TEACHERS’ PERSPECTIVES ON A MULTIMEDIA SUPPORTED PROBLEM SOLVING: FOCUS ON GRADE 8 ALGEBRA IN THE MOUNT AYLIFF DISTRICT

Motshidisi Masilo
University of South Africa
South Africa
masilm@unisa.ac.za

ABSTRACT—This paper reports on a study conducted to determine the teachers’ perspectives on a multimedia supported mathematical problem solving in algebra at the Mount Ayliff district of the Eastern Cape province of South Africa. Mathematics teachers rarely incorporate diverse teaching resources when teaching mathematical problem solving. There is a common belief among these teachers that mathematical content can be taught and learned with only text material and a chalkboard. A qualitative study was conducted where teachers were interviewed about multimedia supported problem solving. Teachers were also observed while teaching algebra. The population consisted of 15 Grade 8 mathematics teachers from 15 schools in the Mount Ayliff district. Ten grade 8 teachers from schools were purposively sampled to participate in the interviews. Findings revealed that teachers are aware of a need for a multimedia supported problem solving, however due to lack of multimedia they utilize only text material and a chalkboard. Furthermore, findings have shown that teachers lack skills to improvise in order to attain and apply multimedia. The paper concludes that with the support of multimedia, problem solving can be approached from diverse perspectives; and content learning develops naturally as students assume an active role on a multimedia supported problem solving process.

Keywords: Multimedia; Mathematical problem solving; Algebra; Teaching and learning resources; Learning support.

1. INTRODUCTION
Algebraic thinking begins at the early stages of mathematics, that is, at early childhood learning when students represent addition and subtraction with objects, fingers, mental images and drawings (Van de Walle, Karp & Bay-Williams, 2016). Visual media plays a big role in concretising algebra to enhance mathematical development at foundation and intermediate phases of learning. As students develop from intermediate (grades 4-7) to senior phase (Grades 8-9), they begin to learn algebra in a more abstract way where they have to acquire new knowledge and understanding of concepts like symbols, variables, constants, expressions and equations. There is a gap between concrete and abstract learning of mathematical concepts and computations. Starting from the senior phase level, teaching promotes abstract learning and teachers rarely incorporate diverse resources in the teaching of algebraic problem solving. It is of essence that teachers should tap into the students’ pre-knowledge by concretising algebraic concepts to enable students to bridge the gap between concrete and abstract learning. Integrating resources in teaching and learning also promotes critical thinking and students’ ability to retain the concepts and procedures. This paper emphasises that it is of essence to use multimedia at grade 8 to assist the students to: (1) bridge the gap between concrete and abstract learning; (2) assist students to approach problem solving from diverse perspectives; (3) enable students to retain mathematical concepts and procedures; and, (4) enable student to play an active role in self-directed learning. In this paper multimedia refers to diverse media or types of teaching and learning resources.

Grade 8 teachers should understand and appreciate the principles underlying how people learn in order to develop effective teaching and learning material (Alessi & Trolip, 2001). In addition, this paper
highlights that teachers should know the existing types of teaching and learning resources and they should be able to improvise in order to utilise the resources at their exposure optimally.

Seeking the teachers’ perspectives on a multimedia supported algebraic problem solving is an initiative to address the problem in this paper. The following question is asked: What are the teachers’ perspectives on a multimedia supported problem solving? The sub-questions asked are: (1) what teaching and learning resources do mathematics teachers have at their exposure? (2) How do the teachers facilitate the process of imparting algebraic reasoning by incorporating the resources they have (3) how do the teachers improvise in order to access multimedia for the teaching purpose.

2. BACKGROUND

Approaching algebraic reasoning from diverse perspectives means incorporating all learning experiences to advance algebraic reasoning. In this paper learning experiences refers to the ways of learning that can assist students to acquire knowledge, understanding and problem solving skills. Three learning experiences are outlined in this paper as shown on Dale’s cone of experience (Anderson, 2000; Corpuz & Lucido, 2008). The learning experiences are outlined as actual learning, visual learning and verbal learning (Anderson, 2000; Corpuz & Lucido, 2008). Furthermore the cone of experience as explained by Anderson (2000), and Corpuz and Lucido (2008) outlines the learning experiences as follows: (1) actual learning refers to learning through active participation in the activity, simulating the activity, discussing the activity and peer educating each other; (2) visual learning means learning through watching demonstrations, watching moving pictures and viewing pictures; and (3) verbal learning refers to learning by hearing words and reading texts. The current approach of teaching algebra in South Africa encompasses an abstract teaching approach that is conveyed through verbal learning experience using text and chalkboard as media. Other learning experiences such as actual learning and visual learning are not opted based of the fact that multimedia is not considered during teaching. Research has suggested the usage of multimedia in teaching and learning in order to advance the learning experiences such as action learning, visual and verbal learning (Anderson, 2000; Corpuz & Lucido, 2008). In light of this background, this study argues that the teaching practices that disregard the incorporation of multimedia in order to include all learning experiences contribute to a non-holistic development of students’ algebraic reasoning through generalisation and symbolisation. With reference to the South African school curriculum, the mathematical algebraic manipulations at grade 8 encompass new algebraic knowledge, processes and terminology. For example, the introduction of variables like \( x + x = 2x \) are introduced for the first time in grade 8. Incorporating multimedia in order to engage students through all three learning experiences can foster a better understanding and retention of new concepts.

Van de Walle et al. (2016) motivated that thinking in algebra involves forming generalisations from experiences with number and computation. Hence this study emphasises that in Grade 8 students still need to build the experience in working with variables, constants and new terminology in order to be able to form generalisations to stimulate algebraic thinking. Therefore, incorporating all learning experiences such as action learning, visual learning and verbal learning would benefit students in reasoning by forming generalisations from experience. Furthermore incorporating the three learning experiences through multimedia in forming generalisations would assist students to explore new knowledge in order to develop experience with computations in algebra. In addition, Van de Walle et al. (2016) outlined that the generalisations in algebra can be formalised with the use of meaningful symbol system. Visualised symbols could enhance development, that is, if teaching supports the visual learning experience, generalisation of algebra may be achieved by students and the relevant algebraic vocabulary (for example, variable, constant, equation, expression) may be retained in the students’ memories. This study emphasises that the usage of multimedia in teaching is necessary in order to assist students to achieve action learning, visual learning and verbal learning for better problem solving in algebra.
3. LITERATURE REVIEW

The need for multimedia to enhance teaching and learning is emphasised in a report by the Science Education Resource Centre (SERC, 2012). SERC (2012) report motivated that media can be used in almost any discipline to enhance learning both in class and out of class assignments. In addition the report highlighted that short films and television clips, written articles, and blog postings can be viewed to reinforce concepts and spark discussions for problem solving; and songs and music videos, especially when the lyrics are made available, can be used to the same effect. Furthermore, the source outlined that students learn abstract, new and original concepts easily when the concepts are presented in both verbal and visual form (SERC, 2012).

Some authors have highlighted advantages in using multimedia during the teaching of problem solving. The advantages are: visual media makes the concepts more accessible to a person than text media and it helps with later recall; multimedia extends human experiences; contributes to longer retention of information; stimulates interest; encourages integrated experience; fosters a multi-sensory learning approach; facilitates change in attitude; showcasing complex ideas; helps develop quantitative reasoning; connect theories taught in the classroom with real world events and policies; hone the students’ analytical skills; and students can experience worlds beyond their own (Supe & Lyer, n.d.; SERC, 2012). In order to cater for diverse advantages different media must be used. Application of one medium cannot enable teachers to cover all advantages in order to cater for all students’ needs. Different students learn differently, that is, every student is an individual in a group. Therefore, teachers must make attempt to reach all students during teaching by inculcating different media.

Teaching and learning material can be classified into the groups that are shown in Figure 1, namely, audio, visual, audio-visual, text material; mathematical virtual manipulatives and digital resources (see, Ehmann, Gerhauser, Miller, Vogel & Wassermann, 2014; Gueudet, 2010; Moyer-Packenham, Bolyard, & Spikell, 2002; Newby, Stepich, Lehman, Russel & Ottenbreich-Leftwhich, 2011; Reddy & Nagaraju, 2007; Research Centre, 2015). All media are essential in teaching and learning; and multimedia can be integrated, that is, more than one media can be used in one lesson. Bertram, Ranby, Adendorff, Reed, & Roberts (2010) motivated that multimedia based teaching should engage learner interest, encourage active learning and link learners’ experiences with new and unfamiliar concepts. Essentially, teachers should know diverse media and they should be able to incorporate diverse media relevant to how students learn.

![Figure 1 Classification of multimedia](image-url)
In depth discussions on each of the components of the conceptual framework in Figure 1 are provided in the following sources: Ehmann, Gerhauser, Miller, Voggel and Wassermann (2014), Gueudet (2010), Moyer-Packenham, Bolyard and Spikell (2002), Newby, Stepich, Lehman, Russel and Ottenbreich-Leftwich (2011), Reddy and Nagaraju (2007) and Research Centre (2015).

4. CONCEPTUAL FRAMEWORK

In order to be able to develop and select relevant material for teaching and learning teachers should know how their students learn. This paper motivates that a combination of actual, and visual learning experiences influence constructivism where students learn inductively through active engagement. It is these learning experiences that encourage students to explore diverse methods of problem solving; and to seek knowledge in order to formulate hypothesis in problem solving. However, verbal learning is also essential as students need to confirm the hypothetical learning through hearing, that is, hearing from the teacher; and reading from the textbook. According to Van de Walle et al. (2016), constructivism is based on the notion that students are not blank slates, but rather creators or constructors of their own learning. In concurrence, Newby et al. (2011) hinted that constructivism has it that knowledge is constructed as students try to make sense of their experiences. In addition, Van de Walle et al. (2016) motivated that to construct something in the physical world tools, materials and effort are requested. Further, Van de Walle et al. (2016) associated tools that are used to build understanding with our existing ideas and knowledge; materials as things that we see, hear, or touch and reflective thought is the effort required to connect new mathematical knowledge to old knowledge. In light of this background, this study proposes that tools, materials and efforts play major role in order to advance learning experiences.

According to Newby et al. (2011), technology is a very essential material needed in teaching and learning because it allows students to gain greater access to more types of information. Technology and media remain essential in assisting students to explore and build experiences that can enable them to solve real life problems. Newby et al. (2011) argue that technology has been used to accentuate constructivist elements such as social interaction, active creation of meaning and an environment that resembles the real world. Therefore, this study suggests that learning that occurs in an environment that is similar to the real world results in the students’ ability to relate the concrete and abstract nature of mathematics for problem solving purposes.

During the 1960s, Edgar Dale theorized that learners retain more information by what they do as opposed to what they hear or read (Anderson, 2000). His research led to the development of the theoretical model known as the Cone of Experience. According to Anderson (2000), Dale’s theoretical model explains that the least effective method, that is, reading and hearing, involves learning from information presented through verbal symbols, i.e., listening to spoken words; the most effective methods known as action learning involves direct purposeful learning experiences, such as hands-on experience. Further, Dale’s cone of experience outlines that verbal learning involves hearing and reading; visual learning involves viewing pictures, watch moving pictures and action learning involves teaching each other the activity, simulating the activity and participating in the activity.

Further, Corpuz and Lucido (2008) argued that according to Dale’s cone of experience verbal learning influences more abstract learning, visual learning is not abstract but not more concrete and action learning is the most concrete learning approach. In addition, Corpuz and Lucido (2008) highlighted that the more senses are involved in learning the better the learning will be. However, the authors motivated that even when better learning may be achieved through concrete learning experience, it does not mean that concrete learning experience is the only effective experience. Therefore a balance must be maintained between concrete and abstract teaching and learning. Maintaining the balance could help each learner in their holistic development (Corpuz and Lucido, 2008). In addition Corpuz & Lucido (2008) argue that in order to advance holistic development the student need to start learning by experiencing foundation experiences (direct purposeful experience, or action learning) and then
advance to visual learning and through to verbal learning. Therefore, in facilitating learning a variety of materials and medium must be used in order to maximise the learning experience (Corpuz & Lucido, 2008). The authors further emphasised that one medium is not enough in teaching and learning. In addition, Anderson (2000) motivated that Dale’s cone of experience is a tool to help instructors make decisions about resources. In making decisions about resources teachers should respond to “how does the instructional resource to be used augment the information supplied by the textbook” (Anderson, 2000: 3). Based on the ideas around the cone of experience, this paper accentuates that there is a need that in teaching algebra teachers must consider the combination of learning experiences (verbal learning, visual learning and action learning) in teaching and learning. Furthermore, this paper emphasises that the combination of the learning experiences will be possible through the application of multimedia.

5. METHODOLOGY
This paper reports on a study conducted to determine the teachers’ perspectives on a multimedia and technology supported mathematical problem solving in algebra. A qualitative research methodology was employed and the ethnomethodology was applied as a method of inquiry. Ethnomethodology in qualitative research questions how people make sense of their everyday activities so as to behave in socially acceptable ways (Boudah, 2011). In addition Cohen and Manion (1994) motivate that ethnomethodology is concerned with the world of everyday life, that is, how people make sense of their everyday life. In light of this background, mathematics teachers’ perspectives on their everyday practice regarding multimedia usage were sought. Teachers were interviewed about multimedia supported problem solving. Semi-structured face to face interviews were conducted by the researcher. Furthermore, teachers were observed while teaching algebra in their specific classrooms. In order to establish the truth value of this paper, that is, trustworthiness, credibility of the methods and findings was ensured through methodological triangulation (Boudah, 2011; Cohen and Manion, 1994). Both interviews and observations were used as sources of information in order to confirm the teachers’ perspectives about a multimedia supported problem solving. The population consisted of 15 grade 8 mathematics teachers from 15 secondary schools in the Mount Ayliff area. The rationale for targeting secondary schools located in a Mount Ayliff rural area emanates from the research findings that have persistently linked poor performance in mathematics with disadvantaged socioeconomic communities, such as those characterizing schools in rural settlements of Mt Ayliff. Purposive non-probability sampling was employed to select 10 schools which were studied in depth. The main strategy of purposive non-probability sampling utilised to select the 10 schools was the purposeful random sampling. Gray (2009) described purposeful random sampling as a sampling strategy in which a limited number of choices are selected randomly from a large possible set of choices. The population consisted of 15 schools; however, 10 schools were the most accessible to the researcher. Therefore, purposeful random sampling was applied and the total number of participants was 10 teachers from the 10 sampled schools. Ethical issues were considered in this paper. Permission to conduct research was granted by the Eastern Cape Department of Basic Education. All participants consented to participate in the study. Furthermore anonymity and confidentiality were adhered to.

6. FINDINGS
Findings that emerged from interviews and lesson observations are reported in this section in order to reflect on the teachers’ perspectives on a multimedia supported mathematical problem solving in algebra. Observations were conducted in order confirm the teachers’ perspectives on a multimedia and technology supported problem solving in classrooms around the Mount Ayliff districts. This paper was planned to focus on algebra in general; however, the situation at the moment of research informed the topic algebraic expressions. The topic was common to all participants due to the common work-schedule that the teachers were following during the time of participation in this research. Observations and face to face interviews were conducted in order to answer the research questions stated in the introductory section.
6.1. Interviews

Face to face semi-structured interviews were conducted by the researcher in order to probe for more detailed perspectives of teachers regarding a multimedia supported problem solving. Ten teachers were interviewed. In order to relate mathematics teaching with multimedia, the following questions were asked: (1) what is mathematics according to you? (2) How can you describe teaching media in Mathematical problem solving? The teachers defined mathematics as: dealing with numbers; finding unknowns; a subject that talks about measurement, space and shape; a subject that is not difficult but challenging; and a subject that is related to real life, like for example, doing calculations at home for shopping purposes.

Teachers described teaching media as important resources that teachers cannot manage teaching mathematical problem solving without. Further the term media in mathematical problem solving was described by teachers as resources that are important to students in terms of assisting them to understand and acquire knowledge for problem solving. In addition, one participant responded “media in mathematics are material that we use when teaching, for example, chalkboard, projectors, and textbooks”; and another participant said “media in mathematics means television, radios and so on”. With regard to the importance of media in teaching mathematical problem solving teachers pointed out that with the use of resources learners can cope, especially when teachers use familiar resources like things around them (stones and sticks were mentioned as resources around them). One teacher exclaimed “resources around are stones and sticks; where can we get computers in an area like this”. Further, teachers hinted that from grade 6, calculators may be used with the objective of teaching students calculator skill for domestic purposes. In addition, teachers highlighted that resources can contribute towards the students’ positive attitude towards learning.

In order to find out what resources teachers are having at their disposal, one teacher declared “I am more traditional, I use a textbook, chalkboard and occasionally a projector”. All teachers mentioned a textbook as the most available resource. Teachers averred that they make copies from textbooks in situations where textbooks are not sufficient. Mathematical instruments were outlined as resources that are sometimes used especially in the construction of angles. Asked where they get the mathematical instruments, teachers indicated that the Department of Basic Education (DBE) supplied the schools with mathematical instruments even though the instruments were insufficient. Therefore, students have to buy the instruments even when not all of them can afford the instruments. In some schools in the Mount Ayliff area the teachers indicated that DBE has provided the laptops, however, they are not being used. The teachers attributed the non-usability of the laptops to: (1) teachers are told that the laptops are meant for students not teachers, therefore teachers cannot have the laptops even for lesson planning; (2) laptops are not programmed; (3) there is no internet connection; and (4) teachers lack skills to integrate the usage of the laptops as the available technology in teaching. One of the teachers exclaimed “I have laptops for me and the students to use, but I am still waiting for someone to come and show me how to use the equipment”. Teachers hinted that their schools are no-fee schools, which means that parents are not liable to any monetary contribution towards the school. The schools depend entirely on what the department of basic education can offer in both financial and material resources.

Teachers were asked about the additional resources they are lacking, and those they would like to have in order to supplement the existing resources. Connectivity to internet or Wi-Fi for laptops provided by DBE was raised as a need. The library was also mentioned as a need based on the fact that it is not available in schools and in the Mount Ayliff area. The other materials outlined as a need include charts, that is, subject display charts and A3 papers for the teachers to develop posters. Further teachers were asked about how they improvise to get diverse teaching media in order to approach mathematical problem solving from diverse perspectives. Teachers pointed out that due to insufficient textbooks; they do copies of pages for students to use during the lesson and at home. Further, the usage of stones
and sticks for patterns was outlined. One of the teachers hinted on the usage of personal technology gadgets to access internet to retrieve worksheets for students’ usage in the classroom.

Teachers were asked about their views on the contribution of teaching resources towards students’ development. The possible source for the teachers’ responses was both their experience as teachers of mathematics and as professionals in teaching and learning. Research could not overlook the fact that teachers as professionals are aware of advantages and disadvantages of multimedia. In responding based on their professional experience both theoretically and practically the following advantages of multimedia were highlighted: (1) teaching resources create a sense of independency and students do not rely on a teacher; (2) resources are a way of attracting students’ interest and positive attitude during the lesson and a (3) a means of enabling students to work after hours, “for example, sufficient textbooks enable students to practise more of mathematics after hours”. In addition one of the teachers said “the availability of resources in teaching mathematics especially the resources that are more familiar to the students can assist students to remember concepts well”. Teachers sounded very positive when sharing their perspectives about the contribution of multimedia. None of the teachers elaborated on the disadvantages of multimedia in problem solving.

6.2. Lesson observations
Non-participant overt lesson observations were conducted by the researcher. Lesson observations were an opportunity to get beyond the teachers’ opinions and self-interpretations of a multimedia supported mathematical problem solving (Grey, 2009). Furthermore, the lesson observations afforded the researcher a chance to note the teachers’ actions in practice, that is, observations were conducted in order to perceive how the mathematics teachers incorporate multimedia in the teaching of algebraic problem solving. Ten teachers were observed while conducting mathematics lessons in Grade 8 classrooms. In all schools that were observed in the Mount Ayliff district, classrooms consisted of desks for learners, a chalkboard, a notice or display board and a cupboard. All teachers were teaching algebraic expressions, mainly the polynomials, where they were adding by grouping like terms. The main teaching approach revolved around chalk, chalkboard and textbook. Teachers followed a common practice of teaching; that is, writing a problem as an example on the chalkboard; showing the students how to solve the problem; showing and narrating the steps to finding the solution by writing on the chalkboard, but often engaging students by asking questions based on the previous knowledge, for example, “x – is equal to...?” Students would sing and respond “positive”. After the example was solved, teachers would refer to the textbook and get a few problems from exercises in the textbook. Majority of the teachers preferred group work. In groups students would do the selected sums on their scribblers and thereafter one in each group would come to the front to show on the chalkboard how his or her group has solved the problem. Display boards were available in some classes, however no displays were evident. From the five groups of teaching and learning materials, the most used in classrooms are text material (textbook, worksheets, and copies from textbooks) and only chalkboard. Laptops and desktops (as digital media) that had been provided by DBE in only few schools, most schools were not yet provided with digital resources. In schools where digital media were available, the media were kept in store rooms, and were not used for teaching and learning purposes in classrooms. In other schools there were no digital media resources. Media like charts, posters, display-boards for subject related matters were not utilised by mathematics teachers in the classrooms. There was no evidence of improvisation to access other teaching media to augment the text material and the chalkboard. Display or notice boards in classrooms were vacant; no chart with mathematical information was posted on display boards and on walls. Lack of displays, posters and charts on subject related concepts is a clear indication that it is a norm and an everyday practise that teachers teach with only a textbook and chalkboard as resources.

7. DISCUSSION
The interviews have revealed the teachers’ perceptions about applying multimedia in the teaching of algebraic thinking and mathematics in general. The teachers know and understand the essence of
concretising the learning environment by using multimedia. Furthermore teachers perceive multimedia as necessary to support the teaching and learning of mathematical problem solving. In addition teachers recognise mathematics as subject that relates to real life. Regardless of their perspectives on the essence of multimedia in supporting problem solving the lack of resources was highlighted as a challenge. According to teachers, they are compelled to stick to abstract teaching and very abstract learning environments as a result of lack of other resources to augment the textbook and chalkboard.

From all the five classes of resources outlined in this paper, teachers could plan and improvise to incorporate attainable resources from the groups of media. For example, by using posters and charts the teacher would easily refer to the posters and charts, and during classroom practices students would be actively engaged in visual learning and verbal learning at the same time in order to build their learning experience in problem solving. Teachers see media in teaching as resources that are essential in teaching mathematics because the resources are important in making students understand, however, they teach without these essential resources; which imply that the teaching cannot advance students’ understanding as hinted by teachers. Further as indicated that media refers to televisions and radios, schools in the Mount Ayliff area do not have audio and audio-visual material in classrooms.

Sticks and stones were mentioned as resources around, however, this paper has a motion that sticks and stones are far below the level of grade 8. Yes, they might be used for exploring patterns, but the resources apply perfectly well in lower grades. Further, the 21st century grade 8 students might need more advanced multimedia to augment the sticks and stones in order to explore algebra. Nonetheless, one of the teachers commented and said “resources around us are stones and sticks, where can we get computers in this area”. This statement refers to the observation that there is no equal distribution of resources in schools within the district. Other schools within the district have laptops meant for students’ usage (laptops are just stored in store rooms and not used) and other schools do not have any digital or electronic material. Based on a comment from one teacher that he is waiting for someone to train him on how to use digital media available at his school, it is clear that there is a need to train teachers at schools where digital media is available. The training will benefit teachers and learners and this is supported by Egbert (2009) who averred that teacher professional development can lead to higher learner achievement and teachers can be refreshed and re-energised in line with multimedia supported problem solving; and further teachers can learn more effective ways to support the learning of all students through multimedia usage.

The available and easily accessible teaching medium is the textbook, chalk and chalkboard. Text in general is easily attainable for teaching purposes. Teachers mentioned doing copies for students in cases where textbooks are insufficient. The schools are equipped with photocopy machines for the teachers’ usage. It is evident that the department of education does provide some of the teaching and learning resources, for example, some teachers indicated that the department of education provided mathematical instruments and students misplaced the instruments; some mentioned that the instruments were provided but were not sufficient. The provision of laptops in some of the schools also indicates that the department has a plan that is still on-going which is to equip all schools with digital resources. In addition to what the department of basic education has provided teachers indicated that there is an urgent need of internet or Wi-Fi to operate the laptops that are stored in schools’ store rooms. The other media that teachers raised as a need are subject display charts that can be used during teaching. Teachers also hinted on a need for A3 papers that can enable them to create posters for teaching purposes. Creating posters is another way of improvising, however, lack of material to enable teachers to improvise is another challenge. Improvisation in this paper refers to a situation where teachers can create additional teaching resources from whatever is available. One teacher motivated that he has to use his own electronic gadgets to retrieve worksheets for students. Clearly, some teachers do try to improvise; however, improvisation as well needs some material in place to enable the one who improvise to be creative.
Observation further revealed that schools are unable to attain all the four classes of media. For example, teachers explained media as television and radio; however, there is no single television and radio at any of the schools. The availability of such materials would enable teachers to extend their teaching by for example playing mathematical programmes presented by other mathematics experts to enable students to acquire more knowledge on mathematical concepts. Audio and audio visual material would also benefit the students who can learn better through these particular materials. Students learn differently, therefore, if mathematics teachers would incorporate multimedia in their teaching, all students would be afforded a chance to learn better.

Teachers seemed to understand better that there is a positive impact in using multimedia during teaching. For example, teachers highlighted on multimedia that create a sense of independency in students; attracts students’ interest; develops students’ positive attitude; and that enables students to practise more of mathematics at their own time. Nonetheless, teachers could not use diverse media in their lessons. The most prominent way that was used to keep students working and interested was group work. The only challenge with the observed group work dynamic was that other students relied on others to complete group activities. Not all students were engaged.

8. CONCLUSION
Based on the teachers’ perspectives on a multimedia supported problem solving, the paper concludes that it is of essence that mathematics classrooms become equipped with multimedia in order to support the teaching and learning of grade 8 algebraic problem solving. With the support of multimedia, problem solving can be approached from diverse perspectives; and content learning can develop naturally as students assume an active role on a multimedia supported problem solving process.

9. RECOMMENDATIONS
Teachers have a clear perspective of how important multimedia is in order to influence a sound teaching and learning environment. However, teachers continue to apply only chalkboard and text material as common resources in classrooms. They attribute their practice to lack of resources and the lack is caused by the fact that their schools are no fee schools; and having to rely on the insufficient budget from the department of education disable them from acquiring relevant multimedia. One would think improvisation through collecting used magazines, news-papers, doing cut and paste to create posters, getting marking pens to write formulae and do drawings on charts to display on boards and walls would be viable even in mathematics. Further, one would think requesting parents to contribute some materials would assist teachers to access some means to multimedia. However, according to the teachers’ perspectives, improvisation is difficult as there is no way of gathering additional material. Teachers rely on what is available within the schools’ premises, for example, photocopy machine for copies from the textbook. It has come to the researchers’ attention that the department of basic education still need to distribute digital resources to other schools that did not receive such material. Further, based on the teachers’ perspectives, internet or Wi-Fi has to be provided to schools to enable the teachers and students to use the available digital resources optimally. Provision of Wi-Fi is possible in most schools in the Gauteng Province; maybe the same could be done in other provinces such as Eastern Cape to alleviate the challenges of lack of internet connectivity at schools. The department of education still need to work on the issue of provision of insufficient resources. School management bodies are liable for supporting teachers by voicing the teachers’ concerns and the teachers’ operational situations at the Department of Basic Education (DBE). DBE still need to intervene by: (1) training teachers to use provided digital resources; (2) instilling a sense of improvisation in teachers; and (3) encouraging teachers through workshops to apply multimedia in teaching. In essence, multimedia usage should be a norm and a common practise in the 21st century teaching and learning of mathematical problem solving.
REFERENCES