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Learners' Interpretations of Non-technical Words Used in Physical Sciences: A Case Study of Two Schools in South Africa

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Abstract

This study explored the high school learners' interpretations of twenty non-technical words used in the classroom teaching and learning of physical sciences. This study was conducted in a classroom context where all the learners speak English as their second language however the medium of classroom instruction is English. Two Government-owned high schools in South Africa participated in this study with focus on the Grade 11 and 12 physical science learners. A validated questionnaire, which contains twenty Items, was administered in two schools with a purposeful sampling strategy employed on 75 students in the two schools. The administration of the questionnaire was followed by an interview conducted with the participant learners and their teachers. The learners' responses to the questionnaire were analyzed quantitatively using Rasch Statistical Analysis to measure person ability and item difficulty. The person reliability and item reliability as generated by the Rasch analysis were 0.70 and 0.91 respectively. The validity of the measures was also established with the statistical values between the acceptable range of +2/-2 for the persons and items. The findings of this study revealed that the participant learners encountered

difficulties in interpreting eight non-technical words correctly when used in the physical science context. The difficulties were observed to be as a result of the students' unfamiliarity with the usage and meanings of the words in physical science contexts; confusion between the meanings of non-technical words with similar spellings and pronunciations; and learners' inability to distinguish the meaning of a word from its opposite meaning. This study recommends that much more attention should be given to the Physical science teachers' instructional language in the classrooms.

Keywords: Non-technical words, technical words, foreign language, Learners' interpretations, South Africa.

Introduction

The contributions of science in any developing country like South Africa cannot be over-emphasized. Science acts as the catalyst in the technological development of a nation. In as much as this denotes the significance of empowering citizens with scientific understanding, education in this aspect stands as an essential product of schooling. One of the goals of science teaching and learning in schools is to empower the learners with knowledge rooted in explaining how natural phenomena affect living and non-living things from both physical and chemical perspectives (Jawahar & Dempster, 2013). In this line of thought, Henderson and Wellington (1998) stated that "*to develop understanding and interpretation, instructions need to be given using a variety of visual or aural support materials: drawings, diagrams and pictures as support for the spoken word*" (p. 37). Consequently, the process of classroom teaching and learning science involves using words, asking questions and making efforts to give explanations either verbally or symbolically. This shows the power of language and understanding of every word used in the classroom teaching and learning of science. While there has been a record of students' poor academic performance in both mathematics and physical science in South African schools (Spaull, 2013), the nature of the instructional language used in teaching these subjects has been reported to be one of the significant factors responsible for such poor performances (Mji & Makgato, 2006). So, teaching and learning of sciences become a complicated issue in multilingual classrooms like we

have in South Africa where learners need to learn science concepts and its language in a language that is entirely different from their home language (Msimanga & Lelliott, 2013). While in the South African context, quite a number of studies have investigated the role of language in the classroom teaching of mathematics and sciences, little is known about studies that focused on the students' understanding of non-technical words a component of science teachers' instructional language (Oyoo, 2012). Thus, as a strategy of addressing language related issues, this study examined learners' interpretations of non-technical words used in physical science and possible factors responsible for the difficulties learners encounter with the meanings of such words when used in the physical science contexts

This study is rooted in the conceptual understanding that the key for students to understand a particular subject is to understand its language. The acquisition of knowledge has been referred to one of the aims of teaching science in schools (Department of Basic Education, 2015). In this line of thought, Hsu and Roth (2014) argued that language is an integral part of science teaching and learning. This implies that both knowledge and language are inseparable components when it comes to science teaching and learning. This is further established in the argument by Postman and Weingartner (1971, p. 102) that:

> *All what we customarily call "knowledge" is language. Which means that the key to understanding a "subject" is to understand its language…what we call a subject is its language. A "discipline" is a way of knowing, and whatever is known is inseparable from the symbols (mostly words) in which the knowing is codified.*

The argument above implies that if science has been regarded as a body of knowledge then science is a kind of language on its own. In other words, this calls for students learning science as one learns a new language (Henderson & Wellington, 1998). That is, teachers are expected to assist students in learning science concepts as well its language. This rests on the empirical finding that beyond African to the rest of the world, the classroom language of instruction serves as a potent factor in enhancing students' conceptual understanding (Okebukola, 2012). Building on that, Oyoo (2007) examined the nature of science teachers'

instructional language since teachers are regarded as the foremost resource in students' learning. More so, there is awareness that in the science classrooms, about two third of the talk is the teacher's talk (Oyoo, 2012). The quality of teachers' talk hence influences students' understanding of the meanings of the words used in teaching. The instructional language used by teachers in explaining science concepts is realized to make up of the technical component and the non-technical component (Oyoo, 2007). The technical component comprises of the "words or terminologies specific to a science subject" (Oyoo, 2007, p. 232). Examples include the words: 'Force' and 'Acceleration' which are commonly used in Physics. The non-technical component represents the "science teachers' classroom language that may be referred to as the medium of classroom instruction or interaction as separate from the technical terms" (Oyoo, 2007, p. 233). The non-technical component is made up of the non-technical words, the meta-representational terms and the logical connectives (Oyoo, 2012). Each of the three stands as a part of the non-technical component. While the meta-representational terms include words like 'demonstrate', 'illustrate', the logical connectives like 'however', 'as a result' are commonly used in the oral or written discourses of science to link observation to inferences (Kim & Wai, 2007). Most importantly, the non-technical words are referred to as the words in context which "may be considered to constitute a language characteristic of school science" (Oyoo, 2012, p. 852). Examples of the non-technical words include 'prepare', 'sensitive', 'contract', 'spontaneous', 'negligible', 'valid', 'factors', 'convention' and so on. Each of these non-technical words has a specific meaning when used in the science context which may carry a different meaning when the same word is used in another context (e.g. everyday context). An example is the word 'sensitive' which when used in physics to describe the ability of a laboratory instrument (like a Galvanometer) to measure very small amount of current (Anyakoha, 2008), the same word in everyday context (or Biology) could be used with a human sexual organ which can contract diseases when not taken good care of. In line with this, Ali and Ismail (2006) referred to the non-technical words as the "*non-technical vocabulary with one or many meanings in everyday language but with a precise and sometimes different*

meaning in a science context" (p. 73). This calls for teachers taking special attention towards the use of these words in the science classrooms. In terms of understanding and appropriate use, Wellington and Osbourne (2001) argued that "many of the words of science are complete strangers to pupils. Often, students can answer questions in science without truly comprehending any of them" (p. 9). This emphasizes how important it is for teachers to be mindful of the use and ensure every word used is well explained to the students.

The learners' difficulties with the meanings of non-technical words and factors responsible for the difficulties have been previously studied by Gardner (1972), Cassels and Johnstone (1985) as reviewed in (Oyoo, 2007, 2009, 2012). Schoerning (2014) in her review of studies also found out that non-technical words in science are known to pose difficulties for students, even those who are fully literate in other forms of English. In support of that Oyoo (2012) found out that students encountered difficulties with everyday words common in science teachers' classroom language irrespective of whether they learn science using first language or not (linguistic circumstances) and whether they are females or males. This does not in any way rule out the need for South African science learners, who are English second language speakers, to first attain a good level of competence in English. With regards to the linguistic structures of science words, Tao (1994) reported that, the difficulty learners encounter is predominantly severe because the language of teaching science concepts makes use of a specialized vocabulary and contains syntactic structures which are more complicated than those in other subjects. This makes it an essential thing for students who learn science in a foreign language to first attain a level of competence in the language of instruction. Considering the students' familiarity with English words, Okebukola (2012) that learners have the tendency of understanding science better in the language in which they have greatest familiarity. Bravo and Garcia (2014) are of the view that to such learners, it is challenging in that most reading and writing in science texts are often in type that they are not familiar with. So, the learners' level of familiarity with English words used in Physical science teaching could be a problem in comprehensive learning. Likewise, Pickersgill and Lock (1991) in their study found out students' difficulties with non-technical

words were related to the student verbal reasoning. The authors noticed students at times chose the opposite meaning of a particularly non-technical word to that expected such that the correct interpretation of the word as used in the science context could not be found in the learners' expression and understanding. Tao (1994) as well as Oyoo (2012) also reported that students' difficulties with non-technical words were traceable to the similarity of words in pronunciation, spelling and other linguistic features and that words that look alike or sound alike do cause confusion for students. The difficulties arise when the meaning of a particular non-technical word a teacher uses while teaching is different from what the students interpret it to mean in their thinking due to the reasons highlighted in the quote above. That means science teachers have a significant role to play as Kim and Wai (2007) argued that "*what educators do, with the language, inadvertently affects how the learner uses the language and that is fundamental to the learning of science*" (p. 47). This implies that the extent to which educators understand the meaning, importance and usage of language in classrooms goes a long in determining the learners' basic conceptual understanding of science. Based on the role of language in science teaching and learning, the following research questions were formulated to guide this study: Do high school learners encounter difficulties with meanings of the non-technical words commonly used in Physical science? What factors are responsible for the difficulties learners encounter with the meanings of the non-technical words used in the physical science context?

Methodology

Based on the research questions guiding this study and the nature of the research problem, this study employed both quantitative and qualitative research methods. Combining the two research methods in this study provided the opportunity of drawing on the strengths of the two methods in collecting and analysing data and in integrating the findings in order to derive a meaningful conclusion (McMillan & Schumacher, 2010). Only two South African Government high schools were involved in this study with focus on the Grade 11 and 12 learners. The selection of the schools and learners were done with "purposeful sampling strategy" (McMillan & Schumacher, 2010:320). The schools were selected based

on their proximity, their functionality (that is they offer physical science and they have a teacher for this subject) and the time available for this study. The total number of learners from the two schools that participated in this research was 75 (that is, 39 students from school A and 36 students from school B). The learners were all boys and girls of black race and 18 years old and above. All the learners speak English as the second language. The official language of instruction in the two schools is English.

The two main research instruments used in this study were a questionnaire (investigation of meanings of everyday words used in the science context questionnaire) and an interview schedule. The instruments were both adopted from previous research studies (Oyoo, 2007, 2009, 2012) in which they have been piloted and validated. The previous studies in which the questionnaire was drafted also targeted high school learners' difficulties with non-technical words used in the classroom teaching and learning of science. The questionnaire, which consisted of twenty (20) multiple choice questions each containing one non-technical word, was used in this study to gather the participating learners' views on the meanings of non-technical words under investigation. To each of the questions (statements), there were four options A to D from which the participating students were expected to choose. The list of non-technical words used in the questionnaire is given in the Table 1 below.

Table 1: List of non-technical words used in the questionnaire

Non-technical words				
prepare	dehydrate	sensitive	characteristic	trace
fundamental	contract	valid	spontaneous	factors
concept	retard	convention	negligible	linear
effect	evacuate	estimate	Conserve	disintegrate

A sample of the questionnaire item containing the non-technical word 'prepare' is given as follows:

If you are asked to describe how to prepare oxygen, it means that you are to say

A. the substances it is made of C. what it is used for
B. how it behaves D. how it is made

Results

Learners' level of difficulties with non-technical words under investigation

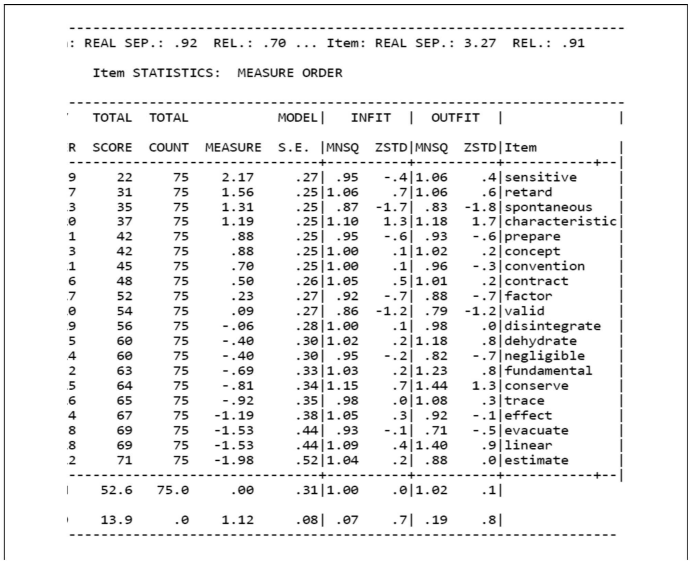
The learners' responses to the administered questionnaire were analysed quantitatively. The raw data was first analysed by estimating the learners' percentages of correct and wrong responses. Table 2 below gives the list of non-technical words and the percentages of correct and wrong responses of the learners per school.

Table 2: Raw data showing the learners' percentages of correct and wrong responses

	School A		School B	
Words	**%Correct Response**	**%Wrong Responses**	**%Correct Response**	**%Wrong Responses**
prepare	36.1	63.9	74.4	25.6
fundamental	77.8	22.2	89.7	10.3
concept	38.9	61.1	71.8	28.2
effect	86.1	13.9	92.3	7.7
Dehydrate	80.6	19.4	82.1	17.9
Contract	63.9	36.1	61.5	38.5
Retard	27.8	72.2	53.8	46.2
Evacuate	88.9	11.1	94.9	5.1
Sensitive	19.4	80.6	35.9	64.1
Factors	47.2	52.8	87.2	12.8
Valid	52.8	47.2	89.7	10.3
Convention	58.3	41.7	64.1	35.9
Estimate	94.4	5.6	94.9	5.1
Characteristic	44.4	55.6	53.8	46.2
Spontaneous	33.3	66.7	58.9	41.1
Negligible	75.0	25.0	89.7	10.3
Conserve	88.9	11.1	82.1	17.9
Trace	83.3	16.7	89.7	10.3
Linear	94.4	5.6	89.7	10.3
Disintegrate	66.7	33.3	79.5	20.5

As shown on Table 2 above, the learners' interpretations of twenty non-technical words used in the physical science context were investigated and reported. The report was done by calculating the learners' percentages of correct responses and wrong responses on each item in the questionnaire. Based on the percentages of correct and incorrect responses, the level of learners' difficulty, regarding the actual meaning of the non-technical words when used in the physical context, was determined. In determining the level of difficulty, the South African academic scale of achievement criteria for high schools was

employed (Department of Education, 2015). According to the scale, correct responses between the percentages of 0 and 39 were considered 'extremely difficult', percentages between 40 and 59 were considered 'very difficult', percentages between 60 and 69 were considered 'difficult' and percentages between 70 and 100 were considered 'not difficult'. In school A, the 'extremely difficult' words for the learners were *prepare, concept, retard, sensitive and spontaneous*; the words considered 'very difficult' were factors, valid and convention; the 'difficult' words included contract and disintegrate. In school B: the only 'extremely difficult' word was sensitive; the 'very difficult' words were retard, spontaneous and characteristic; the 'difficult' words were contract and convention. To establishing the credibility of the measures, the Rasch Model Analysis was employed in analysing the raw data obtained. The Rasch Model Analysis (RMA) converted the raw scores to linear measurements on an equal interval scale (Boone, Townsend, & Staver, 2011). This allows for estimating person ability and order of item difficulty with the determination of reliability and validity of the measures. The summary of the item measure if giving in the Figure 1 below:



: REAL SEP.: .92 REL.: .70 ... Item: REAL SEP.: 3.27 REL.: .91

Item STATISTICS: MEASURE ORDER

R	TOTAL SCORE	TOTAL COUNT	MEASURE	S.E.	MODEL| INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD	Item
9	22	75	2.17	.27	.95	-.4	1.06	.4	sensitive
7	31	75	1.56	.25	1.06	.7	1.06	.6	retard
3	35	75	1.31	.25	.87	-1.7	.83	-1.8	spontaneous
0	37	75	1.19	.25	1.10	1.3	1.18	1.7	characteristic
1	42	75	.88	.25	.95	-.6	.93	-.6	prepare
3	42	75	.88	.25	1.00	.1	1.02	.2	concept
1	45	75	.70	.25	1.00	.1	.96	-.3	convention
6	48	75	.50	.26	1.05	.5	1.01	.2	contract
7	52	75	.23	.27	.92	-.7	.88	-.7	factor
0	54	75	.09	.27	.86	-1.2	.79	-1.2	valid
9	56	75	-.06	.28	1.00	.1	.98	.0	disintegrate
5	60	75	-.40	.30	1.02	.2	1.18	.8	dehydrate
4	60	75	-.40	.30	.95	-.2	.82	-.7	negligible
2	63	75	-.69	.33	1.03	.2	1.23	.8	fundamental
5	64	75	-.81	.34	1.15	.7	1.44	1.3	conserve
6	65	75	-.92	.35	.98	.0	1.08	.3	trace
4	67	75	-1.19	.38	1.05	.3	.92	-.1	effect
8	69	75	-1.53	.44	.93	-.1	.71	-.5	evacuate
8	69	75	-1.53	.44	1.09	.4	1.40	.9	linear
2	71	75	-1.98	.52	1.04	.2	.88	.0	estimate
	52.6	75.0	.00	.31	1.00	.0	1.02	.1	
	13.9	.0	1.12	.08	.07	.7	.19	.8	

Figure 1: Item Measure – Rasch Analysis of the students' responses to the Questionnaire Items

As shown in the Figure 1 above, the non-technical word 'sensitive' with the highest rasch measure of 2.17 emerged as the most difficult item followed by 'retard', 'spontaneous', 'characteristic', 'prepare', 'concept', 'convention' and 'contract' in the decreasing order of difficulty. The participating learners could be seen to have difficulty mostly in the eight listed non-technical words with regards to the appropriate meanings of the words when used in the physical science context. The least difficult non-technical word as shown above was 'estimate' with Rasch measure of -1.98. It could also be seen from the above that the IN.ZSTD and OUT.ZSTD indices generated for the non-technical words all the non-technical words are within the range of -2; +2 confirming the validity of the measures. Also, the generated item reliability 0.91 as shown in the Figure above is higher than the acknowledged 0.7 for Cronbach's Alpha confirming acceptable internal consistency of the measurement. The person reliability of 0.70 as generated in this analysis is moderately higher than 0.5 and in the range of 0-1. This implied that there was an extent of items spread along the continuum and among persons with similar abilities. However, such a person reliability value indicates higher person abilities are needed in completing the questionnaire.

Factors Responsible for the Learners' Difficulties with Non-technical Words under Investigation

In addition to the quantitative measurement reported above, efforts were made in this study to investigate factors responsible for the learners' difficulty in interpreting appropriately the meaning of non-technical words when used in the physical science contexts. For this reason, an oral interview was conducted, audio-taped and transcribed. The participants were asked what they thought the right answer to the questions in the questionnaire should be, the reasons for their answers and if they have ever come across such words in the physical science context. The participants were interviewed on the eight words which emerged as the most difficult as discussed under the quantitative analysis above. The selected non-technical words as they appear in the questionnaire and excerpts of the interviews conducted with the learners are given as follows.

Case 1: The word 'sensitive' appeared in the questionnaire as

The beam balance is a very sensitive instrument.
This means that it ……
(A) can be used to weigh very small things
(B) can be used only by sensible people
(C) is hard to understand how it works
(D) gets spoilt very easily

As used in above physical context, the non-technical word 'sensitive' means that the beam balance 'can be used to weigh very small things' (option A). Investigating why the learners chose their options, the extract of the learners' responses during the interview are as follows:

A1: I think something is sensitive when it is very fragile, weak and soft. Option D is correct.
A2: Sir, it is sensitive because it is hard to understand how it works.
B1: Yah…. temperature too could be sensitive… (Other learners laugh)
B2: Option D because our life science teacher used it to describe female sexual organ that it is very sensitive and it can contract diseases.
Researcher: Have you ever come across the word in your Physical science lessons?
A1: Hmmm…(Laughed)……I don't think so
B2: It's common in life sciences.

As in the excerpt above, the learners who responded were given the pseudonyms A1, A2, B1, B2 instead of their real names in order to protect their identities. It could be deduced from the above responses that the learners did not understand the exact meaning of the word 'sensitive' as used in that context. The learners who responded seemed to have wrongly transferred the meaning of the word when used in everyday conversation and in other contexts (e.g. life sciences) into the physical science context. This conversation also seemed to imply that the learners were not familiar with the meaning of the word when used with a laboratory instrument in such a physical science context. Consequently, the two significant factors that could have been responsible for the learners' difficulties here include lack of understanding of the context in which the word was used and unfamiliarity with the usage of the word in the physical science context.

Case 2: The word 'retard' appeared in the questionnaire as:
The pupil was trying to find a chemical that would retard the reaction. This means the chemical would……
A. speed up the reaction B. make the reaction go the other way
C. slow down the reaction D. give maximum yield from the reaction

The word 'retard' as used with a chemical reaction means 'slow down the reaction' (option A). The extract from the participant learners' responses are given as follows:
A1: I would choose B
B1: Slow down the reaction, option C
Researcher: Why?
A1: Well, I think the reaction would go the opposite way just like people who are mentally retarded normally do things in opposite direction.
A2: Sir, option C is correct because somebody who is mentally retarded always slows down in action, so the reaction would be slow.
B1: (Kept Quiet)……. (Smiling)…….
B2: Yah.....Because any person that is mentally retarded will slow in doing things
Researcher: Have you ever come across the word in your lessons?
A4: I think retardation in physics
A5: Yah, in motion
B2: Emm....No

The above responses revealed that the learners transferred every day meaning of the word 'retard' as associated with a mentally retarded people into the physical science context. To the learners A, the word 'retard' was familiar as used in the science context but reverse was the case to the student B. To such a learner, unfamiliarity with the usage and meaning of the word could have been responsible for the difficulty.

Case 3: Theword 'spontaneous' appeared in the questionnaire as:
The two chemicals seemed to combine in a spontaneous reaction. This means the reaction
A. was very quick B. happened by itself
C. once started increased vigorously D. was explosive

The word 'spontaneous' as used in describing chemical reactions in the context refers to the type of chemical reaction that 'happens by itself' (option B) without any influence. The responses of the participant learners during the interview are as follows:

A1: The answer is A ('was very quick')
Researcher: Why?
A1: Because it's gonna happen by itself
B1: I think the word spontaneous means very quick
Research: When did you first come across the word?
A3: I think in Physical science
B1: Yah.....In Chemistry
R: Was it explained by the teacher?
A1: Laugh!!!.....
A5: Excuse me sir, I have a view, I would say once an exothermic reaction starts, it produces heat and increases vigorously, so i think C should be the right answer
B2: No.....
B3: Haa ..... (Smile)

The above responses showed that the non-technical word 'spontaneous' was familiar with the participant learners. However, the learners' conceptual understanding was noticed here to be inadequate. For instance, the learners A1 responded 'was very quick' as the answer because 'it would happen by itself'. To such a learner, the meaning of the word 'spontaneous' is 'very quick'. Indeed, there are spontaneous reactions that are quick (e.g. the combustion of hydrogen) and there are some that are slow (e.g. graphite turning into a diamond) (Raff, 2014). This understanding did not reflect in the learner's response.

Case 4: The word 'contract' appeared in the questionnaire as:
The experiment was to prove that the brass rod would contract when cooled. This means the rod would

A. change colour	B. become harder
C. become shorter	D. become longer

The word 'contract' as used in the context describes what happens to the length of a brass rod when it is cooled. That refers to a decrease in the length of the brass rod which implies that brass becomes shorter (option C) when it contracts.

Investigating the participant learners' opinions on other options, the extract of their responses are as follows:

B1: I don't really know, I just thought when something contracts like ice-block, it should become harder.
Researcher: In which subject do you mostly come across the word?
A3: In life Sciences
A4: I think in Business transactions ……. (Other learners laugh) …….
Research: In what context was it used?
A3: Like the heart and arteries…. (Paused) …. talking about relaxes and contracts
Researcher: Have you ever come across the word in your Physical science lessons?
A2: Not really….
A1: I'm not sure
B1: I can't remember

From the above, participant learners has the misunderstanding that brass rod is like water which when it solidifies turns into iced block and becomes harder. This could mean that the learner did not know what a brass rod is. So, lack of the conceptual understanding seemed to be the problem in the case of the student. Similarly, from the conversation above, the verb 'contract' was used with the noun 'contract' commonly used in business transactions. The learner confused the non-technical word 'contract' in a physical science context with the same word in another context (e.g. business tractions and life sciences) simply because the word looked alike in the different contexts. This was reported in the previous studies as a difficulty due to the "graphologically" similarity of words (Oyoo, 2012).

Summary

This study majorly focussed on the high school learners' understanding of non-technical words used in the classroom teaching and learning of

physical science. This was done with the purpose of determining whether the learners encounter difficulties with the meaning of the words when used in the physical science context and investigating possible factors responsible for the difficulties. The analysis revealed that the learners encountered difficulties mostly with the meaning of eight non-technical words which include '*sensitive*', '*retard*', '*spontaneous*', '*characteristic*', '*prepare*', '*concept*', '*convention*' and '*contract*'. The difficulty learners encountered with the meaning of non-technical words as discovered in this study supports previous research studies in this line. For instance, previous studies (e.g. Oyoo, 2007, 2009, 2012) indicated that learners encountered difficulties with everyday words commonly used in science classroom irrespective of whether they learn science using first language or not and whether they are females or males. Similarly, it has been reported that non-technical words in science are known to pose difficulties for students, even those who are fully literate in other forms of English (Tao, 1994). As revealed from the analysis of data collected in this study, the factors responsible for the learners' difficulties with non-technical words when used in the physical science context include: unfamiliarity with the usage and meanings of the words in the physical science contexts; inability to distinguish the meaning of a word from its opposite meaning; inadequate understanding of science concepts; and "graphologically" similarity of words. The learners' unfamiliarity with the usage and meanings of the words was noted as in the case of the non-technical word 'sensitive'. This was evident from the learners' responses like '*I don't think so*', '*it's common in life sciences'*, when they were asked if they have come across the word in the physical science contexts. As seen from the analysis in support of previous research findings, students often confused the meanings of non-technical words due to lack of required understanding (Oyoo, 2007) of the concept itself (e.g. the concept of chemical reactions). According the learner A5, the word 'spontaneous' was only associated with an exothermic reaction (in which heat is produced) whereas there are endothermic reactions like melting and vaporizing processes that are spontaneous at certain conditions (Silberberg, 2010). The difficulty might have resulted because the learners were not exposed to enough examples of reactions and processes in the related chemistry topics. Also, from the response of

the participant learner B2, the confusion could have been because the educator used the word but did not explain the meaning.

Conclusion

The findings from this study are of the implication that adequate attention should be giving to the use of words, particularly the non-technical words in the physical science classrooms. The teachers should be encouraged to adequately explain each words used in their teaching to enhance learners' correct understanding of the usage and meaning of the words in the appropriate contexts. The scope of this study was limited to only two schools and investigated the understanding of South African students who speak English as a second language. While the result of this study is consistent with previous findings, it cannot be generalized to the cases of learners who speak English as the first language although it has been argued that "In all the studies..... the trends in the difficulties encountered by students further did not depend on whether a student learns science in English as a first or second language" (Oyoo, 2012, p. 129). This suggests that further studies should examine students' understanding of non-technical words in the classrooms of larger classrooms of both English first language speakers and second language speakers.

Recommendations

- Adequate attention should be giving to the use of words, particularly the non-technical words in the physical science classrooms.
- The teachers should be encouraged to adequately explain each word used in their teaching to enhance learners' correct understanding of the usage and meaning of the words in the appropriate contexts.

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