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RESEARCH ARTICLE

STUDENTS' PERSPECTIVES OF TEACHERS' USE OF LANGUAGE IN DEFINING SELECTED TERMS IN PHYSICS

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ABSTRACT

Teacher talk about terms used in Physics is markedly different from the science talk about the terms, especially in classrooms where English is the language of instruction yet it is a second language to both the teacher and students. Misunderstandings in such classrooms are likely especially if the teacher is not aware of the difficulties between his ways of talking, in relation to how students understand. This paper reports and discusses findings in an investigation on students' perspectives of teachers' use of language in defining selected concept in electricity. Questionnaire for students of Physics as well as focused group discussions were used as methods of data collection. Quantitative data was analyzed by use of percentages means and t- statistics, while qualitative data was analyzed by searching through the data for key words and generating categories and themes in relation to the study. Students' perspectives on teachers' use of language provide evidence of the general difficulty and confusion students experience with teacher talk in learning of key terms in electricity. The results of this study suggests that teachers should be assisted on how to use simple and clear language more carefully and appropriately when teaching electricity and clarify what students hold concerning the terms in electricity.

INTRODUCTION

Classroom communication involves a process (Chinelo and Nonye, 2010). The process is dependent on factors such as attitude of the teacher, material channels, feedback, students' abilities, attitudes of students, class size and school environment (Dynamic, 2007). These factors have contributed to designing of science teachers' training curricula in the world. In Kenya pedagogical issues in the teacher training process are equally emphasized alongside practical approach in teaching, learning and evaluation. However, one other factor that could affect learning of school science is use of language by the teacher that is based on Vygostkian notion of enculturation (Hodson and Hodson, 1998). This is one of the essential factors in successful learning of school science that has since received minimum attention by educators and researchers (Oyoo, 2004). It takes into consideration the central role played by the teacher talk in the learning process because teachers lead learners to new levels of conceptual understanding not only through providing and managing of suitable learning environment but also through interacting and talking with learners. Many studies on students' understanding of electricity have shown that success on Physics instruction on achieving the Physics point of view is usually limited (Williams, 2000; Chinn and Brewer, 1993). Physics Educators have since argued for the need to engage students in doing Physics, rather than reading about it. However very few teachers have been empowered to teach Physics as it is conducted in real world. Instead they teach Physics as isolated facts that are to be memorized and recalled for assessment purposes (Johnson, 2007). Teachers choose to use lecture and worksheets to teach Physics, but they should utilize effective teaching strategies to ensure conceptual understanding (Johnson and Marx, 2006). In majority of schools, strategies of teaching for conceptual change with emphasis on language use are rarely utilized, because of several reasons such as apprehension and anxiety generated due to demands for effective science instruction (Johnson and Marx ,2006). The anxiety could be as a result of Physics teachers being inadequately prepared in both content knowledge and scientific inquiry experiences (Berns and Swanson, 2000). But as Oyoo (2004) had established, use of language effectively by the Physics teacher is one essential factor in successful learning of school science.

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Language use in Understanding of Resistance

Perspectives and conceptions on Resistance are content specific in that they depend on the concrete tasks which are presented (Chinn and Brewer, 1993). Conceptions students hold on Resistance influence the way they see experiments, and students usually are not willing to change their conceptions if their prediction is challenged in just one experiment (Chinn and Brewer, 1993). Students do not see

what actually is to be seen but what their conceptions allow them to see as in the case of a research in which it was revealed that 10% of students use sequential reasoning to predict that all the current stays the same if resistors are placed 'end to end' (Duit and Rhoneck, 2004). The complicated mixture of incorrect argumentation by students in the tasks denoted that instruction generally leads not to a well defined representation of the concept of resistance. Often after instruction, elements of pre-instructional conceptions loosely connects to elements of concepts taught (Duit and Rhonek, 2004) hence the need for Physics teachers to use language in a manner that can enable students challenge their pre-instructional conceptions.

Language use in understanding of current

The meaning of the word current is generally nearer to the meaning of energy as used in everyday talk rather than current as used in Physics (Duit and Rhoneck, 2004). Therefore, students are likely to experience difficulties in understanding the concept of current especially if the teacher mentions the terms current and energy without differentiating the two. Children use very general explanations for the functioning of a simple electric circuit through establishing a causal connection between the battery and the bulb and explain that there is an agent moving between the battery and the bulb. Students explain further that the agent which is an electric current may be stored in the battery and may rest in the wires and also consumed in the bulb (Duit and Rhoneck, 2004). Students' conceptions of the current flow are numerous as many students argue that a "plus" and "a minus" by itself indicate that current flows to the bulb clashing hence the sparks or a bulb to shine. Others think that there is a sort of chemical reaction that results in the light and this is because students try to make sense of what is seen (Williams, 2000). If the teacher simply tells students the correct view of movement of electrons, it is most unlikely that they will understand such an explanation. And as Williams (2000) has further noted, telling does not produce understanding because understanding develops and requires students to link ideas together. The role of the teacher is to encourage students to accept the responsibility of constructing their own understanding. It is therefore important that Physics teachers' language should clearly address Students' ideas especially of consumption and clashing of current which has proven to withstand instruction in a very serious way.

Language use in understanding of Voltage

One of the most difficult concepts in basic electricity is the concept of voltage (Duit and Rhoneck, 2004). Before instruction voltage is related to "Strength of a battery" or "intensity of force of the current". The students' views of voltage can be seen as closely linked to students' perceptions surrounding the concept of electrical power. Research has indicated that even after instruction students use the voltage concept as having approximately the same properties as the current and power concepts. A special kind of reasoning called sequential reasoning was evident when students were given tasks on voltage in that students analyzed the circuits in terms of before and after current passes a given place in the circuit and that any change at the beginning of the circuit influence the elements after, whereas change at the end does not influence elements situated before (Duit and Rhoneck, 2004). Most findings on students' understanding of voltage were drawn on data after instruction by comparing with data before instruction and it was revealed that learning pathways students follow in learning of voltage are very complicated and they can be said to be forward and backward movements, together with parallel developments (Duit and Rhoneck, 2004), developments that go just in the opposite direction than intended by the teacher in his or her talk around the concepts. Physics view of voltage becomes visible only after a long time hence conceptual development towards the Physics view is a strenuous long lasting process. For meaningful learning to occur, Physics teachers should use language appropriately and consciously differentiate between current, voltage and electrical power from the very beginning and equally address the idea of a driving 'force' in reference to voltage.

Language used in understanding of Power

The understanding of electric power by students of all ages before any formal learning experiences is strongly influenced by everyday uses of the word power (Gunstone, Mulhall and Mckittrick, 2009). These learners' preconceptions are mostly in conflict with conceptions of Physics, and frequently little changed by conventional teaching sequences. This is because it is highly abstract, and complicated in the ways that make its understanding both centrally dependant on analogies and metaphors (Mulhall, Mckittrick and Gunstone, 2001). It was established further that conceptual change involving alternative content sequencing had variable results especially in teaching for better student understanding of electrical concepts such as power. Other researches done on perspectives of language use in understanding of power have established that there exist inadequacies in teacher understanding, and confusions in language use both by the teachers and in Physics textbooks (Gunstone, Mulhall and Mckittrick, 2009). A further example of the confusions, both conceptual and pedagogical that characterize the area of electricity especially the concept of power was evident with university entrants in which surprising variation in perspectives of the interviewees was established. Of particular concern was that some teachers were for the idea that power is easier to teach even though they agreed that it was hard for students to learn (Gunstone, Mulhall and Mckittrick, 2009), but findings from this research indicated very little linkage between teachers' perspectives and students' difficulties in understanding of the concept of power.

Language use in the teaching and learning of the concepts; resistance, current, voltage, and power are emphasized in all the studies discussed above (Chinn and Brewer, 1993; Duit and Rhoneck, 2004; Williams, 2000; Gunstone, Mulhall and Mckittrick, 2009) in which students' questionnaires and tests were used as instruments for data collection before and after instruction. However, none of the studies done focused on establishing students' perspectives that could have necessitated use of descriptive survey techniques such as use of students' questionnaire and focused group discussions. These were to elicit information on how teachers' use of language influence understanding of electricity and also give an opportunity for students to justify and elaborate responses they had given on the questionnaire. Furthermore, focused group discussions were to enable the researchers establish the extent of students' understanding of the selected concept and countercheck perspectives given by learners concerning

teachers' use of language. This brought about the need for the current study especially in Kenya because national Physics examiners have noted that misconceptions of Physics concepts particularly in electricity have contributed to poor performance in Physics examinations (KNEC, 2008). Similarly, stakeholders in education in Vihiga District in Kenya have equally raised concerns that the poor performance of students in Physics is because majority of examinees give responses that do not reflect the science view point (DEO, 2009). This could suggest that Physics teachers' use of language in defining of concepts in electricity, a branch of physics contributing to understanding of a wide range of phenomena in secondary school Physics course, could be inappropriate or insufficient to support understanding and accommodation of science concepts.

Purpose of the Study

This study was to establish students' perspectives of teachers' use of language in defining of selected terms in Physics, namely resistance, current, voltage and power.

Research Questions

The study was guided by the following research questions:

1. What are students' perspectives of Physics teachers' use of language in defining of the selected terms in Physics?
2. Is there a significant relationship between students' perspectives of teachers' use of language in defining selected terms?

MATERIALS AND METHODS

Venue

The study was carried out in public secondary schools in Vihiga District in Western Province of Kenya. Vihiga District lies between longitude 34º30`E and 35º0`E and between latitude 0º and 0º 15` N. The equator crosses near the southern tip of the district and it borders Sabatia District to the North, Hamisi District to the East, Emuhaya District to the West and Kisumu Municipality to the south. Vihiga District is one of the densely populated districts in Kenya with a population density of 997 people per square kilometer. Rampant poverty exists amidst high unemployment rates with per household income at approximately Ksh. 2000 per month (Republic of Kenya, 2001). The status of the society can improve significantly if people who go through public secondary schools (Majority of the students come from poor backgrounds) understand physics concepts to the level of applying them for self employment.

Research Design

The study was based on descriptive survey design. According to Shuttleworth (2008), surveys are concerned with describing, recording, analyzing and interpreting conditions that exists or existed. Borg and Gall (2007) defines descriptive survey as a systematic method for collection and analysis of data in order to answer questions or test hypotheses concerning the current status of a programme, project or activity

Population and Sample

The population was made up of all the 1460 Form three students of Physics in the 18 public secondary schools in Vihiga District of Kenya. Cluster sampling technique was employed in selection of six public secondary schools from which all the 524 Form Three students of Physics participated in the study.

Instruments for Data Collection

Instruments that were used to collect data included a questionnaire that was filled by Form Three Physics students together with students' focused group discussion guide. Physics students' questionnaire was used to collect students' opinions on classroom interaction and how Physics teachers use language in defining and explanation of selected technical words. The Physics students' questionnaire was developed by picking some items as they appear in the questionnaire used to establish if there is a girl-friendly approach to the teaching of science in Kenya (Oyoo, 2008). Some other items were picked and modified by changing the wording in order to enable the items fit in the context of the current study and answer to the research questions. Students were able to record their responses by making a mark to show how far they agreed with each of the suggestion that had been made on a five point scale that was provided on the questionnaire. Students focused group discussion guide was developed in order to enable the researcher give room for Physics students to explore their view points as had been indicated on the questionnaire. There was need for focused group discussions because they allow the researcher study people in a more natural setting and questions provided are discussed in an interactive group setting where students are free to talk with group members (Marshall and Gretchen, 1999).

Validity and reliability of instruments

In determining validity of the instruments, the researchers, some of whom are experts on the area of study scrutinized and modified each of the questions, until it could satisfactorily be an accurate measure of the desired construct and to cover each area of investigation adequately. This was guided by the objectives of the study. Although one of the instruments were developed from already published research (Oyoo, 2004), the instruments were still piloted to enable their evaluation and establish their reliability as follows; Reliability of the attitude scale was determined by administering the questionnaire twice at an interval of two weeks to a sample of fifty (50) form three students from two of the secondary schools in Vihiga District. The mean scores on students' opinion on each focused concept were determined separately after which the grand mean score for all the questionnaire items was obtained. The Pearson Product Moment Correlation Coefficient was used to measure the magnitude of the relationship of the grand mean scores and the resulting value was 0.84. This confirmed that the questionnaire was reliable enough to be used in the actual study. Reliability of the focused group discussion guide was established by administering the instruments in the two schools selected for piloting in a period of two weeks and it was established that there was consistency after counter checking responses. The schools picked for piloting of the questionnaire were not included on the sampling lists to avoid collection of pre- formed opinions.

Data Collection Procedure

Data was collected using students' questionnaire and focused group discussion guide as shown below: Each of the students

in the sampled schools was given a copy of the questionnaire, and after the researcher had introduced the preliminary information on the questionnaire and also emphasized the need of giving honest perspectives, each of the students was left to respond to the items independently under the supervision of the researcher. Student were given enough time to read each of the questionnaire items and tick the appropriate box indicating how far they agreed with each of the suggestions made on a five point scale. After administering of students questionnaires, random placement of students in groups of 15 was done and questions inquiring on their perspectives presented for discussion in an interactive group setting. After which one focused group was allowed to watch another focused group and discuss the observed interactions and conclusions about the concepts under investigation. The researchers were able to note the outcome of the discussions, note the number of students who were either correct or wrong basing on the researchers' judgments that were informed by the science view point in each of the cases, together with the number of students who gave correct ideas but justification of their ideas fell outside the science view points (others). Utterances made by students during the discussions were also noted down.

Methods of Data Analysis

Qualitative data was analyzed by searching through the data for key words and generating categories and themes that were to address the objectives of the study. Quantitative data was analyzed by use of percentages, means and t- statistics. The mean scores in the five point scale for each respondent were used to judge the student's perspective in terms of positive, negative or neutral. In the interpretation of the scores, a score of above 3 denoted a positive perspective while a score of below 3 depicted a negative perspective. A score of 3 denoted a neutral perspective.

RESULTS AND DISCUSSIONS

Students' perspectives of teacher' use of language in definition of the selected Physics terms as obtained from the five point attitude scale questionnaire are summarized in Table 1.

Table 1: Students' Perspectives of Teachers' Use of Language in Defining of Selected Physics Terms

Concept	Total score	Mean score	Perspective
Resistance	1983.8	3.786	Positive
Current	2056.2	3.924	Positive
Voltage	2094.4	3.997	Positive
Power	1932.0	3.687	Positive

Research question one: What are students' perspectives of Physics teachers' use of language in defining of the selected terms in Physics?

On students' perspectives on teachers' use of language in defining of resistance, Table 1 indicates that students had positive perspectives of a mean of 3.786 on the questionnaire items presented to them. This indicates that students are for the opinion that they should always be asked what they know about the concept resistance and they should be allowed to speak their mind freely in Physics lessons when the concept of resistance is being taught. Students are also for the opinion that teachers of Physics should accept students' ideas in defining resistance and hence guide them towards the science meaning and application. It was clear that students of Physics do wish that teachers give them an opportunity to be heard and discuss all they know about the concept of resistance alongside the science view point during the learning process rather than being treated as recipient of information. Table 2 indicates percentages of students whose arguments were either correct, wrong or a mixture of both correct and wrong scientific ideas (others) during discussions of students on resistance.

Table 2: Percentages of students in defining and discussing the contribution of resistance in a circuit

Item	Correct	Wrong	Others	Total
Definition of Resistance	66.79	1.91	31.30	100
Resistance of a wire slows current	8.02	82.06	9.92	100

From the focused group discussion, resistance was identified by students as one of the terms they find difficult to define. However, 66.79% of students were able to define the term correctly by bringing up the fact of opposition offered to flow of current by a conductor as indicated in Table2. 1.91% said that it is the ability to resist current so that the material does not explode which was wrong while 31.30% of the students defined resistance as opposition on current when electrons collides with impurities. On further discussion, 82.06% of the learners were for the opinion that resistance of a wire slows current while 8.02% said, "Resistance does not slow current, it just resists it". Students argued further that resistance reduces the voltage which contradicts their earlier definition of resistance. This is an indication of learners' inability to relate the concept of resistance to a circuit especially in discussing its impact and contribution. These findings are in agreement with research findings by William (2000) that words in electricity have several contradictory meanings, these meanings are incompatible and the contradictions confuse everyone. Even teachers, engineers and scientists have a hard time grasping the concepts. And as Aubusson, Harrison and Ritchie (2006) have observed, textbooks with their own sparse logic do not help teachers or students because students noted that textbooks just as the teacher talk has not assisted them much in understanding of resistance.

On students' perspectives of Physics teachers' use of language in defining of Current, students had positive perspectives of a mean of 3.924 as shown in Table 1 on the items presented on the questionnaire, hence implying that When defining current, teachers should carefully differentiate current and electrical energy bearing in mind that teachers' use of language contributes to how students understand the concept of current. Teachers should equally allow students to try out their own experiments on current as teachers endeavor to be as clear as possible in giving instructions where experiments concerning current are involved. Teachers should also incorporate in the lesson issues in the society involving the concept of current and students should be allowed to try out their own experiments on current. Table 3 indicates percentages of students whose arguments were either correct, wrong or a mixture of both correct and wrong scientific ideas (others) during the interactive sessions on current.

Table 3: Percentages of students in defining and discussing the contribution of current in a circuit

Item	Correct	Wrong	Others	Total
Definition of Current	84.35	15.65	00	100
Current cause a lamp to light	45.23	20.04	34.73	100

From the focused group discussions, students did not identify current as one of the difficult terms to define in electricity. Likewise, 84.35% of the students defined current as a flow of charges per unit time as shown in Table 3. In subsequent talk, students used the terms charges and electrons interchangeably, there is need therefore, for the two terms to be clarified by the teachers during the teaching and learning process. When students were asked to comment on a statement involving the role of current in a circuit, they appeared more undecided as 45.23% said that current causes a lamp to light because current produces the energy to light the bulb while 34.73% said that current has the voltage which makes the bulb to light hence contradicting their earlier definition of the term current. These could indicates that those students who gave the correct definition of current may have done so through rote learning hence unable to sustain a discussion on contributions of current in a given circuit. It could equally depict that teachers' talk did very little in convincing learners to understand the science meaning of the term current, one of the most difficult concepts for students to grasp because it is invisible and highly conceptual but at the same time all around them (Shipstone et al, 1998; Duit and Rhoneck, 2004). Of equal importance is that students' discussions were dominated by alternative framework about how current works and as (Baser, 2006), has noted unless this alternative framework are identified and confronted, there will be very little of replacing them with the scientific story. On students' perspectives of Physics teachers' use of language in defining of Voltage, students had positive perspectives of a mean of 3.997 as shown in Table 1 concerning the items about voltage that they were presented to on the questionnaire implying that when defining voltage, teachers should be very careful and clear with their language especially in differentiating voltage from potential difference, electromotive force and voltage drop. Teachers should also know that students come to class with some formed ideas about voltage and are for the opinion that they should be given an opportunity to present and even discuss their views with the teacher for clarity and better understanding. This view of students agrees with findings from research done by (Walsh, 2008), that teachers' ability to control their use of language is as important as their ability to select appropriate methodologies. This is more so in teaching of the concept of voltage. Table 4 indicates percentages of students whose arguments were either correct, wrong or a mixture of both correct and wrong scientific ideas (others) during the discussions on voltage.

Table 4: Percentages of students in defining and discussing the contribution of voltage in a circuit

Item	Correct	Wrong	Others	Total
Definition of voltage	43.89	32.82	23.29	100
Voltage causes a lamp to light	00	83.97	16.03	100
Voltage causes a motor to turn	00	41.41	58.59	100

Students were able to define Voltage during the focused group discussion as follows: 43.89% said that voltage is the Potential different across a circuit some of whom said that voltage is the product of current and resistance, 32.82% defined voltage as the amount of current flowing through a circuit and in some cases voltage was defined as amount of current released from the source which was wrong. On further discussion, it was revealed that students had no idea of whether it was voltage that causes a lamp to light or if voltage is responsible for a motor to turn. It was further observed that students used the terms voltage, potential difference, electromotive force, voltage drop and potential drop interchangeably. This is evidence of how confusing the concept of voltage can be to learners even after having been taught. And as Leach and Scott (2003) have suggested, teachers need to appreciate the learning demands of some area of the syllabus and as in this case, teachers through their use of language, should endeavor to meet the learning demands in teaching voltage and clearly differentiate voltage from associated terms.

On students' perspectives of Physics teachers' use of language in defining of power, Students had positive perspectives of a mean of 3.687 as shown in Table 1 on the questionnaire items on power. This therefore implies that students are for the opinion that they should be consulted on how the concept of power should be taught and teachers should find a way of talking to them in order for them to understand the difference between electrical power and electrical energy. Students would also like teachers to follow the textbook when defining power probably for fear of getting confused by contradictions that always occur between teachers' definition and textbook definition of power. Teachers therefore need to talk more with learners around learning activities concerning power and its application if meaningful learning is to take place. Table 5 indicates percentages of students whose arguments were either correct, wrong or a mixture of both correct and wrong scientific ideas (others) during discussions on power.

Table 5: Percentages of students in defining and discussing the contribution of power in a circuit

Item	Correct	Wrong	Others	Total
Definition of power	50	50	00	100
Power cause a wire to get warm	12.40	76.34	11.26	100

In the focused group discussion, learners mentioned the term power as easy to define. However, they were divided in their definitions of power as indicated in Table 5 as follows; it is the rate of flow of energy, it's the rate of doing work, rate of energy conservation, capacity to do work and even some said that power is the ability to do something grateful. This indicates that the scientific view point of the concept of power was still not plausible with learners. Students further cited the following reasons for giving such varied definition of power: First, that text books do give different definitions of power. This confirms Williams (2000) findings that text books lack discussion of common flaws and misconceptions, and noted further that books tell us about many concepts but never go into details about the possible conceptual pitfalls to avoid. Secondly, students noted that the definition of power has too many associated difficult terms, and what teachers say contradicts what they know about power. Thirdly, students said that they do not know situations in their environment where they can apply the concept of power hence the need to cram for purposes of passing the examination. This is evident that there exists a wide spread believe among students that

understanding concepts in electricity involve memorizing of the right answers and that the concept's networks are not important (Williams, 2000). Finally, students said that the definitions of power and energy are closely related and teachers do not give their exact definitions as it is in the textbooks. This indicates the need for teachers of Physics to talk with the students and endeavor to simplify the concept of power and the other associated terms to ease the contradictions among their students, who are deeply troubled when it comes to discussing the application of the concept of power as indicated by 76.34% of learners who had no idea if it was power that causes a wire to get warm and the motor to turn as shown in Table 5.

Research question two: Is there a significant relationship between students' perspectives of teachers' use of language in defining selected terms?

Comparison of mean scores of students' perspectives of teachers' use of language in defining selected terms was done by use of paired sample t-test and results summarized in Table 6.

Table 6: Paired sample t-test for significant relationship between students' perspectives of teachers' use of language in defining selected terms

Terms	Mean	t	Sig (2- tail)
Resistant - Current	-0.138	-5.856	.000
Resistant - Voltage	-0.213	-8.212	.000
Resistant - Power	0.098	3.950	.000
Current - Power	0.235	9.585	.000
Voltage - Power	0.311	13.321	.000
Current - Voltage	-0.075	-3.099	.002

$p<0.05$

Hypothesis 1: There is no significant relationship between students' perspectives of teachers' use of language in defining resistant and current. Table 6 shows that the t- statistic for the pair of terms resistance and current (-5.856) and its associated significance (<.000) is very small hence there is no difference in students' perspectives of teachers' use of language in defining resistant and current.

Hypothesis 2: There is no significant relationship between students' perspectives of teachers' use of language in defining resistant and voltage. The t- statistic, (-8.212) and its associated significance level (< .000) for the pair of terms resistance and voltage is small hence the probability of difference in students perspectives of teachers' use of language in defining of resistance and voltage is less than one time in a thousand to obtain a mean difference of -0.213 as indicated by Table 6. This leads to adaption of the null hypothesis that there is no significant relationship between students' perspectives of teachers' use of language in defining resistant and voltage.

Hypothesis 3: There is no significant relationship between students' perspectives of teachers' use of language in defining resistant and power. Table 6 shows that the t- statistic for the pair of terms resistance and power (3.950) and its associated significance (<.000) is small hence the researchers upheld the null hypothesis that there is no difference in students' perspectives of teachers' use of language in defining resistant and power.

Hypothesis 4: There is no significant relationship between students' perspectives of teachers' use of language in defining current and power. Similarly the null hypothesis was upheld because the value of the t- statistic (9.585) together with the associated significance (<.000) are small as shown in Table 6.

Hypothesis 5: There is no significant relationship between students' perspectives of teachers' use of language in defining voltage and power. Table 6 shows that the t- statistic for the pair of terms voltage and power (13.321) and its associated significance (<.000) is very small hence the adoption of the null hypothesis that there is no difference in students' perspectives of teachers' use of language in defining voltage and power.

Hypothesis 6: There is no significant relationship between students' perspectives of teachers' use of language in defining current and voltage. Table 6 shows that the t- statistic for the pair of terms current and voltage (-3.099) is small. Its associated significance (<.002) is less than $p<0.05$ which indicates that there is no statistically significant difference concerning students' perspectives of teachers' use of language in defining current and voltage, Hence the adoption of the null hypothesis. Findings from this study indicates that students' perspectives of teachers' use of language in defining of selected terms in electricity are similar hence a reflection of the general difficulty students experience with teachers' use of language in defining and discussing concepts in electricity. This is consistent with research done by Shipstone et al (1998) in which it was revealed that concepts in basic electricity are difficult to understand because even after instruction, students used the voltage concept as having approximately the same properties as the current and power concepts. And in learning of electricity, students usually are not willing to change their conceptions about concepts in electricity if their prediction is challenged even in just one experiment (Chinn and Brewer, 1993). Research has indicated further that the complicated mixture of incorrect argumentation by students in tasks such as the ones observed in electricity denote that instruction generally leads not to a well defined representation of terms. Often after instruction, elements of pre-instructional conceptions loosely connects to elements of concepts taught (Duit and Rhonek, 2004), hence the need for Physics teachers to use language in a manner that can enable students challenge their pre- instructional conceptions as suggested by students in the current research. In research done by Mulhall ,Mckittrick and Gunstone (2001), it was established that conceptual change involving alternative content sequencing had variable results especially in teaching for better student understanding of electrical concepts. Other researches done on perspectives of language use in understanding concept in electricity have established that there exist inadequacies in teacher understanding, and confusions in language use both by the teachers and in Physics textbooks (Gunstone, Mulhall and Mckittrick, 2009). A further confusion in the area of electricity was evident with surprising variation in perspectives of the interviewees that led to the conclusion that electricity was hard for students to learn (Gunstone, Mulhall and Mckittrick, 2009).

CONCLUSIONS AND IMPLICATIONS

Based on the findings of this study, the following conclusions were drawn:

- Students come to classrooms with a lot of information concerning the terms in electricity and therefore, they should be allowed to speak their mind freely in Physics lessons when the terms are being taught; Physics teachers should be very careful with their use of language as they lead learners to the science meaning and application of terms in electricity; Teachers should find a way of talking more to learners in order for them to understand terms in electricity and other associated terms; Teachers should be very careful and clear with their language especially in differentiating voltage from potential difference, electromotive force and voltage drop because teachers' talk do confuse students especially when the terms are used interchangeably.
- There is no significant relationship between students' perspectives of teachers' use of language in defining key terms in electricity.

Implications

The study findings imply that:

- Teachers need to be assisted through in service programs to learn ways of planning for their own lessons by sequencing learning activities, appropriate methodology and talk that will allow students' preconceptions on the terms in electricity to be elicited; Physics teacher should be sensitized further on the importance of talking carefully by using simple and clear language when teaching electricity, clarify what students hold concerning the terms in electricity and what the Physics textbooks present.
- Teacher training institution should train teachers on how to use language more carefully and appropriately in teaching specific areas of the secondary school syllabus that students experience general difficulty such as electricity.

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