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Changes In Teacher's Practices After Video Simulated Recall Intervention In Gashua, Bade LGA, Yobe State

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ABSTRACT

This qualitative case study explored changes in teachers' instructional practices following Video-Stimulated Recall (VSR) intervention in learning fractions in primary schools in Gashua, Bade L.G.A of Yobe State, Nigeria. Grounded in the Knowledge Quartet (KQ) framework, the Study involved two primary school mathematics teachers. The aim of the study is to examine changes in primary school teachers' instructional practices after participating in VSR inventions while teaching fractions. Data were collected through Task- Based interview prior to lesson observation, classroom video recordings, VSR interview, and reflective discussion on some critical areas. Data was analyzed thematically The results revealed that teachers' PCK prior to lesson observations was not encouraging, but there were improvements in teachers' teaching gains in the second lesson observation after the intervention of VSR. In summary, there were shifts in teachers PCK including improved in Choice and Use Examples, Choice and Use of Representations, Connection Between and Within lessons and Response to Learners' Offers, with better responsiveness To pupils' thinking and increased reflective practice. The study concludes that VSR is a powerful professional development tool that promotes reflective teaching and improves mathematics instruction. Recommendations include integrating VSR into teacher professional development programmes in Nigeria.

Keywords: Video-Stimulated Recall, Fraction, Instructional practice, Knowledge Quartet, Qualitative case study, Mathematics education.

INTRODUCTION

Mathematics education in primary schools plays a foundational role in shaping learners' cognitive development and problem-solving skills. Among the difficult topics primary school teachers encounter is fraction as one of the most challenging concepts for both teacher and pupils. Difficulties in teaching fractions often stem from teachers limited pedagogical content knowledge and ineffective instructional strategies.

Studies have shown that, fractions are one of the topics teachers find it difficult to teach (Lamon 2007). Teachers also find fraction very difficult because integers and decimal can be calculated based on the decimal rotation system, whereas fraction cannot be calculated in the same ways an integers and decimal (kusaka 2021), In order to address this problem recent innovations in teacher professional development emphasize reflective practices. One such approach is video stimulated recall (VSR) which involves recording classroom instruction and engaging teachers in reflective discussions based on their teaching. Research indicates that VSR promote reflective thinking and professional growth by enabling teachers to revisit and analyze their instructional decisions (Szivak, etal, 2019).

In mathematics education the knowledge Quarter (KQ) framework provides a robust, lens, for analyzing teaching practices. It comprises four dimensions foundation transformation connection, and contingency that describes how teacher used mathematical knowledge in teaching (Rowland, Hucksteps and Thwaites, 2005). But the paper will only consider, the teachers foundation knowledge choice and used of example (CUE) choice and used of representations (CUR) connection between and within lessons (CBU) and response to learners offers (RLO).

Problem statement

Despite curriculum reforms and teachers teaching initiatives in Nigeria, pupils, performance in mathematics- particularly in fractions remains persistently low. Observation in primary schools in Gashua indicates that teachers often rely in procedural teaching methods with minimal conceptual explanations. Traditional professional development programmes have shown limited impact because they often lack opportunities for reflective practice. Teachers rarely receive feedback on their actual classroom teaching. Although VSR has been shown to improve teachers reflection and instructional practices in other context, there is limited research on its application in Nigerian primary schools, particularly in area like Gashua .This gap necessitates on investigation into how VSR can influence instructional practices in teaching fractions.

METHODOLOGY

The study adopted a qualitative case study design to explore in dept. changes in teachers instructional practices. According to Creswell (2013) case study is used for in-dept. exploration of rather than group. Two primary schools mathematics in Gashua Bade L.G.A were purposively selected based on their teaching experience, willingness to participate and involvement in teaching fractions. Data was collected through Task-based interview prior to lesson observation, two sequences of lesson observation that involve classroom video stimulated recall interview and reflective discussion. Teachers watch their recorded lesson and reflected on their instructional decisions. Data were analyzed using thematic analysis guided by knowledge Quartet frame work. The analysis comprises; transcription of interview, cording of data, identification of themes and mapping of themes to KQ dimension. Ethical approval was obtained from relevant educational authorities. Participants were given informed consent, assured of confidentiality and had the right to withdrawn were used Pseudonym's were used to protect their identities. This study explores how VSR influences teachers' instructional practices in teaching fractions in primary schools in Gashua, Yobe state.

FINDINGS

In the thematic analysis, the following are the themes:

Theme 1: teachers' pedagogical content knowledge displayed in teaching fractions prior to lesson observation.

Theme 2: teachers choice and used of example in the first and second lesson observations.

Theme 4: teachers' connection between and within lesson in teaching fraction.

Theme 5: teachers' response to learners' unplanned or unexpected moments.

The following are the Pedagogical Content Knowledge Teachers displayed prior to Lesson Observation which Kula (2018) indicators were adapted to determine the nature of their PCK displayed. Kula gave the indicators of strong Pedagogical Content Knowledge in a mathematics lesson.

In the analysis, Weston (2013) and Muir and Bswick (2007) was used. Weston used the protocol maximum (3) middle (2) and maximum (1) to quantity the teachers' CUE, CUR, CBW and RLO, while Muir and Beswick was used to help in determining the participants Level of reflective awareness which are technical, deliberate and critical.

Results of Teachers' Pedagogical Content Knowledge Prior to Lesson Observation

Teacher1: Bala's Pedagogical Content Knowledge displayed in teaching fractions

Line	Researcher / Teacher Statements
1	R: Bala, can you share with me how you might have gone about teaching pupils how to solve with question one? What might you say? What representations might you have put on the board to help with this teaching?
2	T: Sir first to add $\frac{3}{4} + \frac{4}{9}$. I will use Lowest Common Multiple (LCM) to multiply $4 \times 9 = 36$ and do cross-multiplication for $3 \times 9 = 27$ and $4 \times 4 = 16$, then add the result.
3	R: How do you go about teaching question two? What representations and what writing might you have put on the board to help with this teaching?
4	T: Sir, question two is a fraction using takeaway. They have relation with question one. So we use LCM to teach the topic using diagram. I will draw paper in square - square and then, take $\frac{3}{4}$ and show them out of this is this one.
5	R: How do you go about teaching question three? What representations and what writing might you have put on the board to help with this teaching?
6.	T: Sir, question three is about multiplying a whole number with a fraction to get a whole number. Using multiplication $\frac{123 \times 3}{5} = 75$ is red.
7.	R: What about question four? How do you go about teaching it? What are the types of representations and what writing might you have put on the board to help with this teaching.
8.	T: We use the same method with question three.
9.	R: Do your pupils view questions three and four as interconnected in any way when teaching? If not, probe for their seeing of connections.
10:	T: Sir, they are connected.
11.	R: Laslty, how do you go about teaching question five? What representations and what writing might you have put on the board to help with this teaching.
12.	T: Question five is sharing something. You can also show them by drawing five oranges or use five learners and divide two this side and two this side, then one child divided into half. I will make it practical using oranges.

In question one, Bala explained that first he will use LCM to multiply $4 \times 9 = 36$ and did cross-multiplication for $3 \times 9 = 27$ and $4 \times 4 = 16$ then add the result.

In question two, Bala explain that he will use diagram of square coloured and takeaway $\frac{3}{4}$. In terms of connection between question one and two, Bala explained that they are connected but no illustration was given.

In question three, Bala multiply the whole number by the numerator of the fraction and ignored the denominator, and did not proceeds further.

While question four, Bala did not comment on how to teach the problem. Bala explained that there is connection between question three and four since both talk about the items remain and the amount remain.

In question five, Bala suggested using practical demonstration of sharing the orange using the idea of ratio and propotion. But Bala felt to suggest appropriate teaching aids for the problems and how to use it with some illustrations.

Based on these explanations, Bala did not used appropriate teaching strategies to solve the fraction task. He did not use the correct concept to explain process in fraction where appropriate. This is from the procedure he used in performing cross-multiplication across numerators and denominators with

addition of fraction. Similarly, Bala could not identify problems that involves part-whole, operators, quotient, ratio and measure and establish their relationships. Concerning representations, Bala was not able to suggest appropriate teaching aids for the problems. Guided by Kula (2018) indicators, Bala's PCK possessed in teaching fraction prior to lesson observation was weak.

Teacher2: Harira's Pedagogical Content Knowledge displayed

Line	Researcher / Teacher Statements
1	R: Harirai, can you share with me how you might have gone about teaching pupils how to solve with question one? What might you say? What representations and what writing might you have put on the board to help with this teaching?
2	T: Sir, the question is improper fraction because numerator is greater than denominator. Then I say change the sign to be $\frac{3}{4} + \frac{4}{9} = \frac{3}{4} \times \frac{4}{9} = \frac{12}{36} = \frac{1}{3}$. For teaching aids I will use some rocks.
3	R: How do you go about teaching question two? What representations and what writing might you have put on the board to help with this teaching?
4	T: The question is $1\frac{7}{36}$ takeaway $\frac{4}{9}$. I will use subtraction. That is $1\frac{7}{36} - \frac{4}{9} = 1\frac{7}{36} = \frac{7}{36} - \frac{4}{9}$. Then $36 - 9 = 27$ and $7 - 4 = 3$. So we have $1\frac{3}{27} = 1\frac{1}{9}$. For teaching aids I will use some boxes and rocks and share them.
5	R: Do your pupils view questions one and two as interconnected in any way when teaching? If not, probe for their seeing of connections.
6.	T: Question one and two are not related because question one is a fraction $\frac{3}{4} + \frac{4}{9}$ and improper fraction. Question two is mixed fractions. So they are not related. I will tell my class in the first lesson. I will treat proper fraction and improper fraction. That numerator is greater than denominator.
7.	R: Can you share with me how you might have gone about teaching pupils how to work with question three? What representations and what writing might you have put on the board to help with this teaching?
8.	T: The question say 125 pencils in a shop $\frac{3}{5}$ are not red. In my own observation, I will draw some pencils in the other side. I will colour some red and some white. I will write four angles and shade some. Second one write nine angles and shade some. So out of 125, I write $\frac{3}{5}$ out of it.
9.	R: How do you go about teaching pupils how to work with question four? What representations and what writing might you have put on the board to help with this teaching?
10:	T: The question says, 125 naira as pocket money and $\frac{3}{5}$ left. Now first $\frac{3}{5} \times \frac{125}{5} \times 45 = 415$
11.	R: Do your pupils view questions three and four as interconnected in any way when teaching? If not, probe for their seeing of connection.
12.	T: Question three and four are related because both have 125 and $\frac{3}{5}$.
13	R: Lastly, can you share with me how to go about teaching question five? What representations and what writing might you have put on the board to help with this teaching?
14	T: I will draw the diagrams of 5 apples and half, half apples. Each will get $2\frac{1}{2}$ apples. For teaching aids, I will use boxes or give apples and divide it into the boxes.

In question one, Harira attempt to explain how to go about teaching question one; she explained by wrong interpretation of the problem. That it is improper fraction and then perform the multiplication of the numerator and the denominator to get the result. Harira also explained that she will use some rocks as teaching aids but she did not explain how to use it when illustrating the operation.

In question two, Harira was subtracting across numerators and denominators without identifying the whole number. She also suggested that some rocks and boxes will be used for teaching the fraction, but did not explain how to use them for the problem. Harira could not identify the connection between question one and two.

In question three, Harira explained that she will draw some diagrams and write some pencils inside. Some will be coloured red and some white. Then write four angles and shade some. Second one, nine angles and shade some. And said out of 125 I write $\frac{3}{5}$ of it.

While in question four, she explained that we multiply the whole number by the fraction but with wrong procedure. Harira was not able to identify the correct connections between questions two and three, but said both have 125 and $\frac{3}{5}$. She could not go further in identifying other connections. Then in question five, Harira was able to explain the problems using the idea of ratio and proportion.

Based on these explanations, Harira could not demonstrate an accurate understanding of fractional ideas or concepts. She did not show a good understanding of the process of adding and subtracting fractions. She was not able to establish part-whole relationship, ratio and proportion in the results. Harira experienced difficulties when solving problems in fraction using the four basic operations (addition, subtraction, multiplication and division). Concerning representation, Harira was able to select appropriate forms of representation like diagrams of circles and rectangles but have no idea on how to use it in teaching fraction. Also she could not make appropriate conceptual connections within the subject matter. Guided by Kula (2018), Harira did not give clear explanations of ideas or concepts, possibly making use of analogy. And did not demonstrate clearly and accurately how to carryout procedures. This shows that Harira's PCK possessed in teaching fraction prior to lesson observation was weak.

Results of Teachers first and second lesson observations

Teacher One: Bala

Bala's Fraction Knowledge displayed in Teaching Lesson One

Lesson	Knowledge Quartet Codes	Minimum	Middle	Maximum	Total number of Episodes
1 st lesson observation	Choice and Use of Examples (CUE).	4	0	9	13
	Choice and Use of Representations (CUR).	1	10	3	14
	Connections Between and Within Lessons or topics (CBW).	6	0	3	9
	Response to Learners' Offers (RLO).	6	0	3	9
Total		17 (38%)	10 (22%)	18 (40%)	45 (100%)

The count of incidents in Bala's first lesson revealed that in Choice and Use of Examples, maximum was nine, middle was zero and minimum was four. The result shows that Bala's Choice and Use of Examples were in the maximum level where it was correct with no ambiguity and with explicit focus on the concept.

While in Choice and Use of Representations, Bala’s counts were three in maximum, 10 in middle and one in minimum. This means that Bala’s Choice and Use of Representations were in the middle level where there was no error in Choice and Use of Representations, but the teacher could not appropriately apply in the discussion to interrogate learners’ engagement in the lesson.

In Connections Between and within lessons or topics, the count in maximum was three, middle was zero and minimum was six. This means Bala’s Connection Between and Within lessons or topics were in the minimum level where there was errors in the teaching and no in-depth Connection Between and Within lessons or topics with press to interrogate learners’ engagements.

Then in Response to Learners’ unexpected or unplanned questions, answers or comments, the count for maximum was three, middle was zero and minimum was six. This means Bala’s Response to Learner’s unexpected or unplanned questions, answers or comments were in the minimum level where there was a lot of errors in verbal / written notations in the lesson.

In summary, the total counts of Bala’s first lesson for maximum were 18(40%), middle was 10(22%) and minimum was 17(38%). The highest count in Bala’s lesson was 18(40%) which was in the maximum level. Gordon, *et al* (2008) describes this as effective teaching. That is, the teacher provides clear and structured instruction that supports student learning.

Bala’s Fraction Knowledge displayed in Teaching Lesson Two

Lesson	Knowledge Quartet Codes	Minimum	Middle	Maximum	Total number of Episodes
2 nd lesson observation	Choice and Use of Examples (CUE).	2	2	9	13
	Choice and Use of Representations (CUR).	1	8	3	12
	Connections Between and Within Lessons or topics (CBW).	0	6	9	15
	Response to Learners’ Offers (RLO).	2	0	12	14
Total		5 (9%)	16 (30%)	33 (61%)	54 (100%)

The count of incidents in Bala’s second lesson revealed that in Choice and Use of Examples, maximum was nine, middle was two and minimum was two. The results shows that Bala’s Choice and Use of Examples were in the maximum level where the teaching was correct with in-depth Choice and Use of Examples in the lesson.

In Choice and Use of Representations, Bala’s counts were three in maximum, eight in middle and one in minimum. This means that Bala’s Choice and Use of Representations were in the middle level where there was no error but lack praise to interrogate learner engagement in the lesson.

While in Connections Between and Within lessons, topics or concepts, Bala’s counts were nine in maximum, six at middle and zero in minimum.

This means that Bala’s Connection Between and Within lessons, topics or concepts were in the maximum level where the teaching was correct with in-depth Connection Between and Within lessons, topics or concepts including press to interrogate learner engagement in the lesson.

Then in Response to Learners’ unexpected or unplanned questions, answers or comments; the count for maximum was 12, middle was zero and minimum was two. This implies that Bala’s Response to Learners’ unexpected or unplanned questions, answers or comments were in the maximum level where the teacher responded to learner’s unexpected or unplanned questions, answers or comments was acknowledged and incorporated in the lesson.

In all the four codes, the total counts of Bala's second lesson were 33(61%) in maximum, 16 (30%) in middle and 5(9%) in minimum level. The highest count in Bashir's second lesson was 33(61%) in maximum level where the teaching was correct with in-depth interactions including press to interrogate learners' engagement. Gordon, *et al* (2008) describes this as effective teaching. This means the teacher provides clear and structured instruction that supports student learning.

Harirai's Fraction Knowledge displayed in Teaching Lesson One

Lesson	Knowledge Quartet Codes	Minimum	Middle	Maximum	Total number of Episodes
1 st lesson observation	Choice and Use of Examples (CUE).	2	0	6	8
	Choice and Use of Representations (CUR).	0	4	6	10
	Connections Between and Within Lessons or topics (CBW).	2	2	3	7
	Response to Learners' Offers (RLO).	3	0	3	6
Total		7 (23%)	6 (19%)	18 (58%)	31 (100%)

The count of incidents for Harira in the first lesson revealed that, in Choice and Use of Examples, maximum was six; zero in middle and two in minimum. This means Harira's Choice and Use of Examples were in the maximum level where the choice was correct with in-depth discussion including praise to interrogate learner engagement.

While in Choice and Use of Representations, Harira's count in maximum was six, middle was four and minimum was zero. The result revealed that Harira's Choice and Use of Representations were in the maximum level where the teaching has no error in verbal / written notations and with explicit focus on the concept.

In Connections Between and Within lessons, topics or comments, Harira's count was three in maximum, two in middle and two in minimum. This implies that Harira's Connections Between and Within lessons, topics or comments were in the maximum level where there was no error in making Connection Between and Within lessons, topics or comments and there was explicit focus on the concept.

Then in Response to Learners' unexpected or unplanned questions, answers or comments, Harira's count was three in maximum, zero in middle and three in minimum. This implies that sometimes she will not respond appropriately when learners give incorrect answers to questions or make incorrect comments. Sometimes also she will respond correctly to learner's unplanned questions or comments with press to interrogate learners' engagement.

In all the four codes, Harira's total counts in the first lesson were 18(58%) in maximum, 6(19%) in middle and 7(23%) in minimum. The count 18(58%) in maximum was the highest, this implies that Harira's teaching in the first lesson was correct with explicit focus on the concept. Gordon, *et al* (2008) describes this as effective teaching. This is where the teacher provides clear and structured instruction that support student learning.

Harira's Fraction Knowledge displayed in Teaching Lesson Two						
Lesson	Knowledge Quartet Codes	Minimum	Middle	Maximum	Total number of Episodes	
2 nd lesson observation	Choice and Use of Examples (CUE).	1	0	9	10	
	Choice and Use of Representations (CUR).	0	6	3	9	
	Connections Between and Within Lessons or topics (CBW).	0	2	9	11	
	Response to Learners' Offers (RLO).	0	2	9	11	
Total		1 (3%)	10 (24%)	30 (73%)	41 (100%)	

The count of incidents in Harira's second lesson revealed that, in Choice and Use of Examples maximum was nine, middle was zero and minimum was one. This implies that Harira's Choice and Use of Examples were at the maximum level where there was correct and in-depth choices and use of examples with praise to interrogate learners' engagement.

While in Choice and Use of Representations, Harira's counts were three in maximum, six in middle and zero in minimum. This implies that, Harira's Choice and Use of Representations were in the middle level where the teaching was correct and no ambiguity in the Choice and Use of Representations, but no press to interrogate learners' engagement.

In Connections between and within lessons, topics or concepts, Harira's counts were nine in maximum, two in middle and zero in minimum. This means that, Harira's Connection between and within lesson, topics or concepts were in the maximum level where there was correct and in-depth Connection between and within lessons, topics and concepts or ideas with explicit focus on the concepts.

Then in Response to Learners' unexpected or unplanned questions, answers or ideas; Harira's counts were nine in maximum, two in middle and zero in minimum. This implies that Harira's Response to Learners' unexpected or unplanned questions, answers or ideas were in the maximum level where she responded appropriately to learners' questions, answers or comments with praise to interrogate learners' engagement.

In all the four codes, Harira's total counts in maximum was 30(73%), 10(24%) in middle and 1(3%) in the minimum. This means that, on average Harira's teaching in the second lesson were in the maximum level where there was detail explanation of concepts with explicit focus on the topic. Gordon, *et al* (2008) describes this as effective teaching. This is where the teacher provides clear and structured instruction that support student learning.

DISCUSSION

The findings indicate that VSR significantly improves teachers in fractional practices. The changes observed align with previous studies like aihong *et al* (2024) showing that video reflection enhances professional development and teaching effectiveness. Using the QR frame work provided a structured way to analyses these changes highlighting improvement across all four dimensions. Results shows that, teachers became more aware of their instructional methods, improved their use of visual representations, and reflected more critically on learners' difficulties with fractions. The study concluded that VSR improved reflective teaching practices and recommended the incorporation of VSR in continuous professional development programmes for teachers working in the primary school sector. Video stimulated recall (VSR) has gained increasing attention in mathematics teachers' education as a reflective

tool that support instructional improvements in Nigeria and Yobe state in particular. Recent empirical evidence confirm it effectiveness in enhancing teachers classroom practices. For example, a qualitative case study conducted by Aihong, Yushan, Yakubu and Deba (2024) revealed significant improvement in lesson delivery, especially in the area representation of fractions, teacher's clarity and responsiveness to pupils is conception. The study concludes that VSR enabled the teachers to identify weakness in initial lessons and improve subsequent teaching episodes similarly, a study conducted by Salami and spangenberg (2024) found that teachers' subject knowledge and pedagogical content knowledge significantly influence.

CONCLUSION

Video stimulated recall is a powerful tool for improving mathematics teaching in primary schools. It enables teachers to critically analyze their practice and make informed instructional decisions. The integration of VSR with the KQ framework provided a comprehensive approach to teacher development.

RECOMMENDATION

From the results of this study, the following recommendations were suggested:

The result of the Primary School Mathematics Teachers' Fraction Knowledge revealed that all of them have Weak Fraction Knowledge (FK). The study recommend that the State Government should revisit the ongoing support to primary school teachers in Yobe State through a training programmes that has a strong focus on FK more frequently, since Fraction is a prerequisite to understanding of many topics in mathematics.

Teacher professional development in Nigeria were organized through seminars, conferences, or provided by Nigerian teacher training institutions or donor-funded projects or through workshops. The study suggested for teacher professional development that is aligned to teachers' Fraction Knowledge (FK) which can help them improve their classroom practice.

Based on the total incidents in the lessons, the result of teachers' lesson observation shows that, five teachers have experienced improvement in their teaching development. The study, recommend that State Government and Universal Basic Education Commission (UBEC) should revisit their training programmes and use lesson observation and Video-Stimulated Recall (VSR) interview as professional development models to support the primary school teachers to develop their teaching knowledge.

The current study was based on data generated from a small number of participants and Fraction as a topic. The study suggested for more than six participants and more than four Knowledge Quartet codes to explore the primary school teachers' teaching knowledge. This will help in determining the specific areas of mathematics teachers' difficulties.

Future research should replicate this study to be extended to other Local Government Areas of Yobe State. This will increase the sample size and enhance generalizability of the results.

There is urgent need to address this problem using Knowledge Quartet framework as a lens because the framework identify and develops teachers' Content Knowledge and Pedagogical Content Knowledge to be responsive in their classrooms. The teachers need an integrated knowledge of content, pedagogy and curriculum materials.

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