

Researching Numeracy Teaching Approaches in Primary Schools

STUDENT WORK SAMPLES TASK

Description

The *Analysis of Student Work Samples Task* was conducted during the first and final State-wide Action Research Meetings (SWARM 1 and SWARM 4). Teachers were required to work in groups of three to analyse a number of student work samples. Each group was provided with a number of work samples and asked to describe what the response of each child revealed about his/her mathematical knowledge and strategies. Two different sets of student work samples were used at each level. Prep–Year 2 teachers worked on the ‘make to ten counting strategy’ or the ‘2 digit subtraction’ samples. Years 3&4 teachers worked on the ‘3 digit subtraction’ or the ‘multiplication’ samples. Years 5&6 teachers worked on the ‘fractions’ or ‘chance and data’ student samples. There were between four and six Student Responses in each Student Work Sample.

Analysis

The *Analysis of Student Work Samples Task* was assessed in a similar way to the Concept Mapping Task. In the Student Work Samples Task, the question addressed by the teachers was, ‘What do the following responses to this task indicate about the student’s strategies and mathematical understanding?’ In this case a generic scoring rubric was used to assess the 7 sub-tasks across Prep-Year 6. It was supported by a detailed analysis of each student’s response in terms of both strategies and mathematical understanding. Once again a moderation procedure was used to ensure an inter-marker reliability factor in excess of 0.9. All beginning and end data was assessed by the same markers at the same time. To score a 0 on the four-point scoring rubric, the teachers’ response was assessed as ‘little/no comment, inappropriate interpretation’. To score a 3 (the highest available score) the teachers’ response was assessed as ‘Identifies child’s strategy (ie what the child appears to have done or is unable to do) and understandings (ie what the child appears to understand or find difficult) in some detail, and with little/no irrelevant ideas’. Scores were coded and entered into a database by teacher (assigned group score), task and student work sample. Descriptive statistics were used to obtain an average score for the task. These were then compared over time where appropriate. Propositional analyses of responses to the *Student Work Samples Task* suggested recurrent themes that were noted and exemplified.

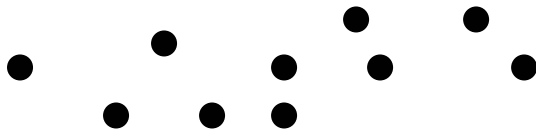
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- Student Work Samples Task 1: Make 10 Instrument
- Student Work Samples Task 2: Two-digit Subtraction Instrument
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- Student Work Samples Task Scoring Rubric
- Student Work Samples Task Technical Report

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STUDENT WORK ANALYSIS: MAKE 10



Ten counters are put on the table in front of a student. Teacher says to the student:
"Here are some counters. Count them"

Teacher covers all the counters then removes two counters from under the cover and puts these in front of the child.

Teacher asks the student:

"How many counters are under the cover?"



What do the following responses indicate about the student's strategies or mathematical understanding for this task?

RESPONSE A

Instant response of "NINE". When questioned by the teacher the student's explanation was "I KNOWED. I KNOWED IT IN MY BRAIN"

RESPONSE B

Student spent a long time tapping with her fingers under the table. After a considerable length of time she said: "IT'S TOO HARD"

RESPONSE C

Instant response of "EIGHT". When questioned by the teacher she pointed to the two counters one at a time and said; "THAT'S NINE, THAT'S TEN, SO THERE'S EIGHT COUNTERS UNDER THE PAPER"

RESPONSE D

Instant response of "EIGHT". When questioned by the teacher he said: "EIGHT AND TWO ARE TEN SO THERE ARE EIGHT UNDER THE PAPER".

RESPONSE E

Instant response of "EIGHT". "I KNOW TEN TAKE-AWAY TWO IS EIGHT".

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STUDENT WORK ANALYSIS: MAKE 10

Name:	School:	
Name:	School:	
Name:	School:	

UNIT	PROJECT USE ONLY
PREP, 1 & 2	

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

RESPONSE D

RESPONSE B

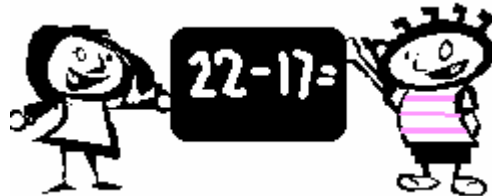
RESPONSE E

RESPONSE C

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STUDENT WORK ANALYSIS: TWO DIGIT SUBTRACTION

Teacher says:

Can you tell me what 22 take away 17 is?



What do the following responses indicate about the student's strategies or mathematical understanding for this task?

RESPONSE A

"Ten". "Two take away seven is zero. Two take away one is one so the answer's ten"

RESPONSE B

"Fifteen" "Seven take away two is five. Two take away one is one. Ten and five is fifteen"

RESPONSE C

"Thirty-nine" Two and seven is nine, two and one is three, three and nine is thirty -nine"

RESPONSE D

"Five" "Seventeen and five is twenty-two"

RESPONSE E

"Five" Counted on fingers - " 22,21, 20, 19, 19, 18, 17, - the answer is five"

RESPONSE F

" 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5 - the answer is five"

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STUDENT WORK ANALYSIS: TWO DIGIT SUBTRACTION

Name: _____ School: _____
 Name: _____ School: _____
 Name: _____ School: _____

UNIT	PROJECT USE ONLY
PREP, 1 & 2	

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

RESPONSE D

RESPONSE B

RESPONSE E

RESPONSE C

RESPONSE F

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STUDENT WORK ANALYSIS: THREE DIGIT SUBTRACTION



Student read the following word problem:

Richard is 131 cm tall.
Mary is 17 cm shorter than Richard
How tall is Mary?



What do the following responses indicate about the student's strategies or mathematical understanding for this task?

RESPONSE A

Student attempted to draw 131 tally marks. Drew about 20 then counted them again before adding another 4. Recounted the tally marks from one, and added a few more. This continued until they thought they had 131. They then crossed off 17 tally marks and recounted the number of tally marks left. Answer was incorrect.

RESPONSE B

" 126 - Seven take away one is six, three take away one is two, one take away nothing is one"

RESPONSE C

Using her fingers the student counted: " 131, 130, 129, 128, 127, 126, 125, 124, 123, 122, 121, 120, 119, 118, 117, 116, 115, 114." The answer is 114.

RESPONSE D

$$\begin{array}{r} 131 \\ - 17 \\ \hline 30 \end{array}$$

ven take away one is zero, put

down a zero and carry the one.

Three plus one is four. Four take away

one is three. One take away one is zero"

RESPONSE E

$$\begin{array}{r} 131 \\ - 17 \\ \hline 114 \end{array}$$

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STUDENT WORK ANALYSIS: THREE DIGIT SUBTRACTION

Name:	School:
Name:	School:
Name:	School:

UNIT 3 & 4	PROJECT USE ONLY

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

RESPONSE D

RESPONSE B

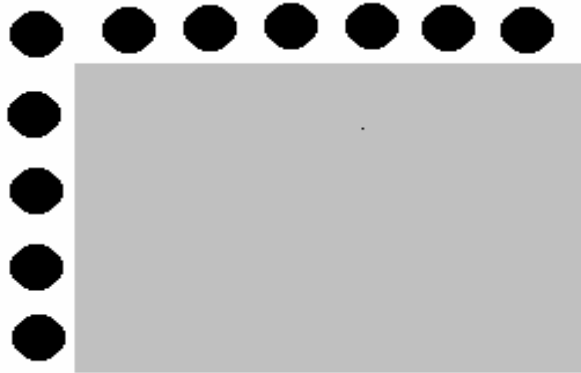
RESPONSE E

RESPONSE C

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STUDENT WORK ANALYSIS: MULTIPLICATION

The student is shown the following diagram:



Teacher says:

"There are the same number of counters in each row and each column. How many counters are covered by the paper?"

What do the following responses indicate about the student's strategies or mathematical understanding for this task?

RESPONSE A

Student counts each counter in the top row and then taps 12 times over the paper where they think the counters could be. "Answer 22"

RESPONSE B

Student counts each counter in the top row, then counts each counter another four times. "Answer is 29"

RESPONSE C

Student counts each counter in the top row ("6"), counts the number in the column ("4") then multiplies the numbers together to get 24.

RESPONSE D

Student counts each counter in the top row ("6"), counts the number in the column ("5") then multiplies the numbers together to get 30.

RESPONSE E

Student nods at each counter in the top row ("6"), counts the number in the column ("5") then multiplies the numbers together to get 30. Almost an instant response.

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STUDENT WORK ANALYSIS: MULTIPLICATION

Name: _____ School: _____
 Name: _____ School: _____
 Name: _____ School: _____

UNIT 3 & 4	PROJECT USE ONLY

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

RESPONSE D

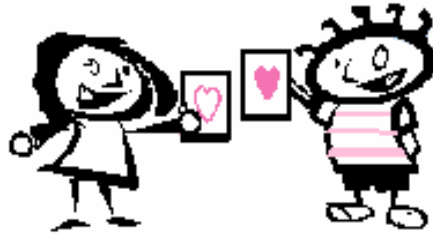
RESPONSE B

RESPONSE E

RESPONSE C

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STUDENT WORK ANALYSIS: FRACTIONS (initial)



Teacher hands the student 12 swapcards and says:

" Here are 12 cards that you and your friends have collected. You collected $\frac{2}{3}$ of these cards. How many cards did you collect?"

What do the following responses indicate about the student's strategies or mathematical understanding for this task?

RESPONSE A

"Five" $2 + 3 = 5$

RESPONSE B

"Six" 2 times 3 equals 6

RESPONSE C

"Six" One-third is three so two-thirds must be six.

RESPONSE D

"Eight" One-third is four so two-thirds must be eight.

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STUDENT WORK ANALYSIS: FRACTIONS (initial)

Name:	School:
Name:	School:
Name:	School:

UNIT 5 & 6	PROJECT USE ONLY

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

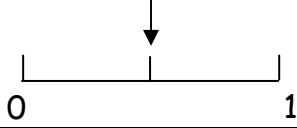
RESPONSE C

RESPONSE B

RESPONSE D

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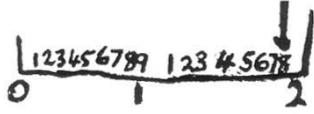
STUDENT WORK ANALYSIS: FRACTIONS (final)

Common Fraction	Number Line	Decimal
$\frac{1}{2}$		0.5
		1.8


Students were given the above table and asked to fill in the empty boxes

What do the following responses indicate about the student's strategies or mathematical understanding for this task?

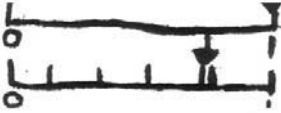
RESPONSE A

	$1\frac{1}{8}$	1.8
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RESPONSE B

$\frac{9}{5}$		1.8
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RESPONSE C

$1\frac{4}{5}$ or $\frac{4}{5}$		1.8
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RESPONSE D

$1\frac{8}{1}$		1.8
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STUDENT WORK ANALYSIS: FRACTIONS (final)

Name: _____	School: _____
Name: _____	School: _____
Name: _____	School: _____

UNIT 5 & 6	PROJECT USE ONLY

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

RESPONSE C

RESPONSE B

RESPONSE D

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STUDENT WORK ANALYSIS: CHANCE AND DATA

The teacher shows the student a six-sided die marked
1, 2, 4, 4, 5 & 6



The teacher says:

"If a die has the number 1, 2, 4, 4, 5 and 6 which of the numbers will be easiest to throw?" "How do you know?"

What do the following responses indicate about the student's strategies or mathematical understanding for this task?

RESPONSE A

"One" "It is my favorite number"

RESPONSE B

"Six" "I get more sixes than any other number when I play games"

RESPONSE C

"Four" "There are two fours but only one of the other numbers"

RESPONSE D

"Four" "I have a two in six chance of getting a four but a one in six chance of getting a 1, or a 2, or a 5 or a 6"

Researching Numeracy Teaching Approaches in Primary Schools

STUDENT WORK ANALYSIS: CHANCE AND DATA

Name: _____	School: _____
Name: _____	School: _____
Name: _____	School: _____

UNIT 5 & 6	PROJECT USE ONLY

What does each student's response reveal about the student's mathematical knowledge and mathematical strategies?

RESPONSE A

RESPONSE C

RESPONSE B

RESPONSE D

Researching Numeracy Teaching Approaches in Primary Schools

SCORING RUBRICS - STUDENT WORK SAMPLES TASK

Question addressed by teachers:

What do the following responses to this task (Student Responses) reveal about the student's strategies and mathematical understanding?

The teacher's assessment of each student response for each SWS task was evaluated and scored according to the following:

Evaluation of Teacher's Assessments of Student Responses

Little or/no comment, inappropriate interpretation.	0
Identifies <i>some</i> aspect of the child's strategy (ie, what the child appears to have done or is unable to do) <u>OR</u> <i>some</i> aspect related to understanding (ie, what the child appears to understand or find difficult).	1
Identifies <i>some</i> aspects of the child's strategy (ie, what the child appears to have done or is unable to do) <u>AND</u> <i>some</i> aspects related to understanding (ie, what the child appears to understand or find difficult, with few irrelevant ideas mentioned).	2
Identifies child's strategy (ie, what the child appears to have done or is unable to do) <u>AND</u> understandings (ie, what the child appears to understand or find difficult) in some detail, with few or no irrelevant ideas mentioned.	3

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES

Make 10

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Estimate, guess, count back (incorrectly), sees single movement as 1 less, cannot articulate strategy, may not be able to count to 10.	'Less than' idea, little/no number fact knowledge or part-part whole, may not have 1:1 correspondence.
B	Child needs physical models to count, cannot count back from 10, may not be able to count to 10.	Does not know part-whole ideas for 10 or 8, less than idea. Does not recognise 10, same as/different. No number-fact knowledge, 1:1 correspondence.
C	Counts on/back, uses number fact knowledge, justifies by physical count.	can deal with hidden collection (trusts the count), knows part-part-whole ideas for 10, comfortable with less than (subtraction), 1-1 correspondence.
D	Uses number fact knowledge (automatic recall, prior knowledge).	Can deal with hidden collection (trusts the count), knows part-part-whole ideas for 10, argument relies on number fact knowledge (addition, commutative/inverse/complimentary addition, $8+2=2+8$).
E	Uses number fact knowledge (automatic recall, prior knowledge).	Can deal with hidden collection (trusts the count), knows part-whole ideas for 10, argument relies on number fact knowledge (subtraction).

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES

2-Digit Subtraction

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Inappropriate application of algorithm (take ones then tens), cannot count back (eg, 22, 12, 10, 5), cannot 'think of addition' (eg, count on from 17 to 22), cannot trade 1 ten for ones (regrouping/trading)	No clear sense of what numbers mean, take-away idea for some combinations (larger first), little/no knowledge of missing addend idea. Little knowledge of place value (1 equivalent to 10). May think zero is lowest possible number or be confusing with algorithmic processes of other operations.
B	Inappropriate application of algorithm (ones first then tens), cannot regroup/trade.	Basic subtraction facts for one digit numbers only. Recognises need to take smaller from larger but no sense of what numbers mean (eg seeing each digit in number separately from the number as a whole). Little knowledge of place value. Recognises can't take/subtract ones.
C	Adds rather than subtracts using basic facts, has some mental strategies for addition. *Finds reading equations difficult.	Addition facts, no sense of what numbers mean, little/no evidence of subtraction ideas (concepts). Little knowledge of place value.
D	Uses basic facts, possibly counts on mentally	Missing addend idea, basic number-fact knowledge (addition, commutative/inverse/complimentary addition, $8+2=2+8$), clear sense of place value and what number mean.
E	Note: there are two 19s in Response E ie 22, 21, 20, 19, 19, 18, 17. Cannot count back on fingers, difficulty counting back by ones to 17, good mental strategies (eg, 22, 20, 17)	Has basic number fact knowledge, trusts number fact knowledge. Subtraction as take-away, some difficulty with number naming sequence. Has place value knowledge and number sense.
F	Can count back, counts back all by ones orally (not clear how count is kept, presumably fingers).	Subtraction as take-away, number naming sequence. Possibly no addend idea. Some number sense.

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES

3-Digit Subtraction

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Make-all/count-all, count by ones, cannot keep track of count for larger numbers. Needs visual/physical model, cannot use 1:1 correspondence.	Cannot trust the count, finds counting difficult, numbers as collections of ones, little/no evidence of place-value knowledge, subtraction only as physical take-away, no 1:1 correspondence.
B	Taking difference between numbers by place-value parts, inappropriate application of algorithm, deal with single digit number combinations	No sense of what numbers mean or effect of operation except in relation to single digit numbers treated in isolation, little/no evidence of place-value knowledge. Some understanding of take-away idea (single digits but not numbers as a whole). May not have 1:1 correspondence.
C	Count backwards by ones using fingers to keep track of count, no evidence of regrouping/trading, uses physical model.	Number naming sequence, subtraction as take-away, numbers seen as ones, little/no evidence of place-value knowledge, understands 1:1 correspondence.
D	Inappropriate application of algorithm, rote application of addition regrouping. Knows how to represent problem as an algorithm (but can't work it out). Doesn't understand regrouping/trading).	Does not relate to reality of situation or how numbers might be represented, little/no idea of subtraction (what there is very superficial), no sense of taking away from larger number, reasonableness of result not checked, confuses subtraction with addition, little/no understanding of place-value (numbers are written in correct columns). May be confusing with algorithmic processes of other operations, confusing "carrying" (regrouping) with "borrowing" (trading), may think zero is lowest possible number.
E	Appears to have applied some sort of algorithm appropriately, uses automatic recall of number facts.	Appears to understand subtraction concept and place-value implications of taking 7 from 1, number fact knowledge.

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES

Multiplication

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Count physical models to 7, cannot keep track of count when hidden, may not be able to count, guessing.	Finds 1:1 correspondence difficult (7 in first row and 12 taps not 22), not sure what to do with hidden counters (does not trust count), may not understand arrays (rows and columns). May not understand number/counting sequence.
B	Attempts to count all, needs physical models, presumably miscounts to get 29.	Appears to understand repeated addition idea, some evidence of arrays, but dealing with ones not groups, may not have 1:1 correspondence, may not have number/counting sequence.
C	Counts and uses number facts (automatic response).	Understands array concept for multiplication, number fact knowledge.
D	Counts each counter shown once only, counts column, uses number facts (automatic response), misreads array.	Knows 6 fives, some understanding of arrays.
E	Counts counters along top edge of shaded region only, counts column, uses number facts (automatic response) - very similar to above. Developing mental computation strategies, has 1:1 correspondence.	Knows 6 fives automatically, some understanding of arrays - similar to above, 1:1 correspondence.

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES

Chance & Data

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Uses some prior knowledge, no evidence of mathematical thinking, intuitive response, recognises one as a number.	Experiment appears not to be understood, outcomes partially related to prior knowledge of tossing standard dice, little/no idea of chance.
B	Uses prior knowledge, some evidence of mathematical thinking, intuitive response.	Experiment appears not to be understood, some suggestion that outcomes related to prior knowledge of tossing standard dice, some evidence of understanding chance ("more sixes").
C	Uses prior knowledge, counts and orders (2 fours, only 1 of everything else), whole number comparison.	Understands experiment and likelihood of particular outcomes, that is, notion of chance, but not measure of chance/probability. Outcomes related to prior knowledge of tossing standard dice.
D	Uses prior knowledge, counts, orders and compares using knowledge of proportion (fractions), measures chance. Adding to calculate frequency. Uses language of chance.	Understands chance/probability (mode) and measurement of chance in terms of fractions (proportion), has language of chance (ratio). Outcomes related to prior knowledge of tossing standard dice.

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES


Fraction as Operator (SWARM 1)

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Added numbers heard, may be using "you and ..." to cue addition.	Little/no evidence that fraction concept, language or 'fraction as operator' idea is understood, does not check meaningfulness of result.
B	Multiplied numbers heard, uses known fact, may have recognise 'of' as multiply.	Little/no evidence that fractio concept, language or 'fraction as operator' idea is understood, does not check meaningfulness of result.
C	Determines part (incorrectly), doubles to find 2 parts, uses known fact	Evidence that fractio concept, language or 'fraction as operator' idea is understood, but does not check meaningfulness of result. Sense of parts and how parts are counted, out-of idea, possibly confusing 'thirds' with '3' rather than '3 equal parts'
D	Determines part correctly, doubles to find 2 parts.	Understands discrete model, good sense of parts, partitioning into equal parts (division implicit - dividing into equal groups), fraction as operator idea.

STUDENT WORKSAMPLES

KEY CONCEPTS AND STRATEGIES

Fraction Representations (SWARM 4)

Student Response	STRATEGIES Can do/Can't do	KNOWLEDGE Understands/Finds Difficult
A	Fraction recording appears to be based on perception (what is heard, seen etc not what is understood by symbols ie 1.8 is $1\frac{1}{8}$).  Can represent decimals on a number line, some evidence of partitioning	Some evidence that decimal notation is understood, that is, that 1.8 is 1 whole and 8 tenths (nearly 2), in relation to a number line, and some evidence that this is understood in relation to common fractions or parts of whole (ie $1.8 \rightarrow 1\frac{1}{8}$ is incorrect but knows that 1.8 is 1 whole and a part of a whole), some evidence of partitioning.
B	Possibly represents fractions as less than 1 (.8 seen as larger fraction). Possibly simplified 18 tenths to 9 fifths to arrive at fraction recording.	No evidence that decimal notation is understood in relation to number line, appears to respond to 0.8 on the basis that "all decimals are less than 1" idea. However, appears to understand 1.8 as 18 tenths and how this is related to 9 fifths (renaming/equivalence)
C	Difficulty with recording on a number line (draws two ones), but some evidence of partitioning. Can possibly simplify fractions $1\frac{8}{10} \rightarrow 1\frac{4}{5}$.	Appears to be able to rename 1.8 as $1\frac{4}{5}$ but also seems to be discounting whole by offering alternative ("or $\frac{4}{5}$ ") perhaps on basis of idea that all fractions are less than 1. Understands number lines are continuous.
D	Cannot use number lines to represent decimal fractions, little/no evidence of partitioning or renaming/equivalence. Some understanding of the difference between a whole number and a fraction. Some understanding of vulgar fractions being represented as one number over another.	No evidence that decimal notation is understood in terms of ones and tenths and thereby, common fractions No understanding of number line representations or concept of partitioning

Researching Numeracy Teaching Approaches in Primary Schools

STUDENT WORK SAMPLES TASK TECHNICAL REPORT

The teacher's assessment of each student response for each Student Work Samples (SWS) task was evaluated and scored according to the following. For further details of scoring refer to the Scoring Rubric in this Appendix.

Table 1 SWS Evaluation and Scoring of Teacher Assessments of Student Responses

Evaluation of Teacher's Responses	Score
Little or/no comment, inappropriate interpretation.	0
Identifies <i>some</i> aspect of the child's strategy (ie, what the child appears to have done or is unable to do) <u>OR</u> <i>some</i> aspect related to understanding (ie, what the child appears to understand or find difficult).	1
Identifies <i>some</i> aspects of the child's strategy (ie, what the child appears to have done or is unable to do) <u>AND</u> <i>some</i> aspects related to understanding (ie, what the child appears to understand or find difficult, with few irrelevant ideas mentioned).	2
Identifies child's strategy (ie, what the child appears to have done or is unable to do) <u>AND</u> understandings (ie, what the child appears to understand or find difficult) in some detail, with few or no irrelevant ideas mentioned.	3

Initial Data: for Student Work Samples is presented in tables 2 – 36 and figures 1 – 29. The initial SWS task was completed during SWARM 1.

End (Final) Data: for Student Work Samples is presented in tables 37 – 71 and figures 30 – 58. The end (final) SWS task was completed in SWARM 4. The teachers responded to the *same* samples that they had responded to in SWARM 1, *except for fractions*, for which a *different* (alternate) sample was presented.

Student Work Samples (SWS) Initial Data for Task 1 (Make 10): Frequency Tables

- N: total number of participants. 'N' will vary over time, depending on the composition of staff of research schools.
- Valid: the number of participants (staff) from research schools who completed the task.
- Missing: the number of participants (staff) from research schools who did not complete the task.
Note: not all participants (staff) were expected to complete all tasks.

Table 2 SWS Initial Data: Task 1 (Make 10) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D	Response E
N	Valid	66	66	66	66	66
	Missing	0	0	0	0	0
Mean		1.09	.76	1.27	.95	.91
Mode		1	1	1	1	1

Student Work Samples (SWS) Initial Data for Task 1 (Make 10): Frequency Tables of Teacher Assessments of Each Student Response A – E

Table 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	9	13.6	13.6	13.6
	ID some strat OR concept OR one strat, one concept ...	42	63.6	63.6	77.3
	ID some strat AND some aspect	15	22.7	22.7	100.0
	Total	66	100.0	100.0	

Table 4

Response B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	24	36.4	36.4	36.4
	ID some strat OR concept OR one strat, one concept ...	34	51.5	51.5	87.9
	ID some strat AND some aspect	8	12.1	12.1	100.0
	Total	66	100.0	100.0	

Table 5

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	9	13.6	13.6	13.6
	ID some strat OR concept OR one strat, one concept ...	33	50.0	50.0	63.6
	ID some strat AND some aspect	21	31.8	31.8	95.5
	ID strat AND concepts in some detail	3	4.5	4.5	100.0
	Total	66	100.0	100.0	

Table 6

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	14	21.2	21.2	21.2
	ID some strat OR concept OR one strat, one concept ...	44	66.7	66.7	87.9
	ID some strat AND some aspect	5	7.6	7.6	95.5
	ID strat AND concepts in some detail	3	4.5	4.5	100.0
	Total	66	100.0	100.0	

Table 7

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	17	25.8	25.8	25.8
	ID some strat OR concept OR one strat, one concept ...	38	57.6	57.6	83.3
	ID some strat AND some aspect	11	16.7	16.7	100.0
	Total	66	100.0	100.0	

Student Work Samples (SWS) Initial Data for Task 1 (Make 10): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – E)

Figure 1

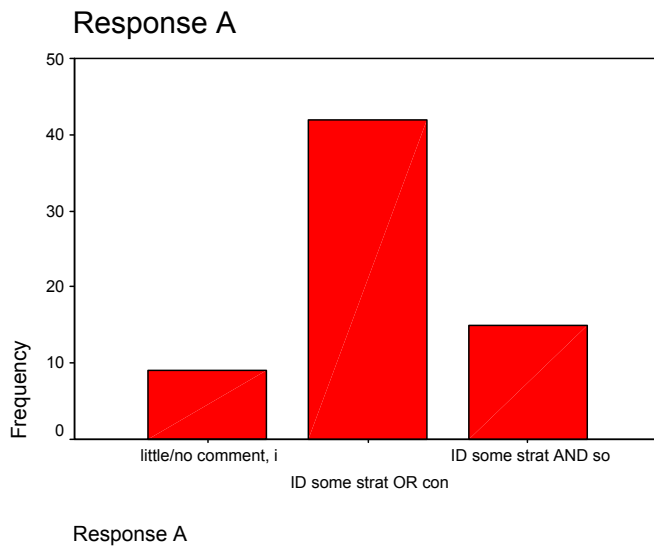


Figure 2

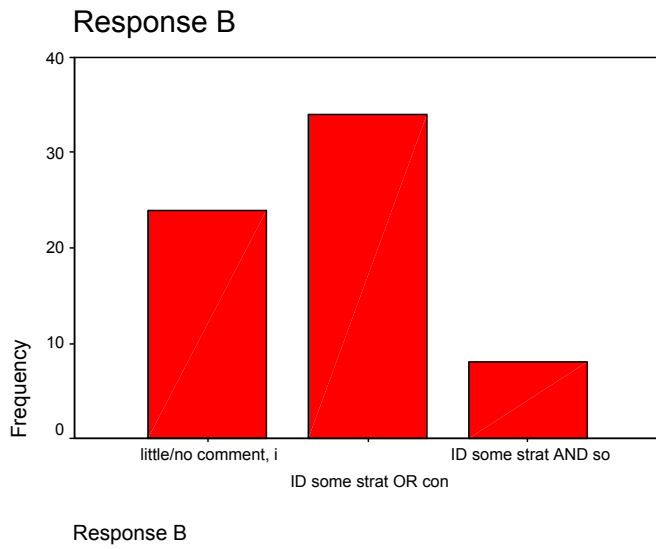


Figure 3

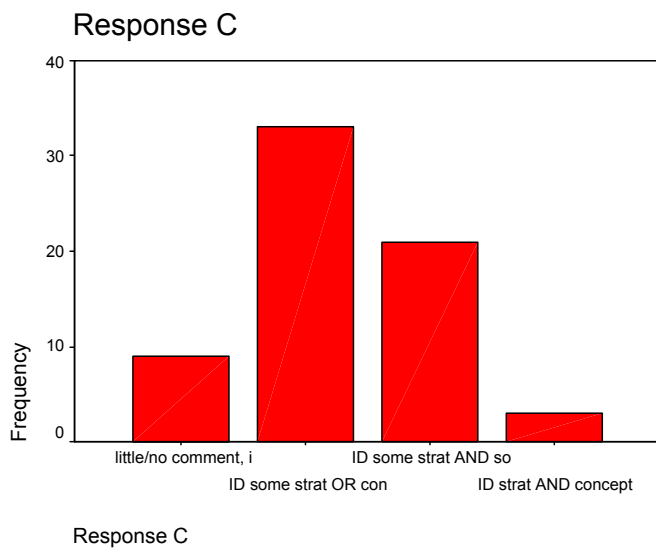


Figure 4

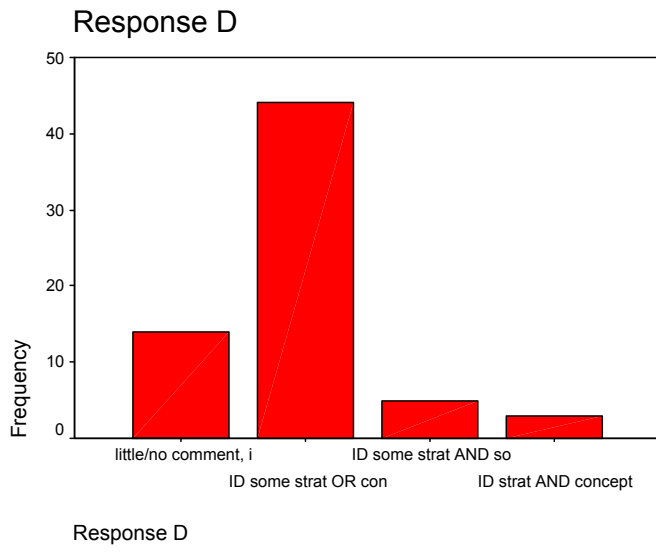
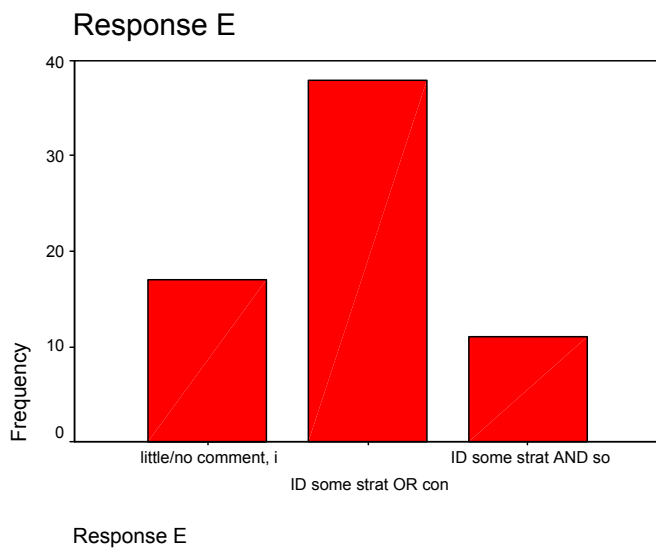


Figure 5



**Student Work Samples (SWS) Initial Data for Task 2 (Two-Digit Subtraction):
Frequency Tables**

Table 8 SWS Initial Data: Task 2 (Two-Digit Subtraction) - Sample Size, Mean and Mode

		Statistics					
		Response A	Response B	Response C	Response D	Response E	Response F
N	Valid	60	60	60	60	60	60
	Missing	0	0	0	0	0	0
Mean		.42	.55	.45	.75	.30	.22
Mode		0	0	0	1	0	0

**Student Work Samples (SWS) Initial Data for Task 2 (Two-Digit Subtraction):
Frequency Tables of Teacher Assessments of Each Student Response A – F**

Table 9

		Response A			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	35	58.3	58.3	58.3
	ID some strat OR concept OR one strat, one concept ...	25	41.7	41.7	100.0
	Total	60	100.0	100.0	

Table 10

		Response B			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	32	53.3	53.3	53.3
	ID some strat OR concept OR one strat, one concept ...	23	38.3	38.3	91.7
	ID some strat AND some aspect	5	8.3	8.3	100.0
	Total	60	100.0	100.0	

Table 11

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	33	55.0	55.0	55.0
	ID some strat OR concept OR one strat, one concept ...	27	45.0	45.0	100.0
	Total	60	100.0	100.0	

Table 12

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	24	40.0	40.0	40.0
	ID some strat OR concept OR one strat, one concept ...	30	50.0	50.0	90.0
	ID some strat AND some aspect	3	5.0	5.0	95.0
	ID strat AND concepts in some detail	3	5.0	5.0	100.0
	Total	60	100.0	100.0	

Table 13

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	42	70.0	70.0	70.0
	ID some strat OR concept OR one strat, one concept ...	18	30.0	30.0	100.0
	Total	60	100.0	100.0	

Table 14

Response F

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	47	78.3	78.3	78.3
	ID some strat OR concept OR one strat, one concept ...	13	21.7	21.7	100.0
	Total	60	100.0	100.0	

Student Work Samples (SWS) Initial Data for Task 2 (Two-Digit Subtraction): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – F)

Figure 6

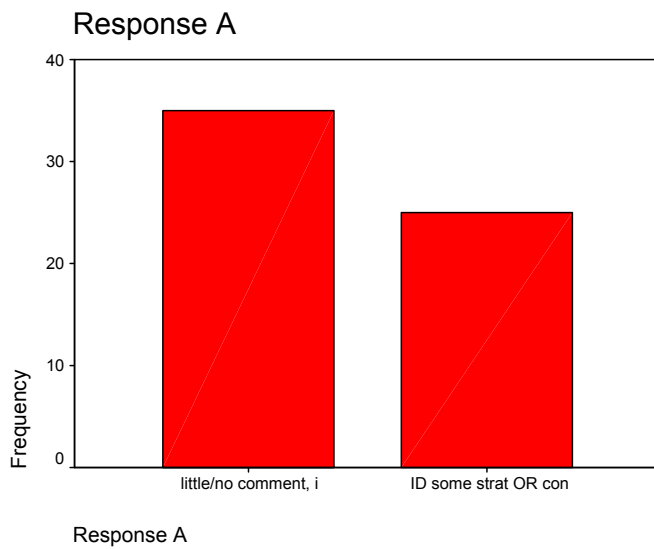


Figure 7

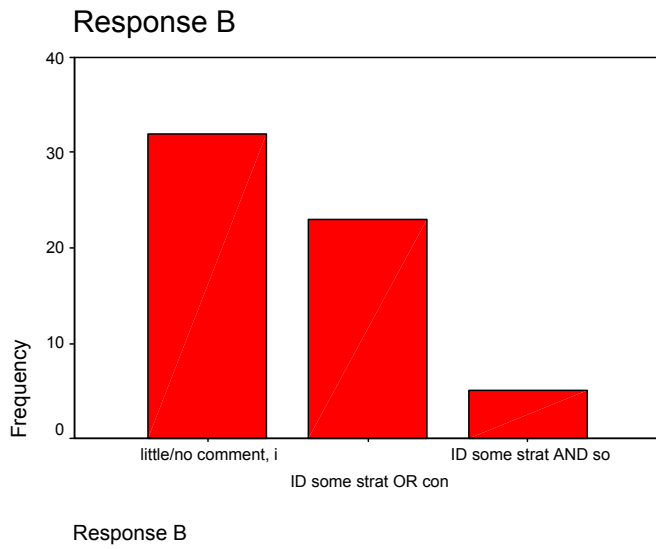


Figure 8

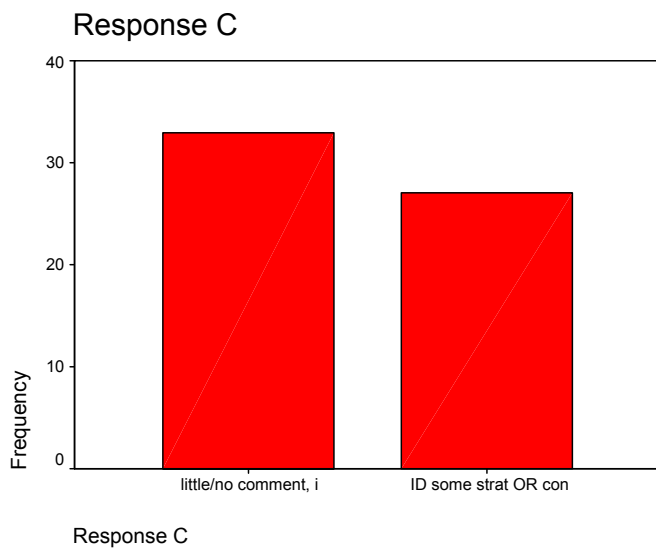


Figure 9

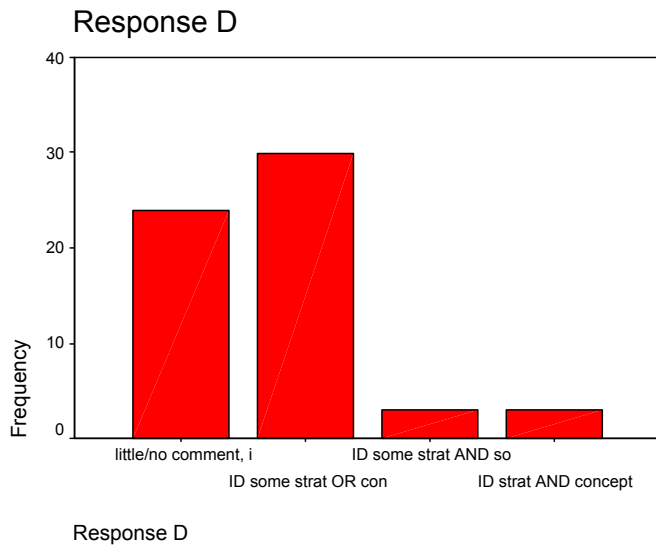


Figure 10

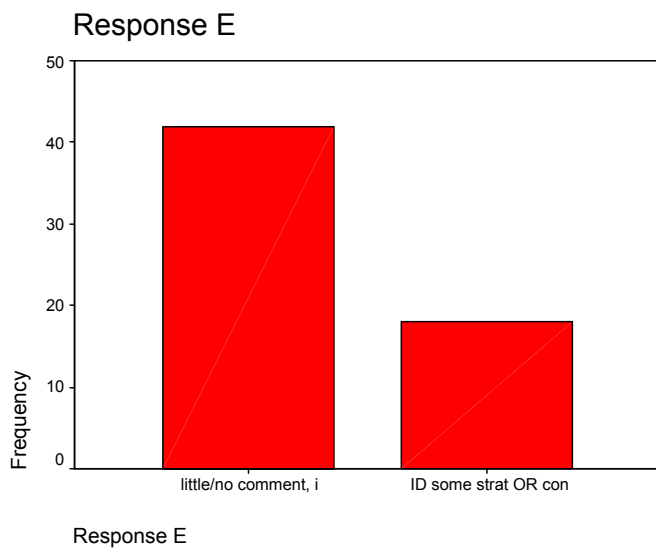
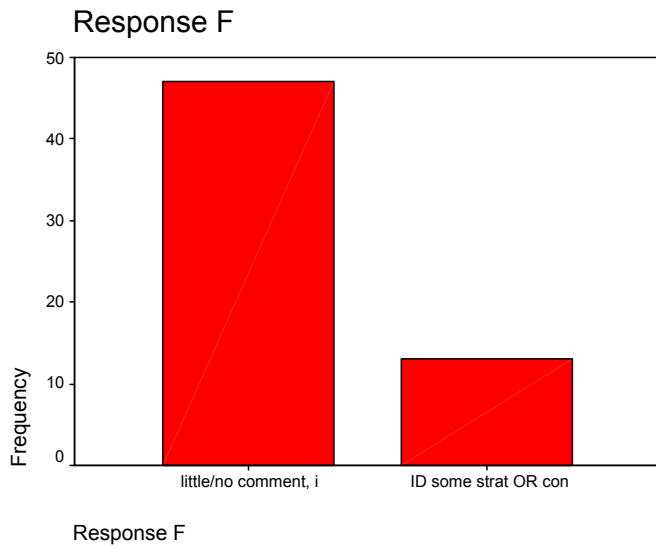


Figure 11



**Student Work Samples (SWS) Initial Data for Task 3 (Three-Digit Subtraction):
Frequency Tables**

Table 15 SWS Initial Data: Task 3 (Three-Digit Subtraction) - Sample Size, Mean and Mode

Statistics

		Response A	Response B	Response C	Response D	Response E
N	Valid	48	48	48	48	48
	Missing	0	0	0	0	0
Mean		1.00	1.10	1.33	.92	.56
Mode		1	1	1	1	1

**Student Work Samples (SWS) Initial Data for Task 3 (Three-Digit Subtraction):
Frequency Tables of Teacher Assessments of Each Student Response A – E**

Table 16

Response A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	13	27.1	27.1	27.1
	ID some strat OR concept OR one strat, one concept ...	22	45.8	45.8	72.9
	ID some strat AND some aspect	13	27.1	27.1	100.0
	Total	48	100.0	100.0	

Table 17

Response B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ID some strat OR concept OR one strat, one concept ...	43	89.6	89.6	89.6
	ID some strat AND some aspect	5	10.4	10.4	100.0
	Total	48	100.0	100.0	

Table 18

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	2	4.2	4.2	4.2
	ID some strat OR concept OR one strat, one concept ...	28	58.3	58.3	62.5
	ID some strat AND some aspect	18	37.5	37.5	100.0
	Total	48	100.0	100.0	

Table 19

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	12	25.0	25.0	25.0
	ID some strat OR concept OR one strat, one concept ...	28	58.3	58.3	83.3
	ID some strat AND some aspect	8	16.7	16.7	100.0
	Total	48	100.0	100.0	

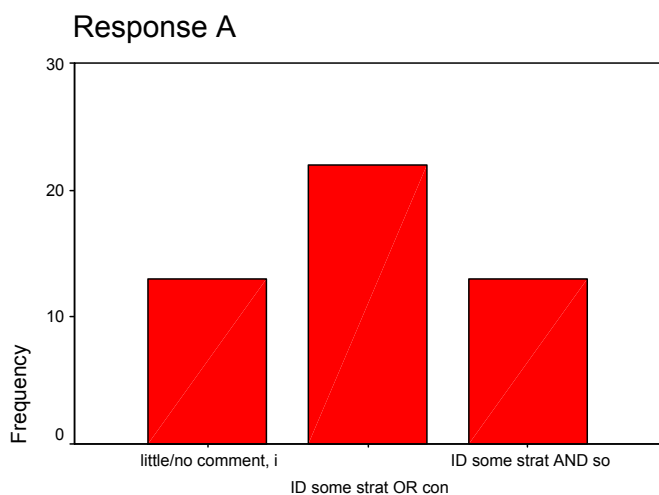
Table 20

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	21	43.8	43.8	43.8
	ID some strat OR concept OR one strat, one concept ...	27	56.3	56.3	100.0
	Total	48	100.0	100.0	

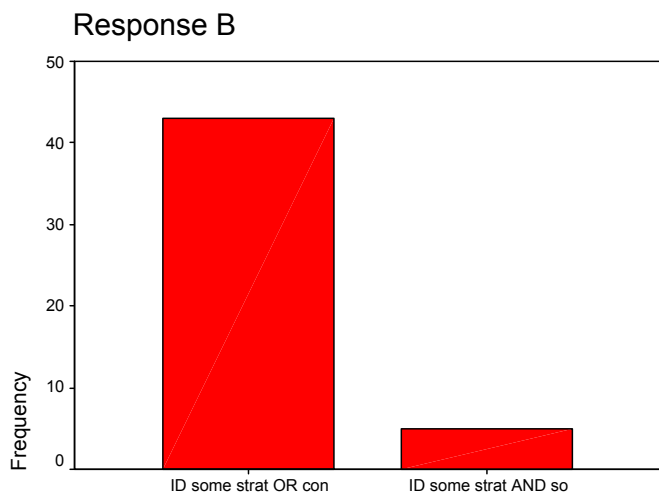
**Student Work Samples (SWS) Initial Data for Task 3 (Three-Digit Subtraction):
Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student
Response A – E)**

Figure 12



Response A

Figure 13



Response B

Figure 14

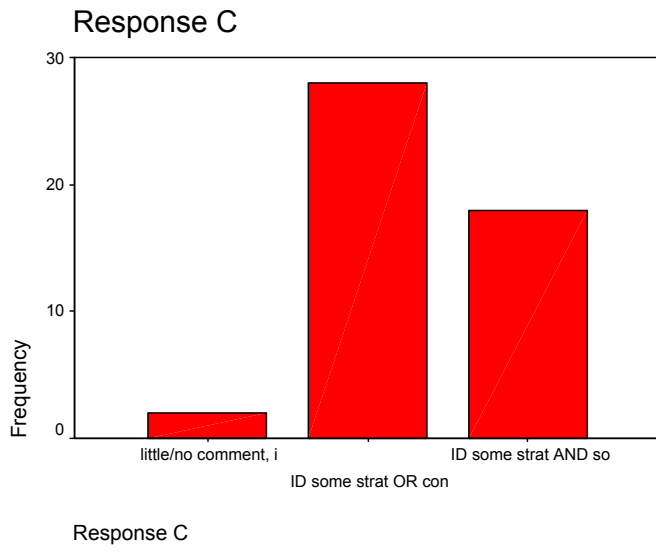


Figure 15

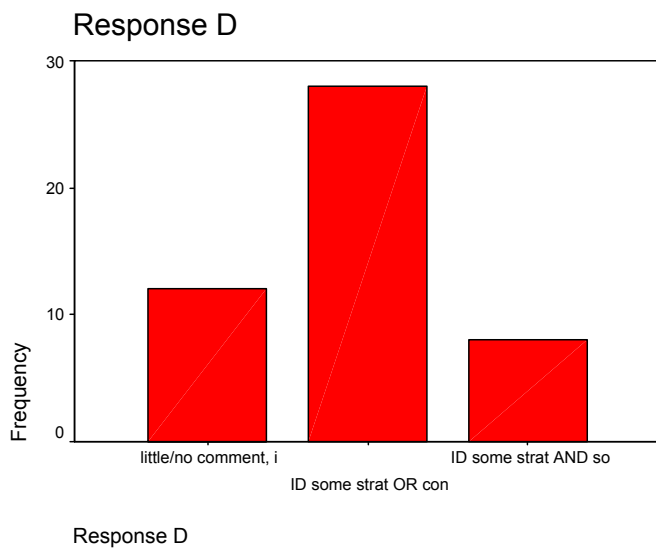
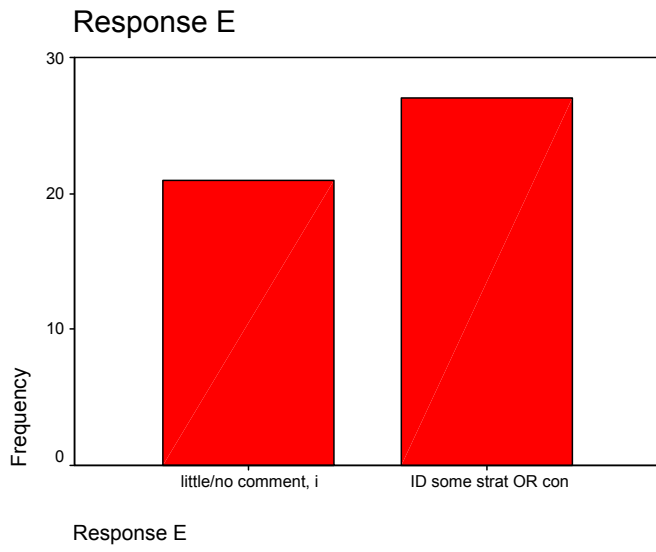


Figure 16



Student Work Samples (SWS) Initial Data for Task 4 (Multiplication): Frequency Tables

Table 21 SWS Initial Data: Task 4 (Multiplication) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D	Response E
N	Valid	36	36	36	36	36
	Missing	0	0	0	0	0
Mean		.17	.44	.64	.36	.44
Mode		0	0	1	0	0

Student Work Samples (SWS) Initial Data for Task 4 (Multiplication): Frequency Tables of Teacher Assessments of Each Student Response (A – E)

Table 22

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	30	83.3	83.3	83.3
	ID some strat OR concept OR one strat, one concept ...	6	16.7	16.7	100.0
	Total	36	100.0	100.0	

Table 23

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	20	55.6	55.6	55.6
	ID some strat OR concept OR one strat, one concept ...	16	44.4	44.4	100.0
	Total	36	100.0	100.0	

Table 24

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	13	36.1	36.1	36.1
	ID some strat OR concept OR one strat, one concept ...	23	63.9	63.9	100.0
	Total	36	100.0	100.0	

Table 25

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	23	63.9	63.9	63.9
	ID some strat OR concept OR one strat, one concept ...	13	36.1	36.1	100.0
	Total	36	100.0	100.0	

Table 26

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	20	55.6	55.6	55.6
	ID some strat OR concept OR one strat, one concept ...	16	44.4	44.4	100.0
	Total	36	100.0	100.0	

Student Work Samples (SWS) Initial Data for Task 4 (Multiplication): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – E)

Figure 17

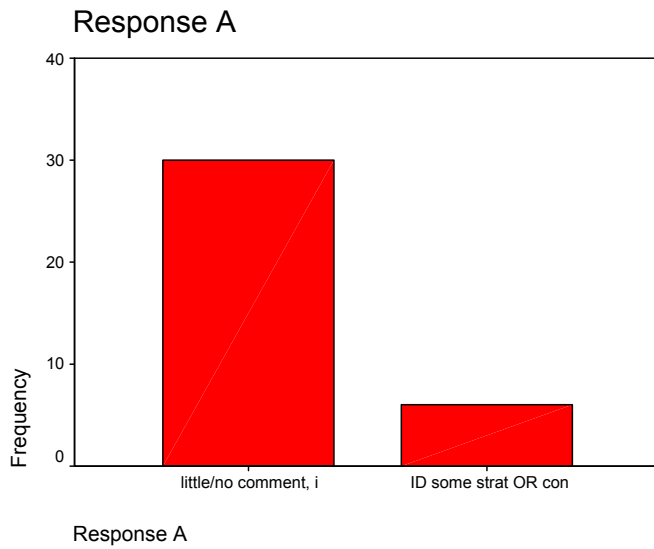


Figure 18

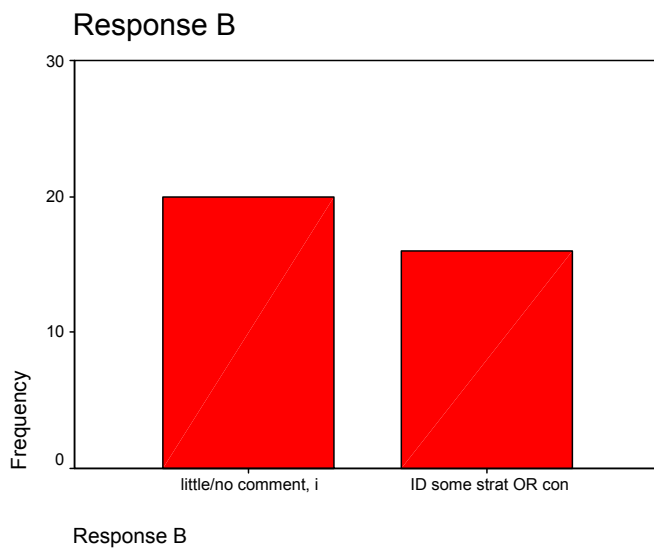


Figure 19

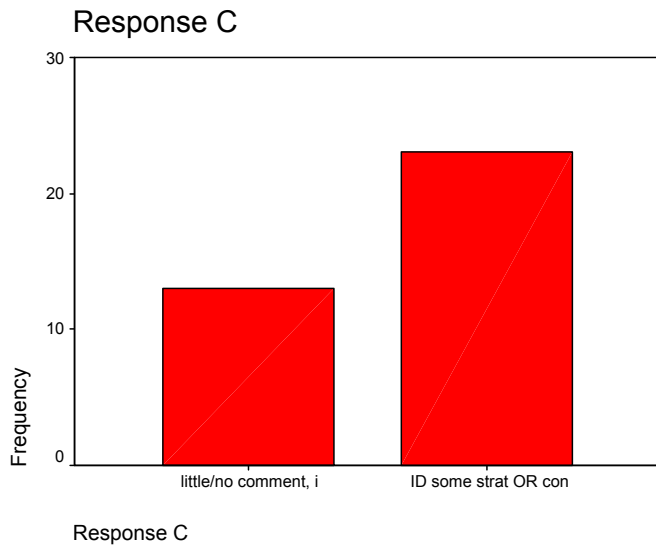


Figure 20

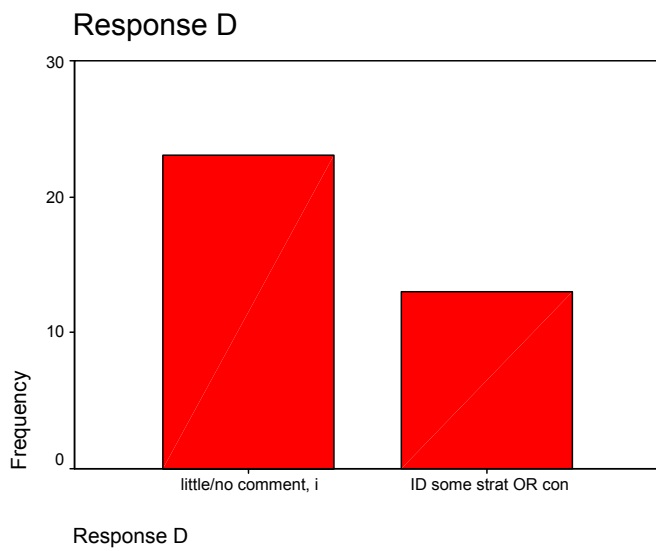
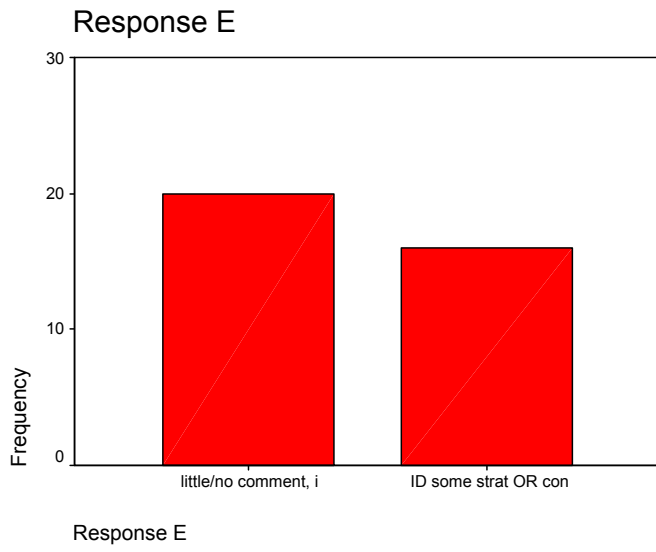


Figure 21



Student Work Samples (SWS) Initial Data for Task 5 (Fractions): Frequency Tables

Table 27 SWS Initial Data: Task 5 (Fractions) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D
N	Valid	36	36	36	36
	Missing	0	0	0	0
Mean		.94	1.17	1.03	1.17
Mode		1	1	1	1

Student Work Samples (SWS) Initial Data for Task 5 (Fractions): Frequency Tables of Teacher Assessments of Each Student Response (A – D)

Table 28

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	10	27.8	27.8	27.8
	ID some strat OR concept OR one strat, one concept ...	21	58.3	58.3	86.1
	ID some strat AND some aspect	2	5.6	5.6	91.7
	ID strat AND concepts in some detail	3	8.3	8.3	100.0
	Total	36	100.0	100.0	

Table 29

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	7	19.4	19.4	19.4
	ID some strat OR concept OR one strat, one concept ...	18	50.0	50.0	69.4
	ID some strat AND some aspect	9	25.0	25.0	94.4
	ID strat AND concepts in some detail	2	5.6	5.6	100.0
	Total	36	100.0	100.0	

Table 30

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	6	16.7	16.7	16.7
	ID some strat OR concept OR one strat, one concept ...	23	63.9	63.9	80.6
	ID some strat AND some aspect	7	19.4	19.4	100.0
	Total	36	100.0	100.0	

Table 31

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ID some strat OR concept OR one strat, one concept ...	30	83.3	83.3	83.3
	ID some strat AND some aspect	6	16.7	16.7	100.0
	Total	36	100.0	100.0	

Student Work Samples (SWS) Initial Data for Task 5 (Fractions): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – D)

Figure 22

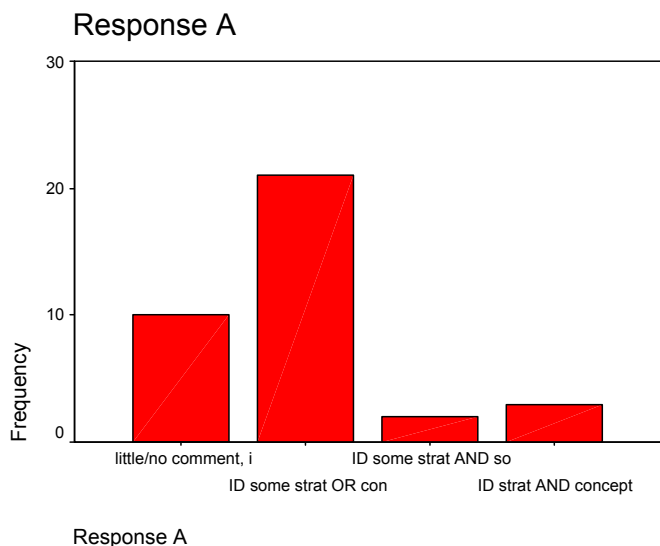


Figure 23

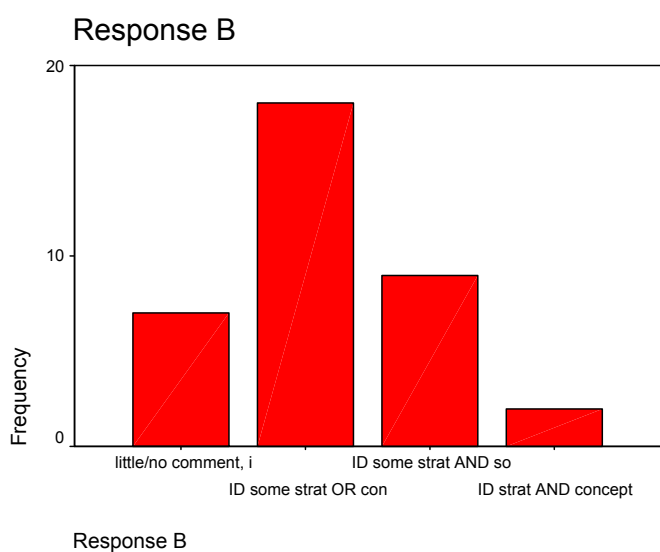


Figure 24

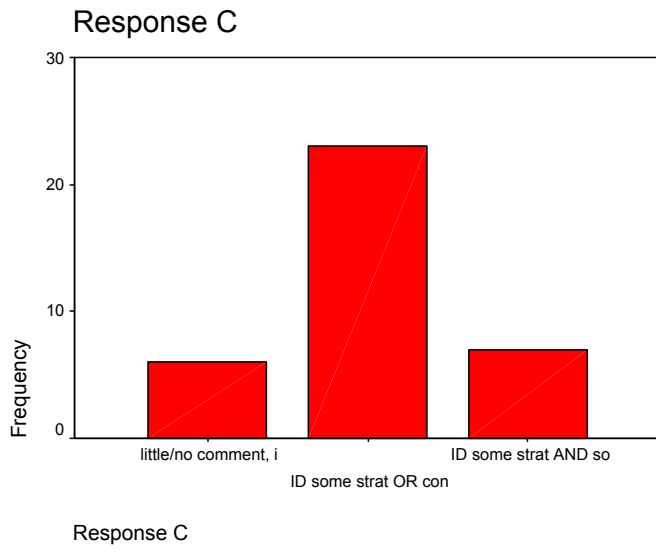
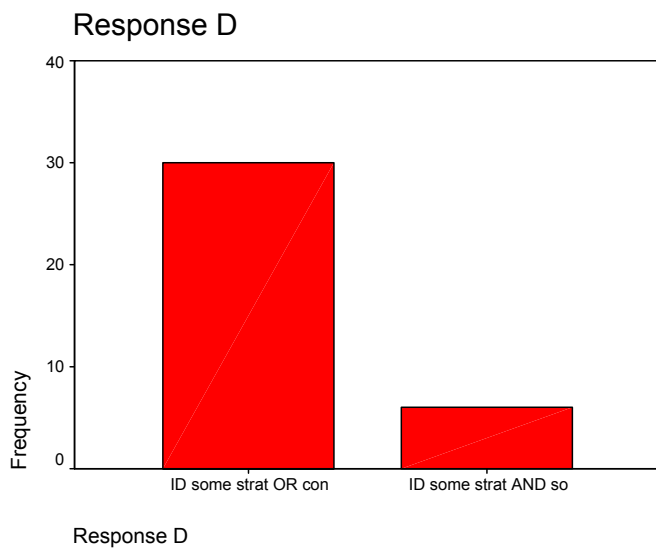


Figure 25



**Student Work Samples (SWS) Initial Data for Task 6 (Chance and Data):
Frequency Tables**

Table 32 SWS Initial Data: Task 6 (Chance and Data) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D
N	Valid	26	26	26	26
	Missing	0	0	0	0
Mean		.23	.54	1.27	1.04
Mode		0	1	1	1

**Student Work Samples (SWS) Initial Data for Task 6 (Chance and Data):
Frequency Tables of Teacher Assessments of Each Student Response (A – D)**

Table 33

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	20	76.9	76.9	76.9
	ID some strat OR concept OR one strat, one concept ...	6	23.1	23.1	100.0
	Total	26	100.0	100.0	

Table 34

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	12	46.2	46.2	46.2
	ID some strat OR concept OR one strat, one concept ...	14	53.8	53.8	100.0
	Total	26	100.0	100.0	

Table 35

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	5	19.2	19.2	19.2
	ID some strat OR concept OR one strat, one concept ...	12	46.2	46.2	65.4
	ID some strat AND some aspect	6	23.1	23.1	88.5
	ID strat AND concepts in some detail	3	11.5	11.5	100.0
	Total	26	100.0	100.0	

Table 36

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	4	15.4	15.4	15.4
	ID some strat OR concept OR one strat, one concept ...	18	69.2	69.2	84.6
	ID some strat AND some aspect	3	11.5	11.5	96.2
	ID strat AND concepts in some detail	1	3.8	3.8	100.0
	Total	26	100.0	100.0	

Student Work Samples (SWS) Initial Data for Task 6 (Chance and Data): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – D)

Figure 26

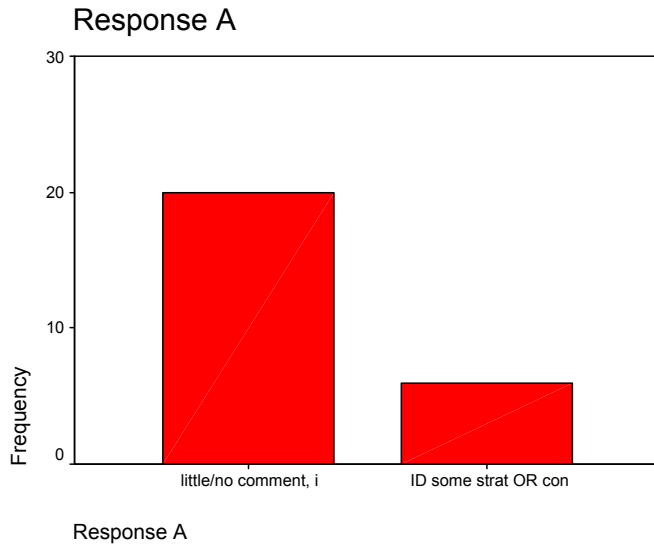


Figure 27

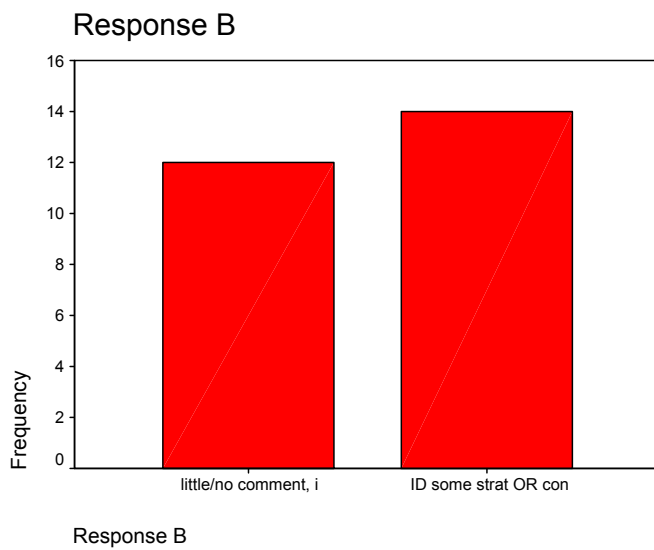


Figure 28

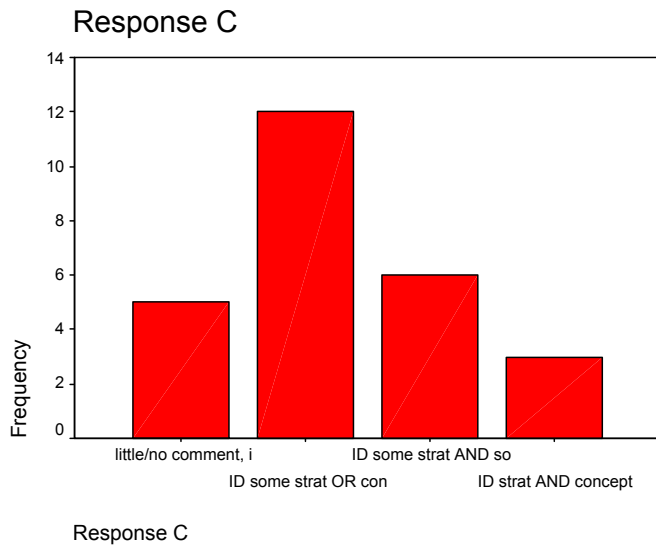
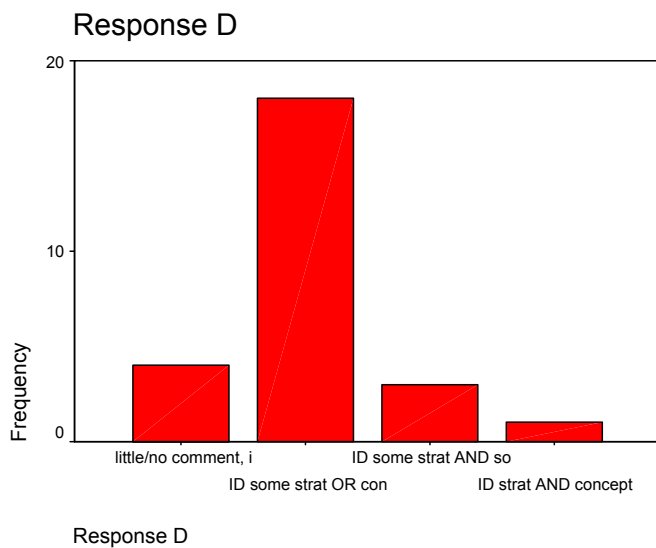


Figure 29



Student Work Samples (SWS) End Data for Task 1 (Make 10): Frequency Tables

Table 37 SWS End Data: Task 1 (Make 10) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D	Response E
N	Valid	44	44	44	44	44
	Missing	66	66	66	66	66
Mean		.73	.18	.64	.80	.55
Mode		0	0	1	1	1

Student Work Samples (SWS) End Data for Task 1 (Make 10): Frequency Tables of Teacher Assessments of Each Student Response (A – E)

Table 38

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	20	18.2	45.5	45.5
	ID some strat OR concept OR one strat, one concept ...	19	17.3	43.2	88.6
	ID some strat AND some aspect	2	1.8	4.5	93.2
	ID strat AND concepts in some detail	3	2.7	6.8	100.0
	Total	44	40.0	100.0	
Missing	System	66	60.0		
Total		110	100.0		

Table 39

Response B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	36	32.7	81.8	81.8
	ID some strat OR concept OR one strat, one concept ...	8	7.3	18.2	100.0
	Total	44	40.0	100.0	
Missing	System	66	60.0		
Total		110	100.0		

Table 40

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	19	17.3	43.2	43.2
	ID some strat OR concept OR one strat, one concept ...	22	20.0	50.0	93.2
	ID some strat AND some aspect	3	2.7	6.8	100.0
	Total	44	40.0	100.0	
Missing	System	66	60.0		
Total		110	100.0		

Table 41

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	13	11.8	29.5	29.5
	ID some strat OR concept OR one strat, one concept ...	27	24.5	61.4	90.9
	ID some strat AND some aspect	4	3.6	9.1	100.0
	Total	44	40.0	100.0	
Missing	System	66	60.0		
Total		110	100.0		

Table 42

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	20	18.2	45.5	45.5
	ID some strat OR concept OR one strat, one concept ...	24	21.8	54.5	100.0
	Total	44	40.0	100.0	
Missing	System	66	60.0		
Total		110	100.0		

Student Work Samples (SWS) End Data for Task 1 (Make 10): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – E)

Figure 30

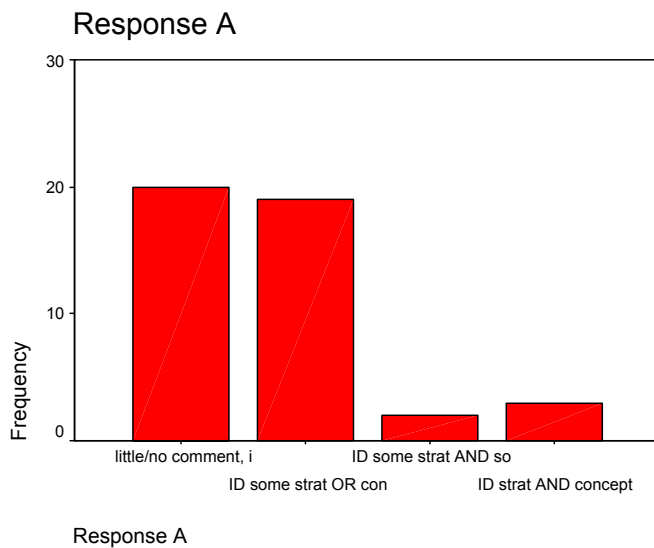


Figure 31

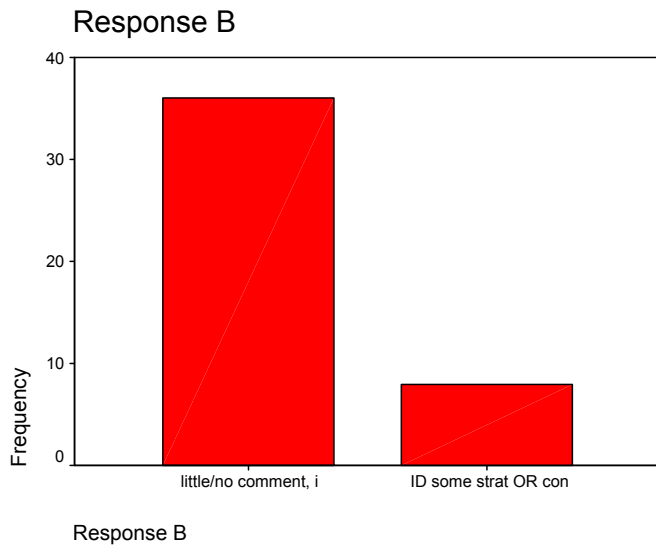


Figure 32

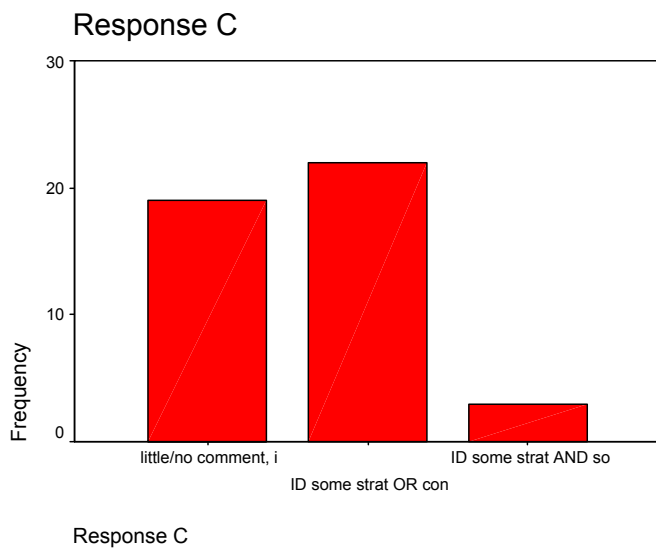


Figure 33

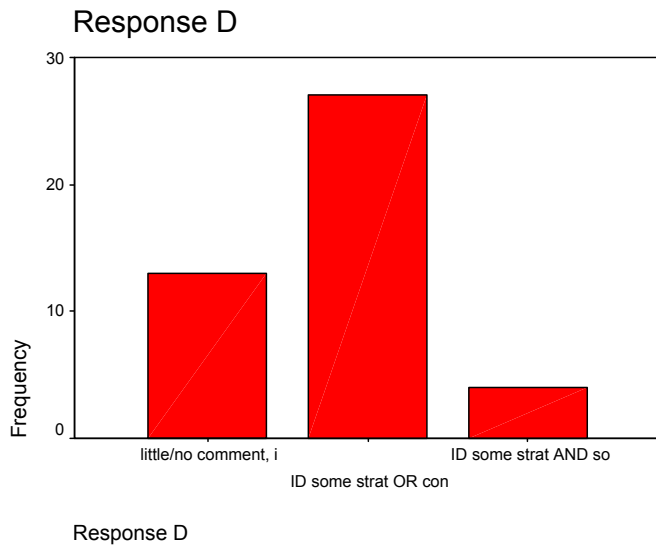
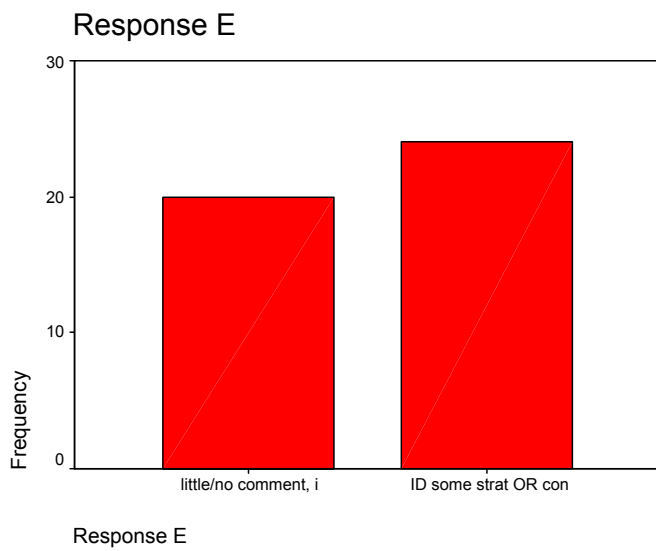


Figure 34



**Student Work Samples (SWS) End Data for Task 2 (Two-Digit Subtraction):
Frequency Tables**

Table 43 SWS End Data: Task 2 (Two-Digit Subtraction) - Sample Size, Mean and Mode

		Statistics					
		Response A	Response B	Response C	Response D	Response E	Response F
N	Valid	33	33	33	33	33	33
	Missing	60	60	60	60	60	60
Mean		.39	.24	.48	.48	.42	.52
Mode		0	0	0	0	0	1

**Student Work Samples (SWS) End Data for Task 2 (Two-Digit Subtraction):
Frequency Tables of Teacher Assessments of Each Student Response (A – F)**

Table 44

		Response A			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	20	60.6	60.6	60.6
	ID some strat OR concept OR one strat, one concept ...	13	39.4	39.4	100.0
	Total	33	100.0	100.0	

Table 45

		Response B			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	25	75.8	75.8	75.8
	ID some strat OR concept OR one strat, one concept ...	8	24.2	24.2	100.0
	Total	33	100.0	100.0	

Table 46

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	17	51.5	51.5	51.5
	ID some strat OR concept OR one strat, one concept ...	16	48.5	48.5	100.0
	Total	33	100.0	100.0	

Table 47

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	17	51.5	51.5	51.5
	ID some strat OR concept OR one strat, one concept ...	16	48.5	48.5	100.0
	Total	33	100.0	100.0	

Table 48

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	21	63.6	63.6	63.6
	ID some strat OR concept OR one strat, one concept ...	10	30.3	30.3	93.9
	ID some strat AND some aspect	2	6.1	6.1	100.0
	Total	33	100.0	100.0	

Table 49

Response F

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	16	48.5	48.5	48.5
	ID some strat OR concept OR one strat, one concept ...	17	51.5	51.5	100.0
	Total	33	100.0	100.0	

Student Work Samples (SWS) End Data for Task 2 (Two-Digit Subtraction): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – F)

Figure 35

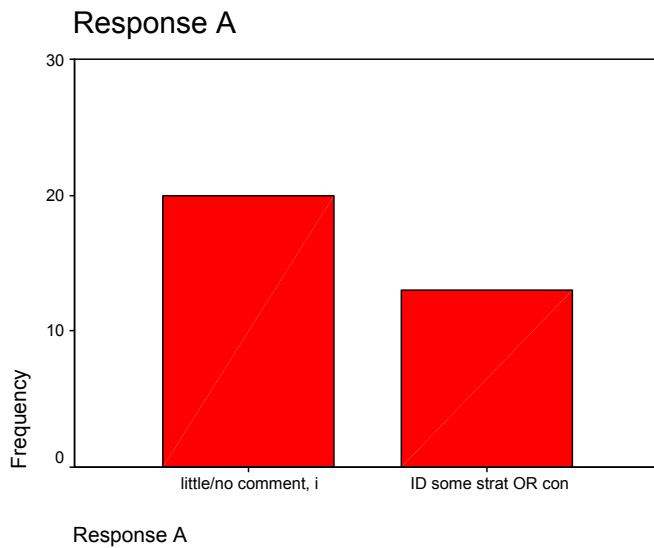


Figure 36

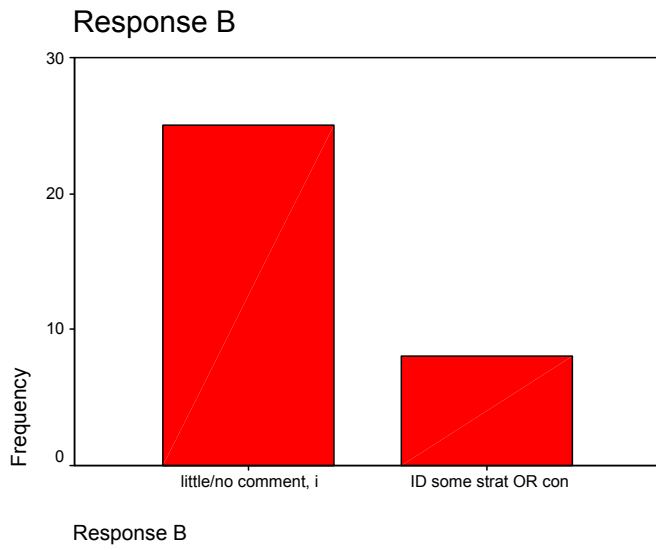


Figure 37

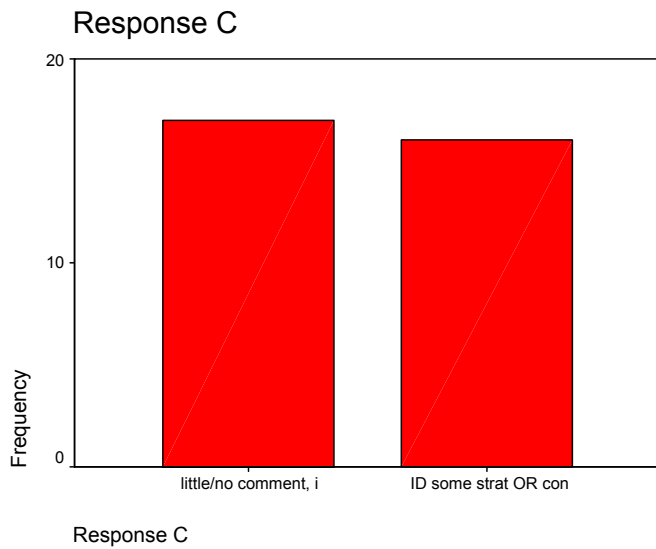


Figure 38

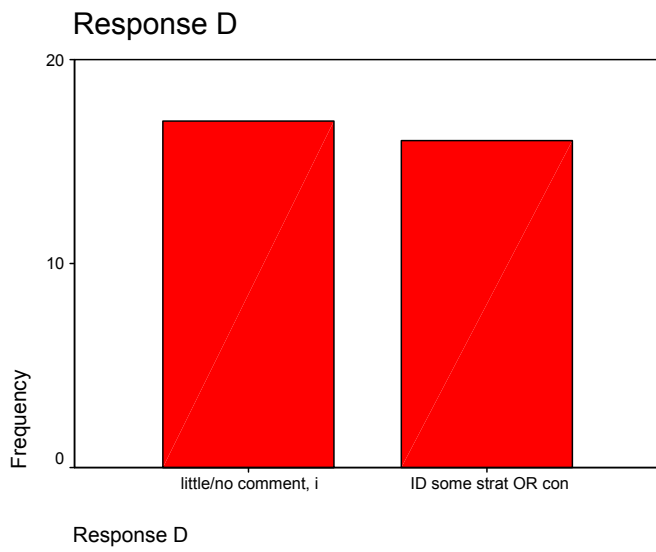


Figure 39

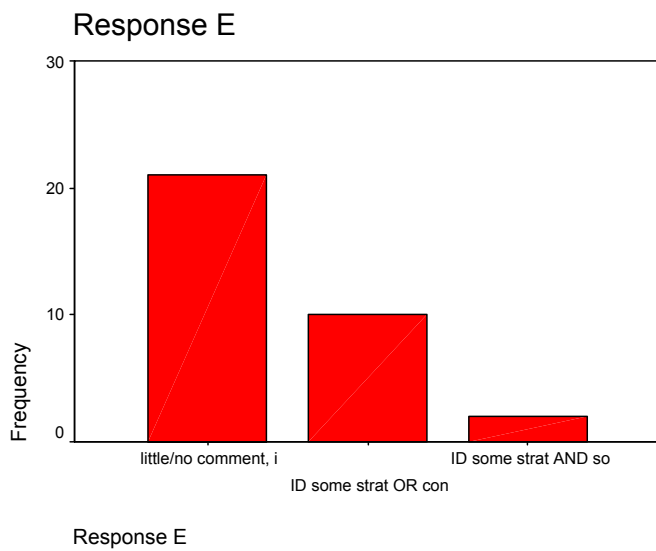
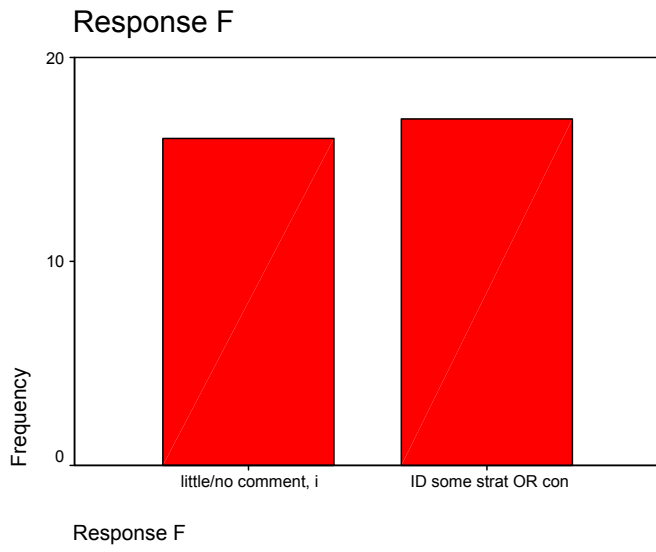


Figure 40



**Student Work Samples (SWS) End Data for Task 3 (Three-Digit Subtraction):
Frequency Tables**

Table 50 SWS End Data: Task 3 (Three-Digit Subtraction) - Sample Size, Mean and Mode

Statistics

		Response A	Response B	Response C	Response D	Response E
N	Valid	24	24	24	24	24
	Missing	48	48	48	48	48
Mean		.92	.88	.83	1.00	.33
Mode		1	1	1	1	0

**Student Work Samples (SWS) End Data for Task 3 (Three-Digit Subtraction):
Frequency Tables of Teacher Assessments of Each Student Response (A – E)**

Table 51

Response A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	8	11.1	33.3	33.3
	ID some strat OR concept OR one strat, one concept ...	10	13.9	41.7	75.0
	ID some strat AND some aspect	6	8.3	25.0	100.0
	Total	24	33.3	100.0	
Missing	System	48	66.7		
Total		72	100.0		

Table 52

Response B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	5	6.9	20.8	20.8
	ID some strat OR concept OR one strat, one concept ...	17	23.6	70.8	91.7
	ID some strat AND some aspect	2	2.8	8.3	100.0
	Total	24	33.3	100.0	
Missing	System	48	66.7		
Total		72	100.0		

Table 53

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	4	5.6	16.7	16.7
	ID some strat OR concept OR one strat, one concept ...	20	27.8	83.3	100.0
	Total	24	33.3	100.0	
Missing	System	48	66.7		
Total		72	100.0		

Table 54

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	5	6.9	20.8	20.8
	ID some strat OR concept OR one strat, one concept ...	14	19.4	58.3	79.2
	ID some strat AND some aspect	5	6.9	20.8	100.0
	Total	24	33.3	100.0	
Missing	System	48	66.7		
Total		72	100.0		

Table 55

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	16	22.2	66.7	66.7
	ID some strat OR concept OR one strat, one concept ...	8	11.1	33.3	100.0
	Total	24	33.3	100.0	
Missing	System	48	66.7		
Total		72	100.0		

Student Work Samples (SWS) End Data for Task 3 (Three-Digit Subtraction): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – E)

Figure 41

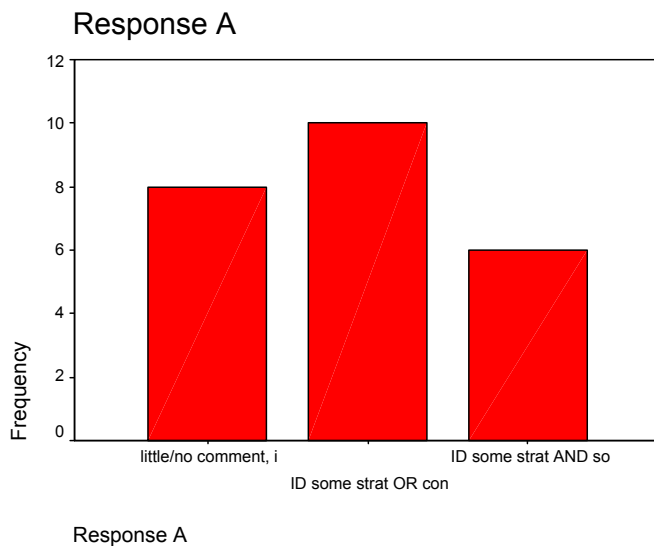


Figure 42

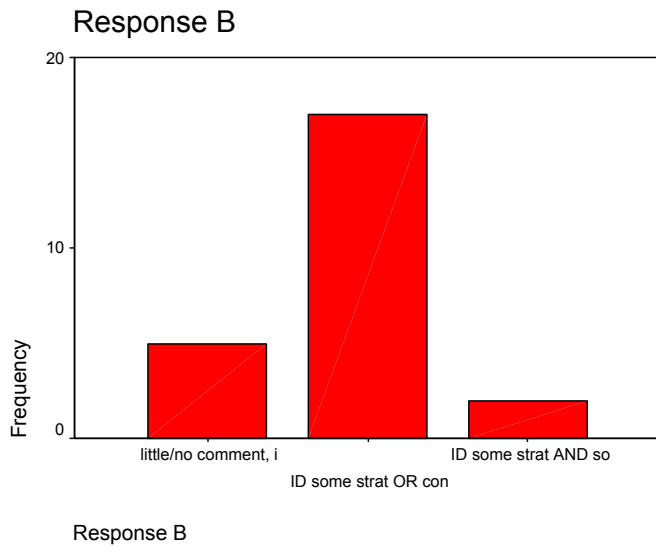


Figure 43

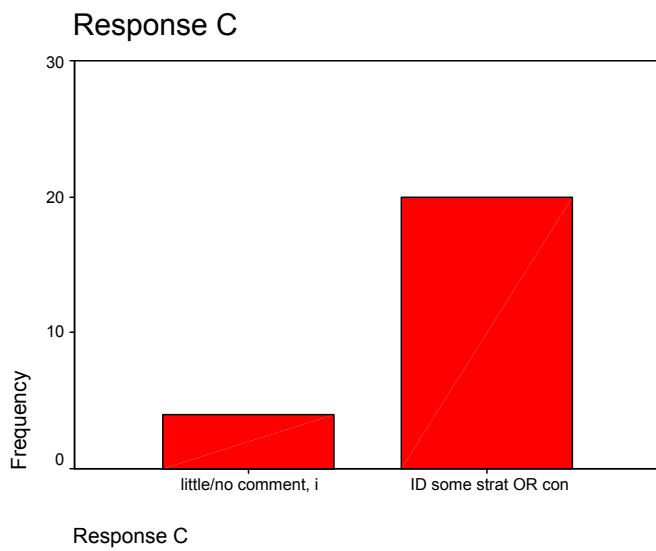


Figure 44

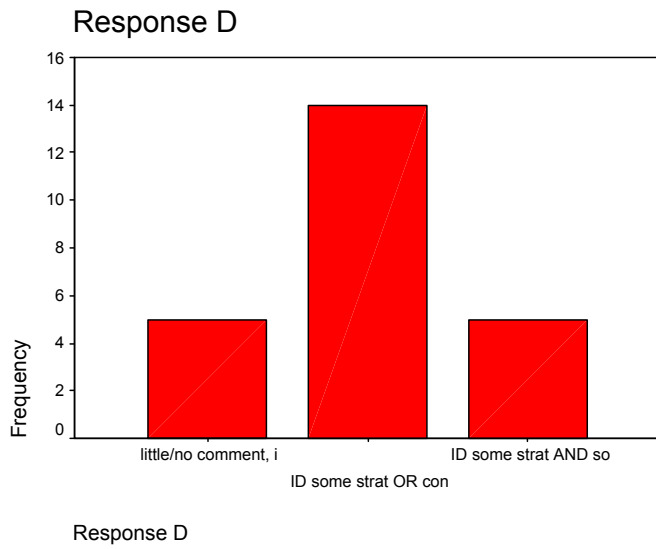
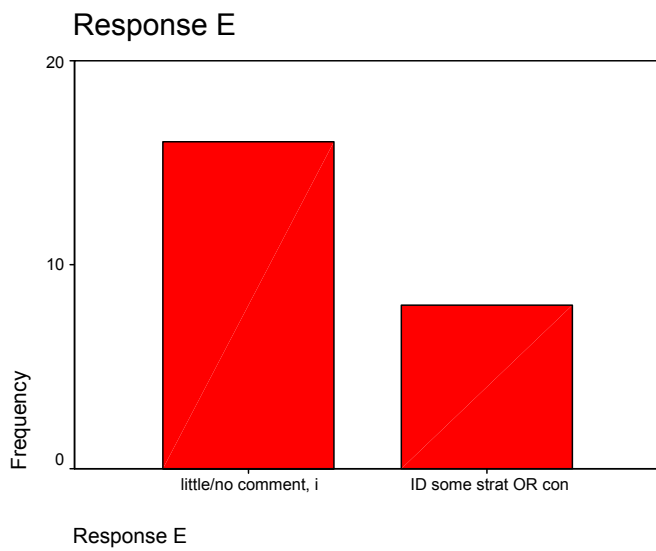


Figure 45



Student Work Samples (SWS) End Data for Task 4 (Multiplication): Frequency Tables

Table 56 SWS End Data: Task 4 (Multiplication) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D	Response E
N	Valid	21	21	21	21	21
	Missing	36	36	36	36	36
Mean		.67	.52	.29	.24	.10
Mode		0	1	0	0	0

Student Work Samples (SWS) Initial Data for Task 4 (Multiplication): Frequency Tables of Teacher Assessments of Each Student Response (A – E)

Table 57

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	10	17.5	47.6	47.6
	ID some strat OR concept OR one strat, one concept ...	8	14.0	38.1	85.7
	ID some strat AND some aspect	3	5.3	14.3	100.0
	Total	21	36.8	100.0	
Missing	System	36	63.2		
Total		57	100.0		

Table 58

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	10	17.5	47.6	47.6
	ID some strat OR concept OR one strat, one concept ...	11	19.3	52.4	100.0
	Total	21	36.8	100.0	
Missing	System	36	63.2		
Total		57	100.0		

Table 59

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	15	26.3	71.4	71.4
	ID some strat OR concept OR one strat, one concept ...	6	10.5	28.6	100.0
	Total	21	36.8	100.0	
Missing	System	36	63.2		
Total		57	100.0		

Table 60

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	16	28.1	76.2	76.2
	ID some strat OR concept OR one strat, one concept ...	5	8.8	23.8	100.0
	Total	21	36.8	100.0	
Missing	System	36	63.2		
Total		57	100.0		

Table 61

Response E

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	19	33.3	90.5	90.5
	ID some strat OR concept OR one strat, one concept ...	2	3.5	9.5	100.0
	Total	21	36.8	100.0	
Missing	System	36	63.2		
Total		57	100.0		

Student Work Samples (SWS) End Data for Task 4 (Multiplication): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – E)

Figure 46

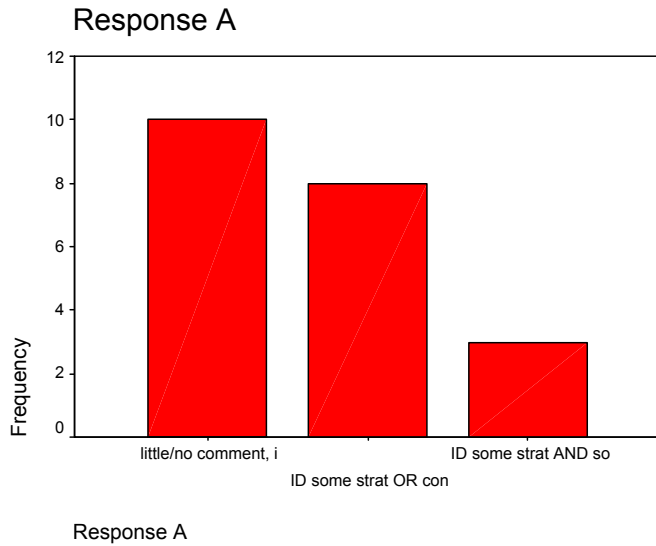


Figure 47

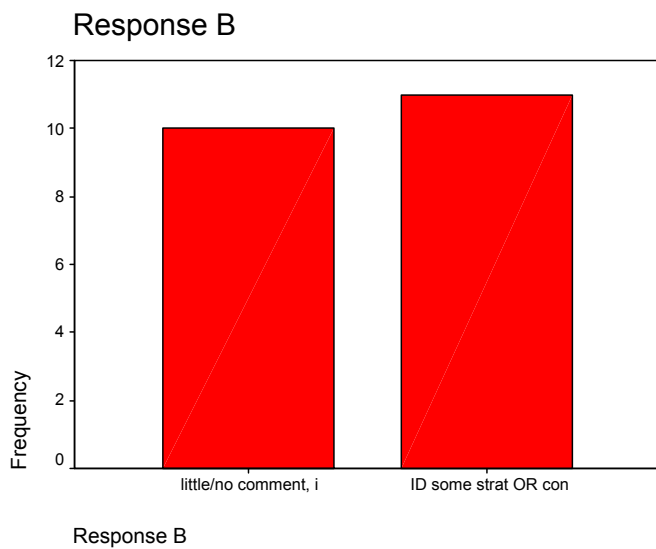


Figure 48

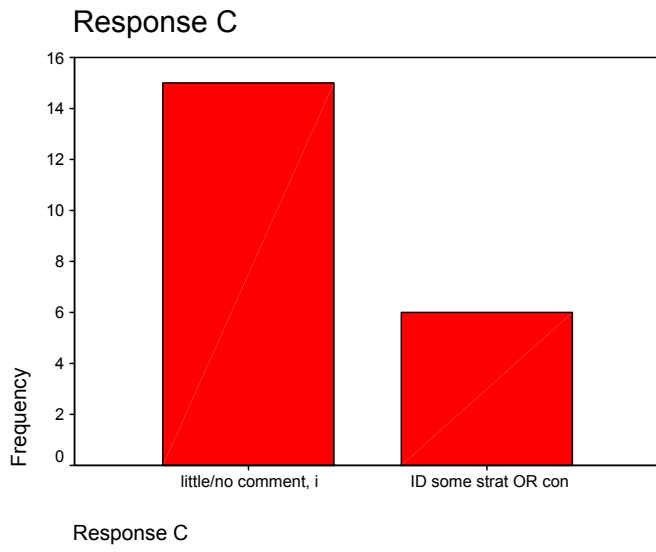


Figure 49

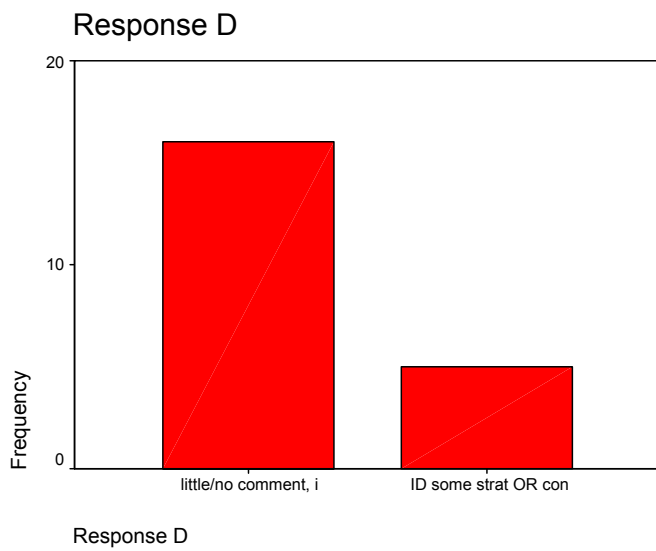
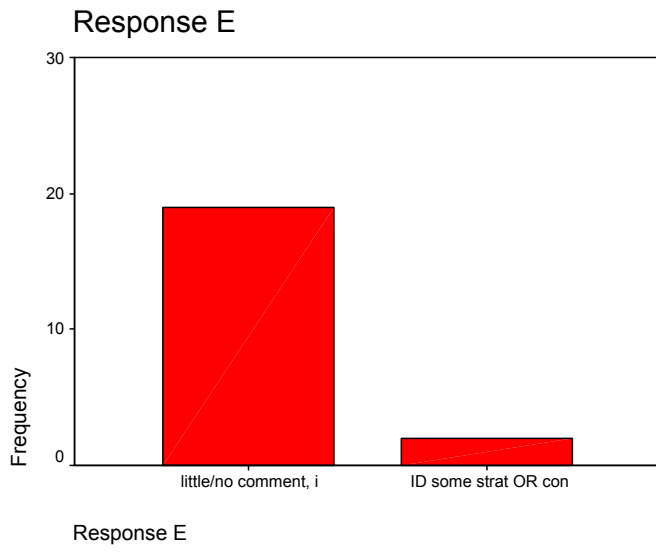


Figure 50



Student Work Samples (SWS) End Data for Task 5 (Fractions): Frequency Tables

Note: For Task 5 (fractions), in SWARM 4 the teachers were presented with an *alternate* Student Work Sample that was different to the Student Work Sample they completed in SWARM 1.

Table 62 SWS End Data: Task 5 (Fractions) - Sample Size, Mean and Mode

		Response A	Response B	Response C	Response D
N	Valid	27	27	27	27
	Missing	36	36	36	36
Mean		.96	.85	.41	.93
Mode		1	1	0	1

Student Work Samples (SWS) End Data for Task 5 (Fractions): Frequency Tables of Teacher Assessments of Each Student Response (A – D)

Table 63

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	3	4.8	11.1	11.1
	ID some strat OR concept OR one strat, one concept ...	22	34.9	81.5	92.6
	ID some strat AND some aspect	2	3.2	7.4	100.0
	Total	27	42.9	100.0	
Missing	System	36	57.1		
Total		63	100.0		

Table 64

Response B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	6	9.5	22.2	22.2
	ID some strat OR concept OR one strat, one concept ...	19	30.2	70.4	92.6
	ID some strat AND some aspect	2	3.2	7.4	100.0
	Total	27	42.9	100.0	
Missing	System	36	57.1		
Total		63	100.0		

Table 65

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	16	25.4	59.3	59.3
	ID some strat OR concept OR one strat, one concept ...	11	17.5	40.7	100.0
	Total	27	42.9	100.0	
Missing	System	36	57.1		
Total		63	100.0		

Table 66

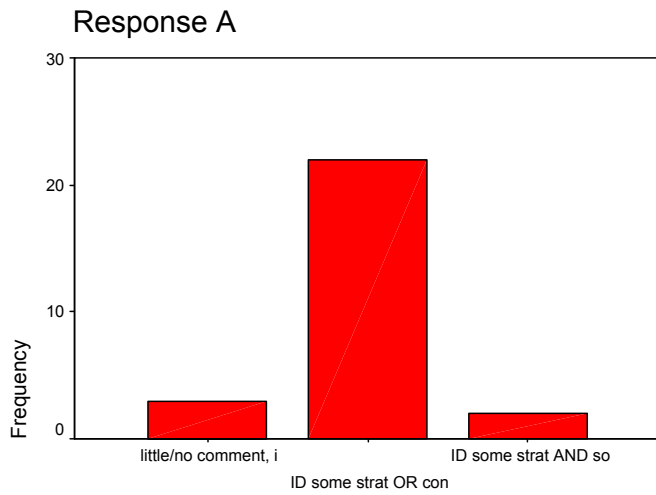
Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inappropriat interpret'n	6	9.5	22.2	22.2
	ID some strat OR concept OR one strat, one concept ...	17	27.0	63.0	85.2
	ID some strat AND some aspect	4	6.3	14.8	100.0
	Total	27	42.9	100.0	
Missing	System	36	57.1		
Total		63	100.0		

Student Work Samples (SWS) End Data for Task 5 (Fractions): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – D)

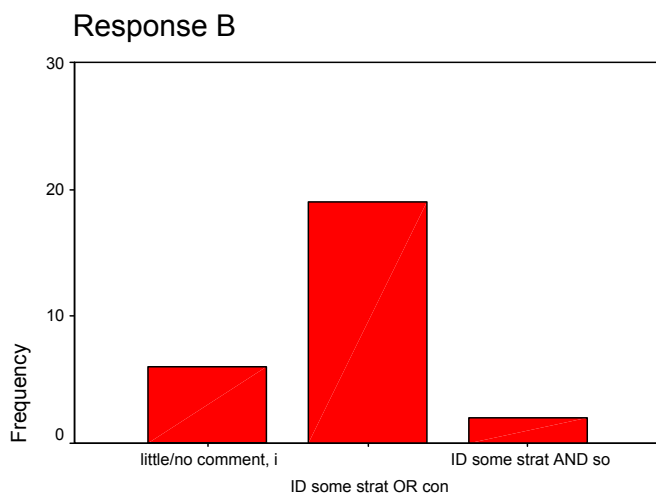
Note: For Task 5 (fractions), in SWARM 4 the teachers were presented with an *alternate* Student Work Sample that was different to the Student Work Sample they completed in SWARM 1.

Figure 51



Response A

Figure 52



Response B

Figure 53

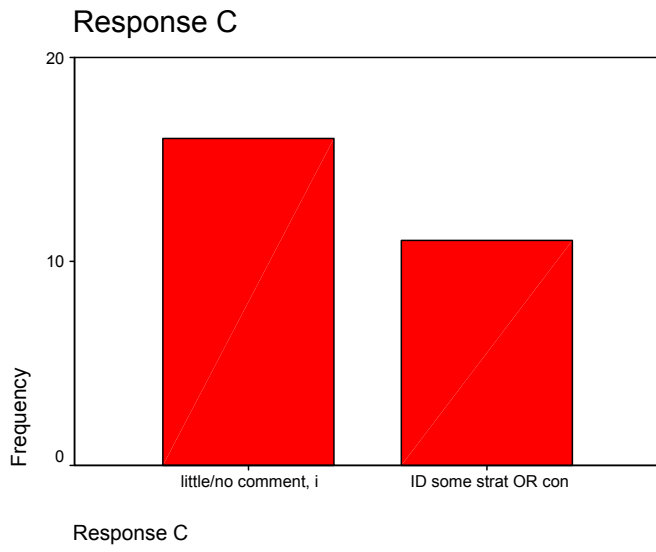
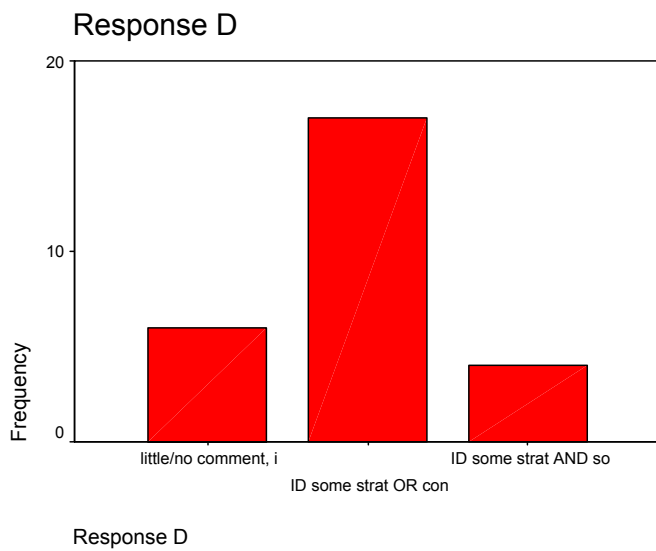


Figure 54



Student Work Samples (SWS) End Data for Task 6 (Chance and Data): Frequency Tables

Table 67 SWS End Data: Task 6 (Chance and Data) - Sample Size, Mean and Mode

Statistics

		Response A	Response B	Response C	Response D
N	Valid	29	29	29	29
	Missing	26	26	26	26
Mean		.28	.55	.55	1.14
Mode		0	0	0	1

Student Work Samples (SWS) End Data for Task 6 (Chance and Data): Frequency Tables of Teacher Assessments of Each Student Response (A – D)

Table 68

Response A

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	21	38.2	72.4	72.4
	ID some strat OR concept OR one strat, one concept ...	8	14.5	27.6	100.0
	Total	29	52.7	100.0	
Missing	System	26	47.3		
Total		55	100.0		

Table 69

Response B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	16	29.1	55.2	55.2
	ID some strat OR concept OR one strat, one concept ...	10	18.2	34.5	89.7
	ID some strat AND some aspect	3	5.5	10.3	100.0
	Total	29	52.7	100.0	
Missing	System	26	47.3		
Total		55	100.0		

Table 70

Response C

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	20	36.4	69.0	69.0
	ID some strat OR concept OR one strat, one concept ...	5	9.1	17.2	86.2
	ID some strat AND some aspect	1	1.8	3.4	89.7
	ID strat AND concepts in some detail	3	5.5	10.3	100.0
	Total	29	52.7	100.0	
Missing	System	26	47.3		
Total		55	100.0		

Table 71

Response D

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	little/no comment, inapprop interpret'n	9	16.4	31.0	31.0
	ID some strat OR concept OR one strat, one concept ...	10	18.2	34.5	65.5
	ID some strat AND some aspect	7	12.7	24.1	89.7
	ID strat AND concepts in some detail	3	5.5	10.3	100.0
	Total	29	52.7	100.0	
Missing	System	26	47.3		
Total		55	100.0		

Student Work Samples (SWS) Initial Data for Task 6 (Chance and Data): Bar Charts of previous Frequency Tables (Teacher Assessments of Each Student Response A – D)

Figure 55

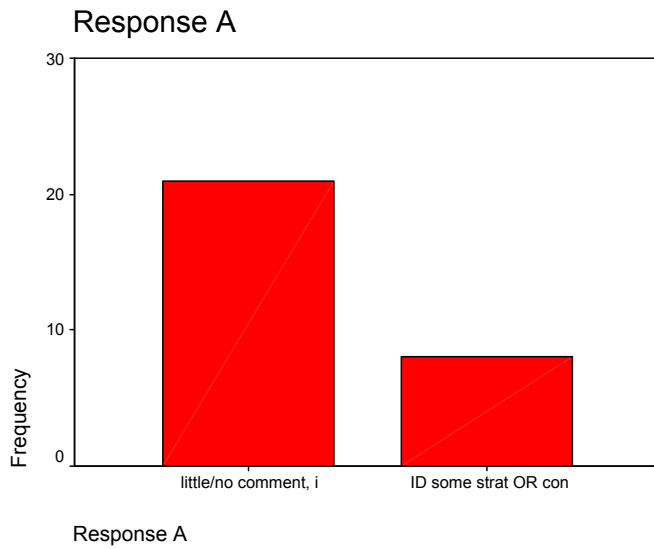


Figure 56

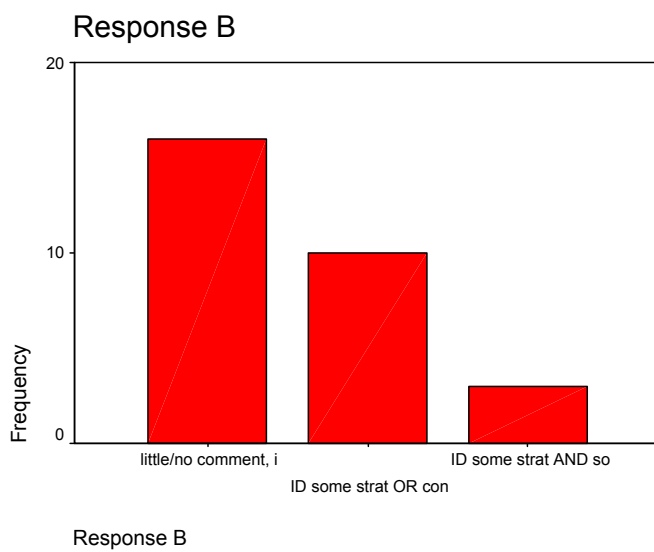


Figure 57

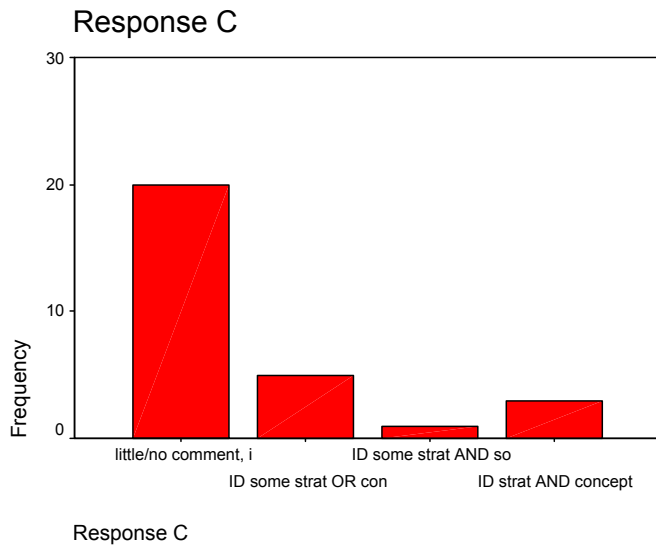
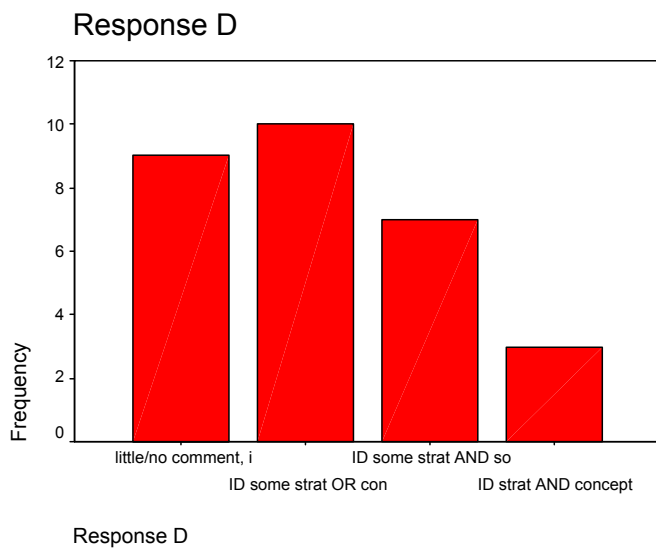


Figure 58



Student Work Samples (SWS) T-Test: Initial Data versus End (Final) Data

The following are independent-samples t-tests comparing the *Initial* and *End (Final)* evaluations of the Teacher Assessments of Student Responses, with the exception of *Task 5: Fractions* for which teachers completed an *alternate* fractions task.

T-Test: SWS Task 1 (Make 10): Initial vs End (Final)

Table 72

	TIME	N	Mean	Std. Deviation	Std. Error Mean
MEAN	1	66	1.00	.42	.05
	2	44	.58	.29	.04

Table 73

		MEAN		
		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	4.60		
	Sig.	.03		
t-test for Equality of Means	t	5.77	6.18	
	df	108.00	107.71	
	Sig. (2-tailed)	.00	.00	
	Mean Difference	.42	.42	
	Std. Error Difference	.07	.07	
	95% Confidence Interval of the Difference	Lower	.28	.28
		Upper	.56	.55

T-Test: SWS Task 2 (Two-Digit Subtraction): Initial vs End (Final)

Table 74

Group Statistics

	TIME	N	Mean	Std. Deviation	Std. Error Mean
MEAN	1	60	.45	.26	.03
	2	33	.42	.26	.05

Table 75

Independent Samples Test

		MEAN		
		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	.31		
	Sig.	.58		
t-test for Equality of Means	t	.40	.40	
	df	91.00	65.88	
	Sig. (2-tailed)	.69	.69	
	Mean Difference	.02	.02	
	Std. Error Difference	.06	.06	
	95% Confidence Interval of the Difference	Lower	-.09	-.09
		Upper	.14	.14

T-Test: SWS Task 3 (Three-Digit Subtraction): Initial vs End (Final)

Table 76

Group Statistics

	TIME	N	Mean	Std. Deviation	Std. Error Mean
MEAN	1	48	.98	.26	.04
	2	24	.79	.34	.07

Table 77

Independent Samples Test

		MEAN	
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	.09	
	Sig.	.76	
t-test for Equality of Means	t	2.69	2.46
	df	70.00	36.88
	Sig. (2-tailed)	.01	.02
	Mean Difference	.19	.19
	Std. Error Difference	.07	.08
	95% Confidence Interval of the Difference	Lower	.05
	Upper	.33	.35

T-Test: SWS Task 4 (Multiplication): Initial vs End (Final)

Table 78

Group Statistics

	TIME	N	Mean	Std. Deviation	Std. Error Mean
MEAN	1	36	.41	.23	.04
	2	21	.36	.27	.06

Table 79

Independent Samples Test

		MEAN		
		Equal variances assumed	Equal variances not assumed	
Levene's Test for Equality of Variances	F	2.82		
	Sig.	.10		
t-test for Equality of Means	t	.72	.69	
	df	55.00	36.94	
	Sig. (2-tailed)	.47	.49	
	Mean Difference	.05	.05	
	Std. Error Difference	.07	.07	
	95% Confidence Interval of the Difference	Lower	-.09	-.10
		Upper	.19	.19

T-Test: SWS Task 6 (Chance and Data): Initial vs End (Final)

Table 80

Group Statistics

	TIME	N	Mean	Std. Deviation	Std. Error Mean
MEAN	1	26	.77	.30	.06
	2	29	.63	.54	.10

Table 81

Independent Samples Test

		MEAN	
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	9.22	
	Sig.	.00	
t-test for Equality of Means	t	1.17	1.21
	df	53.00	44.75
	Sig. (2-tailed)	.25	.23
	Mean Difference	.14	.14
	Std. Error Difference	.12	.12
	95% Confidence Interval of the Difference	Lower	-.10
	Upper	.38	.37

Student Work Samples (SWS) Initial Data Paired-Sample T-Tests for Correct and Incorrect Student Responses

The following t-tests compare the evaluations of the Teacher Assessments of *correct* Student Responses and *incorrect* Student Responses, with the exception of *End (Final) Data* for *Task 5: Fractions* for which teachers completed an *alternate* rather than end task.

T-Test: SWS Initial Data for Task 1 (Make 10): Correct vs Incorrect

Mean AB: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A and B.

Mean CDE: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses C, D and E.

Table 82

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANAB	.92	66	.46	.06
	MEANCDE	1.05	66	.55	.07

Table 83

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANAB & MEANCDE	66	.280	.023

Table 84

Paired Samples Test

		Pair 1	
		MEANAB - MEANCDE	
Paired Differences	Mean	-.12	
	Std. Deviation	.61	
	Std. Error Mean	.07	
	95% Confidence Interval of the Difference	Lower	-.27
Upper		.03	
t		-1.62	
df		65	
Sig. (2-tailed)		.110	

T-Test: SWS Initial Data for Task 2 (Two-Digit Subtraction): Correct vs Incorrect

Mean ABC: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A, B and C.

Mean DEF: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses D, E and F.

Table 85

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANABC	.47	60	.41	.05
	MEANDEF	.42	60	.35	.04

Table 86

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANABC & MEANDEF	60	-.048	.714

Table 87

Paired Samples Test

		Pair 1	
		MEANABC - MEANDEF	
Paired Differences	Mean	.05	
	Std. Deviation	.55	
	Std. Error Mean	.07	
	95% Confidence Interval of the Difference	Lower	-.09
Upper		.19	
t	.70		
df	59		
Sig. (2-tailed)	.485		

T-Test: SWS Initial Data for Task 3 (Three-Digit Subtraction): Correct vs Incorrect

Mean ABD: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A, B and D.

Mean CE: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses C. and E.

Table 88

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANABD	.99	48	.32	.05
	MEANCE	.95	48	.43	.06

Table 89

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANABD & MEANCE	48	-.029	.847

Table 90

Paired Samples Test

		Pair 1	
		MEANABD - MEANCE	
Paired Differences	Mean	.05	
	Std. Deviation	.54	
	Std. Error Mean	.05	
	95% Confidence Interval of the Difference	Lower	-.11
Upper		.20	
t	.58		
df	47		
Sig. (2-tailed)	.566		

T-Test: SWS Initial Data for Task 4 (Multiplication): Correct vs Incorrect

Mean C: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Response C.

Mean ABDE: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses A, B, D and E.

Table 91

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Response C	.64	36	.487	.081
	MEANABDE	.3542	36	.21023	.03504

Table 92

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Response C & MEANABDE	36	.517	.001

Table 93

Paired Samples Test

		Pair 1	
		Response C - MEANABDE	
Paired Differences	Mean	.2847	
	Std. Deviation	.41898	
	Std. Error Mean	.06983	
	95% Confidence Interval of the Difference	Lower	.1430
Upper		.4265	
t		4.077	
df		35	
Sig. (2-tailed)		.000	

T-Test: SWS Initial Data for Task 5 (Fractions): Correct vs Incorrect

Mean D: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Response D.

Mean ABC: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses A, B and C.

Table 94

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Response D	1.17	36	.38	.06
	MEANABC	1.05	36	.56	.09

Table 95

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Response D & MEANABC	36	-.037	.829

Table 96

Paired Samples Test

		Pair 1	
		Response D - MEANABC	
Paired Differences	Mean	.12	
	Std. Deviation	.69	
	Std. Error Mean	.12	
	95% Confidence Interval of the Difference	Lower	-.11
Upper		.35	
t	1.05		
df	35		
Sig. (2-tailed)	.303		

T-Test: SWS Initial Data for Task 6 (Chance and Data): Correct vs Incorrect

Mean AB: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A and B.

Mean CD: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses C and D.

Table 97

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANAB	.38	26	.33	.06
	MEANCD	1.15	26	.69	.14

Table 98

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANAB & MEANCD	26	-.497	.010

Table 99

Paired Samples Test

		Pair 1	
		MEANAB - MEANCD	
Paired Differences	Mean	-.77	
	Std. Deviation	.90	
	Std. Error Mean	.18	
	95% Confidence Interval of the Difference	Lower	-1.13
Upper		-.41	
t	-4.37		
df	25		
Sig. (2-tailed)	.000		

T-Test: SWS End (Final) Data for Task 1 (Make 10): Correct vs Incorrect

Mean AB: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A and B.

Mean CDE: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses C, D and E.

Table 100

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANAB	.46	44	.49	.07
	MEANCDE	.66	44	.36	.05

Table 101

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANAB & MEANCDE	44	.02	.90

Table 102

Paired Samples Test

		Pair 1	
		MEANAB - MEANCDE	
Paired Differences	Mean	-.21	
	Std. Deviation	.60	
	Std. Error Mean	.09	
	95% Confidence Interval of the Difference	Lower	-.39
Upper		-.02	
t	-2.26		
df	43		
Sig. (2-tailed)	.029		

T-Test: SWS End (Final) Data for Task 2 (Two-Digit Subtraction): Correct vs Incorrect

Mean ABC: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A, B and C.

Mean DEF: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses D, E and F.

Table 103

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANABC	.37	33	.33	.06
	MEANDEF	.48	33	.41	.07

Table 104

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANABC & MEANDEF	33	.008	.966

Table 105

Paired Samples Test

		Pair 1	
		MEANABC - MEANDEF	
Paired Differences	Mean	-.10	
	Std. Deviation	.52	
	Std. Error Mean	.09	
	95% Confidence Interval of the Difference	Lower	-.29
Upper		.08	
t			-1.11
df			32
Sig. (2-tailed)			.276

T-Test: SWS Initial Data for Task 3 (Three-Digit Subtraction): Correct vs Incorrect

Mean ABD: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A, B and D.

Mean CE: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses C. and E.

Table 106

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANABD	.93	24	.45	.09
	MEANCE	.58	24	.28	.06

Table 107

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANABD & MEANCE	24	.447	.029

Table 108

Paired Samples Test

		Pair 1	
		MEANABD - MEANCE	
Paired Differences	Mean	.35	
	Std. Deviation	.41	
	Std. Error Mean	.08	
	95% Confidence Interval of the Difference	Lower	.17
Upper		.52	
t	4.14		
df	23		
Sig. (2-tailed)	.000		

T-Test: SWS End (Final) Data for Task 4 (Multiplication): Correct vs Incorrect

Mean C: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Response C.

Mean ABDE: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses A, B, D and E.

Table 109

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Response C	.29	21	.46	.10
	MEANABDE	.38	21	.27	.06

Table 110

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Response C & MEANABDE	21	.487	.025

Table 111

Paired Samples Test

		Pair 1	
		Response C - MEANABDE	
Paired Differences	Mean	-.10	
	Std. Deviation	.41	
	Std. Error Mean	.09	
	95% Confidence Interval of the Difference	Lower	-.28
Upper		.09	
t		-1.07	
df		20	
Sig. (2-tailed)		.296	

T-Test: SWS End (Final) Data for Task 6 (Chance and Data): Correct vs Incorrect

Mean AB: stands for the mean score of the evaluation of the Teacher Assessments of *incorrect* Student Responses A and B.

Mean CD: stands for the mean score of the evaluation of the Teacher Assessments of *correct* Student Responses C and D.

Table 112

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	MEANAB	.41	29	.50	.09
	MEANCD	.84	29	.68	.13

Table 113

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MEANAB & MEANCD	29	.638	.000

Table 114

Paired Samples Test

		Pair 1	
		MEANAB - MEANCD	
Paired Differences	Mean	-.43	
	Std. Deviation	.53	
	Std. Error Mean	.10	
	95% Confidence Interval of the Difference	Lower	-.63
Upper		-.23	
t	-4.38		
df	28		
Sig. (2-tailed)	.000		