

CHAPTER 6: Learning Milieu

In responding to Research Question 2 “How do teachers actually teach the concept of ‘percentages’ in their Grade 7 Mathematics classes?”, the data indicates that in 58% of lessons teachers teach more or less as planned in OBE Mathematics, and in 42% of these lessons too few signs were recorded for this teaching to be considered in-line with the national innovation. More specifically observation data shows one lesson in which teaching happened actually as planned, eleven lessons in which teaching happens as planned but less so than in the lesson above, and a further six lessons where teaching happens as planned but less closely than in the two patterns above. And this data shows two further patterns of lessons in which too few signs of OBE Mathematics teaching were observed for these to indicate that this teaching was as planned in the national innovation. This is evident as seen in the following description of what actually happened in the learning milieu.

Six ‘emergent’ parts of a lesson generated during observations were used in categorizing data. The six parts are: Conceptual Introduction, Guiding Example, Group-work, Report-back, Teacher-Learners’ assessment and Concluding Exercises. The number of parts found in lessons formed patterns; Pattern 1 with all 6 parts, Pattern 2 with 5 parts and so on. Five patterns emerged from the data in lessons as seen in Table 2 below.

Table 2: Patterns observed in lessons of all schools

Patterns formed by parts in lessons	P1	P2	P3	P4	P5	Total
Number of lessons in a pattern	1	11	6	5	8	31

A total of 31 lessons were observed from which the five patterns emerged. Of the 31 lessons observed, 1 lesson in Pattern 1 indicated teaching to happen more closely as planned, 11 lessons in Pattern 2 and 6 lessons in Pattern 3 indicating teaching to happen more or less as planned, lending support for this teaching to actually happening as planned. A further 5 and 8 lessons in Patterns 4 and 5, however, lend little support as these lessons showed too few signs of OBE teaching. 6 years into the national innovation I was looking for clear indications of teaching happening actually as planned in C2005. For that matter I considered teaching to be in place when 6 parts of a lesson were observed in lessons, 5 and 4 parts being considered acceptable too, as teaching was likely to have assisted students attain clear passing grades. When 3 or 2 parts of a lesson were observed in lessons, too little OBE teaching would seem to be in place to permit clear passing grades, or learners were unlikely to pass and thus indicate little shift to OBE teaching in Mathematics.

Pattern One

Most compellingly, one lesson shows all 6 parts of a lesson of OBE teaching of percentages in Algebra in response to the Research Question 2 about what actually happens in these lessons. Observation data shows all 6 parts of a lesson in Pattern 1 in one lesson, being: a Conceptual Introduction, Guiding Example, Group-work, Report back, Teacher-Learners assessment, and Concluding Exercises. This is seen in Pattern 1 as described below.

Taught by Nhlamulo on the 2nd of August 2004, teaching commenced with discussion of the concept of ‘percentage’. The teacher gave learners guiding examples of calculating percentages using two different methods. Learners were then given tasks to do in groups; each group has its own tasks. After learners worked out their solutions to the given tasks, then they gave report back

to the class where the scribe of each group wrote their responses on the chalkboard and explained. After responses were written and explained, the teachers together with learners started assessing if it was done correctly. The lesson was then concluded by giving tasks to learners from the textbook to do as class exercises.

The classroom in which teaching took place had tables and chairs arranged in rows, a big notice board on the back wall, the timetable, chart and pictures of people displayed on the notice board. Next to the notice board there was a red wooden box, which they call 'Read Library Box'. A steel cupboard was situated at the front left corner of the class next to the chalkboard. There was no teacher desk in this class.

The class had 45 learners who were rearranged during the proceedings of the lesson to sit in groups. The teacher facilitated the change of sitting arrangements from rows to groups. Learners formed 6 groups. The groups had numbers of learners ranging from 6 to 8. The lesson started at 07h34 and ended at 08h30.

The 6 parts of a lesson in OBE Mathematics teaching of percentages were observed in this lesson as follows:

1. The Conceptual Introduction:

The teacher greeted learners. He introduced the lesson by saying: *"today we are going to learn about percentages... what is a percent?... a percent is something over a hundred"*, **Nhlamulo**. This part of the lesson shows the existence of the first part of conceptual introduction. The teacher gave an explanation of the concept 'Percent'.

2. The Guiding Example:

The teacher gave learners guiding examples on how to calculate percentages using two different methods. The first method was of multiplying a fraction by 100 over 1. The second method was of finding a number that can multiply a denominator to 100; this number should be written as a whole number fraction.

Nhlamulo: “say we got $\frac{5}{10}$. What can we do to change it into percentage.... we say $\frac{5}{10}$ times 100 which.... Lets say we are 20 in a class, ...as it is raining today.... 10 are absent... we need to find out how many percentage of people are absent....we can say....(the teacher does calculations on the chalkboard)....[$\frac{10}{20}$ times $\frac{100}{1}$ gives $\frac{1000}{20}$...is equals to 50%] ...we can use another method of finding a number that can multiply the denominator to 100. Here we look at the denominator and multiply it to 100....[$\frac{10}{20}$ times $\frac{5}{5}$ is $\frac{50}{100}$ which equals 50%]...you can choose a method that suits you best”.

3. The Group-work:

Learners were arranged in groups and given tasks to discuss. The teacher went around checking groups as they work, giving assistance to some learners.

Nhlamulo: “we are now into 6 groups. I will give you 6 problems from group A to group F.....(teacher writes them on the chalkboard)...start discussing the problems in your groups. Make sure you have a leader and scribe....before you talk raise a hand for your leader to control...”.

4. The Report back:

Learners representing groups gave report back. Learners wrote answers on the chalkboard explaining what they wrote.

A learner from group F: “15 over 20 times 100 over 1...is 1500 over 20, which is 75%”.

5. The Teacher-Learners assessment:

The teacher together with learners did assessment immediately after each group finished reporting.

Nhlamulo: “Is that of group A correct?”

All learners: “no”.

Nhlamulo: “help from the group.....any help from somebody in the class.....”

6. The Concluding Exercise:

The teacher gave learners exercises from the textbook. Learners start doing the work in groups. Teacher moves around talking to learners. The bell rings time off.

02 August 2004

Exercise

Convert the following into percentages:

- | | | | | |
|--------------------|---------------------|---------------------|---------------------|-------------------|
| (a) $\frac{7}{20}$ | (b) $\frac{3}{10}$ | (c) $\frac{16}{25}$ | (d) $\frac{19}{50}$ | (e) $\frac{1}{5}$ |
| (f) $\frac{3}{4}$ | (g) $\frac{33}{50}$ | (h) $\frac{11}{20}$ | (i) $\frac{5}{12}$ | (j) $\frac{7}{8}$ |

The movements Nhlamulo made during his first lesson on Percentages support existence of the 6 emergent parts of the OBE Mathematics lesson design. This is seen as indicated in the observation diagram below.

KEY:

CB--- Cupboard

G --- a female learner

B --- a male learner

R --- a researcher

WIN --- window

7:42 --- time a teacher was at that point

→ --- teacher's movement

Figure 1: The observation sheet showing the movement of the teacher during the lesson taught by Nhlamulo.

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Data in figure 1 indicate that during the first 10 minutes the teacher did Conceptual Introduction standing in front of the class. Next he uses the chalkboard to give learners Guiding Examples of calculating Percentages. The teacher moved around groups of learners as they were doing Group-work checking and assisting some of them. Learners did Report-back of their solutions using the chalkboard with the teacher still moving within groups. The teacher moved between the chalkboard and learners' groups during the conduct of Teacher-Learners' assessment. Learners were given the Concluding Exercise from the textbook and he wrote it on the chalkboard. Movements of the teacher indicate that he utilized most of the teaching time assisting learners.

In conclusion, the proceeding of this lesson shows the teaching of 'percentages' in OBE Mathematics to happen actually as planned in the national innovation of C2005 and the text, with all 6 parts of a lesson of OBE lesson design being met. Amazingly, it is the only lesson out of thirty-one observed lessons that strongly indicated OBE Mathematics teaching happening as planned in the text. Though this lesson strongly indicated teaching of percentages happening as planned in the text, being only one it does not show strongly that what actually happens in classrooms of OBE Mathematics teaching indicate teachers successfully teaching as planned. This suggests that only 3.2% of Mathematics teachers can teach percentages in OBE Mathematics actually as planned in the curriculum.

Pattern Two

Supporting the response to Research Question 2 what actually happen to teach OBE Mathematics, eleven lessons in Pattern 2 lend support to the teaching of percentages in OBE Mathematics. Different to Pattern 1 these lessons miss one part, namely the Conceptual Introduction. Lessons in Pattern 2 have five parts in the teaching of percentages in OBE

Mathematics as planned. The five parts of a lesson include Guiding Example, Group-work, Report back, Teacher-Learners assessment, and Concluding Exercise.

Taught without Conceptual Introduction, teachers in most lessons only told learners the focus of the lessons without discussing, for example, calculating percentage profit. These informative focuses are not to be considered as introducing the concept ‘percentages’ to learners. Two variations existed in these lessons. In ten lessons, teachers started by giving guiding examples of how to perform tasks relating to the outcomes to be achieved by learning. This was followed by giving learners tasks to do in groups, whereby they would give report back after their discussions. The teacher together with learners did assessment of the reported tasks by groups. Lessons were concluded by learners being given exercises to do either in class or as homework. Except for one lesson that started with learners being asked to give the report back of the work previously given, followed by the teacher and learners assessing the reports. Learners were then given a new task to write, before which they were given guiding examples on how to write the task. Finally learners discussed the task in groups.

Classes of the three teachers were the same. Nhlangano had two classes, class A with the enrolment of 56 and class B with 58. Nhlamulo’s class had an enrolment of 49 learners. Ntsakisi had two classes, class A with the enrolment of 32 and class B with 31. The arrangements of learners’ sitting in all classes were in groups. The groups were six to eight in number per class, with learners in each group ranging between five and ten. Only Ntsakisi’ classrooms had a teacher table, with one of the classrooms having a display of science equipments and a fire extinguisher. The five classrooms had variations on items displayed on the walls.

Lessons of Pattern 2 are described below showing the two variations in the teaching.

The first variation described in Pattern 2 is of a lesson that had parts of a lesson emerging differently to the other ten lessons. Nhlamulo taught this lesson in the early stage of observations on the 3rd of August 2004. It was his lesson number two. The period for this lesson started from 7h30 to 8h30. The five parts of a lesson were evident as follows:

1. The Report back:

The teacher asked learners to report back on the homework they were given.

Nhlamulo: “....Are you through with your homework? ...[L_{all}: Yes]...if someone did not write, let him or her stand up....(Goes asking reasons from learners)(Learners write answers on the chalkboard from groups, class clap hands for correct answers and explanations. Class assists a learner on the board. Teacher comment)...Are you telling her or observing where she has difficulties?You can use a chalkboard for counting(a boy writes multiples of 12 on the chalkboard :12, 24, 36, 48, 60,72.... I write ...dots because it will always have 6 as a remainder)... He writes the dots to indicate continuity or recurring”.

2. The Teacher-Learners assessment:

The teacher and learners were doing assessment as groups presented their reports. Learners clapped hands if the group has done correct work.

Nhlamulo: “You can mark and do corrections.....Raymond and your group , Are you ok with these? You were not participating.[Raymond: we are ok][L2: what about number d, if I used a 100 method?]It is ok, it will give you the same answer... Let us check our scores, 1...,2...,3...,4...,5...,6.. (no learners) ..7 ..(Two learners from group E)..... It means you understand these,... the lowest mark is 7....(He go around marking books in groups)”.

3. The Concluding Exercise:

The teacher gave learners an exercise from page 172 of the textbook.

Nhlamulo: “ open page 172 from your textbooks... [L_{all}: We left them at home] Are you given to put them at home? Did you open page 172, we are to write exercise 88. We are to write no.2. I am now writing on the board for the last time, you must bring your textbooks to school”.

4. The Guiding Example:

The teacher gave a guiding example of how they should do the exercise they were given.

Nhlamulo: “ Here I will first give example. They give you marks of 18/20 and 44/100 you must work out this into percentage18/20 and 44/50

$$= 18/20 \times 100/1 \text{ and } 44/50 \times 100/1$$

$$= 1800/20$$

$$= 4400/50$$

$$= 90\%$$

$$= 88\%$$

.....You need to write to indicate that the larger is 18/20 ...”

5. The Group-work:

After the guiding example, learners started to work in groups solving the given tasks.

Nhlamulo: “ The example of number 2 is on the board. When you discuss, do not make noise....group F, Are all your books signed?... [**Group F:** Yes] ...”

The second variation in Pattern 2 is of the ten lessons that start with guiding example, group-work, report back, teacher-learners assessment and concluding exercise. Four lessons are described in this variation, one in the early stage, two in the middle stage and one in the later stage of observations.

The lesson in the early stage is the one taught by Nhlanguano on the 5th of August 2004 in Grade 7B. This was his lesson number 4. The period of the lesson start from 11h00 to 12h00. The five parts of a lesson were evident as follows:

1. The Guiding Example:

The teacher comes into the class and without greeting learners started showing them to change mixed numbers into percentages.

Nhlanguano: “(no greeting) ~ though not feeling well, I will try my best to do good ... do you have your homework... say you have a mixed number, you know it should be changed into a [**L_{all}**: improper fraction]good, but don't forget to write percentage $25\frac{1}{2}\%$ is equal to 25 divide by 2 and is

what? you can use your calculators..... then it is[~L_{all}: 12.5]Don't forget writing percentage..... in your homework..."

2. The Group-work:

Learners were given work to do in groups.

Nhlangano: "... how many sums did we have?..... [~L_{all}: four].....so group A do number a, group B number b, group C number c, group D number d, group E number a, group F number b and group G number c..."

3. The Report back:

Learners reported their solutions to given tasks.

Nhlangano: "you must check for your group if he or she is writing correct things...[learners start writing their reports of discussions on the chalkboard] ...".

4. The Teacher-Learners assessment:

The teacher together with learners assessed work groups reported.

Nhlangano: "...let us now check from group E,... just tell us how you got the answer... (a girl of group E explained)..... wait there.... Do you have questions to ask?.....ok, look at step 2, we still have percentage and a denominator of 100. What is wrong there?.....[a girl from group A: writing percentage there] So do you see the percentage, it should not be there because we have a denominator of 100.....from there I think the answer is correct.... the next group.....ehrr.... Group F go and explain....[a girl from group F explained]..... do you have something to ask?.....[L_{all}: no].. she said her answer is 0.84 rands, is that correct?.....[L_{all}: no].....how do read that in day-to-day language?.....[L₁: zero rands comma eighty-four cents]no, do we talk of a comma in day-to- day life situations?.....[L_{all}: no]... how do we say it?...[L₂: zero rands eighty-four cents].... yes, zero rands eighty-four cents or no rands eighty-four cents. We don't talk of commas in life situations..... next group... group A..."

5. The Concluding Exercise:

The teacher wrote homework on the chalkboard for learners.

Nhlangano: "At the back of the chalkboard there is a homework to be done. write corrections, I will be marking your books..."

The lesson in the middle stage is the one taught by Nhlamulo on the 10th of August 2004. This was his lesson number 5. The period of the lesson was from 7h30 to 8h30. The parts of a lesson were evident as follows:

1. The Guiding Example:

The teacher greeted learners and introduce the lesson as converting percentages to common fractions.

Nhlamulo: “well sit down,...can someone clean the chalkboard...so last time we have learned how to convert a fraction into a percentage, say you have $\frac{3}{5}$...you can multiply by 100 over 1 or 20 over 20, which will make it ...3 times 20 is 60 and 5 times 20 is 100, which is $\frac{60}{100}$ and is 60%.... today we want to reverse what we were doing, trying to convert percentages into common fractions, who can try?... (**L₁**: 60% is $\frac{3}{5}$)...here you are guessing because you know it comes from $\frac{3}{5}$...what if I give you 50% into a fraction...ok... 60% means is 60 over 100, then you look for a number that can divide 60 and 100 without a remainder,...(**L₂**: 20)... we say 20 into 60...(L_{all}: 3)...20 into 100...(L_{all}: 5)...now let us do 50% into a fraction, which number to divide 50 and 100 without a remainder...(L₃: 25)...another number...(L₄: 2)...another...(L_{all}: 5)...another...(L₁: 50)...now we should use a number that will make us work less, which one between these numbers? ... (L_{all}: 50)...so 50 into 50 is....(L_{all}: 1)... 50 into 100 is ... (L_{all}: 2)...now it is $\frac{1}{2}$...who can do 90% for us?”

2. The Group-work:

Learners were given work to do in groups.

Nhlamulo: “ now let us do this one, lets all work in a group, I will call someone to check if you were all doing together....(writes tasks for groups on the chalkboard)..A:38%, B:98%, C:65%, D:48%, E:24%, F:56% and G:20%”.

3. The Report back:

Learners reported their solutions to the class, explaining as they write on the chalkboard.

Nhlamulo: “fine time up, group A to report, choose one in your group...(L₁ of GA: 38% is egual to 38 over 100, we use 2, 2 into 38 is 19 and into 100 is 50)..”.

4. The Teacher-Learners' assessment:

The teacher together with learners assessed work of groups as group representatives finished reporting.

*Nhlamulo: "...(**L₁ of GD**: 48%, we copy 48 over 100..)...do you copy or do...understand what percent mean....(**L₁ of GD**: ...we say 4 into 48 is 12, 4 into 100 is 25)..."*

5. The Concluding Exercise:

Learners were given an exercise from a textbook.

Nhlamulo: "exercise, page 174...(write on the chalkboard)...you don't bring textbooks to school...hheee!!you must bring them. Borrow each other in groups"

Another lesson in the middle stage is the one taught by Nhlamulo on the 17th of August 2004 as his lesson number 6. The period of the lesson started from 7h30 and ended at 8h30. Five parts of a lesson evident were as follows:

1. The Guiding Example:

The teacher told learners that lesson is about changing decimals to percentages and showed a guiding example on how to do the algorithm.

Nhlamulo: "We want to learn how to change from decimal into percentage. Say an employer says he wants to give an increment of 0.1%, so you must first know how to change from decimal into common fraction.....so you look at a comma, you put one under it and zeros after acomma..... say you have 0,9, you put 1 under a comma, and it will be $\frac{9}{10}$, then you multiply by $\frac{100}{1}$, so itSay you have 0,25, this will be $\frac{25}{100}$ times $\frac{100}{1}$ which is $\frac{2500}{100}$, ...100 into 250 is 2, remainder 50, 100 into 500, is 25%...."

2. The Group-work:

Learners were given work to do in groups.

*Nhlamulo: "Now let us do this in groups, change this into percentage..... (writes on the board, name the groups – learners start discussing in groups)..... (discussion in group G): "You said 1000 and not 10, so you should say 100 into 1000 which is...?" ... **Group members:** 1...)"*

3. The Report back:

Learners gave reports of their groups.

~ **L₁ of GD:** 0,013, we say $\frac{0,013}{1000}$ which is $\frac{13}{1000}$ times $\frac{100}{1}$ which is $\frac{1300}{1000}$, which is 1,3%

~ **L₁ of GE:** We say 0.07, and $\frac{0,07}{100}$, so is $\frac{7}{100}$ times $\frac{100}{1}$ which is $\frac{700}{100}$ equal to 7%(all class clap hands).....

~ **L₁ of GF:** We write this number,...0,230, and count number after zero,is $\frac{0,230}{1000}$, and it is $\frac{230}{1000}$ times $\frac{100}{1}$, you say 230 times 100 which is $\frac{23000}{1000}$, 1000 into 2300, is 2, remainder 300, you say 1000 into 3000 is 3, so it is 23%(all class clap hands).....

4. The Teacher-Learners assessment:

Assessment was done after learners have reported their work.

Nhlamulo: “I do not think so...there is a difference when there is 0 and the 1 ..., so the number should be 125, so..... $\frac{125}{100}$ times $\frac{100}{1}$, ... it is $\frac{12500}{100}$, ... so 100 into 125...(L_{all}: 1)... remainder...(L_{all}: 25)... 100 into 250 .. (L_{all}: 2) ...remainder... (L_{all}: 50)into 500 ...(L_{all}: 5)...Ok,... which means it is 125%”.

5. The Concluding Exercise:

The teacher writes the exercise for learners on the chalkboard.

Exercise. 17 August 2004. Change these decimals into percentages: a) 0.29 (f) 0.5 (b) 0.75 (g) 0.02 (c) 0.6 (h) 0.99 (d) 0.071 (i) 0.123 (e) 0.44 (j) 0.005

The lesson in the later stage of observation is the one taught by Nhlangano on the 1st of September 2004 as his lesson number 8 in Grade 7B. The period of the lesson was from 7h30 to 8h30. Five parts of a lesson evident in this lesson are:

1. The Guiding Example:

The teacher gets into the class and assists learners in sitting arrangements.

Nhlangano: “ we still continue with percentages. I give you an example and you continue to work on your own. Ok, ...say you want to start a business...a Spaza shop,... you have R10 in your pocket... say you want to sell sweets,... you go to Ngwenya shop and buy sweets which cost you R10... which cost...(L_{all}: R10)...and you get profit of 50%...you must know how much your selling price...you must calculate 50% of the cost price...that is R10...that is 50% of R10...(L_{all}: 50% of R10)...then you change into common

fraction...which is...(L_{all}: 50 over 100 times R10 over 1)...which is...(L_{all}: R500 over 100)...then divide by 100 which is...(L_{all}: R5)...but this is 50% of R10. you had R10...get R5 as a profit and...selling price is cost price plus profit...so you had R10 plus R5 which is R15...do you have questions?"

2. The Group-work:

The teacher tells learners that they should do all sums in their groups but to report only the one that he will assign to them.

Nhlangano: *"for you to do...before you do, let me give you an exercise to discuss ...(write on the chalkboard)... you do all sums but in reporting, group A number b, group B number c, group D number d, group E number c, group F you report number d and group G number b...you do all but to report only that I said..."*

3. The Report back:

Learners write their report on the chalkboard.

Nhlangano: *"(learners write their report on the chalkboard)...are you through?... (L_{all}: yes)...write what you discussed in your groups into your books...for five minutes...try to be fast..."*

4. The Teacher-Learners assessment:

The teacher together with learners starts to assess the reports written by groups.

Nhlangano: *"ok, lets check for group F...stop writing...look at the board....for group F, 20% of R10...so they calculate...ehrr... is 200% of R10, after changing to common fraction they had...(L_{all}: 200 over 100 times R10 over 1)...which is R200 over 100...and is...R20...so they got R20 profit, now the selling price...because is profit we...(L_{all}: add)...R10 plus R20 is...(L_{all}: R30)... lets check group C.."*

5. The Concluding Exercise:

The teacher concludes his lesson by giving learners homework to do individually.

Nhlangano: *"I'm going to give you homework, it is for individuals and not for groups....here I want you to complete this table, you may calculate separately but then fill this table. To guide you here, you have a cost price, you go buy sweets at R20, after selling you get R25, what is the profit or loss, write it here...(point third column).....how much percentage, write it here.....(point fourth column).....go and try, no examples*

here go and reason, we did percentage.....you know to get profit or loss. When we talk of loss we talk of what.....which sign?

Table 3: A homework table for learners to complete.

<i>Cost Price</i>	<i>Selling Price</i>	<i>Profit or Loss</i>	<i>Profit or Loss %</i>
<i>(a) R20</i>	<i>R25</i>		
<i>(b) R50</i>	<i>R60</i>		
<i>(c) R100</i>	<i>R60</i>		
<i>(d) R100</i>	<i>R200</i>		
<i>(e) R30</i>	<i>R15</i>		
<i>(f) R15</i>	<i>R30</i>		

In conclusion, lessons in Pattern 2 lend support to the teaching of ‘percentages’ in OBE Mathematics classes happening as planned in the text. Teaching of OBE Mathematics as observed in these eleven lessons happens less closely than as planned, less so than in Pattern 1. Pattern 1 corroborated with Pattern 2 make the case of teachers teaching percentages in OBE Mathematics actually as planned in C2005 stronger, but not much strong as desired.

Pattern Three

More so, six lessons in Pattern 3 lend support to the teaching of OBE Mathematics happening as planned in the text. These lessons lend support to teaching of percentages in OBE Mathematics that is not as closely as it happens in Pattern 1 and Pattern 2. Lessons in Pattern 3 have two parts of a lesson missing as compared to lessons in Pattern 2 with only one part of a lesson missing and in Pattern 1 with all six parts of a lesson present. The missing 2 emergent parts of a lesson in lessons of Pattern 3 include the Conceptual Introduction and Guiding Example in five lessons, and Conceptual Introduction and Concluding Exercise in one lesson. Five lessons had four parts of a lesson that include Group-work, Report back, Teacher-Learners’ assessment, and

Concluding Exercise while one lesson had Guiding Example, Group-work, Report back and Teacher-Learners' assessment.

Two variations exist in lesson of Pattern 3. The first form is of the one lesson that had parts of a lesson emerging differently to the other five lessons. Teaching in this lesson started by the teacher giving Guiding Examples to learners followed by Group-work, Report back and the Teacher-Learners' assessment. The second form of variation is of the five lessons that had parts of a lesson emerging in a similar way. The five lessons were taught starting by learners being given tasks to discuss in groups (Group-work), followed by Reporting back their findings, the Teacher together with Learners assessed the reports from groups and giving learners Exercises to do in class or at home concluded lessons. Class arrangements and learners' sitting in the observed three teachers' Mathematics classes are the same as described above in Pattern 2.

Here I describe the two variations of lessons taught in Pattern 3, starting with the one lesson that varies to the other five. The first variation is seen in one lesson taught by Nhlangano on the 3rd of August 2004 in his Grade 7A class. This was his lesson number 3. The period of this lesson started at 10h30 to 11h00. The four parts of the lesson evident in this lesson are as follows:

1. The Guiding Example:

The teacher assisted learners to sit in groups. He told learners that the lesson is about changing fractions to percentages and started showing them the guiding example of how to do the algorithm.

Nhlangano: " can we balance the groups..... (learners still coming to class from break)... next time if you are late, I will punish you.... Lets talk about changing fractions into percentages. say we have 0.35....what is the number we have? [**L_{all}** : thirty-five / 35]. now you put a division line and put a number with two digits after a comma,... what is a number?.... [**L_{all}**: one hundred/ 100]. ...now we have a

common fraction. Now we can change it to percentages..... can I give you another example. Let me give you problems from a textbook. Do all exercises but you will report one per group....

2. The Group-work:

Learners were given work to do in groups and each group had its unique task.

Nhlangano: *“you write a date. now only discuss one – one in order to report..... start with a number or letter of your group.....talk about it, you cannot discuss being quite”.*

3. The Report back:

Learners reported their findings.

Nhlangano: *“the group that is through can write its answer on the chalkboard. Don’t waste time, time is short, you came very late from break.....lets call group A to present how they got the answer.... Or which group wants to start now I’m choosing group A to start....”.*

4. The Teacher-Learners assessment:

The teacher and learners assessed work from each group.

Nhlangano: *“ let us look at Group F... after the comma, how many digits. If we take off the comma.... We left with 7.... But we must have two digits after a decimal comma.... this is 0.7... we must replace the number by zero to make it two numbers after the comma..... lets look at group A, do we put zero in front of a number without a comma?.... **L_{all}** : no... this number is not 03, but should be 3.... The whole number 3.....group B, we have 0.15, we take off the comma and left with what? ... **L_{all}**: 15.... ...15 out of what?.... **L_{all}**: 100 so it is 15 out of 100and as a percentage is 15%”.*

The second variation in Pattern 3 is seen in the lesson taught by Nhlangano on the 20th of August 2004 as his lesson number six. The lesson started at 11h00 and end at 12h00. The four parts of a lesson are evident as follows:

1. The Group-work:

The lesson started by the teacher asking learners to discuss a class work in their groups.

Nhlangano: *“class, we are going to discuss that class work which says.....by Tsakani..... the other one we will do next week.....ehhrr...start... You will report your group’s discussion.....group A..number a....*

group ... like that.... Let's discuss. If you have problems call me to help you.... talk about it....talk about it. (teacher start marking books in group C. level of noise goes up.)..”.

2. The Report back:

After discussion learners reported their findings.

Nhlangano: “ *lets write our reports on the chalkboard. You must check what your friend is writing.... for group D.... come and tell us how you got the answer. First let me read you the question: Dennis buys a soccer ball which cost $12\frac{1}{2}\%$ of R125 less than its original price. How much did he pay for the ball?..... (a boy of group D explained)...*”.

3. The Teacher-Learners assessment:

Learners together with the teacher assessed each group's work.

Nhlangano: “ *lets come to group E. let me read the question first: What will Tsakani pay for her skirt marked R2 500 if the owner give her discount of 40% for each? (L₁ of GE: 40% of R2 500.....0.16) alright, wait there.....do we have something to ask? (L_{all}: yes) ...you... (L₁: at step 2 they should indicate Rands.) (L₂: the number is not 10 000 but 100 000) (L₃: she said equals to(=) not therefore(:.)) do you see this part ...(from step 3)... there is a mistake. I don't know where it comes from..... lets erase and try to help them.... The article is a skirt.... From here you divide by..... (L_{all} : 100) ... then, the answer is (L_{all}: R1 000)skirt.....the question is how much will Tsakani pay we cannot stop here..... therefore the original price is what?... (L_{all}: R2 500) ... minus what?..... (L_{all} : R1 000) so the answer is what? ... (L_{all} : R1 500) ...so we conclude and say: Tsakani will pay R1 500 for a what?..... (L_{all} : skirt)....”.*

4. The Concluding Exercise:

Learners are given the previous homework.

Nhlangano: “*... so take out your books and do corrections,that one of homework we will do on Monday that of trying to increase.....write corrections. Mark your books, some don't.... I will check.*”

In conclusion, lessons in Pattern 3 lend support to the teaching of percentages in OBE Mathematics happening as planned in the text, but not as strongly as in Pattern 1 and Pattern 2. Corroborating Patterns 1, 2 and 3, the case of teachers teaching percentages actually as planned in

“On Track with Maths” is made stronger. 18 out of 31 lessons from the three patterns provide evidence of what actually happens in teachers’ classes to be as planned in the text.

Patterns Four

The 5 lessons in Pattern 4 have only three parts for teaching OBE Mathematics. The parts of a lesson in Pattern 4 include: Report back, Teacher-Learners’ assessment, and the Concluding Exercise. Parts missing in lessons of Pattern 4 include the Conceptual Introduction, Guiding Example and the Group-work. The three parts found in lessons of Pattern 4 fall short of showing teachers to be teaching percentages in OBE Mathematics actually as planned. Teachings done in this pattern was for learners to do calculations of given sums on the chalkboard, whereby the teacher did assessment with little involvement of learners and finally giving more sums for learners to do. This type of teaching focuses mostly on drilling learners to know how to do calculations of percentages, or learning to be rote. OBE aims at developing learners to have relational understanding of concepts so that they can creatively think of proper ways to utilize them in situations of needs. Lessons in Pattern 4 indicate that teachers are not actually teaching percentages as intended in their lessons. Pattern 4 constitutes 16.1% of teachers who have not yet shifted to teaching percentages in OBE Mathematics as intended in the text.

Ntsakisi as described below in the lesson teaches to the form of lessons proceedings in Pattern 4 on the 25th of August 2004 as his lesson number 9. The duration of the lesson was 30 minutes starting from 9h40 to 10h10. The lesson proceeded as follows:

09h43:(<i>Learners comes back from the break.</i>)..... 09h47: T: ~(<i>Teacher enters the class</i>)may you clean the chalkboard...(teacher writes exercises on the chalkboard)eehrr... may people come to try answer sums on the chalkboard.....number a), number b), number c) and number d)	write the following as common fractions in their simplest form:
--	--

5writing them as common fractions in their simplest form.....there is number a) with no one(2 boys, 2 girls come to write).....

T: ~ is number c correct

~ L_{all} : No

10 T: ~ is there anyone who wants to write it correct...Snakile.....people you are taking too much time..... OK...number a)is it correct...

~ L_{all} : Yes

T: ~ ...there is something wrongwhere is it?.....we said Percent is out of 100...who wrote it?.....

15 ~ L_{all} : Xichavo

T: ~ where did you get this 100.....even on number b) and number c) so in number a) the 100 should not be there... (*he erase it*)..... then it qualifies to be correct.....it is $12\frac{1}{2}$ out of 100 which is 25 over 2 divide by 100 over 1, then is 25 into 25 is 1 and 25 to 100 is 4, then it is $\frac{1}{8}$

20 Same as in number b), it is $37\frac{1}{3}$ divide by 100 over 1 and it goes on like that..... Is number c) is correct?.....even in number d), it should be $87\frac{1}{2}$ divide by 100 over 1, which is 175 over 2 times 100 over 1 and 25 to 175 is 7 and into 100 is 4, so it is $\frac{7}{8}$

10h00: T: ~ any one to ask.....so you understand.....

25 ~ L_{all} : Yes

~ L₁ : Sir, where does 4 comes from?

T: ~ someone to help.....

~ L₂: it comes from 25 into 100

T: ~ Someone to ask...Siphiwe,Remember.....

30 ~ **Remember:** I don't understand about the 125 over 2 it comes from.....

T: ~ someone to help.....

~ L₃ : it is 62 times 2 which is 124 plus 1 is 125

T: ~ so it means from $62\frac{1}{2}$ when you convert back to improper fraction it is $\frac{125}{2}$Do you all see and understand this things now.....

35 ~ L_{all} : Yes

T: ~ Mbatile...are you raising up a hand

~ Mbatile: No

T: ~ ...didn't I see your hand? ...

~ Mbatile: No

40 T: ~ ...Oh.....maybe I did not see it clearly...(write classwork and homework on chalkboard/ homework from the Researches' copy of text).....(Learners start writing classwork).....

10h10:Bell rings time out.....

$$\begin{aligned} \text{(a). } 12\frac{1}{2} \% &= \frac{12\frac{1}{2}}{100} = \frac{25}{2} \div \frac{100}{1} \\ &= \frac{25}{2} \times \frac{1}{100} \\ &= \frac{1}{2} \times \frac{1}{4} \\ &= \frac{1}{8} \end{aligned}$$

$$\begin{aligned} \text{(b). } 37\frac{1}{3} \% &= \frac{37\frac{1}{3}}{100} \div \frac{100}{1} \\ &= \frac{75}{2} \times \frac{1}{100} \\ &= \frac{3}{2} \times \frac{1}{4} \\ &= \frac{3}{8} \end{aligned}$$

$$\begin{aligned} \text{(c). } 62\frac{1}{2} \% &= \frac{62\frac{1}{2}}{100} \\ &= 5\frac{125}{100} \end{aligned}$$

$$\begin{aligned} \text{(d). } 87\frac{1}{2} \% &= \frac{87\frac{1}{2}}{100} \div \frac{100}{1} \\ &= \frac{195}{100} \times 1 \\ &= \frac{39}{20} \\ &= 1\frac{19}{20} \end{aligned}$$

$$62\frac{1}{2} = \frac{125}{2}$$

25 August 2004

Classwork

write the following as common fractions in their simplest form:

- (a). 15% (b). 75%
(c). 25% (d). 90%

Homework

Write the following as common fractions in their simplest form:

- (a). 250% (b). 175%
(c). 60% (d). 24%

In this lesson the teacher gets into the class and without greeting started giving sums for learners to calculate on the chalkboard as seen in the first five lines of the lesson. Immediately after learners have written, the teacher started to do corrections or assessment involving learners through asking questions as seen from line 8 to line 39 of the lesson. Giving classwork and homework as seen on line 40 and 41 of the lesson concluded the lesson.

The movements of the teacher between groups of learners as seen in figure 2 during this lesson also confirms that teaching was not learner centered as is the case in OBE Mathematics teaching, but that it was content centered. Movements the teacher made does not indicate him attending to learners in their groups to assist them, but just moved around the class as he watched those learners who were writing on the chalkboard. The teacher also spent some time writing on the chalkboard while learners were watching him write corrections to sums done by learners. The diagram below indicates the movements the teacher made during the proceedings of this lesson.

KEY:

CB--- Cupboard

G --- a female learner

B --- a male learner

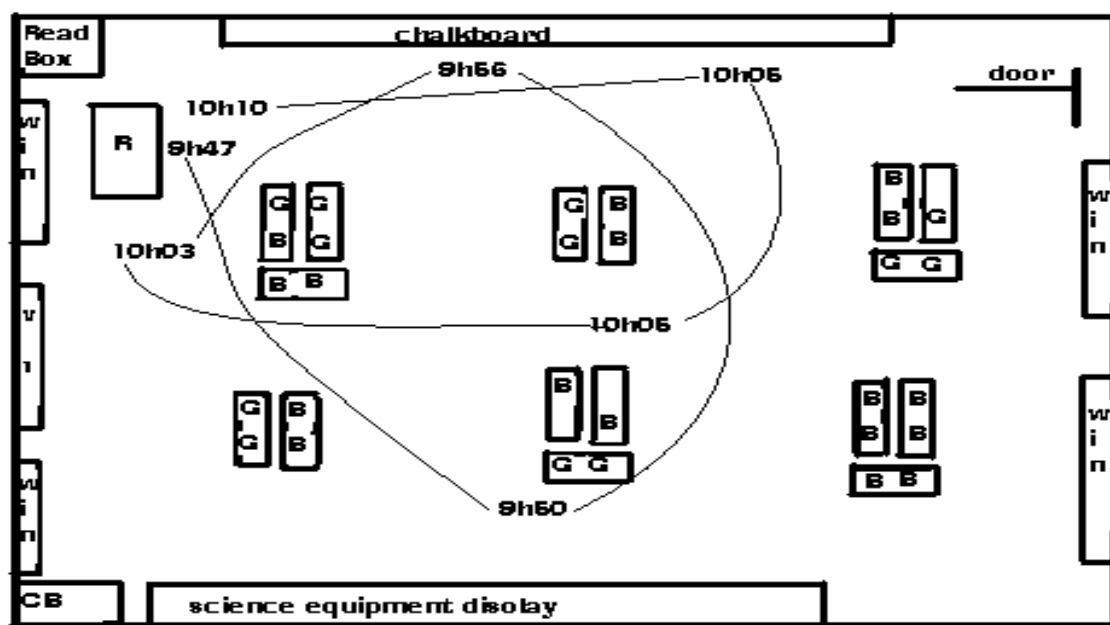
R --- a researcher

WIN --- window

7:42 --- time a teacher was at that point

→ --- teacher's movement

Figure 2: The observation sheet showing the movement of the teacher during the lesson taught by Ntsakisi.



In conclusion, what actually happened in lessons of Pattern 4 showed too little evidence of teachers teaching to outcomes of OBE Mathematics as planned in text of C2005, thus not to be considered to be teaching OBE Mathematics as intended.

Pattern Five

Similarly, lessons in Pattern 5 indicate what actually happened not to be as planned in the text. Pattern 5 has eight lessons that only have two parts of a lesson. The two parts of a lesson in lessons of Pattern 5 are the Report back and Teacher-Learners' assessment. Four parts missing in lessons of Pattern 5 are the Conceptual Introduction, Guiding Example, Group-work and Concluding Exercises. Lessons of Pattern 5 show too little or nothing at all of signs contributing for it to be considered as teaching OBE Mathematics actually as planned in the text. Two parts of a lesson seem to show too little of teachers' teaching having shifted to OBE, but rather that teaching is still content based focusing on learners doing more calculations, or to manipulate numbers as McNeil puts it (Davis, 1988). Teaching in many of these lessons shows only learners working as individuals doing calculations of given sums on the chalkboard, teacher doing assessment and giving more work for learners to do. The eight lessons constitute 25.8% of teachers who are not teaching percentages actually as planned in the text of C2005.

In conclusion, Pattern 5 indicates what actually happened in lessons of teaching percentages in OBE Mathematics not to be as planned in the text of C2005. It indicates 25.8% of teachers having not shifted to teaching Percentages following the OBE Mathematics lesson design. Corroborated by Pattern 4 which indicates 16.1% of teachers not teaching Percentages in OBE Mathematics as intended in the text, it shows that just below half of teachers (42%) have not yet shifted to teaching percentages actually as planned in OBE and C2005 documents.

Conclusion

In response to Research Question 2 “How do teachers actually teach the concept of ‘percentages’ in their Grade 7 Mathematics classes?” using naturalistic observations data that is supported by probing interview data, I found that in 58% of lessons teachers actually taught as planned in OBE Mathematics, and in 42% of these lessons too few signs were recorded for teachings to be considered in-line with the national innovation. More specifically observation data shows one lesson in Pattern 1 in which the teacher taught OBE Mathematics as planned, eleven lessons in Pattern 2 in which this teaching happens but less so than in the lesson of Pattern 1, and a further six lessons in Pattern 3 where this teaching happens but less closely than in the two patterns of lessons above. The 42% of lessons considered not to be teaching to OBE Mathematics is formed by lessons in Patterns 4-5, which are 13 out of 31. Observation data show these lessons as having too few signs of OBE Mathematics teaching observed for them to indicate that this teaching was as planned in the national innovation. Thus, evidence show that just over half of teachers have shifted to teaching OBE Mathematics following text of the new curriculum, whereas just below half have not yet shifted to teaching OBE Mathematics as in texts.