How does authentic learning activities influence Grade 7 learners' attitude towards Natural Science in two educational regions in Namibia?

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Abstract
Teaching and learning Natural Science for conceptual understanding requires appropriate and effective teaching approaches and inquiry-based learning activities. This study therefore investigated how authentic learning activities influenced Grade 7 learners' attitude towards Natural Science in the Khomas and Omusati educational regions in Namibia. The study used a quantitative research approach with a population size of 716 Grade 7 classes comprising of 180 classes (5 400 learners) in the Khomas region and 536 (16 080 learners) in the Omusati region. Schools and learners were randomly selected. Data were analysed using SPSS. The STAQ-R was given to learners to establish whether authentic learning activities influenced their attitude towards Natural Science. Respondents indicated that the self-directed effort factor among others, attracted them to Natural Science and positively influenced their attitude towards the subject. Learners appreciated the use of authentic learning activities as the activities helped them to understand concepts of science better since they could easily remember what was taught. Based on these findings, it was concluded that the use of authentic learning activities in schools could positively influence learners' attitude towards the Natural Sciences subjects. Hence, the study recommended that curriculum developers in the Ministry of Education, Arts and Culture should incorporate more fun and enjoyable activities in the national curriculum, the syllabus as well as other teaching and learning support materials where the use of authentic learning activities is required.

Keywords: *Natural Science, authentic learning activities, Grade 7 learners, learners' attitudes*

Background

Teaching and learning Natural Science for conceptual understanding require appropriate and effective teaching approaches and inquiry-based learning activities (Ilter & Kilic, 2015). However, not all teachers are able to teach Natural Science using suitable and effective teaching and learning activities. Therefore, the problem of teaching and learning Natural Science for deeper understanding is not only found in Namibian schools but also in other African and Western countries such as South Africa and Turkey, among others (Azri & Al-Rashdi, 2014; Shumba et al., 2012; Ultanir, 2012). In most countries, it is a concern that many teachers seem to teach Natural Science using the syllabus and a textbook only rather than including authentic learning activities in their teaching (Ates & Eryilmaz, 2011). According to Oguz (2008), authentic learning activities promote learners' attitude to learn science.

Some studies done in Namibia (Nakanyala, 2015; Nghipandulwa, 2011) indicate that teachers concentrated on teaching rules than employing innovative strategies and activities in teaching and learning science content. Amoonga and Kasanda (2011), Awe (2007) and Uugwanga (2015) also found that teachers in Namibian schools prefer to use the lecture method, which is teacher-centred. A teacher-centred method is not only used by many Namibian teachers, but is also used globally (Thompson-Krug, 2014; Safdar et al., 2012). Although, Awe (2007) argued that the lecture method contributes to better performance in examinations, learners are not fully equipped with varieties of opportunities that enable them to acquire scientific skills. Therefore, there is need to practice other constructive approaches such as authentic learning activities in teaching and learning concepts of science in order to foster learners' scientific skills and understanding.

Thompson-Krug (2014) conducted a study on the effects of authentic learning experiences on learners' perceptions of science in Nebraska (USA) and found that authentic learning activities can improve learners' attitude towards learning regardless of subject; impact learners' interest in science more than traditional textbook teaching; improve learners' academic achievements; and

encourage teachers to adopt effective teaching methods (p. 251), just to mention but a few. Based on the above-mentioned benefits, authentic learning activities are also regarded as the most constructive teaching and learning activities in developed and developing countries such as Finland (Hyvonen, 2011) and South Africa (Titus, 2013). It is therefore obvious that authentic learning activities have many positive effects on learners and teachers, as these activities foster meaningful learning instead of rote learning (Uugwanga, 2015).

Statement of the problem

The National Standardised Achievement Tests (SATs) results of Grade 7 Natural Science in Namibia have shown that learners scored under the basic achievement category over the past few years (Ministry of Education, Arts and Culture, 2018). At a regional level, Omusati region was one of the regions that had been performing below 60% while the Khomas region had performed above 60% in Natural Science (Ministry of Education, Arts and Culture, 2018). In 2018, Omusati region scored 53% whilst Khomas region only scored 60% (Ministry of Education, Arts and Culture, 2018). It is presumed that the learners' unsatisfactory performance in Natural Science is caused by lack of meaningful teaching and learning activities (United Nations Educational, Scientific and Cultural Organisation, 2015) as well as by the learners' attitude who might not have had interest in the subject (Ivowi, 2001). This study therefore investigated how authentic learning activities influenced Grade 7 learners' attitude towards Natural Science in the Khomas and Omusati educational regions in Namibia. The following research question was used:

Does authentic learning activities influence Grade 7 learners' attitude towards Natural Science in the Khomas and Omusati educational regions?

The following hypothesis was also tested:

H_o: The authentic learning activities have no influence on the Grade 7 learners' attitude towards Natural Science after exposing them to authentic learning activities. **H_1:** The authentic learning activities have influence on the Grade 7 learners' attitude towards Natural Science after exposing them to authentic learning activities.

Literature review

Making use of authentic learning activities in science classes enables learners to think deeply as they are allowed to create meaning and construct knowledge within their mind (Pearce, 2016). With authentic learning activities, learners are expected to connect the real meaning of the objects used in the science class during the lesson presentation with what they mostly see in the real world (Pearce, 2016). In tune with the constructivist theory, the use of authentic learning activities allows learners to be active in their learning and provide them with higher order thinking skills (Oguz, 2008) that enable them to positively change their attitude towards their learning. Moreover, use of authentic activities also allows teachers to plan their teaching activities more effectively and positively (Luo et al., 2017). Authentic work should equip learners with essential life skills and provide them with abilities to fully engage in their own learning that require them to solve real-life problems beyond the school (Du & Han, 2016; Iucua & Marina, 2014; Kuuskorpi, 2014). The teaching of Natural Science as a subject also requires practical work unlike the teaching of social and/or language subjects. According to Koller et al. (2015), practical work refers to "any type of science teaching and learning activity in which learners, work either individually or in small groups, are involved in manipulating and/or observing real objects and materials as opposed to virtual objects and materials as those obtained from digital video disc, a computer simulation, or even from a text-based account" (p. 87). It is quite interesting to note that learners can be involved in observing real objects which are authentic. Therefore, it is important to teach Natural Science in an authentic learning environment that draws and maintains learners' attention.

In order to prepare learners for the real world, teachers need to teach learners to understand the real meaning of the universe in an authentic science classroom. In an authentic Natural Science classroom, learners should fully participate and engage in meaningful activities that interact with their own environment and that of the outside world (Christmas, 2014). Learners should use learning materials that stimulate their conceptual understanding and relate to their own real-life experiences (Herrington & Herrington, 2008; Kovač & Kovač, 2011). According to Rafi (2015), learners fully participate in their learning activities, monitor

their learning progress and take responsibility for their own learning with the assistance of their teachers as facilitators. That means, during the learning process, Natural Science learners should engage in hands-on activities that encourage them to think critically and solve real-world problems logically.

The notion of teaching Natural Science to enable learners cope with 21st century technologies is supported by Neo et al. (2012) who state that "moving into 21st century teaching, more relevant, authentic and applied teaching and learning strategies need to be incorporated into learning environments to innovate the learner learning process" (p. 50). Therefore, teaching and learning Natural Science for the 21st century requires learners to learn by doing Natural Science rather than listening to the teacher lecturing about Natural Science. According to Lombardi (2007, p. 1) "learning-by-doing is generally considered as the most effective way to learn". By moving towards authentic learning, teachers need to acquire skills on how to manage teaching and learning resources and control the Natural Science classroom. Since the 21st century is a technology-based era, Natural Science teachers should therefore link their pedagogies with learners' needs through technologies in order to "construct more interactive, engaging and learner-centred environments that promote the 21st century skills and encourage self-directed learning" (Parker et al., 2013, p. 227).

According to Parker et al. (2013), the use of real-world activities supported by latest technologies is likely to change the learners' attitude towards Natural Science as they learn better and improve the quality of education for the 21st century. Importantly, teaching science concepts authentically improves learners' understanding of a subject matter, and develop learners' positive attitude towards learning Natural Science (Lacap, 2015; Newell et al., 2015). Similarly, teaching science concepts for authentic learning boosts learners' feelings and confidence as they work in groups; and it's through group discussions that learners are able to clarify and understand the science concepts and help each other in the learning process (Altun, 2015; Mehta & Kulshrestha, 2014). This means that teaching science concepts for authentic learning, enables learners to take responsibility for their own learning by solving real-world problems and making right decisions.

Theoretical framework

The theoretical framework that underpinned this study is attributed to the theory of Berger and Luckmann's (1966) and Wittgenstein's (1956) Social Constructivist Epistemology Theory (SCET). The term constructivist epistemology was used first by Piaget in 1967 (Mutekwe et al., 2013). The SCET theory focuses on the learning of knowledge-based meaning and understanding of reality (Andrews, 2012; Mutekwe et al., 2013). The Social Constructivist Epistemology Theory is filtered through the researcher's lens in relation to the teaching and learning of Natural Science using authentic learning activities in science classrooms. The SCET emphasises the significance of how learners construct knowledge to understand and view the real world outside the science classrooms (Shumba et al., 2012). The theory stresses the importance of learners' thinking and focuses more on learning and creating meaning than the teaching and presentation of information (Andrews, 2012). According to Shumba et al. (2012), SCET is about how "knowledge is constructed in the mind of the learners" (p. 14).

The core expression of SCET is that teaching learners using authentic learning activities, enables them to construct and understand the real meaning of new information and concepts of science presented to them (Mutekwe et al., 2013; Shumba et al., 2012). It is important to mention that social constructivism emphasises that learners should actively participate in the authentic teaching and learning process and play an active role than their teachers. Therefore, in teaching Natural Science, learners are expected to actively participate in the lessons only when authentic learning activities are used. In fact, social constructivism focuses on three aspects, namely: learn, knowledge and reality (Galbin, 2014; Mogashoa, 2014). This implies that in authentic science classrooms, learners are encouraged to actively participate in learning of science concepts in order to acquire and construct knowledge in their mind as they learn. Thereafter, learners would be able to transform and apply the learnt knowledge into reality beyond science classrooms.

Methodology

The quantitative research approach was used to collect numerical data from learners. The targeted population of this study consisted of 716 Grade 7 classes, comprising 180 classes (5 400 learners) in the Khomas region and 536

classes (16 080 learners) in the Omusati region. Hence, a total of 21 480 learners from the public senior primary schools offering Natural Science. For numerical data collection, a questionnaire [The Simpson Troost Attitude Questionnaire-Revised (STAQ-R)] was used to find out whether authentic learning activities had any influence on learners' attitudes toward Natural Science. The questionnaire was analysed using the Statistical Package for Social Sciences (SPSS) (Version 25), in which a Chi-square test and exploratory factor analysis were run.

The Chi-square was used to analyse the STAQ-R's data to count the frequency (%) of learners' responses per statement regarding their attitude towards Natural Science after being taught on the topic of "electricity" using authentic learning activities. In other words, a Chi-square test was only used to count how many learners responded to each statement on a five-point Likert Scale and not necessary to find out or test if there was a significance difference or there was no significant difference among the tested statements in the learners' responses in the four schools. The exploratory factor analysis was used to cluster the similar variables/items that were measuring learners' attitude into one factor. Permission to collect data was sought through the Executive Director of the Ministry of Education, Arts and Culture as well as through the Regional Directors, school principals and parents. Ethical clearance for carrying out this study was obtained from the University of Namibia Ethical Committee prior to the collection of data.

Findings

Results from the Simpson Troost Attitude Questionnaire-Revised (STAQ-R)

The STAQ-R instrument comprised 50 multiple choice items and was administered to 124 learners (69 males and 55 females) to assess their views on whether authentic activities influenced their attitude towards Natural Science learning. Each item was a five-point Likert Scale namely: 1 = Strongly Disagree, 2 = Agree, 3 = Undecided/Uncertain, 4 = Disagree and 5 = Strongly Agree. The STAQ-R was used to test the following hypothesis:

H_0: The authentic learning activities have no influence on the Grade 7 learners' attitude towards Natural Science after exposing them to authentic learning activities. **H_1:** The authentic learning activities have influence on the Grade 7 learners' attitude towards Natural Science after exposing them to authentic learning activities.

Learners' responses towards Natural Science

Learners' frequency responses on various items that assessed their attitude towards Natural Science were presented separately but, in the interpretations, the 'Strongly Agree' and 'Agree' were combined; the same was done for the 'Disagree' and 'Strongly Disagree' responses to provide the extent of agreement or disagreement with each statement.

Table 1: Learners' responses towards Natural Science on self-directed efforts items

Statement	Respondents (N = 124) (Frequency) %					Total
	SA	A	UN	D	SD	
I really like science.	(63) 50.8	(34) 27.4	(15) 12.1	(3) 2.4	(8) 6.5	(123) 99.2
I always try hard in science, no matter how difficult the work is.	(73) 58.9	(19) 15.3	(17) 13.7	(6) 4.8	(6) 4.8	(121) 97.5
I enjoy science.	(66) 53.2	(34) 27.4	(12) 9.7	(7) 5.6	(3) 2.4	(122) 98.3
I am confident that I can understand science.	(62) 50.0	(28) 22.6	(13) 10.5	(6) 4.8	(13) 10.5	(122) 98.4
I like to learn more about science.	(80) 64.5	(34) 27.4	(3) 2.4	(3) 2.4	(3) 2.4	(123) 99.1
We live in a better world because of science.	(59) 47.6	(25) 20.2	(25) 20.2	(1) 0.8	(10) 8.1	(120) 96.9
I look forward to science activities in class.	(53) 42.7	(43) 34.7	(17) 13.7	(4) 3.2	(4) 3.2	(121) 97.5

I have good feelings towards science.	(52) 41.9	(39) 31.5	(20) 16.1	(6) 4.8	(6) 4.8	(123) 99.1
Most of my friends do well in science.	(56) 45.2	(30) 24.2	(19) 15.3	(7) 5.6	(5) 4.0	(117) 94.3
When I fail that makes me try much harder.	(72) 58.1	(31) 25.0	(9) 7.3	(4) 3.2	(6) 4.8	(122) 98.4
My best friend in this class likes science.	(42) 33.9	(42) 33.9	(24) 19.4	(6) 4.8	(6) 4.8	(120) 96.8
If I work hard enough, I can learn difficult science concepts.	(51) 41.1	(32) 25.8	(20) 16.1	(7) 5.6	(11) 8.9	(121) 97.5
I will continue studying science after I leave school.	(47) 37.9	(27) 21.8	(26) 21.0	(11) 8.9	(8) 6.5	(119) 96.1
My brothers and sisters like science.	(36) 29.0	(35) 28.2	(27) 21.8	(16) 12.9	(8) 6.5	(122) 98.4
Science will help me to understand the world around me.	(65) 52.4	(30) 24.2	(9) 7.3	(8) 6.5	(9) 7.3	(121) 97.7
We learn about important things in science class.	(88) 71.0	(25) 20.2	(4) 3.2	(1) 0.8	(5) 4.0	(123) 99.2
I really enjoy science lessons.	(67) 54.0	(35) 28.2	(12) 9.7	(3) 2.4	(3) 2.4	(120) 96.7
My mother likes science.	(24) 19.4	(32) 25.8	(41) 33.1	(15) 12.1	(10) 8.1	(122) 98.5
My family encourages my interest in science.	(35) 28.2	(38) 30.6	(26) 21.0	(14) 11.3	(8) 6.5	(121) 97.6
We do a lot of activities in science class.	(44) 35.5	(49) 39.5	(15) 12.1	(10) 8.1	(5) 4.0	(123) 99.2
I like to watch TV programs about science.	(51) 41.1	(23) 18.5	(20) 16.1	(14) 11.3	(15) 12.1	(123) 99.1
My science teacher makes good plans for us.	(51) 41.1	(42) 33.9	(13) 10.5	(10) 8.1	(5) 4.0	(121) 97.6
My friends like science.	(39) 31.5	(34) 27.4	(31) 25.0	(7) 5.6	(12) 9.7	(123) 99.2
Science is easy for me.	(62) 50.0	(29) 23.4	(21) 16.9	(8) 6.5	(3) 2.4	(123) 99.2

The results in Table 1 point out that more than 80% of the learners strongly agreed that they enjoyed science, liked to learn more about science (91.9%), when they failed that made them try much harder (83.1%), they learned about important things in science class (91.2%) and they really enjoyed science lessons (82.2%). It seems that most of the learners really enjoyed science itself and its lessons. They also agreed that science was easy for them (73.4%) and they really liked science (78.2%). Science was not only easy for the learners because they liked it, but they also agreed that they had good feelings towards science (73.4%), confident that they understood science (72.6%) and always tried hard in science no matter how difficult the work was (74.2%). These learners were self-driven and motivated towards Natural Science. However, only two statements on self-directed efforts had more than 20% of the learners disagreeing with the statements. Hence, 20.1% of the learners disagreed that their mothers liked science and 23.4% of the learners disagreed that they liked to watch TV programs about science. Despite that 45.2% of the learners agreed that their mothers liked science, 33.1% of the learners were uncertain to the same statement. The statements: "I like to learn more about science", "we learn about important things in science class" and "I really enjoy science lessons" had 4.8%, the lowest percentage of the learners who disagreed and with more than 82% of the learners who agreed to the same statements.

Table 2: Learners' responses towards Natural Science on anxiety about science items

Statement	Respondents (N = 124) (Frequency) %					Total
	SA	A	UN	D	SD	
If I could choose, I would not take any more science in school.	(13) 10.5	(13) 10.5	(27) 21.8	(20) 16.1	(46) 37.1	(119) 96.0
Science lessons are a waste of time.	(10) 8.1	(8) 6.5	(18) 14.5	(9) 7.3	(76) 61.3	(121) 97.7
I cannot understand science even if I try hard.	(15) 12.1	(12) 9.7	(17) 13.7	(25) 20.2	(53) 42.7	(122) 98.4
My family watches science programs on TV.	(37) 29.8	(23) 18.5	(24) 19.4	(15) 12.1	(25) 20.2	(124) 100.0
I do not like science.	(16) 12.9	(5) 4.0	(16) 12.9	(13) 10.5	(73) 58.9	(123) 99.2
A job as a scientist would be boring.	(14) 11.3	(20) 16.1	(30) 24.2	(20) 16.1	(39) 31.5	(123) 99.2
Learning science is not important for my future success.	(17) 13.7	(8) 6.5	(17) 13.7	(30) 24.2	(51) 41.1	(123) 99.2
Teachers encourage me to understand concepts in science classes.	(59) 47.6	(32) 25.8	(15) 12.1	(9) 7.3	(6) 4.8	(121) 97.6

Learning Natural Science should be an exciting experience for some learners and a cause of anxiety for others. Table 2 shows that over 20% (21.8%) of the learners agreed that if they could choose, they would not take any more science in school because they did not understand science even if they tried hard. However, 53.2% and 62.9% of the learners strongly disagreed with the statements respectively. On the other hand, 68.6% of the learners disagreed with the statement that "science lessons are a waste of time". They (47.6%) also disagreed with the statement that "a job as a scientist would be boring". Seventeen (16.9%) of the learners agreed that they did not like science, 12.9% were not sure and 69.4% agreed with the statement. In addition, the results show that 73.4% of the learners strongly agreed that teachers encouraged them to understand concepts in science classes while 12.1% of the learners disagreed and were uncertain with the statement. Even though, 12.1% of the learners were not sure whether teachers were encouraging them to understand concepts in science classes, science teachers are urged to encourage their learners to overcome anxiety and negative perceptions about Natural Science. According to Wrobbel (2004), science teachers should prepare authentic instructions that encourage learners to engage in substantive conversation where they can exchange their views openly with teachers and other learners about the subject matter and science teachers should create authentic learning environments that encourage learners to think critically, reason scientifically and explore the real-world independently (Lau, 2011).

Table 3: Learners' responses towards Natural Science on career awareness items

Statement	Respondents (N = 124) (Frequency) %					Total
	SA	A	UN	D	SD	
I will become a scientist in future.	(37) 29.8	(19) 15.3	(44) 35.5	(14) 11.3	(10) 8.1	(124) 100.0
I will study science if I get into a university.	(47) 37.9	(29) 23.4	(31) 25.0	(8) 6.5	(9) 7.3	(124) 100.1
I am sure I can do well in science.	(75) 60.5	(23) 18.5	(12) 9.7	(6) 4.8	(3) 2.4	(119) 95.9
Science is one of the most interesting school subjects.	(64)	(24)	(18)	(7)	(9)	(122)

	51.6	19.4	14.5	5.6	7.3	98.4
Science classes will help prepare me for university.	(53) 42.7	(37) 29.8	(21) 16.9	(3) 2.4	(8) 6.5	(122) 98.3

Learners should be aware of their future careers at an early age. The results in Table 3 indicate that 45.1% of the learners agreed that they would become scientists in the future compared to 19.4% who disagreed while 35.5% were not sure. Even though, some learners did not want to become scientists in the future, 37.9% of the learners agreed that they would study science if they got to the university while 13.8% disagreed. Despite learners' choices about their future studies, 79% of the learners strongly agreed to the statements that "I am sure I can do well in science"; "science is one of the most interesting school subjects" (71.0%) and "science classes will help prepare me for university" (72.5%). On the other hand, 9.7% of the learners were uncertain about their own science learning capabilities, while 16.9% of the learners were not sure whether science classes would help them prepare for university education. Close to 13% (12.9%) of the learners disagreed with the statement that science was one of the most interesting school subjects. It seems that many learners were aware about their future careers as 45.1% of them wanted to become scientists. When learners are aware of their scientific future careers at an early stage of their education, it is likely to influence their attitude positively towards science and might result in better achievements in the subject.

Table 4: Learners' responses towards Natural Science on motivating classroom items

Statement	Respondents (N = 124) (Frequency) %					Total
	SA	A	UN	D	SD	
I usually give up when I do not understand a science concept.	(16) 12.9	(19) 15.3	(23) 18.5	(22) 17.7	(44) 35.5	(124) 99.9
Our science classroom contains a lot of interesting equipment.	(44) 35.5	(37) 29.8	(10) 8.1	(20) 16.1	(11) 8.9	(122) 98.4
My best friend likes science.	(47) 37.9	(26) 21.0	(31) 25.0	(6) 4.8	(10) 8.1	(120) 96.8

Table 4 shows that only 28.2% of the learners agreed to the statement that "I usually give up when I do not understand a science concept" as compared to 53.2% of the learners who disagreed. More than sixty-five (65.3%) of the learners agreed that their science classrooms had a lot of interesting equipment and 25.0% of the learners disagreed and 8.1% of the learners were not sure about their classrooms' environment. More than 58.5% of the learners agreed to the statement that "my best friend likes science" while 12.9% of the learners disagreed and 25.0% were undecided. Learners' responses to the statements on motivating classrooms seemed to indicate that the majority of the learners had positive attitude towards Natural Science because their science classrooms contained a lot of interesting equipment. The interesting science equipment seems to attract and motivate learners to like science subjects and not to give up when they did not understand the science concepts.

Table 5: Learners' responses towards Natural Science on the relevance of science items

Statement	Respondents (N = 124) (Frequency) %					Total
	SA	A	UN	D	SD	
I will miss studying science when I leave school.	(49) 39.5	(30) 24.2	(12) 9.7	(16) 12.9	(16) 12.9	(123) 99.2
Science is useful in solving everyday life problems.	(52) 41.9	(24) 19.4	(25) 20.2	(15) 12.1	(7) 5.6	(123) 99.2

My father likes science.	(30) 24.2	(24) 19.4	(44) 35.5	(13) 10.5	(9) 7.3	(120) 96.9

The results (Table 5) revealed that 63.7% of the learners strongly agreed that they would miss studying science when they left school. Whereas 25.8% of the learners strongly disagreed and 9.7% of these learners, showed that they were uncertain. Furthermore, 61.3% of the learners agreed that science was useful in solving everyday life problems while 17.7% of the learners disagreed. However, 43.6% of the learners agreed that their fathers liked science while 35.5% of the learners were not sure. Generally, learners agreed with the statements about the relevance of science. This means that learners had a positive attitude towards Natural Science as a subject and that they would miss science when they left school and viewed science as a relevant subject in solving everyday life's problems. Furthermore, the results show that 57.3% of the learners agreed that they would enjoy working in a science-related career and 34.6% agreed that scientists did not have time for fun.

Table 6: Learners' responses towards Natural Science on value of efforts items

Statement	Respondents (N = 124)					
	(Frequency) %					Total
	SA	A	UN	D	SD	
I always try to do my best in school.	(87) 70.2	(20) 16.1	(7) 5.6	(2) 1.6	(5) 4.0	(121) 97.5
My science teacher is very good.	(79) 63.7	(26) 21.0	(6) 4.8	(2) 1.6	(10) 8.1	(123) 99.2
I consider our science classroom attractive and comfortable.	(27) 21.8	(40) 32.3	(27) 21.8	(15) 12.1	(14) 11.3	(123) 99.3
I will not pursue a science-related career in the future.	(11) 8.9	(21) 16.9	(33) 26.6	(25) 20.2	(30) 24.2	(120) 96.8

The results (Table 6) show that learners strongly agreed that they always tried to do their best in school and their science teachers were very good in teaching Natural Science with 86.3% and 84.7% respectively. Moreover, 54.1% of the learners agreed to the statement that they considered their science classrooms attractive and comfortable; while only 25.8% of the learners agreed that they would not pursue a science-related career in the future. Even though 84.7% of the learners strongly agreed that their science teachers were very good, 21.8% of the learners were not sure whether they considered their science classrooms attractive and comfortable while 24.2% of the learners disagreed that they would not pursue a science-related career in the future. In general, the learners were optimistic to all the statements.

Results from exploratory factor analysis

According to Gay et al. (2011) factor analysis "is a statistical procedure used to identify relations among variables in a correlation matrix and to determine how variables group together based on what they may have in common" (p. 368). Gay et al. (2011) further state that factor analysis is "commonly used to reduce a large number of responses or questions to a few more meaningful groupings known as factors" (p. 368). Table 7 shows seven key factors that were extracted after varimax rotation. The varimax rotation is a commonly useful orthogonal rotation method in factor analysis that clusters the variables (Example: I will become a scientist in future) into groups (Example: career awareness) and the group becomes a factor (Yong & Pearce, 2013). The seven factors were incorporated in the study to align with the 50 items which measured learners' attitude towards Natural Science. That is, the items that commonly measured learners' attitude were clustered into one factor.

Table 7: Factor extracted after varimax rotation with items revealed and each of their factor loadings

Factors and % of Variance	Item Number	Item	Load Factor
Self-directed Efforts 15.70%	39	I really like science.	.68
	43	I always try hard in science, no matter how difficult the work is.	.61
	11	I enjoy science.	.60
	38	I am confident that I can understand science.	.58
	30	I like to learn more about science.	.56
	40	We live in a better world because of science.	.53
	26	I look forward to science activities in class.	.52
	27	I have good feelings towards science.	.51
	37	Most of my friends do well in science.	.51
	25	When I fail that makes me try much harder.	49
	35	My best friend in this class likes science.	.49
	47	If I work hard enough, I can learn difficult science concepts.	.48
	34	I will continue studying science after I leave school.	.47
	41	My brothers and sisters like science.	.47
	46	Science will help me to understand the world around me.	.46
	05	We learn about important things in science class.	.45
	32	I really enjoy science lessons.	.44
	31	My mother likes science.	.43
	36	My family encourages my interest in science.	.43
	15	We do a lot of activities in science class.	.41
	20	I like to watch TV programs about science.	.37
	21	My science teacher makes good plans for us.	.36
	03	My friends like science.	.36
	14	Science is easy for me.	.31
Anxiety about Science 6.70%	45	If I could choose, I would not take any more science in school.	.60
	48	Science lessons are a waste of time.	.55
	22	I cannot understand science even if I try hard.	.51
	29	My family watches science programs on TV.	.46
	50	I do not like science.	.46
	28	A job as a scientist would be boring.	.45
	02	Learning science is not important for my future success.	.38
	10	Teachers encourage me to understand concepts in science classes.	.32
Career Awareness 5.05%	01	I will become a scientist in future.	.57
	04	I will study science if I get into a university.	.52
	23	I am sure I can do well in science.	.45
	08	Science is one of the most interesting school subjects.	.42
	12	Science classes will help prepare me for university.	.38
Motivating Classroom 4.60%	06	I usually give up when I do not understand a science concept.	.49
	07	Our science classroom contains a lot of interesting equipment.	.46
	19	My best friend likes science.	.43
Relevance of Science	44	I will miss studying science when I leave school.	.59
	24	Science is useful in solving everyday life problems.	.42

	33	My father likes science.	.32
Science is Fun 3.87%	42	I would enjoy working in a science-related career.	.47
	49	Scientists do not have time for fun.	.33
Value of Efforts 3.59%	13	I always try to do my best in school.	.46
	16	My science teacher is very good.	.40
	17	I consider our science classroom attractive and comfortable.	.35
	18	I will not pursue a science-related career in the future.	.32
Load factor beyond cut-off 3.25%	09	We do a lot of interesting activities in science class.	

With factor analysis, the principal component analysis method was also used to load the factor of each variable and extract the percentages of variance of each factor. As seen in Table 7, there are seven factors identified with the represented items and their factor loadings. The seven identified factors with percentages of variance included were: self-directed efforts (15.70%), anxiety about science (6.70%), career awareness (5.05%), motivating classroom (4.60%), relevance of science (4.55%), science is fun (3.87%), and value of efforts (3.59%).

The results (Table 7) show that item number nine (9) was removed from clustering; in other words, it was not related to any of the seven factors because its loading factor was beyond the cut-off of seven extracted factors in component matrix. Even if item nine was removed, it had 3.25% of variance. Table 7 displays that seven factors had a total variance of 44.06% for the variables that measured the learners' attitude towards Natural Science, excluding variable number nine due to its load factor. The results also show that the self-directed effort had 15.70% of variance with 24 variables and factor loadings ranging from 0.31 to 0.68 and was the highest factor in explaining the variance compared to other factors. This implies that a self-directed effort factor mostly attracted learners to Natural Science and positively influenced their attitude towards the subject. For self-directed effort factor, learners seemed to be self-motivated towards the learning of Natural Science after they were exposed to authentic learning activities.

Despite learners' self-directed effort towards Natural Science, learners were also sceptical about Natural Science as the anxiety towards science factor was ranked the second highest with 6.70% of variance and factor loadings ranging from 0.32 to 0.60 in terms of measuring learners' attitude towards Natural Science as a subject. For instance, with reference to the variables, learners were grateful and confident that they would continue studying science after leaving school; though they were also worried that working as a scientist would be boring. Even though anxiety about science factor was the second in the scale of learners' attitude towards Natural Science, learners were aware of their future. In other words, the career awareness factor concerned with learners' future interests had 5.05% of variance with factor loadings ranging from 0.38 to 0.57 and that also attracted and changed learners' attitude to like Natural Science. Learners viewed a motivating classroom and relevance of science with 4.60% and 4.55% of variance with factor loadings ranging from 0.43 to 0.49 and from 0.32 to 0.59 respectively. These were factors that also played equal roles on the learners' attitude towards Natural Science. This suggests that a science classroom that had a lot of interesting science equipment seemed to develop learners' interest in studying science after leaving school.

However, 'science is fun', and 'the value of efforts' had 3.87% and 3.59% of variance with factor loadings ranging from 0.33 to 0.47 and from 0.32 to 0.46 respectively. These were regarded as the factors that had no greater effect neither influenced many learners' attitude towards Natural Science as they had the lowest role to play among other factors. In fact, few learners were of the view that

scientists had no time for fun; therefore, these learners believed that they would not pursue a science-related career in the future. Nevertheless, the findings by factor analysis (Table 7) indicated that authentic learning activities positively influenced learners' attitude towards Natural Science.

Discussion

Self-directed efforts

The results of this study indicate that more than 80% of the learners strongly agreed that they enjoyed science, liked to learn more about science, when they failed, that made them to try much harder, they learned about important things in science, and they really enjoyed science lessons. It seems that most of the learners enjoyed learning science itself and its lessons. The findings are in congruence with that of Gomez-Arizaga et al. (2016) who found that learners enjoyed science lessons and science learning activities as much as they could because they were provided with an "opportunity to create, share and put their ideas into action" (p. 449). Similarly, Harlen (2010) states that learners liked to study science as it enabled them to enjoy and understand the natural world. The results also indicated that since learners liked science, they were motivated to try much harder even if they failed. Similarly, the results were also in agreement with Deans for Impact (2015) who argued that in self-directed learning, learners were motivated to believe that to work harder, their intelligence and abilities might improve. Therefore, the results ascertained that authentic learning activities encouraged learners to be self-motivated and enabled them to achieve.

According to this study's findings, learners agreed that they learned important things in science. These results are in support of the results by Gomez-Arizaga et al. (2016) and Harlen (2010) who argue that it is important for the learners to learn more about science in order to understand the world around them; increase their subject content knowledge; and realise that science is more fun, enjoyable and motivating. The findings further indicate that learners agreed that science was easy for them, and they really liked science. These findings agree with the report by the Wellcome Trust (2011) which found that young learners appreciated science as an easy subject and learners liked the subject because it was interesting, and its content related to real life compared to other subjects. On the contrary, the study conducted by Rohandi (2015) found that learners had trouble in learning science comprehensively. According to Rohandi (2015), learners hardly understood their teacher's teaching and the use of uninteresting learning activities in the science classroom. Lack of interesting learning activities in science classes seemed to lead learners to dislike science and might contribute to learners' poor academic achievements.

The results of this study also indicate that learners agreed that they had good feelings towards science, confident that they could understand science and always tried hard in science no matter how difficult the work was. These results are in line with the result obtained by Lalmuanzuali et al. (2019) who argue that learners who develop positive feelings towards science at the beginning of their science education, tended to be more motivated and were likely to have a deeper understanding of scientific concepts in the future. Learners' responses on self-directed efforts items concurred with what Kan'an and Osman (2015) found in their study that "learners that were highly self-directed can depend on themselves in learning science and would have greater academic achievements in science" (p. 794). This view seems to suggest that learners in this study were self-driven and motivated towards Natural Science and their achievement scores in Natural Science were a result of their attitude towards the subject.

Anxiety about science

Learning Natural Science should be an exciting experience to learners and should not cause anxiety among learners. According to Langat (2015), learners' negative attitude towards science subjects causes fear and anxiety within the learners as they continue to perform poorly in science subjects due to lack of interest, curiosity and patience required for learning and performing in science subjects. The results show that 21% of the learners agreed that they were fearful and anxious about Natural Science. These findings corroborate with the results reported by Cooper, Downing, and Brownell (2018) who found high levels of anxiety shown by learners towards science. According to Cooper et al. (2018), the anxiety was shown because learners were afraid of their academic performance during active learning activities. On the contrary, Ali (2015) found that authentic learning activities tend to help learners "understand science and not be fearful of it" (p. 21). Ali further indicated that "science anxiety is the fear of science" (p. 24).

Hence, Ali (2015) seemed to caution learners that they should not be worried about science otherwise their academic achievements and attitude toward science would be negatively affected when they fear the subject.

Even though 68.6% of the learners strongly disagreed on the questionnaire that science lessons were a waste of time, 16.9% of learners agreed that they did not like science although teachers encouraged them to understand concepts in science classes. Based on this result, learners seemed to regard their science teachers as motivators because teachers encouraged learners to do science and understand its concepts while learners disliked science. These findings are in line with the results reported by Christmas (2014) who found that in authentic learning, teachers facilitated and encouraged learners to take ownership and responsibility for their own learning. This means that science teachers should encourage learners in their classes not to fear Natural Science but rather to overcome their anxieties and negative perceptions towards the subject. Thus, Sabzian and Gilakjani (2013) argue that "high anxiety can lead to negative attitude and eventually negatively influence the learning process" (p. 633).

Career awareness

The results show that 45.1% of the learners agreed that they would become scientists in the future, 19.4% of the learners disagreed while 35.5% of the learners were not sure. The research findings in this study concurred with the findings of Veloo, Nor, and Khalid (2015) who found that learners especially girls showed a negative attitude towards any career related to science. On the other hand, the findings by the American Society for Engineering Education (2017) found that more girls than boys increased their interests and attitude towards pursuing careers in the science field. The results of Ahmad and Asghar (2011) seem to caution learners to guard against their attitude towards science as this might affect their course, achievements and future career choices. Even though, the study revealed that 37.9% and 79.0% of the learners strongly agreed that they would study science if they got to university and do well in science respectively; this does not necessarily mean that all these learners would become scientists in the future. Similarly, the results also confirmed the findings of Cohen et al. (2014) who argued that the "understanding of the role of science in our society" (p. 16) and awareness in science related careers are important for all the learners even if learners opted not to become scientists. The findings of this study proved that career awareness is necessary and should be introduced to the learners at an early stage of their schooling. In the same vein, Fernandez (2017) states that "authenticity in science had the potential to radically improve career awareness and in so doing, it improves learners' motivation to study the subject by making them aware of their future relationship with the subject" (p. 5).

Motivating classrooms

From the study findings, 65.3% of the learners strongly agreed that their science classrooms contained a lot of interesting equipment. These findings are in line with the results reported by Gürgil (2018) that the authentic materials prepared for science teaching were found to be effective and interesting to the learners. Similarly, the results support those by Ghanbari Esmaili, and Shamsaddini (2015) who found that science materials in a science class were helpful as they encourage and motivate learners to understand the real world rather than the classroom environment. This could suggest that when learners are exposed to science classrooms that contain interesting, encouraging, and motivating science equipment, their attitude towards the science subject tend to be positively influenced. In addition, the study results are supported by Christmas (2014) who found that meaningful and useful authentic learning materials provide learners with in-depth understanding of the subject content and discourage them on depending solely on the textbooks. The results of this study on a motivating classroom environment revealed that the majority (65.3%) of the learners had a positive attitude towards Natural Science, because their science classrooms contained a lot of interesting equipment.

According to Needham (2014), the interesting science equipment seems to attract and motivate learners to like science subjects and not to give up when they do not understand science concepts. For the learners to understand science concepts and perform better, they should be motivated, encouraged and be taught in a science-oriented classroom environment with interesting science activities, otherwise, they might lose interest in the subject and give up (Ivowi, 2001). According

to Lyons and Quinn (2010) the most effective way to encourage learners to understand science is to ensure that science classrooms' environments were interesting and enjoyable.

Relevance of science to learners' lives

Natural Science seems to be an important subject since 63.7% of the learners strongly agreed that they would miss studying science when they leave school. The findings concur with those by Lewin (1992) who found that science was relevant to the lives of the learners, mostly to those who leave school during or after secondary education as their understanding of science content was still useful and was positive towards science. According to Lyons and Quinn (2010), the best way to encourage learners to pursue science after leaving school is to make science lessons at primary level authentic. Furthermore, 61.3% of the learners strongly agreed that science was useful in solving everyday life problems. This is in line with the views of the European Union (2015) that suggest that learning science is more relevant in learners' lives and should be prioritised and connected to their lives for solving social problems.

On the contrary, the findings by Sharpe (2012) reveal that learners do not see the relevance and usefulness of what they learn or do in practical science work after leaving school because what they learned in science had little influence on their lives or careers. Similarly, the study published by Opinion Panel (2010) found that only few learners who indicated that studying science was relevant to them because they intended to pursue their careers in science fields at the university as compared to most of the learners. According to the Wellcome Trust (2011), there is a need to increase learners' understanding of science so that what they learned in school would be relevance and have a direct influence in their everyday lives after leaving school. Mukhopadhyay (2013) argues that problem solving activities should be taught to the science learners to enable them to cope with their lives beyond school. Our study showed that the learners who agreed to the three items about the relevance of science had a positive attitude towards Natural Science as a subject and they viewed science as being a useful and relevant subject in solving everyday life's problems.

Science is fun

Under the item 'science is fun', 57.3% of the learners indicated that they would enjoy working in a science-related career even though they (34.6%) believed that scientists did not have time for fun. Whereas 45.1% of the learners were uncertain to both items while 61.3%, of the learners strongly disagreed with the item. The findings corroborate with the results reported by Chapman (2013) and Lewin (1992) who found that school science was fun and enjoyable to the learners; therefore, learners were interested in science and opted to study in science-related careers after high school, but they were unsure which specific careers they would follow. Similarly, previous studies by Ahmad and Asghar (2011), Newell, Tharp, Vogt, Moreno, and Zientek (2015) found that learners were interested in science and were encouraged to pursue careers related to science even though they were not aware before which careers, they would follow. The results on learners' interest in a science-related career support the findings of Sadi and Cakiroglu (2011) who found that teachers were using authentic activities in their classrooms to make science lessons fun, more enjoyable and attract learners' attention. In so doing, motivated learners to enjoy science subjects and encouraged them to take science-related careers in the future. On the other hand, Sharpe (2012) found that authentic activities had very little influence on learners' career aspirations. According to Sharpe's findings, although learners appreciated the benefits that authentic activities had on their careers and valued the science subject itself, most of the learners were found not interested to take a job in a science profession especially where practical work would be involved.

Value of efforts in learning Natural Science

The study findings indicate that 86.3% of the learners strongly agreed that they always tried to do their best in school while 84.7% of the learners strongly agreed that their science teachers were very good in teaching Natural Science. These results support those by Darlington (2017) who found that learners praised their teachers as good teachers. According to Darlington's findings, teachers were regarded as good because they explained the contents of science clearly to the learners and also used authentic learning activities that helped learners to better understand science. Darlington's findings are in line with the results reported by the Wellcome Trust (2011) that teachers positively influenced learners' attitude towards science. According to the

Wellcome Trust (2011), teachers made their "science lessons enjoyable, interesting and understandable through their passion for their subject" (p. 7). This implies that teachers' passion for teaching science using authentic learning activities also motivated learners to perform better in science. On the contrary, the findings of Sharpe (2012) revealed that not all the learners regarded their teachers' use of authentic learning activities as the best way of learning science. According to Sharpe, learners mostly valued their self-effort which they viewed as motivating them to learn science.

Conclusion

Based on the study findings it is concluded that authentic learning activities seem to positively influence the Grade 7 learners' attitude towards Natural Science subjects. It can also be concluded that the participating learners appreciated the use of authentic learning activities in teaching and learning Natural Science as an appropriate and effective teaching approach.

Recommendations

It is recommended that the use of authentic learning activities in teaching Natural Science should be promoted to enhance learners' conceptual understanding, to positively influence learners' attitude towards Natural Science. It is also recommended that schools should procure appropriate authentic materials such as the science kits for the effective teaching and learning of science concepts that might provide learners with in-depth understanding of the Natural Science content and allow learners to connect the science content with everyday real-life situations. This study was limited to public primary schools in two regions out of fourteen in Namibia. It is therefore, recommended that a similar study with a larger sample be carried out in order to generalize the findings to the larger population and enrich the study findings. There is also a need to investigate the teachers' perceptions towards the integration of authentic learning activities in Natural Science on whether they enable or constrain the learners' acquisition of science concepts.

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