

**CHALLENGES FACED BY SENIOR SECONDARY SCHOOL LEARNERS WHEN
PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATIONAL
REGION, NAMIBIA**

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APPROVAL PAGE

This research has been examined and is approved as meeting the requirement standards for partial fulfillment of the requirement of the degree of Master of Education

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DECLARATION

I, Foibe Ndinela Nghishongwa, declare hereby that “CHALLENGES FACED BY SENIOR SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI REGION, NAMIBIA” is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

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DEDICATION

This study is dedicated to my lovely husband Phillipus Mwashindange Iyambo, my nephew Nehoya Jonas Nanyeni and my two lovely daughters, Ruusa Omwa-Tugamena Iyambo (who was 3 years old) and Tuulikefo Eveline Ndafapawa Iyambo who was less than a year when I registered for this study and to my late father Simson Nghishongwa (the pillar of my strength) and my lovely mother Eveline Ndafapawa Nghiiyelekwa. It was because of their unconditional love, support and encouragement that I managed to complete this study. Without their attention I would never had come this far.

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ABSTRACT

The main purpose of this study was to investigate the challenges faced by senior secondary school learners when preparing science fair projects in the Omusati educational region, Namibia. The study provided answers to the following research questions: 1). What are the challenges faced by secondary school learners in the Omusati Educational Region when preparing science fair projects? 2). what are the science teachers' perceptions of the challenges faced by learners when preparing science fair projects? 3). What are the main causes of the challenges faced by the learners when preparing science fair projects? And 4) how can the process of preparing science fair projects be improved in order to assist learners to overcome their challenges?

Qualitative research approach using descriptive design was used to gather information about the experiences of the participants based on the research questions. Three research instruments were used in the collection of data: These instruments were Open-ended questionnaires, interviews and observation schedules. A total of 45 learners and 16 science teachers selected from 9 senior secondary schools in the Omusati Educational Region participated in the study. All participants completed open –ended questionnaires, following which 19 out of 45 learners and 8 out of 16 learners were interviewed. In addition, observation notes were also used to collect data.

From the results obtained, challenges faced by learners when preparing science fair projects in the study area include: lack of resources, lack of proper guidance from teachers, poor parental support and understanding, lack of basic knowledge about the projects by teachers and learners, official language barrier/ poor communication, and limited time to do projects. It was also found that that the most difficult stage to the learners when preparing science fair projects was during data collection.

The identified causes of these challenges includes lack of financial support from educational stakeholders, learners not aware of the importance of preparing science fair projects, lack of proper guidance from the facilitators and all the science teachers, and socio-economic status of both the learners and the schools

This study recommended provision of adequate resources needed during the science fair projects preparations, introducing different kinds of incentives at schools, circuits and regional level to motivate the learners, revising the school curriculum to include Project-Based-Learning(PBL) as a promotional subject and teachers need to be trained to teach those subjects.

TABLE OF CONTENTS

APPROVAL PAGE	i
DECLARATION	ii
COPYRIGHT	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
ABSTRACT	viii
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF ACRONYMS	xv
CHAPTER ONE	1
INTRODUCTION	1
1.1 Orientation of the Study	1
1.2 Statement of the Problem	4
1.3 Research questions	5
1.4 Significance of the Study	6
1.5 Limitations of the Study	7
1.6 Delimitations of the Study	7
1.7 Definition of Terms	7
CHAPTER TWO	10
LITERATURE REVIEW AND THEORETICAL FRAMEWORK	10
2.1 Introduction	10
2.2 Theoretical Framework	10
2.3 Overview of Science Education in Namibia	11
2.4 Overview of Secondary School Science Fair in Namibia	14
2.5 Importance of preparing Science Fair Projects	15
2.6 Challenges faced by Learners when preparing Science Fair Projects	17
2.6.1 Lack of Information and Skills	17
2.6.2 Insufficient Financial and Technical support	19
2.6.3 Socio-economic status of Learners and that of the School	20
2.6.4 Lack of cooperation among Learners, Teachers and Schools	21
2.7 Possible causes of the Challenges Learners face when preparing Science Fair Project and how to overcome them	22

CHAPTER THREE	24
RESEARCH METHODOLOGY.....	24
3.1 Introduction.....	24
3.2 Research Design.....	24
3.3 Population of the Study.....	24
3.4 Sample and Sampling Procedures.....	25
3.5 Research Instruments	25
3.6 Data Collection Procedures.....	27
3.7 Data Analysis	27
3.8 Ethical Considerations	28
3.9 Reliability and Validity of the Study	28
3.10 Pilot Study.....	30
CHAPTER 4	32
RESULTS AND DISCUSSIONS	32
4.1 Introduction.....	32
4.2 Biographical Information of Participants.....	33
4.2.1 Biographical information of the Learners.....	33
4.2.2 Biographical Information of Science Teachers.....	38
4.3 Challenges experienced by senior secondary school Learners when preparing Science Fair Projects in Omusati Educational Region	43
4.4 Main causes of the Challenges faced by senior secondary school Learners when preparing science projects in the Omusati Educational Region.....	47
4.5 Learners’ Views on the Possible ways to Minimize the Challenges	49
4.6 Perceptions of Science Teachers on the Challenges faced by Learners when preparing Science Fair Projects.....	51
4.6.1 Teachers’ Opinions on the Importance of preparing Science Fair Projects	51
4.6.2 Teachers’ Views on the challenges learners face when preparing Science Fair Projects in Omusati Educational Region.....	53
4.6.3 Teachers’ opinions on the Main Causes of the Learners’ Challenges during Science Fair Project preparation	55
4.6.4 Teachers’ opinions on the Prevention Measures that can be taken to Minimise the Learners’ Challenges when preparing Science Fair Projects	56
4.7 Findings from Observation Notes.....	58
CHAPTER 5	60
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	60

5. 1 SUMMARY	60
5.2 CONCLUSION.....	63
5.3 RECOMMENDATIONS	64
REFERENCES	66
APPENDICES	73
Appendix A: Letter to the Permanent Secretary	73
Appendix B: Permission from the Permanent Secretary	75
Appendix C: Letter to the Director of Education in Omusati region.....	76
Appendix D: Permission from the Director of Education of Omusati region.....	78
Appendix E: Letter to the school principal	79
Appendix F: Principals ‘consent form	80
Appendix G: Consent form: Learners parents	81
Appendix H: Open-ended Questionnaires for Learners.....	82
Appendix I: Open-ended Questionnaires for Teachers.....	87
Appendix J: Interview guide for Learners	93
Appendix K: Interview guide for the Teachers.....	95

LIST OF TABLES

Table 1: Challenges faced by the senior secondary school learners when preparing science fair projects	43
Table 2: The main causes of the challenges experienced by learners when preparing science fair projects	47
Table 3: Teachers' opinions on the Importance of preparing science fair projects	51
Table 4: The views of teachers on the challenges learners face when preparing science fair projects.....	53

LIST OF FIGURES

Figure 1:Pie chart showing distribution of respondents (learners) by Sex	33
Figure 2: Age Range of respondents (Learners)	34
Figure 3: Pie chart showing distribution of respondents by Grade Level	35
Figure 4: Distribution of respondents (learners) by years of experience of participation science fair projects.....	36
Figure 5: Number of times the learners won prizes during science fair competitions	37
Figure 6:Pie chart showing the distribution of respondents (teachers) by Age Range	38
Figure 7: Distribution of respondent (teachers) by Sex	39
Figure 8: Number of respondents (teachers) by Qualification.....	40
Figure 9: Years of Teaching Experience of respondents of the science teachers	41
Figure 10: Number of years of teachers' experiences in training learners for science fair project's competition.	42

LIST OF ACRONYMS

ACE	Advanced Certificate in Education
MEC	Ministry of Education and Culture
MoE	Ministry of Education
NIED	National Institute of Educational Development
NCRST	National Commission on Research Science and Technology
ICT	Information Communication Technology
HPP	Harambee Prosperity Plan
NDP	National Development Plan
IBL	Inquiry Based-Learning
PBL	Project Based learning
BED	Bachelor of education
BETD	Basic Education Teachers' Diploma

CHAPTER ONE

INTRODUCTION

This chapter highlights the following main components: the orientation of the study, the statement of the problem, research questions, significance of the study, limitations, delimitation, and definition of key terms used in this study.

1.1 Orientation of the Study

In Namibia, a national science fair takes place annually in Windhoek in which learners from all the 14 regions of the country participate. This event offers learners the opportunity to engage competitively in preparing scientific investigations (science projects) that are in keeping with the principle of scientific inquiry and curriculum requirements. Before learners go for national science fair competition, a regional science fair competition is organized, for all interested science learners from the secondary schools in the region. This gives learners a wide range of skills to learn from while fairly competing with their age mates.

The current situation in Namibia in learning science through projects is that, only few learners could prepare science projects of good quality (Ministry of Education [MoE], 2014). The set quality assessment criteria for science fair projects include: a project should be a study, an investigation or a model with a proper write-up on a display board in a format of research poster presentations (NamPower, 2014). It is required that a study should involve the collection of data that give evidence of scientific interest; an investigation should involve a case of testing hypothesis using experiments in order to solve a problem; while the model should be an innovated device that demonstrates application of scientific skills (NamPower, 2014).

Recent studies associates poor quality projects with the type of teaching methods which are not project based, lack of teachers training on science projects, lack of problem solving and

decision making skills by learners, lack of ability to do basic research where learners collect data and synthesis them into a generalized statement (Demirel, Baydas, Yilmaz, &Goktas, 2013). In the same studies it was further explained that, learners' inability to communicate well in the quest for information needed to prepare quality projects is also responsible for poor quality science fair projects (Demirel et al, 2013). There is evidence that if communication skills are not well developed among learners, they lead to poor performance in terms of quality science projects (Opolot-Okurut, 2016). This is due to the fact that, during project preparations learners are supposed to improve their thinking, searching and communication skills which will affect academic achievements and enhance the process of preparing quality science fair projects (Demirel et al, 2013).

Lesson presentation in which learners are given the chance to carry out a study, an investigation or a model about what they have learned theoretically is important. During such project based learning, learners gain an in-depth understanding of the concept under investigation through which they develop problem solving and decision making skills (Eldelson, 2009). In addition, Bencze and Bowen (2009) pointed out that learners also gain technical skills such as measurement skills when they are given the opportunity to carry out investigations.

Arousing learners' brilliances has a real meaning to giving birth to joy in learning (Armstrong, 2000) as cited in (Kovscek, 2002). Armstrong (2000) further pointed out that there is much a teacher or an adult can do to help learners awaken their own natural genius; for example providing simple activities to activate the genius of learners.

Einstein said that a simple magnetic compass awakened his love for learning science at the age of four (Kovscek, 2002). Thus when learners are encouraged to prepare quality science fair projects, it can arouse their interest and love for learning more about science.

When learners are involved in carrying out science projects, they learn how to apply the knowledge acquired through scientific concepts, theories, principles and laws of nature in the real life situations (Hangula, 2003). Furthermore, Bochinski (2005) asserts that through such activities, learners gain hand-on experiences and knowledge in their own independent study of a particular topic in science. This process of preparing science fair projects requires the learners to make their own design, be involved in problem solving and decision making, and also to study independently (Kormaz, &Kaptan, 2002). Preparing a science fair project is different from any other type of project a learner works on at school. This is due to the fact that a science project is an independent educational activity that incorporates different skills many of which the learner has to teach him/herself along the project development (Bochinski, 2005). During the preparation of science fair projects, learners are expected to investigate, interact with different people and make connections, conduct interviews and learn how to answer questions during interviews, use various scientific procedures including how to use tools and equipment, analyze data, draft an abstract, write a report, prepare a proper laid out display, and speak in public. Thus, preparing a science fair project is a challenging extracurricular assignment that allows learners to use their own ideas to investigate a scientific problem or a question of one's interest according to a process of scientific method (Bochinski, 2005). Therefore, it is important to investigate the challenges faced by senior secondary school learners when preparing science fair projects and suggest what could be done to mitigate such challenges.

1.2 Statement of the Problem

Science fair projects are complex activities that raise many challenges during the preparation stage. As a judge of science fair projects at the circuit, regional and national levels since 2010 to 2014, the researcher has observed that learners, particularly, those from the Omusati Region, prepare projects that do not meet the quality assessment criteria set for the projects to be awarded trophies and medals. The quality assessment criteria considered in judging the quality of science fair projects include a project should be: an original study involving collection of data that give evidence of scientific interest; an investigation involving a case of testing hypothesis using experiments; and a model showing an innovated device that demonstrates application of scientific skills (NamPower, 2014).

Reports of judges have shown that, in most of the science projects the learners often present, there was no originality of idea to show that the projects are original works of the learners as stipulated in the assessment criteria. Furthermore, the investigations and models presented did not follow the criteria provided (MoE, 2014). Another report on the 2013 Omusati Regional Science Fair Competition also indicated that out of the total of 80 science projects presented; only 20 met the quality criteria to win trophies and medals (MoE, 2013).

The situation persisted in 2014 where the report on Omusati Regional Science Fair competition indicated that a large number of learners who presented science fair projects performed very poor and could still not meet the quality criteria (MoE, 2014). In the year 2015 another report on the Nampower National Science Fair of 2015 indicated that some learners from regions such as Khomas, !Karas and Erongo had projects that scored more marks and were awarded in the category of overall best projects in the country but none of the learners were from Omusati region (MoE, 2015).

A recent study in Turkey indicates that some of the reasons for poor quality projects prepared by secondary school learners include lack of proper teaching methods, insufficient resources and low motivation to study (Demirel et al., 2013).

Even though, international literature have identified some of the challenges faced by learners when preparing science fair projects, those challenges might not be completely the same with the case of learners in the Omusati region Namibia, considering the country's educational structure after her independence which emphasizes skill-based learning. Therefore, it is important to investigate the challenges faced by secondary school learners when preparing science projects, their causes and the possible prevention measures in the Omusati region, Namibia. It is hoped that such intervention measures would likely to lead to improvement of the quality of science fair projects.

1.3 Research questions

This study addressed the following research questions.

1. What are the challenges faced by secondary school learners in the Omusati educational region when preparing science fair projects?
2. What are the science teachers' perceptions of the challenges faced by learners when preparing science fair projects in the Omusati Educational Region.
3. What are the main causes of the challenges faced by the secondary school learners when preparing science fair projects?
4. How can the process of preparing science fair projects be improved in order to assist learners to overcome those challenges?

1.4 Significance of the Study

The discoveries and recommendations from this study could have several benefits for school teachers, school principals, school inspectors and material developers who wish to base their teaching materials on guiding learners during the preparation of science fair projects.

The results of this study might also provide educators and learners with case-based information that would help them to understand the challenges encountered by secondary school learners when preparing science fair projects, their causes and the possible ways to overcome these challenges. The results of this study might also inform the institutions that organize science fair project competition (the National Commission on Research, Science and Technology, NCRST) as to which areas need improvement in order to minimize learners' challenges.

Information generated might also be useful to curriculum planners at the National Institute of Educational Development (NIED) to consider introducing project-based learning as a subject from primary schools in order to improve the quality of science education in Namibia. The advisory teachers might use the results of this study to provide relevant information to educators during science teachers' training workshops to enhance effective science teaching and learning of science content in Namibia.

Finally, these research findings would provide a baseline information on the challenges faced by secondary school learners when preparing science fair projects in the Omusati Region, Namibia and could be helpful to other researchers who wish to carry out further research about science fair projects in Namibia.

1.5 Limitations of the Study

The researcher was constrained by finances and time to carry out the study with participants in all the 16 senior secondary schools in Omusati Education Region. In the year 2015 there were 16 senior secondary schools in the Omusati Region, but only 11 senior secondary schools took part in the regional science fair competitions for that specific year.

It is for that reason that the researcher tried to minimize this limitation by selecting participants in 9 out of the 11 senior secondary schools in the region, representing over 81% of the senior secondary schools in the study area. Thus, generalizations of the study findings were limited to Omusati Education Region only as conditions and situations might be different in other regions in the country.

1.6 Delimitations of the Study

The population and sample of the study was restricted to senior secondary school learners and science teachers selected from 9 senior secondary schools in the Omusati educational region only. The study focused on the challenges faced by senior secondary school learners when preparing science fair projects, the causes and science teachers' perception of the learners' challenges in the selected secondary schools in the Omusati Education Region only.

1.7 Definition of Terms

- **Science Project** – This is an educational activity in which learners carry out experiments or investigations in the science disciplines (National Institute for Educational Development (NIED), 2008). In this study the researcher used the term “science projects” to refer to educational activities such as experiments, investigations or

models carried out by learners in any science subjects in order to take part in the competition called a science fair.

- **Science fair** – This is a competition where contestants, usually learners present their science project (NCRST, 2013). In this study the researcher used the term “science fair” to refer to a competition in which learners present their science projects in order to be awarded prizes based on the quality of the science project presented. A science fair can be organized at the school, circuit, regional and national levels and the winning science projects progresses from the school, to the circuit, to the region and then to the national level. If the science project wins with high marks at national level in Namibia, it can be taken to international science fairs.
- **Challenges** – Refers to setbacks or difficulties that someone encounters and also affects the desired success in any contest (Uitto, Juuti, Lavonen, & Meisalo, 2006). In this study the researcher used the term “challenges” to refer to difficulties encountered by senior secondary school learners when preparing science fair projects, and these difficulties or setbacks affect the quality of science projects prepared by learners and hence end up preparing poor quality projects which do not win trophies or medals.
- **Facilitators**- These are science teachers who act as coaches/mentors for learners who guide them during the process of preparing science fair projects, and normally accompany learners when they are going to participate in science fair competitions.

- **Black schools** -. Black schools resulted from a legal segregation public policy which was aimed at keeping races such as black people separated from whites to maintain white supremacy. There was a wider discrepancy between funding and provision of resources to whites and black schools (Kasanda, Kapenda, Kandjeo-Marenga & Goaseb, 1999). In this study the term black schools refers to schools attended by black people, taught by black people, provided with few resources and limited fund by the ruling government.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter consists of review of related literature for this study. This study sought to determine the challenges faced by senior secondary school learners when preparing science fair projects in the Omusati educational region. According to Best & Khan (1998) as cited in Amoonga (2008), literature review deals with what is known and what is still unknown and untested by previous researchers that contribute to the knowledge about the research problem. In addition, literature review also comments on both strength and limitation of reported studies, methodologies used to gather information, research findings and recommendation for further studies (Johnson & Christensen, 2004).

This chapter begins by giving a theoretical framework on which the study was based, overview of science education in Namibia, overview of secondary school science fair in Namibia, importance of preparing science fair projects, then discusses challenges faced by secondary school learners when preparing science fair projects, their causes and remediation measures that had been taken to minimize the challenges.

2.2 Theoretical Framework

This study was based on the social constructivism theory of Vygotsky (1978), which explains how knowledge generation from life experiences is influenced by different challenges. In this case, the emphasis of the constructivist thinker is on the interaction between learners and their environments, which can be other learners or objects. As learners interact with objects and events around them, they gain understanding of the features held by such objects and events (Vygotsky, 1978). During this kind of interaction with their environment, learners discover, transform complex information, and construct their own

conceptualization as well as finding solutions to problems (Glaserfeld, 1990). Thus, learners' interaction with their environment and fellow learners could influence their learning and hence, experience various challenges. This theory of social constructivism forms the basis of this study because when learners interacting with the environment they might encounter challenges from which they learn as part of their experiences.

2.3 Overview of Science Education in Namibia

Before Namibia's independence in 1990, the education system was discriminating in the knowledge empowerment of various people. The Namibian education system was a replica of Bantu Education system which exists in the Republic of South Africa (Kasanda et al, 1999). This type of education advanced the interest of the colonial power rather than those of the individual Namibian learners in the country. For majority of Namibians, the colonial education was meant to provide a semi-literate black person that provided a dependent and cheap labour to the colonizers (Salia-Bao, 1991, world University services, n.d, as cited in Kasanda et al, 1999). During the colonial period, science subjects were not emphasized in the majority of black schools. Even though these subjects were theoretically on offer, the reality was very different. Clegg (1989) as cited in Kasanda et al (1999) noted that few blacks' schools offer science subjects as it is believed by the apartheid regime that black people were inherently incompetent of learning science. This was supported by the study by Kasanda and Shaimemanya (1998) and Mwetulundila (2000).

The one time South African Prime Minister, in justifying the implementation of apartheid education in 1945 in South Africa, said: *What is the use of teaching a Bantu child Mathematics when he/she cannot use it in practice? Education must train and teach people in accordance with their opportunities in life... It is therefore necessary that native education should be controlled in such a way that it should be in accordance with the policy of the state*

(cited by Mwetulundila 2000)”. As a result, the black child’s environment was deemed to have no need for science knowledge. In addition, it was decided not to directly encourage the study or teaching of science subjects in black schools, and where science subjects were offered, the teaching relied on oral presentations of content with little students’ participation (Kasanda et al, 1999).In addition to that, the majority of teachers have weak content knowledge, emphasized rote learning and coupled with lack of text book, did little to help the situation of encouraging and provision of quality science education to learners in black schools (Kasanda et al, 1999)

The government inherited an education system plagued with a plethora of problems such as separate systems run along racial, ethnic and gender lines, under- and non-qualified teachers, overcrowded classrooms, poorly equipped laboratory facilities where any existed and lack of library or resource facilities(Mwetulundila, 2000). Mwetulundila (2000) further added that, government thus, had a lot of tasks to accomplish.

Up on attaining independence in 1990, the Namibian’s new government was more concerned with unification of the different education authorities in the country into a single education ministry (MEC, 1993). In addition, reform of the school curriculum was carried out to ensure that all learners in the country follow one curriculum (Kasanda et al, 1999). However, the curriculum attainment had been affected by the background and environmental factors including the socio-economic status of majority of Namibia population.

Furthermore, the Namibian government addressed the imbalances that were reflected in the former education system, by increasing access to education, equity, and equality and strengthening democracy in education (MEC, 1993).

Science subjects that were denied to the majority of Namibians before independence were made compulsory through grade 10. The aims and objectives of science education as highlighted in the Ministry of Education documents and syllabi clearly indicated that science plays an important role and occupies important place in the education system in Namibia (Kasanda et al, 1999). The establishment of the National Endowment Fund on 31 March 1994 which was aimed at providing bursary for deserving students to pursue science as a field of study, and the establishment of the Namibian Student Financial Assistance Fund(NSFAF) to assist students financially including those doing science as a field of study as a way of motivating them. Other important activities that indicated the significance of science in the Namibian education system are the establishment of Science Fair competitions with the help of the National Commission on Research, Science and Technology (NCRST) for the promotion of science. All the above mentioned government initiatives are tangible proof of the government's desire to popularize and encourage Namibian students to pursue science careers. Kasanda et al (1999), asserted that scientific knowledge is essential for social, economic development and empowering of Namibian people. It is therefore necessary for Namibian learners to engage in scientific practices such as designing/preparing science fair projects.

2.4 Overview of Secondary School Science Fair in Namibia

A science fair is a competitive event in which learners prepare science fair projects for competition held by school districts, regions and the state. The fairs involve public displays of the learners' projects to recognize their work and to arouse interest in science (Bochinski, 2005). Experts from the scientific communities often judge the science projects. Learners who participate can earn valuable experiences along with educational grants, scholarships and other prizes. The same happens in Namibia where learners voluntarily prepare science fair projects at their respective schools in order to partake in science fairs that take place at different levels starting at the school, circuit, region and national levels provided a learner prepared a quality projects, since the project can only proceed to the next level upon wining at the current level.

Namibia's National Science Fair is an annual event where the best science fair projects from all the 14 regions compete against each other. The event normally takes place during August or September. The main aim of the National science is to stimulate interest in young people in science, provide educational experience through participating in scientific research, give public recognition to learners, to encourage inquisitive learners to explore their environment in a systematic, logical manner and stimulate learners interest in science and technology while simultaneously promoting the development of the life skills of communication, decision making, evaluation of alternative solutions, and critical thinking.

All science fairs at different levels are organized in such a way that all learners from different phases and grades (1-12) participate in that specific event, but compete against each other as per their phases in order to determine the best project. The best projects are awarded with medals depending on the marks obtained. For instance, gold medal (80-100%), silver medal (70-79%), bronze medal (60-69%) and those obtaining below 60% receive no medal(

NCRST, 2016). A science project would obtain the highest marks if it met the quality assessment criteria. The quality assessment criteria include: an original study involving collection of data that give evidence of scientific interest; an investigation involving a case of testing hypothesis using experiments; and a model showing an innovated device that demonstrates application of scientific skills (NamPower, 2014). In addition to that the project must be presented in writing on a display board in the form of research postal presentation.

In Omusati Education Directorate, a regional science fair is organized annually, in which learners from different schools participate after winning circuit science fairs at their respective circuits (MoE, 2014). Secondary school learners who are actively involved in preparing science fair projects in the Omusati Education Region are identified through their performance at the regional and the national science fairs. Recent report on the Omusati Regional Science Fair indicated that few learners perform well at the national science fair, a number of secondary school learners who managed to make it to the national science fair mostly be awarded with Bronze medals (60-69%). This is a clearly indication that something needs to be done in order to produce learners from Omusati region who can prepare quality projects that would be awarded gold medals (80-100%).

2.5 Importance of preparing Science Fair Projects

Preparing a science fair project helps learners to better understand the concepts they learn in classes. Preparing of science fair projects is regarded as a very important tool for education because there are many advantages attached to this practice (Tortop, 2012). Some benefits of such practice includes deepening and broadening learners scientific and technological literacy that enable them to succeed in different activities that are greatly affected by processes and products of science and technology (Bencze & Bowen, 2009). Studies have identified project preparation as an effective way to integrate Information Communication Technologies (ICT)

into the curriculum because a single science fair project can accommodate the use of computers and the internet, digital cameras, video cameras some related editing equipment (Edutopia, 2008). This would automatically force a learner to use ICT in order to prepare the best and unique science fair project.

When learners are involved in carrying out science projects, they learn how to apply the acquired knowledge, scientific concepts, theories, principles and laws of nature in the real life situations (Hangula, 2003). During project preparations, learners create, construct knowledge and assign meaning to what they have learnt and experienced (Kickbusch, 2002). Mallick (2012) and Tortop (2012) indicated that preparing a science fair project is such a great learning experience because learners will be exposed to writing research reports, where they are introduced earlier to systematic and scientific approaches of answering questions in different areas. The hands on activities such as science fair projects are central to the epistemology and appeal of science (Ndlovu, 2013). In addition, informal science learning activities such as science fair projects can provide suitable learning opportunities to diverse learners and motivating them to learn science both within and outside the school (Hofstein & Rosenfeld, 1996).

According to Edutopia (2008), adopting project-based learning approach in your classroom or school can invigorate your learning environment, energizing the curriculum with real-world relevance and sparking learners' desire to explore, investigate and learn more about science.

The Ministry of Higher Education and the Government of the Republic of Namibia calls all young Namibians to improve their skills in research, science innovations and technology especially post graduate students from Institutes of High Learning through producing more qualified in research, science and technology. This was according to the speech by the Minister of Higher Education, Training and Innovations *Hon Itah Kandji-Murangi at the*

NCRST 2016 award ceremony at Safari Court Hotel in Windhoek, 23 September 2016. This clearly indicates that allowing learners to prepare science fair projects at school level would install fundamental research knowledge in learners at early age.

The Government of the Republic of Namibia through the Harambee Prosperity Plan (HPP)'s goals that are aimed at improving infrastructure development such as energy, water, transports and ICT. These can be achieved when learners are given opportunities at early age to do investigations, models, and studies that might solve national problems through improving infrastructure development and social progression as stated in the HPP, National development goals (NDP) and Vision 2030 documents.

Preparing science fair projects makes the fundamental root of science education as it enhances its quality. Thus, it is important to determine what challenges learners face when preparing science fair projects, so that appropriate measure can be put in place in order to address the challenges and improve learners' performance.

2.6 Challenges faced by Learners when preparing Science Fair Projects

2.6.1 Lack of Information and Skills

Learners may lack relevant information and skills for conducting researches on their projects. . This includes the inability to develop a unique research problem, difficulty to select an appropriate method of research, inability to link data with results and lack of knowledge about how to report results in an appropriate way (Ayvaci, & Coruhlu, 2010). These can be difficult challenges for learners who do not have the required information in preparing science fair projects. Such learners will end up preparing science projects which are not up to the required standard.

When preparing science fair projects, learners need to have access to more information and technological skill (Thomas, 2000). In addition to that, Thomas (2000) further explained the need for information and skill to the learners as follows:

“Research on the application of technology to learning and instruction has led, in general, to an interest in using technology as a "cognitive tool" and, in particular, to the incorporation of computer hardware and programs into Project-Based Learning (PBL) as extensions of and models for student capabilities. In addition, technology has, among its touted benefits, the value of making the knowledge construction process explicit, thereby helping learners to become aware of that process (Brown & Campione, 1996). *"Using technology in project-based science makes the environment more authentic to students, because the computer provides access to data and information, expands interaction and collaboration with others via networks, promotes laboratory investigation, and emulates tools experts used to produce artifacts."* (Krajcik et al., 1994, pp. 488-489 as cited in Thomas, 2000). Thus, access to information is critical in learners' performance in the science fair competitions.

Computer technology in schools may be helpful in ensuring that the learners have access to information that may not be available from other teachers, peers or school libraries, with the use of computer technology, learners can create dialogues with others who have access to computer technology through emails and the use of video clips. This may encourage learners-centered approach since learners become active member in searching for knowledge, and the constructivist view of learning is highly emphasized (Kasanda et al, 1999). A study by Singh, Yager, Yager and Ali (2012) agreed with Kasanda et al (1999) in which the researchers suggested that it is only through active engagement of learners that the desired outcome s can be achieved.

Project preparations require learners to develop and use multiple skills such as skills for measuring, investigating, networking with various people, conducting interviews and learning how to answer questions during interviews, use various scientific procedures and tools, follow certain rules and guidelines, analyze data, draft an abstract write a report, prepare a proper lay out display and speaking in public (Bochniski, 2005). Tortop (2013) pointed out that science fair project preparation was claimed by a number of studies to be effective in developing different skills in doing research , creative thinking , carrying out scientific process , problem solving and drawing pictures. Lack of relevant information for assisting in developing these skills can be considered as affecting the process of preparing science fair projects negatively that might lead to gaining of limited scientific knowledge.

2.6.2 Insufficient Financial and Technical support

Insufficient resources at the disposal of most school learners constitute a great challenge in their preparations of science fair projects (Edelson, Gordin, & Pea, 1999). For example, learners do not have enough funds to buy some materials needed in the preparation of projects and the schools do not provide all the needed materials for preparing science fair projects. According to Bencze and Bowen (2009), learners with access to great financial resources always have competitive advantages over other learners because they have most of the funds needed to buy required materials for project preparations and come up with a quality project.

Uitto, et al (2006) pointed out that lack of library resources and inability to effectively use library resources make it difficult for learners to find relevant data to support their results. A study by Edelson et al (1999) agreed with Uitto et al (2006), in which it was clearly stated that limitations in accessing existing resources and technology, or not having appropriate technology makes it difficult for learners to obtain required information for project

preparations It was also submitted that the integration of technology into learners' science projects without adequate support from their teachers might be a challenge to learners since most teachers give little attention to children's learning that take place outside the classroom (Uitto et al., 2006).

2.6.3 Socio-economic status of Learners and that of the School

The socio-economic status of learners can also be a challenge because learners from different types of schools namely; advantaged and disadvantaged schools perform differently when it comes to project preparation. Ndlovu (2013) submitted that learners from the advantaged schools have higher chances of success in project competitions since they have almost everything needed during the preparation of projects. Bencze and Bowen (2009) added that the preparation of science fair projects appear to favor learners from advantaged, resource-rich back grounds and disadvantaged learners seem not to be favored and hence, this results in poor quality projects and this seems to a be a challenge.

The process of preparing science fair projects may be discriminating against learners who regardless of their inborn ability may not have access to various kinds of resources that improve the quality of their projects (Bencze & Bowen, 2009). They further pointed out that learners with access to greater financial resources may have competitive advantages over other learners; this makes other learners find science project preparation unpleasant. Adding to that, learners who have greater economic status also have more chances of success in science fair competitions. On the other hand, poorly equipped learners in disadvantages schools as their capital deficits appear to deny them equal opportunity to compete fairly with learners from historical advantaged schools (Ndlovu, 2013).

2.6.4 Lack of cooperation among Learners, Teachers and Schools

If teachers from various schools do not work together, learners will face challenges including access to resources and relevant information (Uitto et al., 2006). When teachers and learners from different schools interact in a cooperative manner, those who have access to relevant information about science project preparation can share with others and support each other to learn. In addition to that, learners with adequate support from knowledgeable teachers lead to meaningful inquiry based learning and enhanced science self-concept in learners (Betts, 2014). Betts (2014) further highlighted that there must be a greatest amount of interaction between the facilitators and learners throughout all the stages of project preparation from deciding on the topic, experimenting/testing until the stage of presentation of results.

In most cases, projects are carried out in groups or pairs; this encourages cooperative learning among students (Paul, 2005). A study by Tapscott, 1999; and Chris, 1997 viewed cooperative learning as one of the learning methods that promotes interactions and sharing of ideas among learners and giving learners a chance to work actively in finding meanings to materials.

Cooperative learning plays an important role in assisting learners to grasp science content. Haimbodi (2012) asserted that cooperative learning enhances learners' performance due to the fact that learners are involved in explanations and receiving explanations from fellow learners in which the concept could be understood easily. Furthermore, Haimbodi (2012) identified that there is a positive effect of cooperative learning on the performance of the learners.

The scientific community sees collaboration as important in creative yield and thus offers team work in their competitions such as science fair and collaboration during project preparation is an integral for the project's success (Tortop, 2012). Therefore the interactions

and cooperation between teachers (facilitators) and learners play an important role in the good quality of project prepared.

2.7 Possible causes of the Challenges Learners face when preparing Science Fair Project and how to overcome them

Recent studies identify the causes of some challenges most secondary school learners face in carrying out science fair projects (Baki, & Butuner, 2009; Uitto, 2006). These include the types of teaching methods which are not project based, teachers' lack of training in science fair projects management, lack of problem solving and decision making skills by learners, and inability to do basic research where learners could collect data and synthesis them into a generalized statement. Furthermore, there are issues of learners' inability to communicate well when searching for information needed to improve the quality of their science fair projects (Demirel et al, 2013).

To overcome the above mentioned challenges, Baki & Butuner (2009) suggested the creation of courses to teach project managements skills right from primary schools. It was also suggested that teachers should be trained in project management and development in which they undertake an in-service training programs to acquire more information about preparing science fair projects (Baki, & Butuner, 2009). In another report, it was indicated that organizing workshops and seminars for learners on how to conduct projects, and sponsorship of science fair projects competitions will help to mitigate the challenges learners face in preparing science projects (Uitto et al., 2006). The authors also noted that encouraging frequent project competitions are useful steps toward improving learners' performance.

Revising the curriculum to include science fair project preparation and as a promotional school subject can assist individual Namibian to achieve Vision 2030 as well as 21st century skills. A study in Turkey showed that a new science curriculum for primary school was

introduced which is aimed at bringing up children who inquire, search, investigate and establish science in their daily life and use science methods in every perspectives around the world (Tortop, 2012).

2.8 Conclusion

The reviewed literature points out the challenges faced by learners when preparing science fair projects, the main causes of the challenges and the possible ways of minimizing the challenges were suggested.

Although the reviewed literature has identified a number of challenges faced by learners when preparing science fair projects, the main causes of challenges and some possible ways of minimizing those challenges, it is not known if the same challenges were prevailing in Omusati Education Region. This study, therefore intends to find out the challenges faced by secondary school learners when preparing science fair projects in the Omusati Education Region.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The main focus of this chapter is to describe the methods that were used in the study-to collect and analyze data. This includes the research design, population and sample, the sampling techniques, the research instruments, pilot study, data collection procedure, the methods of data analysis, and ethical considerations.

3.2 Research Design

This study employed qualitative research design using a descriptive approach. Ormord (2014) defined a descriptive study as the one that reveal the multifaceted nature of a certain situation, setting, process, relationships, systems or people. The qualitative research design was considered suitable for this study because data was collected only from a sample of a representative of the population and no variable was manipulated. Rather, respondents were required to express their opinions through the questionnaires and oral interviews. Observation schedules were additionally used to collect data.

3.3 Population of the Study

Neuman (2011) defined population as the abstract idea of a large group of many cases from which a researcher draws a sample and to which results can be generalized. The target population for this study consisted of all present senior secondary school learners and science teachers who have participated in science fair projects in the Omusati Educational Region. A report on the Omusati Science Fair for the year 2013 and 2014 indicated that approximately 80 learners from 11 out of 16 senior secondary schools in the region participated in the competition on a yearly basis and accompanied by their science quiz facilitators (MoE, 2014).

3.4 Sample and Sampling Procedures

A sample consists of a small set of cases a researcher selects from a large pool and generalizes to the population (Kothari, 2004). The sample of this study consisted of 45 learners and 16 science teachers purposively selected from 9 out of the 11 senior secondary schools in the Omusati Educational Region that have participated in the regional science fair competitions. In this sample, 5 learners were selected from each of the 9 senior secondary schools while 2 science teachers were selected from each of the 7 senior secondary schools while 1 teacher each was selected from each of the remaining 2 schools. The selection was based on their availability. The purposive sampling procedure was used in order to select participants who had participated at least, once in the science fair project competition in the Omusati Educational Region. This sample size represented an estimated 81% of the learners' population and science teachers taking part in the science fair project each year in the study area. A list of all present learners who had already participated in the science fair competition from the region was obtained from the regional Chairperson of science fair competition in the Omusati Educational Region. This list was confirmed by the facilitators of the competition at each of the schools. All the 45 learners and 16 science teachers completed qualitative questionnaires and, a subsample of 19 learners and 8 science teachers was purposively selected from those who completed the questionnaires to participate in the follow up interview schedule.

3.5 Research Instruments

The study made use of the following instruments namely; qualitative questionnaires consisting of open-ended questions, interview guides and observation notes to collect qualitative data from both the learners and science teachers.

3.5.1 Open-ended questionnaires

The questionnaires consisted of two sections: A and B. Section A requires participants to give bibliographical information about themselves while section B requires participants to respond to open-ended questions based on their opinions and experiences of the challenges faced by senior secondary schools' learners when preparing science fair project in the Omusati education region. The open-ended questionnaires were also used to collect data from the participants on the causes of the identified challenges. Open-ended questions enabled the participants (learners and science teachers) to respond to each question based on their experiences and perceptions without restriction. The questionnaires dealt with information required which might not have been sufficiently addressed through interview and observations.

3.5.2 Interviews

The interview schedules were used to collect additional information that may not be provided by the participants when completing the questionnaires. The interview guides were developed based the researcher's perceived challenges faced by senior secondary schools' learners when preparing science fair project and their possible causes. The interview guides also contain questions that collected data from the participants on what are the possible ways that they think the challenges faced by the learners when preparing science fair project could be mitigated. The interview allows participants to further express their opinions and experiences (Alvesson, 2011), on issues which may not be covered by the questionnaires.

3.5.3 Observations

The observation notes were used to obtain information from the schools' libraries, science laboratories and computer laboratories to determine their capabilities in supporting learners

with relevant information and materials needed during the preparations for science fair competition. In this case, the researcher played an observational role as a non-participant observer which is defined as an observer who visits the research site and record notes without becoming involved in the activities of the participants (Creswell, 2014).

3.6 Data Collection Procedures

The researcher visited the selected schools in the region, talked to the principals about the aim of the study and asked for a permission to conduct the study. The researcher asked the learners and science teachers to respond to questionnaires and later to the interview questions about the challenges learners experience when preparing science fair projects, the causes and to suggest possible ways that they think can mitigate the challenges.

The questionnaires were distributed to the participants by the researcher and all completed questionnaires were collected within two days after administering in order to minimize losses.

3.7 Data Analysis

The data obtained were analyzed using the content analysis method in which data were divided into categories such as patterns, relationships and themes. Neuman (2011) described content analysis as a technique for examining the content or information and symbols contained in written documents or other communication media, and it is mostly used in descriptive studies. Information obtained from the interviews and questionnaires were scored using number tallies in order to determine the frequency of occurrence of a particular challenge and the causes among the participants. The number tallies were presented as frequencies and relative frequencies (expressed in percentages) of occurrences of the various

challenges and their causes. Finally, the relative frequencies were plotted in pie charts and interpreted.

3.8 Ethical Considerations

After approval of the proposal, the researcher first obtained ethical clearance letter from the University of Namibia (Research and Publications office). Thereafter, the researcher wrote a letter. (see Appendix A) to the Permanent Secretary in the Ministry of Basic Education, Art and Culture asking for permission to carry out the research in secondary schools in the Omusati Region. After permission (see Appendix B) was been granted by the Permanent Secretary, further permission (see Appendix C) was requested from the Director of Education in Omusati Region, as well as from the principals (see Appendix E) of the selected schools. Participants were asked to give their consents and for the minors, assents were obtained from their parents to allow them to participate in the study after school hours. Before data were collected from the participants, the purpose of the study was clearly explained to them after which they were asked to give their information voluntarily and participants were assured of confidentiality by informing them not to write their names and the names of the schools on the questionnaires. The participants were also assured of their right to withdraw from the study anytime they wished to. Data collected were stored in locked briefcase to which only the researcher had access and would be kept for a period of five years after completion of the study. Thereafter, the hard copies will be destroyed by using a shredder while the soft copies will be deleted from memory sticks and hard drives.

3.9 Reliability and Validity of the Study

Precautions were taken to ensure the validity and reliability of the study. While preparing the interview guides and open-ended questionnaires the related literature was examined for the researcher to understand the contextual framework in order to increase the internal validity of

the research. In addition, after the development of each research instrument by the researcher under the supervision of a supervisor a copy was given to a subject specialist and peer reviewed by three fellow Masters of education students and both results conquered with the supervisor. Moreover, the participants were able to express their opinions freely. The research process was explained clearly to increase external validity. The design of the research, data collection instrument and process as well as analysis and interpretation of the data were explained in detail. All the data were written without any interpretation to ensure internal reliability (Miles & Huberman, 1994). In addition, another researcher who had experience in qualitative research and science education coded the information obtained from the interviews. This code was compared with that of the researcher, and the consistency was calculated (95%).

3.10 Pilot Study

The pilot study was conducted to validate the design of the study. To ensure reliability and validity of the questionnaires and interview guides, a pilot study was carried out at one secondary school in Omusati education region and the school is not part of the main study. The aim for carrying out the pilot study was to pretest the instruments to determine whether the instruments would measure what they are supposed to measure (Berg, 2007).

The pilot study was designed to gather information on the appropriateness of the instruments and other administrative logistics prior to the conduct of the main study, in order to improve its quality and efficiency (Lancaster, Dodd, & Williamson, 2004). According to Lancaster et al (2004), a pilot study can reveal deficiencies in the design of a proposed experiment or procedure and these can then be addressed before time. In addition, the pilot study enables the researcher to: determine whether the study participants would understand the questions, determine deficiencies of the instruments, and establish whether the data obtained could be meaningfully analyzed in relation to the research questions of the study in order to make some adjustments or retain them as they were (Depoy & Gitlin, 2011).

In the pilot study, seven learners and two science teachers (projects facilitators) were purposefully selected based on their participation in the preparation of science fair projects during previous years and their willingness to participate. Three out of seven learners were further interviewed and the two teachers were also interviewed.

The following changes were done on the instruments used after the collection of data for pilot study.

1. Indicating the aim of the study on the open-ended questionnaires and interview guides which was not clearly indicated during the pilot study.
2. The question on the main causes of the challenges was not fully addressed by participants, some of them left it unanswered in both questionnaires and interview guides, hence was rephrased to make it more clear and well understood.
3. Question 4 on how long have you been preparing science fair projects was having interval options which was changed to specific responses.
4. The question asking about the “reoccurring challenge” was not well understood and hence, modified to help learners understand it more clearly. Reoccurring challenge was changed to the “challenge that occurs most of the time” when you are preparing science fair project.
5. Question 7 about any comment on the challenges was moved down to become the last question.
6. During the pilot study, no voice record was used, but it was used in the main study. The voice recorder was used because the researcher found it difficult to keep track of most relevant information during the interview.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

The data obtained in this study were presented, analyzed and interpreted based on the research questions of the study raised in Chapter 1. The subheadings of this chapter include:

1. Biographical information of the participants (learners and science teachers).
2. Challenges faced by senior secondary school learners when preparing science fair projects in the Omusati Educational Region.
3. Main causes of the challenges faced by senior secondary school learners when preparing science fair projects in the Omusati Educational Region.
4. Perceptions of the teachers on the challenges that learners face when preparing science fair project in the Omusati Educational Region.
- 5 The possible ways of minimizing the challenges faced by the senior secondary school learners when preparing science fair projects in Omusati Educational Region.

4.2 Biographical Information of Participants

4.2.1 Biographical information of the Learners

The biographical information such as sex, age, grade, years of experiences and achievement of learners in science fair competitions are presented in this section.

Sex of the learners

The participants were asked to indicate their sex and the results obtained are presented.

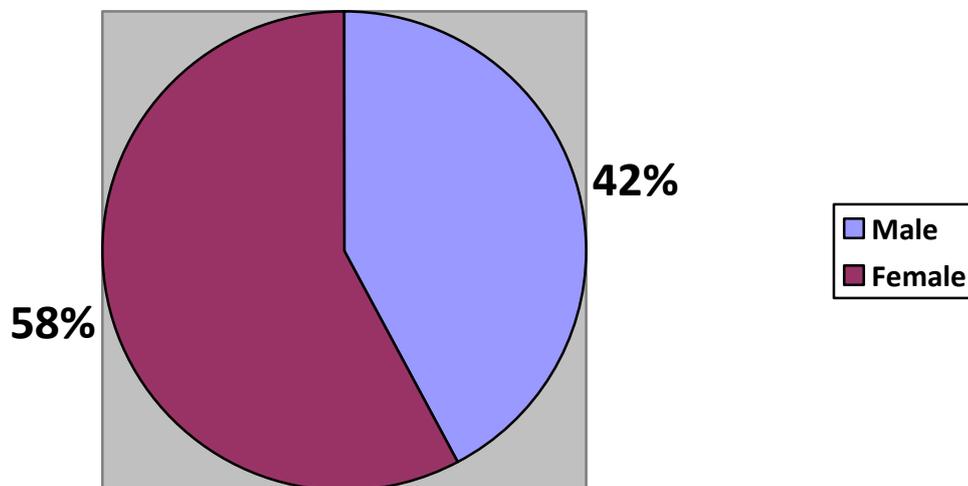


Figure 1. Pie chart showing distribution of respondent by sex (n = 45)

Out of the total of 45 secondary school learners who participated in this study, 19 (42.2%) were male while 26 (57.8%) were female. These results revealed that female constituted the majority of learners who have participated in the process of preparing science fair projects in the Omusati Educational Region. These findings are at variance with the results of the studies by Mwetulundila (2000) and Kasanda et al (1999), in which the results of their study had shown that more male learners mostly participate in science related activities compared to female learners.

Age Range of the learners

The results of the age distribution of the participants (Figure 2) reveal that 8 (18%) of the learners were below 16 years, 34(76%) were between 17-20 years, while 3 (7%) of the learners were between 21-24 years.

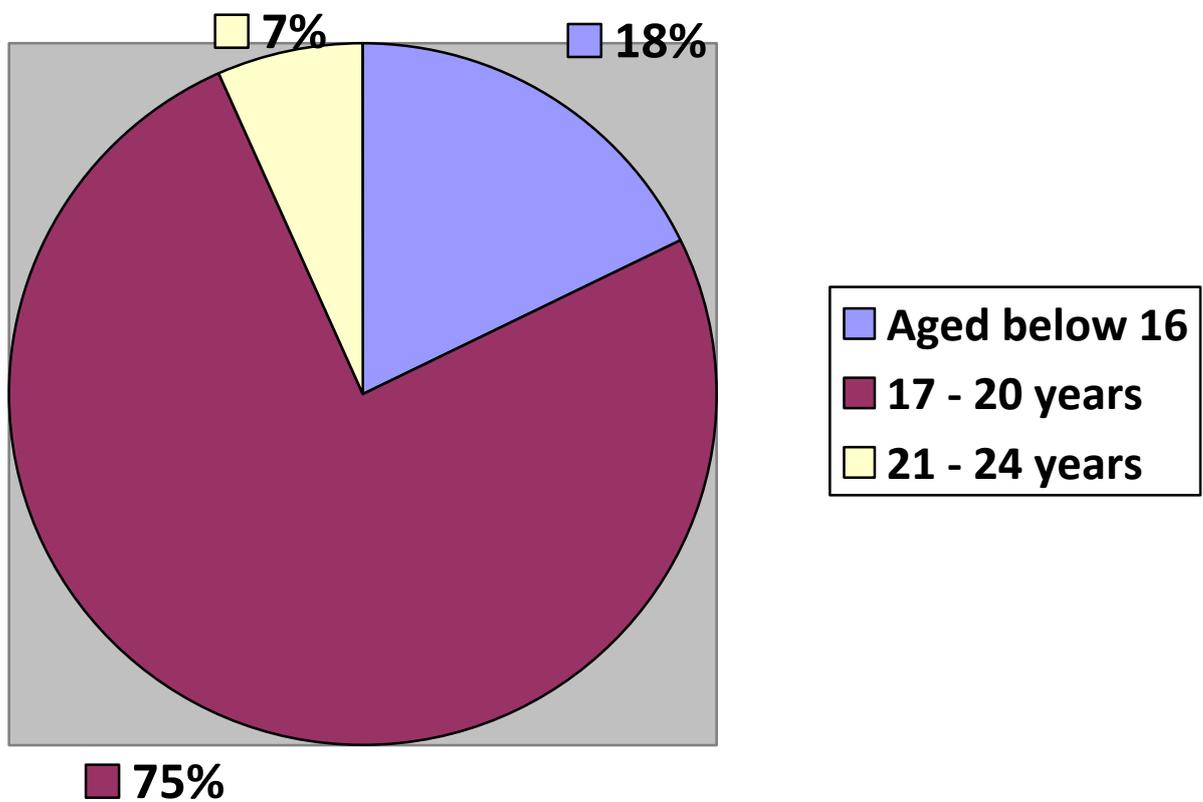


Figure 2: Age Range of the learners (n=45)

Grade level of the learners

The grade levels of the learners who participated in the study were as presented in Figure 3 below. The results showed that 7(16%) of the learners were in grade 10, 24(53%) of them were in grade 11 while 14(31%) were in grade 12. These findings indicated that only few learners from grade 10 and 12 participated in the study. The limited number of learners participated from grade 10 and 12 may be due to the fact that these learners need more time throughout the year to prepare for their external examinations. The larger number of the participants consists of learners in grade 11 who do not write external examinations. However, all learners from different grades need to fully participate in the preparation of science fair projects, since this process is an important step for future science careers. Immediate benefits that learners participating in science fair projects competitions would gain include learning new things, broadening scientific knowledge, entertaining time, developing positive attitude towards science and improving learners' performance (Tortop, 2012; Roth & Lee, 2004; Betts, 2014; Singh et al., 2012; Korkmaz & Kaptan, 2002).

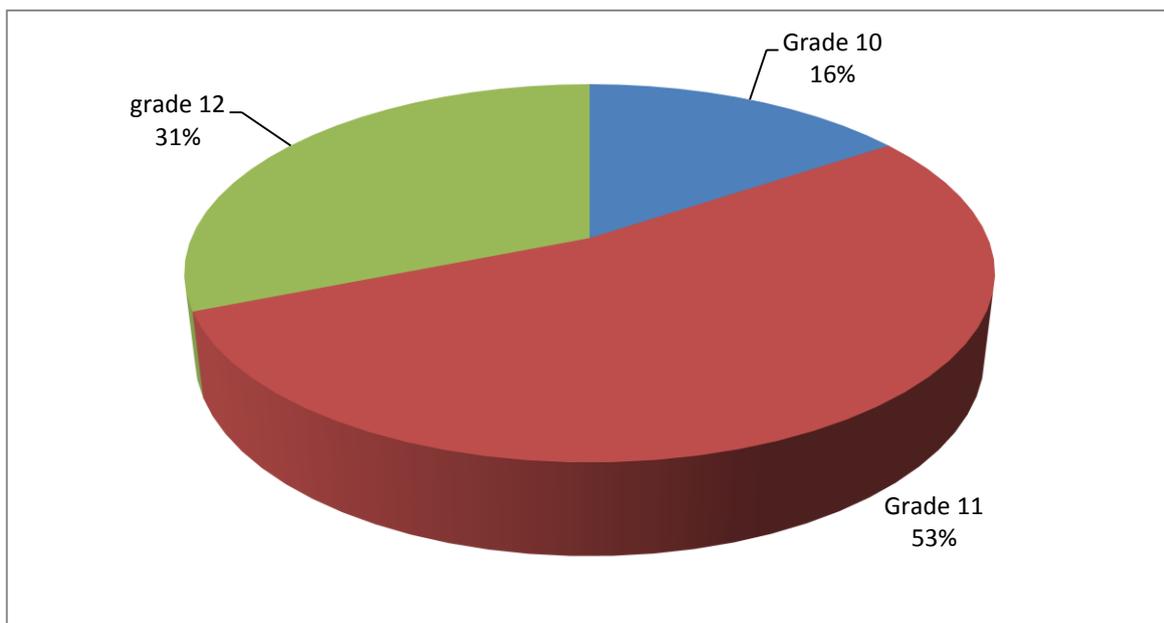


Figure 3: Pie chart showing Distribution of learners by grade level

Years of experiences of the learners who participated in preparing science fair projects.

Figure 4 below shows the experiences of learners in number of years of participation in science fair projects competitions at school, circuit, region and national levels.

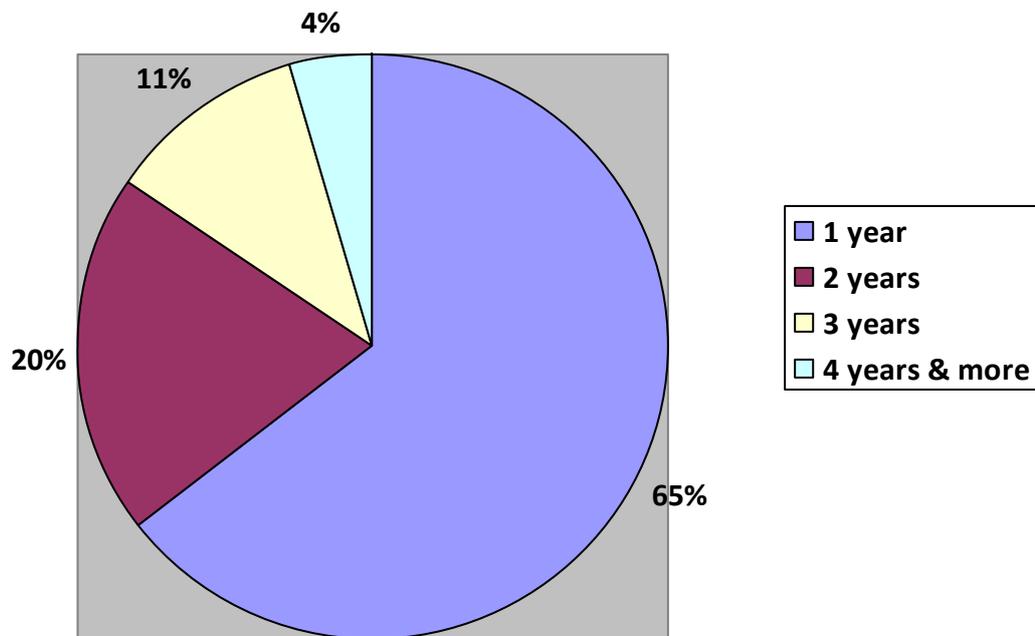


Figure 4: Distribution of participants (learners) by years of experiences of participation in science fair project competition (n = 45)

The results of the years of experience of the learners participation in science fair projects competitions in Figure 4 shows that 29(65%) have one year experience, 9(20%) have 2 years of experiences, 5(11%) have 3 years of experiences and 2(4%) have 4 years of experiences. These results concur with those of Tortop (2013) which established that science fair project beginners find it difficult to prepare quality projects especially if there is no proper guidance from teachers and other expert learners. The study further recommended that there must be sufficient time to introduce the beginners to the preparation process.

Achievements of the learners in science fair competitions during their years of participations.

The learners were asked to indicate their achievements in terms of how many times they have won prizes in all the science fair competitions they have participated.

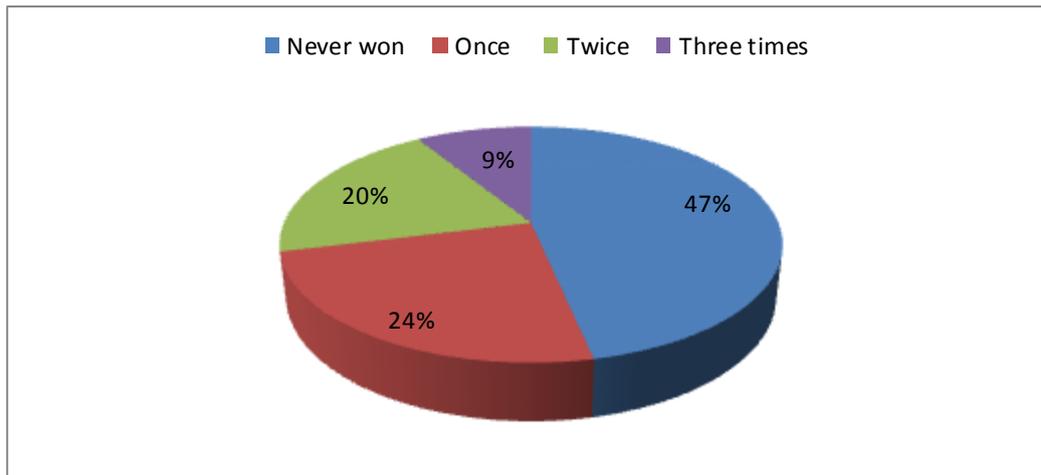


Figure 5: Number of times the learners won prizes in science fair competitions

The results obtained (Figure 5) revealed that 21(47%) of the learners have never won any prize in the science fair competition, 11(24%) of them had won prizes only once, 9(20%) had won prizes twice while 4(9%) had won prizes three times. Majority of the learners who indicated that they have never won any prize in the science fair competition is in line with the Ministry of Education’s report on Omusati regional science fair competition which indicated that a large number of learners who presented science fair projects performed very poor and could not meet the quality criteria (MoE, 2014).

4.2.2 Biographical Information of Science Teachers

This section presents the biographical information which includes the age, sex, educational qualification, and years of teaching experiences of the 16 science teachers who participated in the study from 9 senior secondary schools in the Omusati Educational Region.

Age ranges of Science Teachers

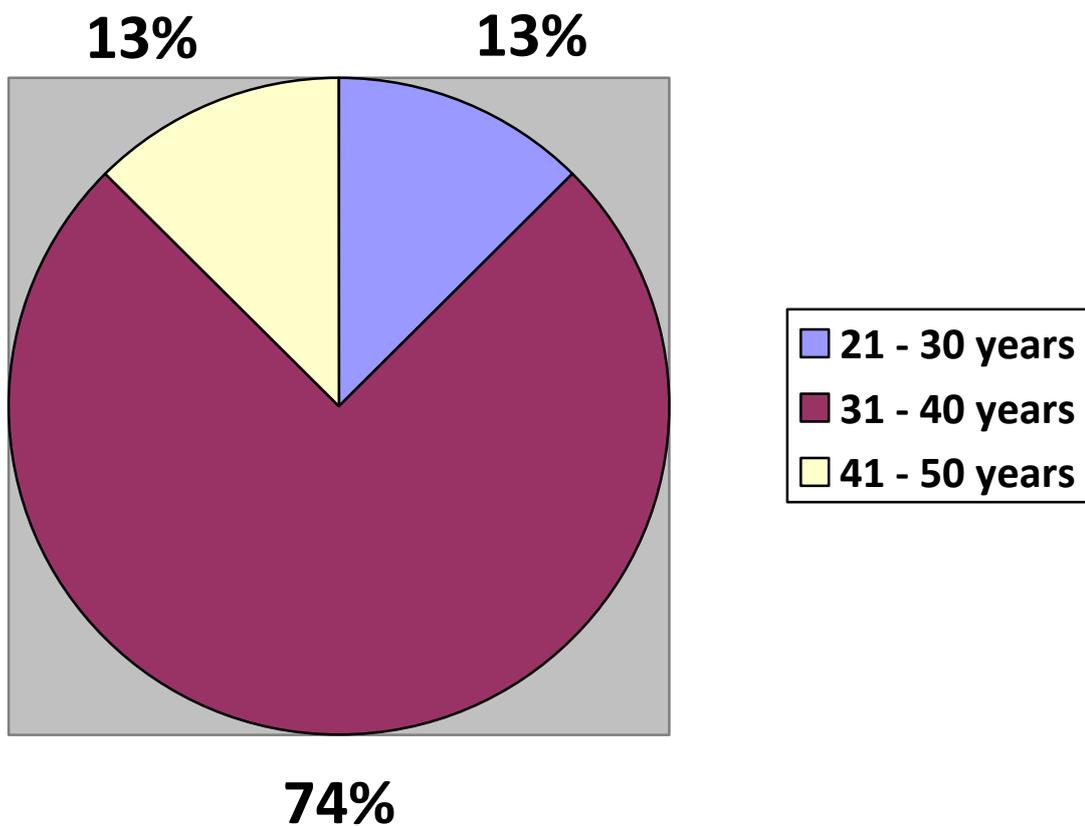


Figure 6: Pie chart showing the Distribution of Respondents (teachers) by age range (n=16)

It can be noticed from Figure 6 that majority of the participants 12 (74%) were aged between 31-40 years while 21-30 years and 41-50 years age brackets had 2 (12.5%) participants each.

Sex of respondents (Science Teachers)

A total of 16 science teachers from 9 Senior Secondary Schools in the Omusati Education Region participated in the study. Of the 16 participants 2 (13%) were females while 14 (87%) were males, as shown by figure 7.

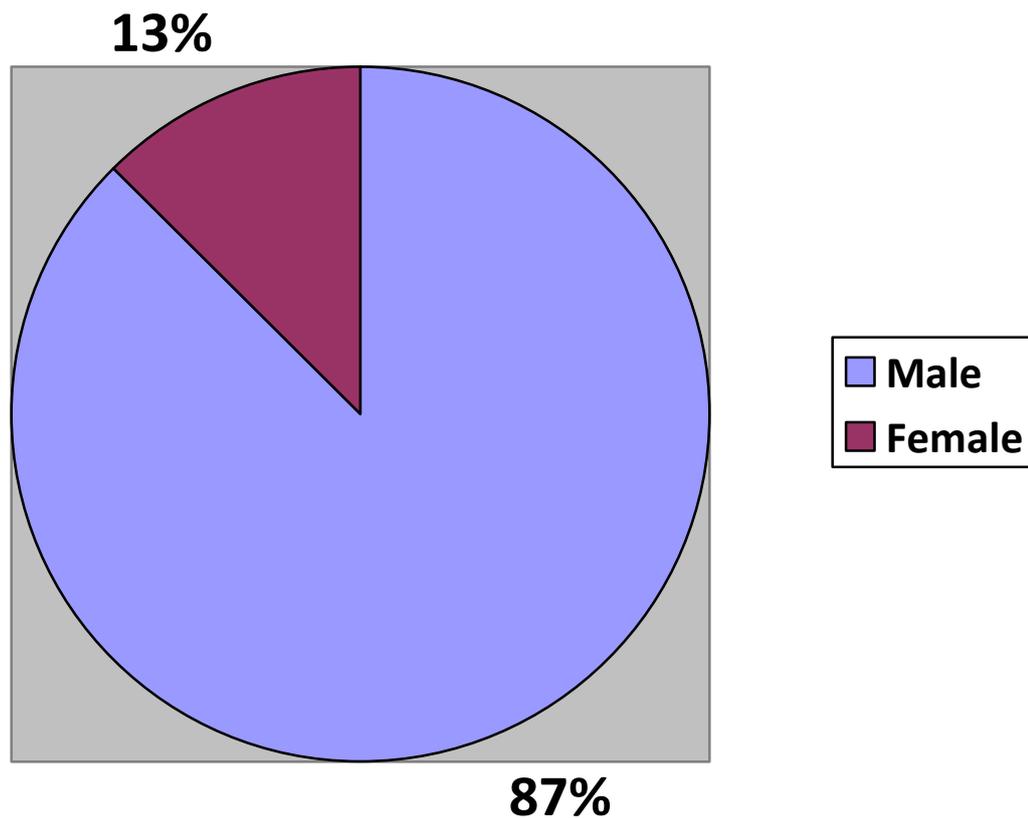


Figure 7: Distribution of Respondents by sex (n=16)

Qualifications of Respondents (Science Teachers)

The findings presented in figure 8 show that 9 (56%) of the science teachers had Bachelor of Education (B.Ed) degree, followed by 4 (25%) of them having Basic Education Teachers Diploma, and the remaining 3(19%) participants had the Basic Education Teachers' Diploma (BETD), Advanced Certificate in Education(ACE), and Master's in education.

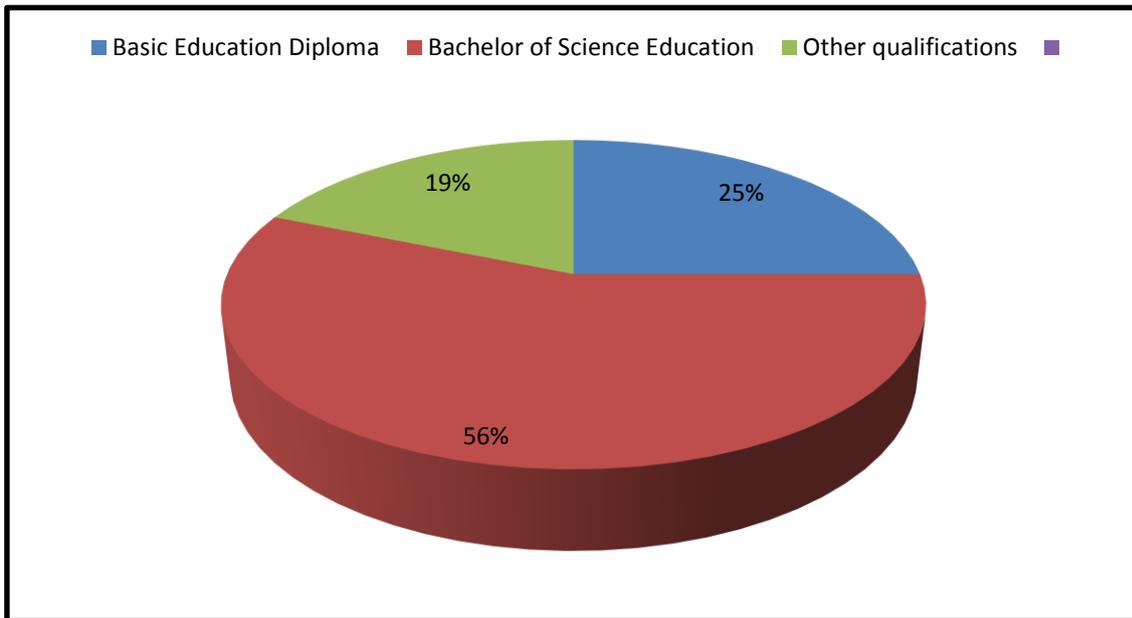


Figure 8: Number of respondents by qualification (n=16)

Teaching Experience of Respondents (Science Teachers)

Participants were asked to indicate their teaching experience in years and the results obtained are given in figure 9.

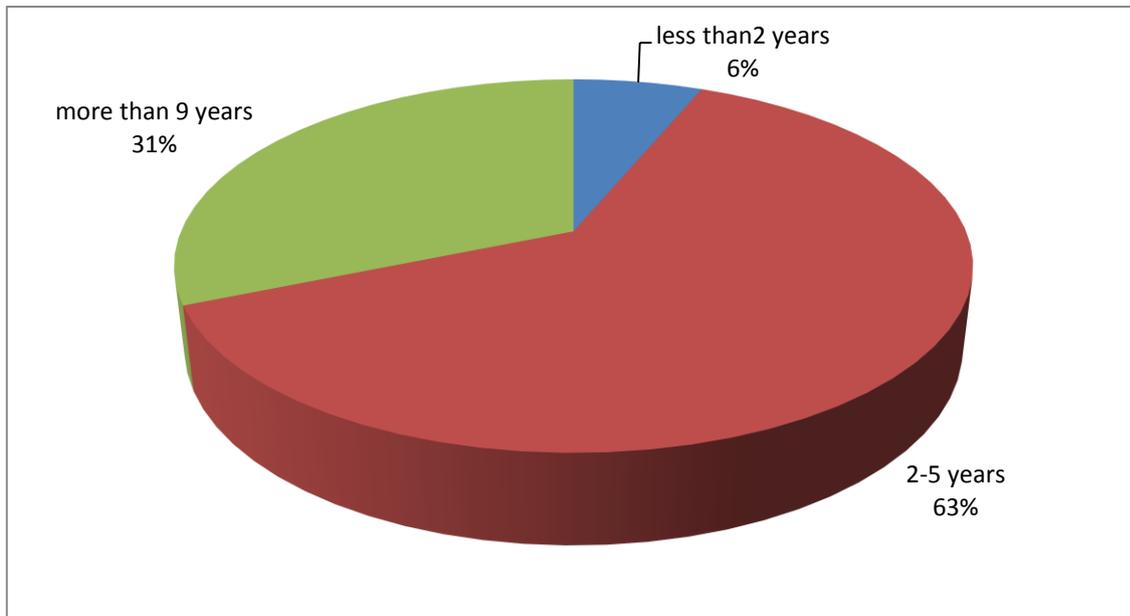


Figure 9: Years of teaching experience of the science teachers (n=16)

Participants were asked to indicate their teaching experience in years and the findings (Figure 9) showed that 1 (6%) of the participants had teaching experience of less than 2 years, 10 (63%) of the participants had 2 to 5 years of teaching experience, none of the participants had teaching experience of 6 to 9 years, and 5 (31%) of the participants had teaching experience of more than 9 years.

Respondents (Science Teachers)' experiences in training learners for science fair projects' competition

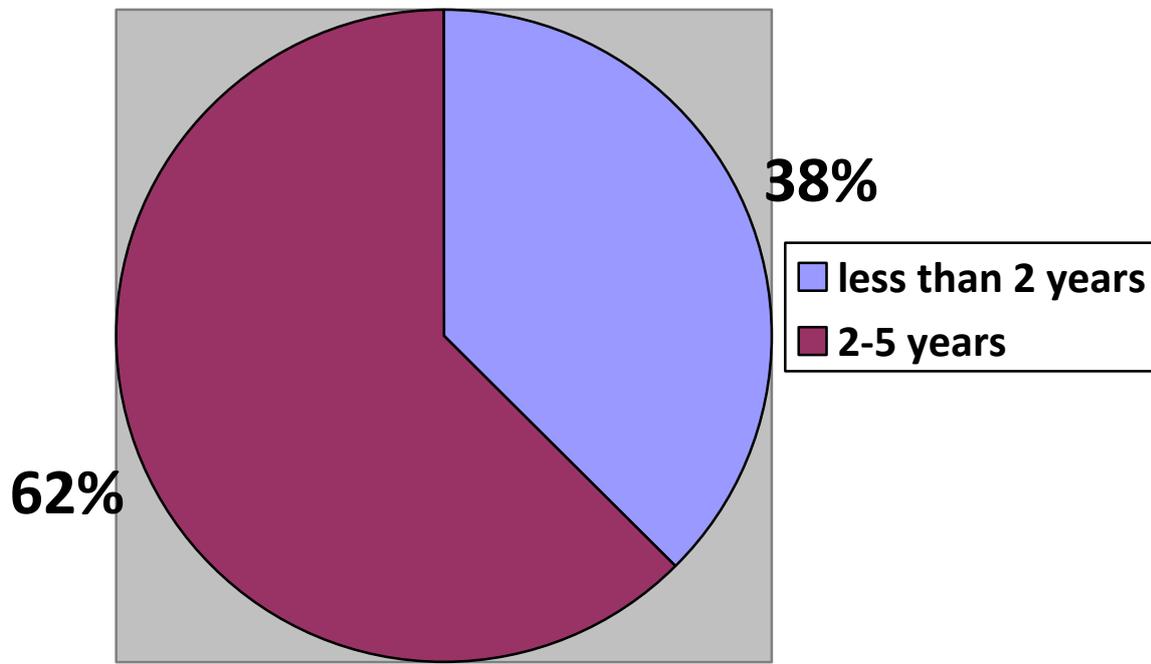


Figure 10: Number of years of teachers' experience in training learners for science fair projects' competition (n=16)

Furthermore, the findings on the teachers' years of experience in training learners for science fair projects' competitions (Figure 10) showed that 6 (38%) of the participants had less than 2 years of experiences, while 10 (62%) of them had 2-5 years of experiences. The results revealed that none of the participants had experiences of training learners falling in the following year categories 6-9 years and more than 9 years. This result suggested that majority of science teachers had 2-5 years of experience in training learners when preparing science fair projects.

4.3 Challenges experienced by senior secondary school Learners when preparing Science Fair Projects in Omusati Educational Region

The results (Table 1) outlined the different challenges experienced by senior secondary school learners when preparing science fair projects in the Omusati educational region. Open-ended questionnaires were used to collect the data. The results obtained revealed that the participants (learners) experienced various challenges. Majority (76%) of the learners who completed the questionnaires identified lack of resources/materials needed during the preparation of science fair as a major challenge.

Table 1: Challenges faced by the senior secondary school learners when preparing science fair projects

Challenges	%Number of Participants
Lack of resources	34(76)
Lack of information	17(38)
Lack of proper guidance from teachers	13(29)
Lack of access to technical equipment such as computers and electronic sources of information such as internet	13(29)
Limited time to do projects	13(29)
Lack of self-confidence in learners	6(13)
Lack of support from other learners	6(13)
Non-functional science club at schools	2(4)

Note: A participant can mention more than one challenge, number in parenthesis indicates percentage.

As shown in Table 1, the challenges in order of occurrences as they were experienced by participants are: Lack of resources was indicated by (76%) of the participants, followed by lack of information indicated by 38% of the participants, 29% of them indicated lack of proper guidance from teachers, the same 29% of the participants indicated lack of computers as one of the challenges, and another 29% of the participants indicated that there is limited time to prepare the projects. Table 1 further showed that 20% of the participants indicated that lack of assistance from other learners is a challenge, while 13% of them indicated lack of self-confidence in themselves. Betts (2014) submitted that learners do struggle with confidence in pursuing their own ideas and have fear of failure when they are preparing science fair projects. Only 4% of the participants indicated nonfunctional science clubs in their schools as a challenge also faced when preparing science fair projects. However, lack of functional science clubs in secondary schools could make it difficult to bridge the gap between in- and out-of-school learning. There is therefore a need for a strong connection between the two ways of learning for learners to do better in science fair project competitions. The follow up interview also revealed that the majority (89%) of respondents (learners) indicated the problem of insufficient materials as a major challenge they face when preparing science fair projects. In a similar study by Bencze & Bowen (2009), it was established that the process of preparing science fair projects may be discriminating against learners who have the ability to prepare science fair projects but do not have access to various kind of resources needed during the preparation process.

It was also found during the follow up interview that 32% of the respondents have no access to technical equipment such as computers and electronic sources of information such as internet. Campbell, Wagner, & Walberg (2000), had identified that one of the basic features of a successful program for preparing science fair projects is when learners have easy access to different sources of information. In addition, when learners have access to various sources

of information, they will be exposed to different ways of preparing science fair projects, and collecting different information which could be synthesized into concrete ideas in their project.

In addition to the challenges identified, 40% of the learners indicated during the interview that the most difficult stages of science fair project preparation were deciding on the topic for investigation and collecting data. Furthermore 24% of the respondents found it difficult to perform an experiment in order to test their results, while (9%) had difficulty in typing their projects. In a similar study, Betts (2014), submitted that learners face various challenges in acquiring the skills necessary to complete different stages of their projects.

Learners need guidance and support from their facilitators/teachers and other learners who have sound knowledge of science fair projects' preparation process. A recent study by Betts (2014) submitted that for the learners to be successful in activities that bother on inquiry-based learning, such as science fair projects preparation, there must be appropriate guidance from mentors and teachers. Betts (2014) also added that there must be highest level of interaction between the facilitators and the learners throughout all the stages of the preparation. During the interview, one respondents stated that: *“Some learners do not support us instead they discourage us from preparing our projects, for example, one was telling me to quit from preparing science fair projects apparently it is a wasting of time, because I will never win”*.

Limited time to do projects was also a major challenge during science fair project preparation according to the participants. From the open-ended questionnaires, 29% of the learners identified limited time as one of the challenges, and in the follow up interview, 37% of the learners further indicated that they do not get enough time to prepare their projects. In a similar study, Betts (2014) noted that some learners may be struggling with balancing their

school work with deadlines from science fair programs. In the interview, one of the respondents stated that: *“there is no enough time to prepare science fair projects, one day I failed a test because there was no enough time to study for the test as I was busy preparing my project”*.

4.4 Main causes of the Challenges faced by senior secondary school Learners when preparing science projects in the Omusati Educational Region

The participants (learners) identified the following factors as the main causes of the challenges they face during science fair projects preparation.

Table 2: Main causes of the challenges experienced by learners when preparing science fair projects.

Main Causes of challenges	Number of participants in %
Lack of financial supports	47
Poor time management	20
Low Socio-economic status of learners and the school	18
Learners are not aware of the importance of preparing science fair projects	9
Learners informed about science fair late	9
Non-functional computers	6

As shown in Table 2, 47% of the participants identified lack of financial support as another cause of the challenges. During the follow up interview, one of the respondent revealed that: *“...since the school only allocate little amount of finance for science fair project preparation, we, learners end up using our own pocket money to buy materials needed for project preparations”*. Eldelson, Gordin and Pea (1999), asserted that learners might not have enough fund for buying relevant materials and the school might not provide most of the needed materials. In addition Betts (2014), highlighted that in order to prepare a successful science fair project, learners must have access to necessary resources and must be provided with adequate support from knowledgeable teachers.

Poor time management by learners and facilitators (science teachers) was identified as one of the main causes of the challenges learners faced, as indicated by 20% of the participants. Betts (2014) noted that when preparing science fair projects, learners face problems of limited time to do their projects as they find it difficult to balance their school work with deadlines from science fair programs. This was an indication that learners had poor time management skills in their preparation process.

The present study also found that 18% of the participants pointed out low socio-economic status of the learners and their schools as one of the main cause of the challenges. In the follow up interview, 42% of the participants also indicated that low socio-economic status of learners and their schools is one of the main causes of the challenges faced by learners. Learners from poor backgrounds and low socio-economic status are disadvantaged during science fair competitions due to the fact that they had no access to greater financial resources and hence find science fair unpleasant (Bencze & Bowen, 2009). In addition, Ndlovu (2013) also submitted that ill-equipped learners in disadvantaged schools with low capital income do not have the resources to prepare quality science fair projects and compete with learners from historically advantaged schools who have access to sufficient resources. Nine percent (9%) each of the participants identified that the learners are not aware of the importance of preparing science fair projects and the information about science fair are received late. Bencze and Bowen (2009) had also submitted that learners may not be aware of the importance of preparing science fair projects because the preparation of science fair projects tend to be de-emphasized in schools. In the follow up interview, one of the respondents stated: *“Teachers must prepare us on time before the science fair competition in order to organize ourselves”*.

Some senior secondary schools in Omusati Educational Region had enough computers but most of them were nonfunctional (out of order). Findings from the open-ended questionnaires revealed that 6% of the learners indicated non-functional computers as another contributing factor to the challenges faced by learners during science project preparation. In the follow up interview, one respondent explained: *“Our school is outdated, most of the computers in ICT laboratory are not working, and you find one computer used by 10 learners to search for information and type project reports”*. Under this kind of learning situation, most learners willing to prepare science fair projects will face challenges of lack of technical support. Moreover, Uiiito et al (2006) had noted that lack of appropriate technology such as computer and internet limit learners’ access to proper information.

4.5 Learners’ Views on the Possible ways to Minimize the Challenges

In order to improve the process of preparing science fair projects in the Omusati educational region, learners were asked to suggest some possible ways of mitigating the challenges that they faced during science fair projects preparation. From the open-ended questionnaires responses, 26(58%) of the participants indicated that facilitators of the science fair projects competition should make arrangements with the school managements to provide resources needed for the projects preparation process. During the follow up interview, 63% of the respondents further suggested that the school management should request for sponsorship of science fair projects’ resources by different organizations in order to provide sufficient resources to the learners and minimize the challenge of lack of resources. Furthermore, they indicated the need to provide internet access to the learners. With the internet access, learners could search for relevant information in order to enhance the quality of their projects. As stated by Kasanda et al (1999), computer technology may be helpful in schools in providing learners with access to information that may not be provided by other peers and facilitators. Another 20% of the participants suggested that each school should have a separate room for

preparing science fair projects where learners work on their projects independently with minimum disturbances from other learners. Furthermore, 29% of the participants suggested via the open-ended questionnaires, and 31% suggested during the follow up interview the need to provide relevant information in the form of a well explained information booklet about the requirements and criteria of the science fair projects in order to guide learners during the preparation process. The learners also suggested proper time managements during the preparation process by both learners and their trainers (science teachers). Proper time managements ensure adhering to deadlines, proper planning, and finishing of all activities within a given time frame. Singh et al (2012) noted that in order to manage time properly, there must be a well-designed science fair calendar with a list of necessary tasks to be completed before the given due date.

In another finding (84%) of the learners suggested that teachers should assist them during the preparation process, while (63%) of the learners proposed adequate training for both learners and teachers about project preparations. In earlier studies, Campbell et al (2000) and Betts (2014) noted that programs such as preparing science fair projects must be given variety of options and new opportunities for learners and teachers to engage in learning activities such as training workshops, courses, seminars and competitions. Such learning activities will equip learners and teachers with more knowledge, and develop their skills of science projects. In addition, the training could avail learners and teachers relevant information needed during the preparation process and hence minimize the challenge of learners not receiving adequate support from their facilitators.

Other ways of minimizing the challenges learners face when preparing science fair projects in the Omusati educational region, as suggested by the learners during the interview includes:

inculcating self-confidence in learners, equipping science laboratories, and timely provision of information about science fair competitions at the regional level.

4.6 Perceptions of Science Teachers on the Challenges faced by Learners when preparing Science Fair Projects

4.6.1 Teachers’ Opinions on the Importance of preparing Science Fair Projects

The opinions of the science teachers who participated in this study on the importance of preparing science fair projects are as shown in Table 3.

Table 3: Teachers’ Opinions on the Importance of preparing Science Fair Projects

Importance of preparing science fair projects	Number of respondents and percentage (%)
Assisting learners to gain more knowledge	13(81)
Learners discover new ideas, and develop cooperative learning and critical thinking skills	6(38)
Enhance learners understanding of science subject content	4(25)
Arouse learners interest in science careers and curiosity	4(25)

Note: A participant can mention more than one importance of preparing science fair projects. Number in parenthesis indicates the percentage.

Table 3 shows the teachers’ view on the importance of preparing science fair projects by the learners. From the open-ended questionnaires, the result showed that 13(81%) of the participants indicated that the process of preparing science fair projects assist learners to gain

more knowledge, followed by 6(38%) of the participants who indicated that during science fair projects preparations, learners have the opportunity to discover new ideas, develop cooperative learning and critical thinking skills. During this process learners find answers to long overdue questions, learn how to work together with others in order to come up with quality science fair projects, and through that exercise they could develop the ability for critical thinking. In a report by Jaworski (2013), many educators believe that science fairs project preparations are the best way to develop skills, attitudes and knowledge that will lead to future success. Moreover, Betts (2014) also emphasized that learners' involvement in science fair projects preparations process gives them the opportunity to develop conceptual learning and manipulative skills, investigative skills and positive learning outcome.

The results further showed that 25% of participants indicated that the preparation of science fair projects enhances learners understanding of science subjects and arousing their interest and curiosity in science. These findings corroborate the report of Campbell et al (2000), in which it was stated that preparing science fair projects incites curiosity, quest for knowledge, interest in learning science and must be encouraged in learners.

4.6.2 Teachers' Views on the challenges learners face when preparing Science Fair Projects in Omusati Educational Region.

Table 4: The view of the science teachers on the challenges experienced by learners when preparing science fair projects in the study area. (n-16)

Challenges faced by learners according to the science teachers	Number of respondents and Percentage (%)
Insufficient materials	12(75)
Little knowledge of using a computer	5(31)
No access to internet	5(31)
Poor communication in English language	5(31)
Lack of detailed information on the procedures involved	4(25)
Poor parental guidance and involvement in the preparation process	1(6)

Note: A participant can mention more than one challenge; the number in parenthesis indicates percentage.

The results (Table 4) revealed that 12(75%) of the participants identified insufficient materials needed for preparing project by learners, while 4(25%) of participants indicated lack of detailed information related to all the procedures that need to be followed in the project preparation process. It was indicated by 5(31%) of the teachers that most of the learners have little knowledge on how to use computers in their preparations: for example how to type, search for information on internet and constructing diagrams/graphical presentations. Furthermore, 5(31%) of the participants indicated that most of the learners find it difficult to communicate properly in English and hence, have great challenge when

searching for information, interpreting their findings, and communicating their results through presentations and interviews. Good communication skill in English as a second language in Namibia is one of the criteria used by judges of science fair projects when awarding marks for the projects presentation. When learners are unable to communicate properly in English language, it may lead to poor performance in projects competitions. These same learners might end up getting unnecessary information during searching, misinterpret their findings and may not give correct information during interview by the judges. One of the respondents (a science teacher) further explained that: *“Sometimes a learner will come to me asking for guidance in the project preparation process, but that same learner is communicating in English language using wrong scientific terminologies, as a result this conversation between the two of us may end up diverting from the learner’s initial idea just because of the learner’s poor communication in English”*.

The teachers further stated that some learners especially those from poor primary schools write their research reports in vernacular languages. Therefore, it is difficult for the judges who are non-speakers of that specific language to judge the project when the report is written in vernacular language.

Thirty-one percent 5(31%) of the participants indicated that the learners have no access to the internet. When learners do not have access to internet, then, they will not be able to access certain relevant information that may be needed to produce quality projects. Kasanda et al (1999), submitted that learners need to use computer technology such as internet to search for information and communicate with others who have access to the internet through emails and video clips in order to share relevant information. Six percent 1(6%) of respondents indicated that poor parents and teachers’ involvement has a negative effect on the quality of science fair projects prepared by learners. According to Roth and Lee (2004), and Neu, Baum and

Cooper, (2004), the involvement of parents in project preparation process provide necessary support to their children.

The results of the follow up interview on the teachers' view of the challenges faced by learners when preparing science fair projects in the Omusati Educational Region revealed that (88%) of the participants still pointed out lack of materials and resources needed in the preparation process as one of the challenges, while 5(63%) of participants identified lack of understanding and proper guidance. It was also found that 3(38%) of respondents identified the following challenges: limited time to do projects; some educational stakeholders are not aware of the importance of preparing science fair projects to the learners and the school; and there is no planned budget in the schools for the preparation of science fair projects. Lastly, 2(25%) of respondents indicated challenges consisting of lack of support from teachers, no access to the internet, learners' negative perceptions towards science fair projects and lack of confidence in themselves.

4.6.3 Teachers' opinions on the Main Causes of the Learners' Challenges during Science Fair Project preparation

Results from the Open-ended questionnaires indicated that, majority (56%) of the respondents identified lack of financial support as one of the main causes of the challenges learners face during science fair project preparations. In this case, learners may be unable to acquire all the needed materials for their projects, and this may result in poor quality project.

It was also established that the learners lack exposures to different places and basic information about preparing science fair projects. Furthermore, the teachers indicated that very little research projects are given in schools to the learners as part of assessment. The other causes of the learners' challenges identified by the teachers include: lack of properly equipped laboratories to cater for the projects' preparations, poor socio-economic status of

learners, parents and the school at large which result in learners facing varieties of other challenges. Furthermore, the management teams of some schools are reluctant to avail money for project preparation because most of them do not understand the importance of preparing science fair projects to the learners and to the school at large. It was also indicated that most of the time learners and teachers have hectic schedules which do not allow them to accommodate the process of preparing science fair projects.

The results of the follow up interview revealed that, majority of the participants 6(75%) still pointed out that insufficient financial support is one of the main causes of the challenges learners face when preparing science fair projects preparation in the study area. Another 4(50%) of the participants identified lack of exposure for both teachers and learners, and limited time as the causes of learners' challenges. Furthermore, 3(38%) of the participants identified little parental involvement and poor English language communication as a major cause of the challenge faced by some learners. It also indicated that only limited numbers of learners and teachers are often recommended to participate at the circuit level of the science fair project competition and this afford the only few participants the experience relevant to further preparation for regional and national science fair competitions.

4.6.4 Teachers' opinions on the Prevention Measures that can be taken to Minimise the Learners' Challenges when preparing Science Fair Projects

The teachers who participated in this study were asked to suggest possible ways that can minimize the challenges experienced by learners when preparing science fair projects and they gave the following opinions.

- The school must provide enough time to the learners who are preparing science fair projects. To achieve this, the teachers suggested that such learners can be excluded from other extracurricular activities in the schools.

- They also suggested that the facilitators of the science fair projects competition should carryout awareness campaign to sensitize parents/guardians about the importance of preparing science fair projects and mobilize supports for the learners. This might create interest and more understanding from parents to assist their children during science fair projects preparation.
- Facilitators of the science fair projects competition should motivate learners by providing them with relevant information and take them to different places to observe how others carryout their preparation processes.
- The schools should be provided with enough resources and laboratory facilities that will be useful to learners when preparing science fair projects.
- Involvement of all science teachers may create positive attitudes in learners towards what they are doing and hence, impact on the quality of science fair projects learners produced.
- Curriculum revision is needed to include project based learning as a promotional subject and teachers need to be trained to teach this subject and provide the learners with proper guidance.
- Teachers were urged to use teaching methods that are more practical and learner-centered as it creates a culture of experimenting among learners.
- Institutions of higher learning were urged to emphasize project-based learning in training teachers who will be capable of providing proper guidance to the learners with regards to quality project preparation.
- Provision of relevant training to learners and teachers through workshops.
- Provision of adequate resources needed during the project preparation process.
- Requesting for sponsors to assist learners with fund or resources needed.

- Rotation of judges so that other teachers get knowledge of the science fair project assessment for prizes award.
- The National Commission on Research Science and Technology (NCRST) should create awareness among different stakeholders and involve more learners at circuit and regional levels of the science fair projects competition.
- The Ministry of Education in collaboration with the National Institute for Educational Development (NIED) should initiate compulsory project-based learning from lower grade.
- The directorate of education in Omusati educational region should improve infrastructures by building science fair Training Centre for learners and teachers in the region.

4.7 Findings from Observation Notes

Observation notes were taken by the researcher in the 9 senior secondary schools where learners and teachers formed the samples for the study. This was done to enable the researcher make a personal assessment of the facilities available to learners for use during science fair projects preparations. It was observed that only 2 out of the 9 senior secondary schools have well equipped laboratories (science and ICT), including libraries. The two secondary schools also have functional computer laboratories with e-resources capable of providing relevant information and technical support to the learners.

It was also observed that one of the two schools was offering Computer Studies as a promotional subject in grades 11-12. According to the Information and Communications Technology (ICT) teacher of the school, most of the learners doing Computer Studies have been performing well in science fair project competitions because they often develop more advanced projects by using variety of computer programs.

The remaining 7 of the 9 senior secondary schools have very poorly equipped computer laboratories with an average of 1-3 computers functioning properly in each laboratory. Furthermore, the science laboratories in these 7 senior secondary schools had few resources needed by learners to prepare science fair projects of good qualities. Besides, it was also observed that the libraries in the schools had few science related textbooks that can be used by learners when preparing science fair projects. Preparing a science fair project with little or no access to the computer is a challenging exercise due to the fact that this activity requires the use of different aspects of technology. According to Edutopia (2008), science project learning/preparation is an effective way to incorporate technology into the curricula because a simple science fair project can accommodate the use of computers and the internet, digital camera, video camera and associated copyreader equipment.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter gives the summary, conclusions and recommendations originating from the results of this study.

5.1 SUMMARY

The main purpose of this study was to investigate the challenges faced by senior secondary school learners when preparing science fair projects in the Omusati Educational Region. In this regard, four research questions were generated to guide the collection of data.

1. What are the challenges faced by senior secondary school learners in the Omusati educational region when preparing science fair projects?
2. What are the science teachers' perceptions of the challenges faced by the learners when preparing science fair projects in the Omusati educational region?
3. What are the main causes of the challenges faced by the senior secondary school learners when preparing science fair projects?
4. How can the process of preparing science fair projects be improved in order to assist learners to overcome those challenges?

This study adopted a qualitative research approach to gather information about the opinions and experiences of learners and science teachers' participants on the challenges faced by the learners when preparing science fair projects. A purposive sampling technique was used to select the learners and science teachers in 9 out of 11 senior secondary schools in the Omusati educational region which have previously participated in the Omusati Educational Region science fair projects competition. A total of 45 learners and 16 science teachers (facilitators)

from the 9 senior secondary schools participated in the study. All the participants completed open –ended questionnaires after which 19 out of the 45 learners were sub sampled and interviewed as a follow up to open–ended questionnaire completed. Eight (8) out of the sixteen (16) teachers were also sub-sampled and interviewed. In addition an observation notes were also used to collect data.

The results of this study revealed that the senior secondary school learners experienced various challenges when preparing science fair projects. The identified challenges include: lack of resources and technical supports, lack of proper guidance from teachers, poor parental support and understanding, lack of basic knowledge about science fair projects by the teachers and learners, official language barrier that lead to poor communication by the learners, and limited time to do the projects. The results also revealed that the most difficult stage to learners when preparing science fair projects was the point of data collection and deciding on the topic of investigation. The major causes of these challenges according to the participants include lack of financial support from educational stakeholders, learners not aware of the importance of preparing science fair projects, lack of proper guidance from facilitators and the science teachers, as well as poor socio-economic status of the learners and their schools.

The science teachers and learners suggested various ways of mitigating the challenges faced by learners when preparing science fair projects in Omusati Educational Region. Notable among the suggestions given by the science teachers and learners include: provision of sufficient resources needed during the preparations, learners’ access to the internet, introducing different kinds of incentives at schools, circuits and regional level, revising the school curriculum to include project-based learning as a promotional subject in secondary schools, and teachers need to be trained to teach this subjects. Furthermore, the directorate of

education in the Omusati Region should improve infrastructure by building a science fair Training Centre for learners and teachers, the NCRST should create awareness about science fair projects among different educational stakeholders, Provision of relevant information in the form a well explained information booklets based on science fair project preparations, provision of adequate training for both science teachers and learners through workshops, and also proper time management by both learners and science teachers.

5.2 CONCLUSION

The study investigated the challenges faced by senior secondary school learners when preparing science fair project, their causes and possible prevention measures that can be applied to minimize the identified challenges in the Omusati educational region. Based on the results of this study, the identified challenges faced by the senior secondary school learners when preparing science fair project in the Omusati education region includes: lack of resources and technical support, lack of proper guidance from teachers, poor parental support and understanding, lack of basic knowledge about science fair projects by teachers and learners, official language barrier, and limited time to do the projects. The results also revealed that the most difficult stages to the learners when preparing science fair projects were during data collection and deciding on the topic of investigation. The identified challenges were attributed to the following contributing factors (main causes): poor financial support from educational stakeholders, poor socio-economic status of learners and that of their schools, and the learners not aware of the importance of preparing science fair projects.

The participants (learners and teachers) indicated that provision of adequate resources needed during the preparation, introducing different incentives at schools, circuits, and regional levels, and revising the curriculum to include project based learning as a promotional subject in secondary schools would minimize the challenges learners face when preparing science fair projects. It was also stated that the science teachers should be given training opportunities such as induction courses, in-service training programs, training workshops and support services in order to properly guide the learners when preparing science fair projects.

5.3 RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. Learners should be encouraged to prepare quality projects. This can be done through making learning a long-term thinking process, by giving learners long term investigations assignments as such task could give learners the opportunity to explore the world around them and construct knowledge from their experiences which will improve their ability to conceptualize good ideas for science fair projects.
2. Science teachers should be trained through relevant workshops, seminars and short term courses about science fair projects preparations in order to provide them with vast ideas on science fair projects and hence, equip them with the right skills to properly guide their learners during science fair projects preparation.
3. To minimize the official language barriers which lead to poor communication among learners when searching for information, developing and presenting the science fair projects, English language teachers should be involved in the training of the learners during science fair projects preparation in order to improve both written and spoken language.
4. Curriculum developers in Namibia should introduce Project-based learning as a promotional subject in secondary schools. This will enable the secondary education system to instill basic research knowledge in learners and hence, improve the quality of science fair projects preparations among the learners. The institution of high learning that train teachers must include project-based learning as one of the core modules in order to equip science teachers with the right knowledge on how to assist learners when preparing science fair projects.

5. There is also a need to mobilize for sponsorships in order to raise fund to assist learners with the preparation of science fair projects and the introduction of incentives that will encourage learners to be actively involved in the preparation process.

6. Further research of the same kind should be conducted in other regions of Namibia in order to identify the challenges faced by senior secondary school learners when preparing science fair projects.

REFERENCES

- Alvesson, M. (2011). *Interpreting interviews*. Thousand Oaks: Sage Publications.
- Amoonga, T.(2008).*The use of constructivism in teaching Mathematics for Understanding. A study of the challenges that hinder effective teaching of Mathematics for Understanding in Senior Secondary schools in the Omusati region*. Unpublished Master's thesis. University of Namibia, Windhoek.
- and Mixed Approaches*. Boston: Pearson Education, Inc.
- Ayvaci, H.S. & Coruhlu, T.S. (2010). *Project based learning environment in science technology, instruction and students' problem*. Uluday Univrsity journal of Education Faculty, 1(2), 43-59.
- Baki, A. & Butuner, S.O. (2009). *Reflection on the project implementation at primary school in rural areas*. Elementary Education online,8(1), 146-158
- Benceze, J.L & Bowen, G.M (2009). *A National Science Fair,; Exhibiting support for knowledge economy*. International journal of science Education, 31(18), 2459-2483. Retrieved at [http://:www.tandfonline.com](http://www.tandfonline.com) on April ,14 2016
- Berg, B.(2007). *Quantitative research methods of social sciences*. USA:Pearson.
- Betts J.N (2014). *Evaluating of high school fair program for promoting successful inquiry-based learning*. A thesis submitted in partial fulfilments of the requirement for the degree of Masters of Education in teaching in General science, Portland State University.

- Bochniski, J.B (2005). *The complete work book for Science Fair Projects*. Newjersey: Johnwiley & Sons,Inc.
- Brown, A. L., & Campione, J. C. (1996). *Psychological theory and the design of innovative learning environments: On procedures, principles, and systems*. Lawrence Erlbaum Associates, Inc
- Campbell J.R, Wagner, H. & Walberg, H.J (2000). *Academic competitions and programs designed to challenge the exceptionally talented*. Online article retrieved 19 May 2016 @ Doi:10.1016jB478//
- Chris, K. (1997). *Effective teaching in schools*. Stanley Thrones Press: Cheltenham
- Creswell, J.W (2014). *Educational research; planning, conducting and evaluating quantitative and qualitative research* (Fourth Edition). Boston:Pearson Education
- Demirel, T., Baydas, O., Yilmaz, R. & Goktas, Y. (2013). *Challenges faced by project competition participants and recommended solutions*. Turkey: Educational Consultancy & Research Center
- Depoy, E & Gitlin, L.(2011).*Introduction to research understanding and applying multiple strategies*(4thEd). Philadelphia: Mosby
- Edutopia (2008). *Why teach with project-based learning? Providing students with a well-rounded classroom experiences*. Online article retrieved on 23 September 2016 at www.edutopia/
- Eldelson, D.C. (2009). *The effects of the project based learning approach to the attitudes of learners toward science lesson*, Elementary Education Online, 8(1), 36-47.

- Eldelson, D.C., Gordin, D.N., & Pea, R.D. (1999). *Addressing the challenges of inquiry-based learning through technology and curriculum design*, Journal of the learning science: 8(3/4), 391-450.
- Glaserfeld, E. (1990). *Environment and education: transforming children's mathematics education*. International perspectives, NJ: Lawrence Erlbaum.
- Haimbodi, F. N. (2012). *The effects of cooperatives learning on motivation and performance of grade 11 higher level mathematics learners in the Oshana Education Region* (Master's thesis, University of Namibia).
- Hangula, L. (2003). *A visit to three schools to find out teaching approaches in science*. Unpublished research report for a diploma in education. Windhoek: University of Namibia
- Hofstein, A. & Rosefeld S (1996). *Bridging the gap between formal and informal science learning*. *Studies in Science Education*, 28(1) 87-112.
- Jaworski B.A (2013). *The effects of science fair on student's knowledge of scientific inquiry and interest in science: A professional paper submitted in partial fulfillments of the requirement for the degree of Master of Science (Sciences Education) Montana State University, Bozeman, Montana*.
- Johnson, B. & Christensen, L. (2004). *Educational research. quantitative, qualitative and mixed approaches*. Boston: Pearson Education, Inc.
- Kasanda C.D, Kapenda H.M, Gaoseb N.I , Kandjeo-Marenga, H.U, (1999). *Female students participation in science and technology education in Namibia*. A selected paper

from the second sub-regional conference on understanding of science and technology education held at Grand Palm Hotel, Gaborone, 6-9 December 1999.

Kasanda, C.D. and Shaimemanya, C., (1998). *Factors hindering the provision of quality education for girls in Namibia*. In Otaala, B and Mostert, L (Eds.). *Issues in Education: An occasional publication of the Faculty of Education*. University of Namibia and the National Institute for Educational Development.

Kickbusch, I. (2002). *Influence and opportunity: Observations on the US role in global public health in healthy affairs*, 21(6),131-141.

Kothari, C.R (2004). *Research methodology: Methods and techniques* (2nd revised edition). India: New AGE International Limited, Publisher.

Korkmaz, H. & Kaptan, F. (2002). *The effects of the project based learning on elementary school learners's academic achievement, Academic self-concepts and study time in science education journal*, 94(5), 483-497.

Kovscek, F.G. (2002). *Multiple intelligences, cooperative learning and Junglan teaching strategy integrated learning style and multiple intelligence through cooperative learning*. California: Pennsylvania Springs.

Lancaster, G. A., Dodd, S., & Williamson, P. R. (2004). Design and analysis of pilot studies: recommendations for good practice. *Journal of Evaluation in Clinical Practice* 10(2), 307-12.

Mallick, H. (2012). *What is the importance of science fair to the curriculum?* Retrieved on:09 May 2014 at http://www.perservearticle.com/what_of_the_importance_of_science

Miles, M.B., & Huberman, A.M. (1994). *Qualitative data analysis*. London: Sage Publication.

Ministry of education (MoE), (2013). *A report on Omusati Regional Mathematics & Science fair*. Outapi: Omusati Educational directorate.

Ministry of education (MoE), (2014). *A report on Omusati Regional Mathematics & Science fair*. Outapi: Omusati Educational directorate

Ministry of education (MoE), (2015). *Omusati report on the NamPower national science fair 2015*. Outapi: Namibia

MEC (1993). *Towards education for all: A development brief for education, culture and training*. Windhoek: Gamsberg Macmillan.

Mwetulundila P.N (2000). *Why girls aren't fully participating in science and mathematics in Namibia*. Reform Forum Volume 11 March 2000

NamPower, (2014). *NamPower National Science Fair: National Science Fair Guide 2014*, Windhoek: National Commission on Research Science & Technology (NCRST).

National Commission on Research, Science & Technology (NCRST), (2013). *A report on Promoting Science*. A conference about science fair in Namibia. Retrieved on 12.08.2014 at www.omalaetisupport.com/ncrst...us/

National Institute of Education Development (NIED), (2008). *Physical science higher level syllabus grade 11-12*: Okahandja, MOE.

- Neu, T.W, Baum S.M.,& Cooper, C.R. (2004). *Talent development in science: A unique tale of one student's journey*. The Journal of Secondary Gifted Education (JSGE). Vol xvi (1), 30-36.
- Neuman W.L (2011). *Social research methods qualitative and quantitative approaches* (7th ed). Boston: Allyn and Bacon
- Ndlovu, M. (2013). *Investigating some back ground factors affecting students participations in science fair: A case study of a regional Expo for Young Scientists*. South Africa: Stellenbosch University centre for Pedagogy.
- processes*. Cambridge, MA: Harvard University Press.
- Opolot-Okurut, C.(2016). *Improving communication skills in science and mathematics education for quality student outcomes*. Uganda: Makerere University.
- Ormord, L.(2014). *Practical pesearch, planning and design* (10th ed). United States of America: Pearson Education Limited.
- Paul, C. (2005). *Constructivism: Theory, perspectives and practice*. NewYork, NY: Teachers College Press.
- Roth, W-M. & Lee, S.(2004). *Science education as/for participation in the community. rethinking science education*. Science education journal vol 88(1), 263-291
- Singh, A, Yager, S.O, Yager, N.Y.R.E, and Ali, M.M, (2012).*Constructivist teaching practices used by five teachers leaders for Iowa Chautauqua professional development program*. International journal for Environmental and Science Education. 7(2), April 2012, 197-216

- Tapscott, C. (1999). *Vision for Science Education*. London:Routledge Falmer.
- Thomas, J. W. (2000). *A review of research on project-based learning*. California: The Autodesk Foundation.
- Tortop, H.S (2013).*Science teacher's views about the science fair at primary education level*. Turkish online journal of Qualitative Inquiry, April 2013, 4(2).
- Tortop, H.S (2012). *Development of teachers'attitudes scale towards science fair*. Turkey: Academic Journal on Educational research and Reviews, Vol 8(2) 58-62
- Uitto, A., Juuti, K., Lavonen, J. & Meisalo, V. (2006).*Learners' interest in biology & their-out-of school experiences*. Journal of Biology Education, 40(3), 124-129.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological*

APPENDICES

Appendix A: Letter to the Permanent Secretary

P. O. Box 3598
Ondangwa
08 February 2016

To: The Permanent Secretary
Ministry of Education, Arts and Culture
Private Bag 13186,
Windhoek

Dear Mrs. Steenkamp

RE:REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN OMUSATI REGION ON THE TOPIC: “CHALLENGES FACED BY SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATIONAL REGION.”

I am a part-time Master’s student in the Faculty of Education (Science Education) at the University of Namibia. As a requirement for partial fulfilment for the award of my Master’s degree, I am required to conduct a Thesis research. It is for this reason that I humbly request your permission to conduct research on the “ *challenges faced by secondary school learners when preparing for science fair projects in the Omusati Educational Region.*”

Science projects are complex activities that raise many challenges during the preparation stage. As a judge of science fair projects at the circuit, regional and national levels since 2010 to 2014, the researcher has observed that learners particularly, those from the Omusati region, prepare projects that do not meet the quality assessment criteria set for the projects to be awarded trophies and medals. Furthermore, a report on the Omusati regional science fair held in 2014 indicated that a large number of learners who presented science fair projects could not meet the set quality criteria (MoE, 2014). However, the researcher could not get any literature to show the work done on challenges learners faced when preparing science fair project in the Omusati educational region.

Even though, international literature have identified some of the challenges faced by learners when preparing science fair projects, those challenges might not be completely the same with the case of learners in the Omusati region, considering the country’s educational structure after her independence which emphasizes skilled based learning. Therefore, it is important to carry out this study which is aimed at investigating the challenges faced by secondary school learners when preparing science fair projects, their causes and the possible prevention measures in the Omusati region, Namibia.

I kindly therefore request for permission from your good office to allow me to use selected schools in Omusati region as my research sites for my main study I will also select a one school for a pilot study. I planned the data collection process to take place from 20th February

2016 to 31st April 2016. The schools and the participants will be assured of confidentiality and anonymity in the final research report. A time table for scheduled interviews with dates and times of visits will be provided, and my visits will not interfere with the normal class teaching time-slots of the schools.

I trust that you will give this request a favorable consideration at your earliest convenience. Should you have any queries about this request, please contact my Main Supervisor Dr. J Abah at +264 66 262 6000, Email: jabah@unam.na

Thanking you in anticipation.

Yours sincerely

Foibe Ndinela Nghishongwa(+264 81 2209 387)
HOD (Mathematics & Sciences, Pendukeni Iivula Ithana High School, Omusati region)

Appendix B: Permission from the Permanent Secretary



REPUBLIC OF NAMIBIA
MINISTRY OF EDUCATION, ARTS & CULTURE

Tel: +264 61-293 3283
Fax: +264 61-293 3219
Enquiries: C. Muchila/E.N. Hamupembe

Luther Street, Govt. Office Park
Private Bag 13186
WINDHOEK

Ms. F.N Nghishongwa
P.O Box 3598
Ondangwa

Dear Student

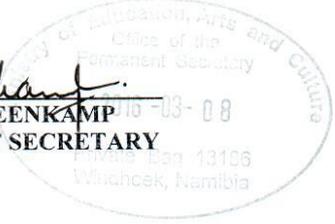
RE: REQUEST FOR PERMISSION TO CONDUCT RESERCH IN OMUSATI REGION ON THE TOPIC: "CHALLENGES FACED BY SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATIONAL REGION"

Your letter, dated 08 February 2016 has reference (letter attached).

The Office of the Permanent Secretary does not have any objection for Ms Foibe Ndinela Nghishongwa (Student number 200437569) to conduct his research study in the schools in Omusati region provided that the following conditions are met:

- You must obtain a permission letter to enter the schools from the Regional Director for Omusati Region.
- The research will not disrupt any normal school activities and it done according to ethical standards.
- A copy of the findings and recommendations in provided to the Ministry of Education, Arts and Culture upon approval of the thesis.

Yours sincerely,


SANET L. STEENKAMP
PERMANENT SECRETARY


08.3.16
Date

All official correspondences must be addressed to the Permanent Secretary

Appendix C: Letter to the Director of Education in Omusati region

P. O. Box 3598
Ondangwa
Email : foibe.nghishongwa @yahoo.com
08 February 2016

To: The Regional Director of Education
Omusati Region
Private Bag 529, Outapi

Dear Mr. Shapange

RE: A REQUEST FOR A PERMISSION TO CONDUCT A RESEARCH IN OMUSATI REGION ON THE TOPIC: “CHALLENGES FACED BY SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATIONAL REGION.”

I **Foibe Ndinela Nghishongwa** a head of department of Mathematics and Sciences at Pendukeni Iivula Ithana high school in Etayi circuit, and a part-time Master’s student in the Faculty of Education (Science Education) at the University of Namibia. As a requirement for partial fulfilment for the award of my Master’s degree, I am required to conduct a Thesis research. It is for this reason that I humbly request your permission to conduct research on the “ *challenges faced by secondary school learners when preparing for science fair projects in the Omusati Educational Region.*”

Science projects are complex activities that raise many challenges during the preparation stage. As a judge of science fair projects at the circuit, regional and national levels since 2010 to 2014, the researcher has observed that learners particularly, those from the Omusati region, prepare projects that do not meet the quality assessment criteria set for the projects to be awarded trophies and medals at National level. Furthermore, a report on the Omusati regional science fair held in 2014 indicated that a large number of learners who presented science fair projects could not meet the set quality criteria (MoE, 2014). However, the researcher could not get any literature to show the work done on challenges learners faced when preparing science fair project in the Omusati educational region.

Even though, international literature have identified some of the challenges faced by learners when preparing science fair projects, those challenges might not be completely the same with the case of learners in the Omusati region, considering the country’s educational structure after her independence which emphasizes skilled based learning. Therefore, it is important to carry out this study which is aimed at investigating the challenges faced by secondary school learners when preparing science fair projects, their causes and the possible prevention measures in the Omusati region, Namibia.

I kindly therefore request for permission from your good office to allow me to use selected secondary schools in Omusati region as my research sites for my main study and I will also

select a one school for a pilot study. I planned the data collection process to take place from 01 April 2016 to 30th April 2016. The schools and the participants will be assured of confidentiality and anonymity in the final research report. A time table for scheduled interviews with dates and times of visits will be provided, and my visits will not interfere with the normal class teaching time-slots of the schools.

I trust that you will give this request a favorable consideration at your earliest convenience. Should you have any queries about this request, please contact my Main Supervisor Dr. J Abah at +264 66 262 6000, Email: jabah@unam.na

Thanking you in anticipation.

Yours sincerely

Foibe Ndinela Nghishongwa(+264 81 2209 387)

HOD (Mathematics & Sciences, Pendukeni Iivula Ithana High School, Omusati region)

Appendix D: Permission from the Director of Education of Omusati region



REPUBLIC OF NAMIBIA



OMUSATI REGIONAL COUNCIL

DIRECTORATE OF EDUCATION, ARTS AND CULTURE
Team Work and Dedication for Quality Education

Tel: +264 65 251700
Fax: +264 65 251722

Private Bag 529
OUTAPI

Enq: Apollonia Hango

11 March 2016

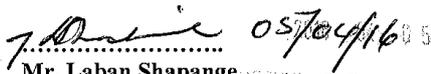
Foibe Ndinela Nghishongwa
Pendukeni Iivula Iithana
Etayi Circuit

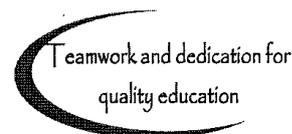
Subject: Permission to conduct research

This letter serves to notify you (**Ms. Foibe Nghishongwa**) that permission has been granted to conduct a research in Omusati Region on challenges faced by secondary school learners when preparing science fair projects at **Haudano SS, Onawa SS, David Sheehama SS, Pendukeni Iivula Iithana HS, Mwaala SS, Shikongo Iipingwe SS, Canisianum RCHS, Negumbo SS Ruacana HS and Ashipala SS**. Please be informed that the research to be conducted at schools should by no means whatsoever disrupt teaching and learning.

We hope and trust this exercise will enhance quality education in the Region.

Yours faithfully


Mr. Laban Shapange
Director of Education Arts and Culture
REPUBLIC OF NAMIBIA



Cc: The Principals for Haudano SS, Onawa SS, David Sheehama SS, Pendukeni Iivula Iithana HS, Mwaala SS, Shikongo Iipingwe SS, Canisianum RCHS, Negumbo SS, Ruacana HS and Ashipala SS

Inspectors of Education for Okalongo, Anamulenge, Outapi, Etayi, Tsandi, Elim and Onesi Circuits.

All official correspondence must be addressed to the Chief Regional Officer.

Appendix E: Letter to the school principal

P.O.Box 3598, Ondangwa
Email: foibe.nghishongwa@yahoo.com

The Principal
..... School
P/Bag

Dear Sir/Madam

Re: RESEARCH TO BE CONDUCTED AT SCHOOL.

I, Foibe Ndinela Nghishongwa a registered student for a Master's degree in Science Education at the University of Namibia (UNAM). In partial fulfilment to qualify for my Master's degree, I am required to write a research report on the topic: *"Challenges faced by secondary school learners when preparing science fair projects in the Omusati Educational region, Namibia.*

I therefore kindly, request your good office to allow me to carry out my research at the above mentioned purposefully selected school. Attached please find the proof of permission to conduct the research in the Omusati Education Region, granted by both the office of the Permanent Secretary as well as the office of the Omusati Regional Director of Education, respectively.

I will conduct the study with science teachers and learners who have participated in the circuit, regional or national science fair competitions before. The participants (science teachers and learners) will be requested to first answer open-ended questionnaires and some will be interviewed on a separate date when the questionnaires will be collected. I hope to complete this study before the end of June 2016. The participants will be assured of confidentiality and anonymity in the final report. Through the Head of Department for Mathematics and Sciences at the school, the dates and times of visits will be provided, and will not interrupt the normal class teaching time.

For any clarifications, please contact me at 08122 093 87 or my Main Supervisor Dr James Abah at +264 66 262 6000.

Yours Sincerely

.....

Date.....

Foibe N. Nghishongwa

Appendix F: Principals 'consent form

Consent form for the School Principal

Foibe Ndinela Nghishongwa is hereby given permission to useSchool as the research site for the research study he is required to conduct in partial fulfilment for the Masters degree in Education of the University of Namibia.

I understand that:

The data for analysis will be collected by means asking learners and facilitators of science fair projects to fill in Open-ended questionnaires and interview sessions, and the researcher will take observation notes about the school laboratories.

The information from these instruments may be used in the final report of this study.

I have been assured that the school and the teachers will have anonymity in the final report and the information collected will be used for the sole purpose of the study.

____/____/2016

Principal's signature

Date

Appendix G: Consent form: Learners parents

Instruction: Please fill out this consent form and return it.

I, _____, the parent of _____ a grade ____ learners atSenior Secondary School in Omusati region hereby give consent for my child to be a subject in the study entitled “*Challenges faced by senior secondary school learners when preparing science fair project in the Omusati educational region*” by attending answering Open-ended questionnaires and attend interview sessions if happens to selected for a follow up interview

I understand that:

1. My child is under no obligation to participate, and may withdraw from the study at any point prior to the publication or presentation of research results.
2. Anonymity will be maintained through the use of pseudonyms. The name of my child will not be reported.
3. The research will be used for academic and professional presentations and publications only.

_____/____/2016

Signature Date

Appendix H: Open-ended Questionnaires for Learners

Open-ended Questionnaires about the challenges faced by secondary school learners when preparing science fair projects for LEARNERS

INTRODUCTION

I am Foibe Ndinela Nghishongwa conducting a research project on the **CHALLENGES FACED BY SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATION REGION**. The purpose of this study is to investigate the challenges faced by secondary school learners when preparing science fair projects in Omusati region, their main causes and the possible ways of minimizing those challenges

This research is a requirement for my Master of Education degree at the University of Namibia. Your answers to the questions in this paper will help me understand your perceptions of the challenges you face as learners when preparing science fair projects. The information gathered will be treated confidential and used for this research purpose only. I will appreciate it if you could answer the questions honestly. Please be assured that your answers will not prejudice you in any way.

SECTION A: BIOGRAPHICAL INFORMATION

Please tick in the appropriate box

1. In which age group do you fall?

- Below 16 years
- 17-20 years
- 21-24 years
- 25 and more years

2. What is your sex

- Male
- Female

3. Identify your current grade?

- Grade 10
- Grade 11
- Grade 12

4. How long have you been preparing science fair projects?

- 1 year
- 2 years
- 3 years
- 4 years or more

5. How many times have you won a prize at regional science fair competitions?

- Never won
- Once
- Twice
- Three times

- Four times or more

Section B: Challenges faced by learners when preparing science fair projects

1. Kindly suggest at least 3 benefits that preparing science fair projects have for the learners.

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.....

.....

2. How would you describe the process of preparing science fair projects at your school in relation to the quality of projects prepared?

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.....

3. From your experience, please state at least 3 most challenges that you often face when preparing science fair projects in your school.

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.....

4. Can you please state the main causes of the above mentioned challenges in question 3?

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5. Mention one of the challenge that occur and you are always facing that challenge every time you have to prepare a science fair project in your school?

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6. What do you think could be done to minimize the challenges you face in preparing science fair project in your school?

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7. Have you ever won any prize during regional science fair projects? Yes/No, please in your opinion explain the CHARACTERISTICS that made you to win/not to win.

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.....

8. Which stage of the project preparation process is the most difficult and why?

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.....

9. Do you have a functional science club at your school where you engage as learners on issues related to science fair projects? If yes, how often does the science club meeting holds?

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.....

10. In your opinion, is it necessary to have a teacher facilitating you when preparing science fair projects? Yes/No please give a reason for your choice.

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.....

11. Which way of preparing project is the best, when you are preparing as a team or individually, please give a reason for your choice?

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.....

12. Please give any other comment(s) on the challenges you face when preparing science fair projects

.....
.....

End.... Thank you for your time!

Appendix I: Open-ended Questionnaires for Teachers

Open-ended Questionnaires on the science teachers' perceptions about challenges faced by secondary school learners when preparing science fair projects **for Teachers**

INTRODUCTION

I am Foibe Ndinela Nghishongwa conducting a research project on the **CHALLENGES FACED BY SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATION REGION**. The purpose of this study is to investigate the challenges faced by secondary school learners when preparing science fair projects in Omusati region, their main causes and the possible ways of minimizing those challenges

This research is a requirement for my Master of Education degree at the University of Namibia. Your answers to the questions in this paper will help me understand your perceptions of the challenges faced by learners when preparing science fair projects. The information gathered will be treated confidential and used for this research purpose only. I will appreciate it if you could answer the questions honestly. Please be assured that your answers will not prejudice you in any way.

SECTION A: BIOGRAPHICAL INFORMATION

Please tick in the appropriate box

6. In which age group do you fall?

- Below 20 years
- 21-30 years
- 31-40 years

- 41- 50 years
- 51- 60 years
- Other ...specify

7. What is your sex

- Male
- Female

8. What is your highest qualification in the subject that you teach?

- Certificate in Education
- Basic Education diploma
- Bachelor of Science Education
- Others. Please specify

9. How long have you been teaching?

- Less than 2 years
- 2- 5 years
- 6-9 years
- More than 9 years

10. How long have you been part of preparing learners for science fair projects competitions at your school?

- Never been involved
- Less than 2 years
- 2- 5 years

- 6-9 years
- More than 9 years

Section B: Teachers perceptions on the challenges faced by learners when preparing science fair projects

1. Kindly suggest at least 3 benefits that preparing science fair projects have for the learners and school at large.

.....

.....

.....

.....

2. How would you describe the process of preparing science fair projects at your school in relation to the quality of projects learners prepare?

.....

.....

.....

3. From your experience, please state at least 3 challenges that learners often face when preparing science fair projects in your school.

.....

.....

.....

.....

4. What are the main causes of the above mentioned challenges learners face when they are preparing science fair projects.

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4. What do you think could be done to minimize the challenges learners face in preparing science fair project in your school?

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5. In your opinion, do learners at your school prepare quality projects that could win them trophies and medals Yes/No, please explain

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6. What is the average score of your learners when they participate at the regional science fair competitions? Tick in the appropriate box below

0- 20%	30-40%	50-60%	60-70%	80-100%

7. Use the table below to indicate the type of awards your learners **mostly** obtain when they take part in the regional competitions by ticking the correct answer. Tick in the

Bronze medal	Gold medal	Silver medal	Overall best project trophy	Floating trophy

8. Please give any other comment(s) on the challenges learners face when preparing science fair projects

.....

.....

.....

9. Do you have science club at your school where you engage learners on issues related to science fair projects. If yes, how often does the science club meeting holds?

.....

.....

.....

10. Do you as science teachers attend workshop/seminar on guiding learners towards preparing science fair projects?

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11. In preparing science fair projects, do learners come up with idea of their own topic or the science fair facilitators give those topics to work on?

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.....

12. .In preparing science fair projects in your school, do learners work one project as a team or individually?

.....
.....

End.... Thank you for your time

Appendix J: Interview guide for Learners

LEARNERS' INTERVIEW GUIDE

Standardized open-ended interview for the learners

I am Foibe Ndinela Nghishongwa conducting a research about the challenges faced by learners when preparing science fair projects. The research is a requirement for my Master of Education degree at the University of Namibia. Your answers to the questions I am going to ask you will help me understand your educational needs and concerns based on the challenges that you face when preparing science fair projects. The information gathered will be treated as confidential and used for research purposes only. I will appreciate it if you could answer the questions honestly.

Thank you. Before we start, do you have any questions for me?

QUESTIONS : A. Challenges

1. What do you like about preparing science fair projects?
2. What problems or challenges do you experience when preparing science fair projects?
3. What are the main causes of those challenges?
4. Have you ever used modern technologies such as internet to search for information regarding your projects? Yes/No, Justify your answer.

B. Main causes of the challenges learners face when preparing science fair projects

5. Are the things you learn when preparing science fair projects important to you? Explain.

6. What happens in the classroom that makes you to be interested/not interested in preparing science fair projects?

7. Does the type of teaching method have an effect on your preparation? Explain your answer.

8. Which stage is the most difficult you when preparing science fair projects?

9. How do you feel about the project preparations process with regards to the way of collecting and analyzing information? Explain your answer

C. Ways of minimizing those challenges learners face when preparing science fair project

11. What do you think can be done in order to help/assist you learners to prepare quality science fair projects?

12. On the sides of the teacher, what do you think can be improved in order to minimize the challenges you face when preparing science fair projects?

END!

Appendix K: Interview guide for the Teachers

INTERVIEW QUESTIONS FOR SCIENCE TEACHERS ON THEIR PERCEPTIONS REGARDING THE CHALLENGES FACED BY SECONDARY SCHOOL LEARNERS WHEN PREPARING SCIENCE FAIR PROJECTS IN THE OMUSATI EDUCATIONAL REGION, NAMIBIA

School:**No:**

Introduction

This interview is designed to find out your honest views about the challenges faced by learners when preparing science fair projects. Please respond to all the questions below carefully and honestly. This is not a test and there is no right or wrong answers. Your responses will be kept strictly confidential, and will only be used for the purpose of this study. Please be assured that your answers will not prejudice you in any way.

Section A

Biographical information

Please tick in the appropriate box

1. In which age group do you fall?
 - Below 20 years
 - 21-30 years
 - 31-40 years
 - 41- 50 years
 - 51- 60 years
 - Other ...specify

2. What is your sex

- Male
- Female

3. What is your qualification in the subject that you teach?

- Certificate in Education
- Basic Education diploma
- Bachelor of Education
- Others. Please specify

4. How long have you been teaching?

- Less than 2 years
- 2-5 years
- 6-9 years
- More than 9 years

5. How long have you been helping learners when preparing science fair projects at your school?

- Less than 2 years
- 2-5 years
- 6-9 years
- More than 9 years

Section B INTERVIEW QUESTIONS

6. As part of your experience as a facilitator of science club at school, identify at least three(3) challenges that you think learners face when preparing science fair projects at your school

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7. In your view, what do you think are the causes of those challenges you mentioned above?.....

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8. How do you think those challenges can be prevented or minimised, Briefly explain your answer?

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9. At your school, where do learners get financial assistance from, in order to buy materials needed during the preparations?

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10. What do you think influence learners to prepare poor quality projects?

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11. In your opinion mention any factors that affect the quality of science fair projects prepared by learners

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Do you have a library at your school? Yes/no, If yes to what extend do learners use libraries in search for information regarding their projects?

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.....

12. Most of the learners lack the ability to communicate effectively when searching for information regarding their projects. Yes/No, please explain briefly

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13. Do you have a science laboratory at your school? Yes/no, If yes to what extend do learners use science laboratory facilities in their project preparation.

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.....

14. If you have a science laboratory at your school, is it well equipped enough to assist learners during their project preparation

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.....

15. What do you think are the measures that could be put in place in order to minimise the challenges faced by learners when preparing science fair projects?

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.....

16. Do you have learners' science club in your school? If yes, may you share with the highlight of activities often carried out at the science club meeting.

END