	0.58 (0.7)	11 (11)	10 (10)				
		G - F	0.59 (0.70)	0.59 (0.70)	13 (13)	11 (11)				
		H - G	0.59 (0.70)	0.59 (0.70)	14 (14)	13 (13)				
		G - D	0.59 (0.70)	0.57 (0.66)	13 (13)	9 (9)				
		I - C	- (0.46)	- (0.35)	- (7)	- (4)				
		J - D	- (0.71)	- (0.66)	- (12)	- (9)				
		K - H	- (0.77)	- (0.70)	- (17)	- (14)				

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX I

TABLE 17I

Attitude 4 - % variance accounted for by modified stepwise regression on individual schools (for key see Table 5E) - 12 school sample

	Roman Catholic	non-Denominational 1	non-Denominational 2
Small	6	4	5
	9	10	17
	26	29	26
	(15)	(12)	(19)
	(16)	(16)	(20)
	32	38	(27)
Medium (Integrated)	16	3	10
	22	7	10
	32	13	28
	(26)	(9)	(16)
	(28)	(13)	(20)
	37	20	35
Medium (Separate Science)	4	7	13
	10	14	14
	16	23	36
	(18)	(20)	(16)
	(24)	(26)	(22)
	30	29	40
Large	10	6	15
	16	6	15
	24	14	22
	(24)	(10)	(27)
	(30)	(11)	(30)
	32	20	34

APPENDIX I

TABLE 18I WITHIN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 4

(For key for multiple regression see Table 5E. Only those F-values significant at the 5% or better are shown)

No. of pupils in sample N	Regression Differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N-m-1-24)}{(1 - R^2)(m_1 - m_2)}$	df_2 $(N-m_2-1-24)$	df_1 $m_1 - m_2$	Significance Levels
885	A	0.04	0	1	0	36.00	859	1	0.001
	B	0.05	0	3	0	15.00	857	3	0.001
	B - A	0.05	0.04	3	1	4.50	857	2	0.025
	C - B	0.06	0.05	4	3	9.10	856	1	0.01
	D - C	0.13	0.06	9	4	13.70	851	5	0.001
	E - C	0.07	0.06	7	4	3.04	853	3	0.05
	F - E	0.08	0.07	9	7	4.72	851	2	0.01
	G - D	0.15	0.13	14	9	4.00	848	5	0.01
	G - F	0.15	0.08	14	9	14.00	846	5	0.001

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX J

Tables Relating to Analysis
of Attitude Scale 5 Scores

APPENDIX J

TABLE 1J

MEAN SCORES ATTITUDE 5: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	4.25	7.00	5.53	9.31	6.27	5.34	5.49	4.98	7.30
	C_2 Girls	3.88	6.45	6.26	8.88	4.64	4.61	5.43	5.89	5.47
B_2 Separate Sciences	C_1	6.59	6.84	5.06	7.40	6.65	8.40	4.76	6.11	7.32
	C_2	2.73	7.67	2.86	5.84	5.15	9.76	6.09	7.16	6.47

APPENDIX J

TABLE 1J

MEAN SCORES ATTITUDE 5: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	4.25	7.00	5.53	9.31	6.27	5.34	5.49	4.98	7.30
	C_2 Girls	3.88	6.45	6.26	8.88	4.64	4.61	5.43	5.89	5.47
B_2 Separate Sciences	C_1	6.59	6.84	5.06	7.40	6.65	8.40	4.76	6.11	7.32
	C_2	2.73	7.67	2.86	5.84	5.15	9.76	6.09	7.16	6.47

APPENDIX J

TABLE 2J

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 5 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1341.75	1	1341.75		
A	12.39	2	6.19		
B	0.94	1	0.94		
C	2.40	1	2.40		
AB	1.66	2	0.83		
AC	1.69	2	0.84		
BC	0.05	1	0.05		
ABC	2.63	2	1.31		
S(AB)	54.68	12	4.55	4.34	0.01
SC(AB)	12.62	12	1.05		

APPENDIX J

TABLE 3J

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 5 (5 FACTOR)
MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F Value	Significant level
MEAN	1593.95	1	1593.95	-	-
A	28.87	2	14.43	-	-
B	14.26	1	14.26	-	-
C	4.26	1	4.26	5.21	0.05
D	141.09	1	141.09	268.00	0.001
AB	3.85	2	1.92	-	-
AC	4.09	2	2.04	-	-
AD	0.58	2	0.29	-	-
BC	0.00	1	0.00	-	-
BD	5.78	1	5.78	11.00	0.01
CD	0.01	1	0.01	-	-
ABC	0.47	2	0.23	-	-
ABD	0.12	2	0.06	-	-
ACD	1.13	2	0.56	-	-
BCD	0.07	1	0.07	-	-
ABCD	3.11	2	1.55	-	-
SWAB	90.74	12	7.56	9.95	0.001
SCWAB	9.78	12	0.81	-	-
SDWAB	6.31	12	0.52	-	-
SCDWAB	9.10	12	0.75	-	-

MEAN SCORES PRETEST ATTITUDE 5: MEDIUM SIZED SCHOOLS FOLLOWING 2 TYPES OF SCIENCE COURSE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1 Integrated Science	C_1 Boys	3.13	2.58	3.63	5.96	1.69	2.31	2.64	1.08	2.48
	C_2 Girls	-0.29	2.06	2.09	5.02	2.13	2.29	2.48	2.94	1.87
B_2 Separate Sciences	C_1	2.66	6.24	1.71	3.79	5.32	6.49	2.90	5.05	3.95
	C_2	2.00	4.45	1.29	4.09	5.04	6.96	3.78	3.38	3.51

$\Sigma B_1 = 46.09$

$\Sigma B_2 = 72.61$

$\Sigma C_1 = 62.80$

$\Sigma C_2 = 55.09$

	A_1	A_2	A_3
C_1	19.95	25.56	17.29
C_2	11.60	25.53	17.96

APPENDIX J

TABLE 5J

ANALYSIS OF VARIANCE TABLE PRETEST ATTITUDE 5 -

MEDIUM SIZED SCHOOLS FOLLOWING TWO TYPES OF SCIENCE COURSE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	391.38	1	391.38		
A	17.44	2	8.72		
B	19.53	1	19.53	5.47	0.025
C	2.01	1	2.01	3.60	0.10
AB	2.13	2	1.06		
AC	3.79	2	1.89	3.39	0.10
BC	0.04	1	0.04		
ABC	1.05	2	0.52		
S(AB)	42.79	12	3.56	6.26	0.31
SC(AB)	6.70	12	0.55		

MEAN SCORES ATTITUDE 5: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	5.95	4.53	4.22	6.58	6.16	4.51	5.63	9.75	6.00
	C_2 Girls	5.16	6.54	2.74	1.95	4.78	4.73	7.46	7.88	6.91
B_2' Medium	C_1	4.25	7.00	5.53	9.31	6.27	5.34	5.49	4.98	7.30
	C_2	3.88	6.45	6.26	8.88	4.64	4.61	5.43	5.89	5.47
B_3' Large	C_1	6.37	5.45	6.78	5.62	4.82	3.78	7.00	6.20	6.58
	C_2	6.59	6.41	5.36	5.74	6.08	4.82	5.91	6.46	6.13

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TABLE 7J

ANALYSIS OF VARIANCE TABLE FOR ATTITUDE 5, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	1832.37	1	1832.37	-	-
A	11.27	2	5.63	-	-
B'	0.97	2	0.48	-	-
C	1.26	1	1.26	-	-
AB'	20.99	4	5.25	-	-
AC	0.98	2	0.49	-	-
B'C	1.15	2	0.57	-	-
AB'C	5.06	4	1.26	-	-
S(AB')	45.79	18	2.54	2.49	0.05
SC(AB')	18.34	18	1.02	-	-

MEAN SCORES PRETEST ATTITUDE 5: VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

		A_1 Roman Catholic			A_2 Non-denominational 1			A_3 Non-denominational 2		
		S_1	S_2	S_3	S_1	S_2	S_3	S_1	S_2	S_3
B_1' Small	C_1 Boys	2.80	1.23	1.67	2.38	3.81	2.37	2.63	6.00	3.00
	C_2 Girls	2.63	3.61	-0.13	0.67	2.59	2.35	1.69	6.12	4.03
B_2' Medium	C_1	3.13	2.58	3.63	5.96	1.69	2.31	2.64	1.08	2.48
	C_2	-0.29	2.06	2.09	5.02	2.13	2.29	2.48	2.94	1.87
B_3' Large	C_1	4.12	3.36	3.93	2.83	1.52	0.39	4.87	3.14	4.34
	C_2	4.15	2.23	3.11	2.76	2.08	0.26	3.37	2.70	3.52

$\Sigma C_1 = 79.89$

$\Sigma C_2 = 68.06$

APPENDIX J

TABLE 9J

ANALYSIS OF VARIANCE TABLE FOR PRETEST ATTITUDE 5, VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	406.84	1	406.84	-	-
A	7.68	2	3.84	-	-
B'	1.21	2	0.60	-	-
C	2.47	1	2.47	3.92	0.10
AB'	24.05	4	6.01	-	-
AC	0.90	2	0.45	-	-
B'C	0.20	2	0.10	-	-
AB'C	5.07	4	1.27	-	-
S(AB')	50.39	18	2.80	4.44	0.01
SC(AB')	11.35	18	0.63	-	-

APPENDIX J

TABLE 10J

ANALYSIS OF VARIANCE TABLE ATTITUDE 5 (SCHOOL MEANS)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-Value	Significance Level
MEAN	980.82	1	980.82		
A	8.61	2	4.30		
B'	0.36	2	0.18		
D	121.20	1	121.20	604.00	0.001
AB'	19.53	4	4.88		
AD	0.29	2	0.14		
B'D	0.45	2	0.22		
AB'	0.92	4	0.23		
S(AB')	41.50	18	2.30	12.2	0.001
SD(AB')	3.40	18	0.18		

APPENDIX J

TABLE 11J

ANALYSIS OF VARIANCE TABLE ATTITUDE 5 (BOYS ONLY)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-Value	Significance Level
MEAN	1078.16	1	1078.16		
A	6.30	2	3.15		
B'	0.12	2	0.06		
D	123.03	1	123.03	324.00	0.001
AB'	27.87	4	6.96		
AD	1.04	2	0.52		
B'D	0.96	2	0.48		
AB'D	1.23	4	0.30		
S(AB')	53.10	18	2.95	7.75	0.001
SD(AB')	6.76	18	0.37		

APPENDIX J

TABLE 12J

ANALYSIS OF VARIANCE TABLE ATTITUDE 5 (GIRLS ONLY)

VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	911.92	1	911.92		
A	12.81	2	6.4		
B'	1.15	2	0.57		
D	131.94	1	131.94	307.00	0.001
AB'	22.19	4	5.54		
AD	0.36	2	0.18		
B'D	1.17	2	0.58		
AB'D	3.44	4	0.86		
S(AB')	56.76	18	3.15	7.30	0.001
SD(AB')	7.82	18	0.43		

APPENDIX J

TABLE 13J

ANALYSIS OF VARIANCE TABLE ATTITUDE 5 ROMAN CATHOLIC - VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	590.49	1	590.48		
B'	12.11	2	6.05		
C	1.46	1	1.46		
D	78.44	1	78.44	197.00	0.001
B'C	1.34	2	0.67		
B'D	0.64	2	0.32		
CD	0.96	1	0.96		
B'CD	1.41	2	0.70		
S(B')	18.62	6	3.10	8.70	0.01
SC(B')	9.51	6	1.58	4.42	0.05
SD(B')	2.37	6	0.39		
SCD(B')	2.15	6	0.35		

APPENDIX J

TABLE 14J

ANALYSIS OF VARIANCE TABLE ATTITUDE 5 NON-DENOMINATIONAL 1 - VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	560.34	1	560.34		
B'	15.61	2	7.80		
C	2.38	1	2.38		
D	84.67	1	84.67	385.00	0.001
B'C	5.53	2	2.76		
B'D	1.94	2	0.97		
CD	0.25	1	0.25		
B'CD	1.19	2	0.59		
S(B')	47.11	6	7.85	19.4	0.001
SC(B')	5.82	6	0.97		
SD(B')	1.31	6	0.21		
SCD(B')	2.43	6	0.40		

APPENDIX J

TABLE 15J

ANALYSIS OF VARIANCE TABLE ATTITUDE 5 NON-DENOMINATIONAL (2) - VARIOUS SIZED SCHOOLS FOLLOWING INTEGRATED SCIENCE

Source	Sum of Squares	D.F.	Mean Square	F-value	Significance Level
MEAN	854.29	1	854.29		
B'	15.50	2	7.75		
C	0.22	1	0.22		
D	92.06	1	92.06	174.00	0.001
B'C	1.23	2	0.61		
B'D	1.04	2	0.52		
CD	0.00	1	0.00		
B'CD	0.57	2	0.28		
S(B')	22.83	6	3.80	7.30	0.025
SC(B')	5.95	6	0.99		
SD(B')	3.17	6	0.52		
SCD(B')	3.13	6	0.52		

APPENDIX J

TABLE 16J BETWEEN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS
ATTITUDE 5 Figures shown are for (a) 40 schools and (b) 23 schools (in brackets)
(For key to multiple regressions see Table 1E. Only those F-values significant at the 5% or better are shown)

Number of schools in sample	Sample Size N	Regression Differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N - m_1 - 1)}{(1 - R_1^2)(m_1 - m_2)}$	df_1 $(m_1 - m_2)$	df_2 $(N-m_1-1)$	Significance Level
40	79	A	0.01 (0.02)	0 (0)	1 (1)	0 (0)				
		B - A	0.33 (0.39)	0.01 (0.02)	3 (3)	1 (1)	17.9 (12.7)	75 (42)	2 (2)	0.001 (0.001)
		C - B	0.49 (0.62)	0.33 (0.39)	4 (4)	3 (3)	23.5 (24.8)	74 (41)	1 (1)	0.001 (0.001)
		D - C	0.62 (0.74)	0.49 (0.62)	9 (9)	4 (4)	4.74 (3.33)	69 (36)	5 (5)	0.001 (0.025)
		E - D	0.62 (0.74)	0.62 (0.74)	10 (10)	9 (9)				
		F - E	0.63 (0.75)	0.62 (0.74)	11 (11)	10 (10)				
		G - F	0.63 (0.75)	0.63 (0.75)	13 (13)	11 (11)				
		H - G	0.65 (0.79)	0.63 (0.75)	14 (14)	13 (13)	(5.90)	(31)	(1)	(0.025)
		G - D	0.63 (0.75)	0.62 (0.74)	13 (13)	9 (9)				
		I - C	- (0.69)	- (0.62)	- (7)	- (4)	(2.86)	(38)	(3)	(0.05)
		J - D	- (0.75)	- (0.74)	- (12)	- (9)				
		K - H	- (0.79)	- (0.79)	- (17)	- (14)				

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables

APPENDIX J

TABLE 17J

Attitude 5 - % variance accounted for by modified stepwise regression on individual schools (for key see Table 5E) - 12 school sample

		Roman Catholic	non-Denominational 1	non-Denominational 2
Small	B	4	2	6
	C	26	16	17
	D	46	40	32
	E	(43)	(22)	(21)
	F	(45)	(23)	(28)
	G	59	43	40
Medium (Integrated)		6	8	5
		14	19	20
		51	37	34
		(21)	(23)	(20)
		(22)	(23)	(23)
		58	39	39
Medium (Separate Science)		8	6	8
		28	7	17
		35	29	32
		(34)	(12)	(17)
		(34)	(15)	(18)
		40	34	35
Large		8	2	2
		8	21	7
		42	40	39
		(17)	(25)	(13)
		(24)	(26)	(22)
		47	45	51

APPENDIX J

TABLE 18J WITHIN-SCHOOLS ANALYSIS, SIGNIFICANCE OF DIFFERENCES BETWEEN MULTIPLE R'S FOR SUCCESSIVE MULTIPLE REGRESSIONS

ATTITUDE 5

(For key for multiple regression see Table 5E. Only those F-values significant at the 5% or better are shown)

No. of pupils in sample N	Regression Differences	R_1^2	R_2^2	m_1	m_2	$F = \frac{(R_1^2 - R_2^2)(N-m-1-24)}{(1 - R^2)(m_1 - m_2)}$	df_2 $(N-m_2-1-24)$	df_1 $m_1 - m_2$	Significance Levels
885	A	0	0	1	0		859	1	
	B	0.02	0	3	0	8.75	857	3	0.001
	B - A	0.02	0	3	1	5.75	857	2	0.001
	C - B	0.11	0.02	4	3	86.50	856	1	0.001
	D - C	0.27	0.11	9	4	37.40	851	5	0.001
	E - C	0.15	0.11	7	4	13.30	853	3	0.001
	F - E	0.15	0.15	9	7		851	2	
	G - D	0.29	0.27	14	9	4.76	848	5	0.001
	G - F	0.29	0.15	14	9	33.40	846	5	0.001

R_1 - multiple R with larger number of predictor variables

R_2 - multiple R with smaller number of predictor variables

m_1 - larger number of predictor variables

m_2 - smaller number of predictor variables