ZAMBIAN GRADE TWELVE PUPILS' EXPERIENCES OF BIOLOGY PRACTICAL WORK DURING SCHOOL CERTIFICATE EXAMINATIONS: THE CASE OF KABWE HIGH SCHOOL

By

Vincent Mudenda

A thesis submitted to the University of Zambia in Fulfillment of the Requirements for the Degree of Master of Education in Science Education

The University of Zambia

DEDICATION

To my late young sister, Dama, whose long period of being infirm coincided with this study.

DECLARATION

I declare that with the exception of the assistance acknowledged, this thesis is the result of my own studies. This work has not already been accepted in substance for any degree, and is not being currently submitted in candidature for any other degree.

Candidate Signature .....

Mudenda Vincent

Date 6th March, 2008

CERTIFICATE OF APPROVAL

This Thesis has been submitted with our approval as fulfilling the Requirements for the award of the Degree of Master of Education in Science Education of the University of Zambia.

Internal Examiner's signature _____ Date 13th March, 2008

Internal Examiner's signature: _____ Date _____

External Examiner's signature _____ Date 20th March, 2008

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LIST OF ACRONYMS

APU	Academic Production Unit
BPE	Biology Practical Examination
BPW	Biology Practical Work
CDC	Curriculum Development Centre
CPD	Continuous Professional Development
ECZ	Examination Council of Zambia
EOF	Educating Our Future
MDGs	Millennium Development Goals
MOE	Ministry Of Education
SCE	School Certificate Examination
RQ (1-5)	Research Question
R (1-5)	Respondents (1-5)
JICA	Japanese International Aid

LIST APPENDICES

ABSTRACT

This thesis discusses first hand experiences grade twelve pupils at Kabwe High School, in Zambia, had in ordinary level school certificate biology practical examination for the year 2005.The reported research utilized qualitative case study methodology. Data was collected through; I) clinical interviews, I) participant observation, iii) focus group discussions and iv) written narratives that formed a major source of data. Central to narrative inquiry are stories that inform and draw us into understanding the experiences of learners so that we, as science educators, can inform and transform our practice.

As a high school science teacher, I decided to listen to my students as a way to better understand the multidimensional nature of the BPE and learners' success or failure. In seeking to understand the general reality of sitting Biology practical examinations (BPE), the following questions guided the research: What was the nature of pupils' experiences of biology practical work during School Certificate Examination (SCE)? Secondly, what factors contributed to the type of experiences manifested? Did both boys and girls encounter similar (or different) experiences during BPE? And lastly, what were the implications of these experiences on academic performance in the practical paper?

Five pupil- respondents' written narratives (which were not tampered with when typing) have been presented in the report. Furthermore, a substantial number of excerpts from narratives were used in the analysis of data with a view of preserving the voices of the respondents.

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Five pupil- respondents' written narratives (which were not tampered with when typing) have been presented in the report. Furthermore, a substantial number of excerpts from narratives were used in the analysis of data with a view of preserving the voices of the respondents.

The study revealed, to an extent I hadn't realized before, the depth of pupils' lack of conceptual development about BPW, the damaging effect of concentrating studies on a perceived leaked paper, the lack of confidence and autonomy in pupils' problem solving, the debiliting effects of limited facilities and the more often than rare teacher ethical transgressions. Broadly then, the results of the study showed that the main experiences Grade 12 pupils had in sitting BPE could be classified into i) content, ii) conceptual, iii) process skills, iv) psycho-physiological and v) contextual embedded related experiences. The various constraints learners experienced during BPE at Kabwe High School were caused by a 'faulty' teaching-learning period and the highly unsupportive examination-situation.

Learners lacked practical exercises and therefore they found practical work, during the examination, new. In some cases the stage at which biology practical exercises were introduced was late and so the various skills necessary to tackle practical work remained undeveloped. In the examination room, limited facilities and unprofessional conduct of invigilators compounded the problem further.

The conduct of invigilators often led pupils, especially the less confident ones, to lose concentration. Inadequate provision and hence the improvisations of materials sometimes led to overcrowding and wrongful observation on the side of pupils. Clarity of examination items and unfamiliar biological terms threw up additional barriers for pupils. Furthermore the study has established that girls, in general, were far more disadvantaged than boys in as far as the examination-situation was concerned. The respondents felt that various issues, especially those often taken for granted, caused numerous obstacles to quality academic performance in the BPE. It also came out clearly that some of the respondents took advantage of the examination situation to raise their scores. These

results, if robust, suggest that at the time of the study in the year 2005 respondents' true levels of attainment in the practical component of biology were highly distorted.

Arising from the findings of this research I wish to argue and put a thesis that the many barriers pupils met are a clear indication that the biology practical examining system in its present form, at Kabwe High School and probably in other school where the recorded experiences are commonplace, requires considerable improvements. The examining system has remained rigid despite many variables that have changed over time. For instance, at Kabwe High school, the number of candidates has risen from about 165 in 1995 (before it was converted into a high school and the intake at Academic Production Unit were still minimal) to 534 in 2005. The change in numbers, which has not been followed by appropriate 'reforms' in the examination system, has impacted negatively on the examination-taking situation. Improvements in the examination system are long over due. Should this area of the education system remain unattended to, then, efforts being made in other areas such as the teaching-learning process will go to waste. The failure rate will continue to rise year in, year out.

In many matters there comes a point in time when it is obvious that some action will have to be taken. I think that we may have reached this position with pupil achievement in school biology. A lot of recommendations and implications could be drawn but it is, perhaps, more useful to merge those into a single idea- to get the teaching-learning objectives, the processes and assessment system right and then the academic performance in BPE (and school biology as a whole) at SCE will take care of itself.

CHAPTER 1:INTRODUCTION

1.1 Background

Learners' achievement at School Certificate Examination (SCE) is not without interest to pupils, teachers, administration, and the general public. A large amount of interest at present time is centered on the sciences and mathematics. The interest lies in the fact that these subjects are regarded as basis for scientific and technological advancement of any nation. In Zambia, however, performance in these subjects is still of great concern (MOE, 1996).

In the context of Zambia these examinations are the sole arbiter of achievement at secondary school level. Most importantly, these examinations are used in selecting learners for the next higher level of education system and other options in seeking careers. It is for this and other reasons that the assessment process should emphasize reliability and self- validating.

As highlighted earlier on, the failure rate had been increasing in Zambia (MOE, 1996). It is worth noting that according to Kelly (1986), those who do not make it to the next educational level are stigmatized as failures. Arguably, in most cases opportunities are lost, education is wasted and often the mediocre products become the non-productive dependant members of others. Generally there is perpetuation of inefficiency, lack of productivity and yet further impoverishment.

Instead of generalizing to all School subjects, this study takes keen interest in pupil attainment in school biology and particularly biology practical examinations (BPE). As a high school biology teacher for the past sixteen years as at 2005, I had a growing concern to understand why, despite being one of the most popular subjects according to the Ministry of Education (MOE) (1996) and Haambokoma *et. al* (2002), biology had year in, year out been underachieved by most pupils at school Certificate level. The biology chief examiner's reports from as far back as 1995 indicated a significant decline in attainment in this subject. This being the case, it became evident to me that there was something that was not being done the right way.

Secondary data collected from the Examination Council of Zambia (ECZ) indicated, for instance, that in 2002 only 48.5 percent of 19,000 candidates passed biology and of these15 percent were at distinction level, 8.5 percent at merit, 9 percent at credit level and 16 percent at satisfactory level.

This implies that 52.5 percent failed. In the year that followed, 2003, of the 20,500 candidates who sat biology examination, only 12,610, which translate to 42 percent, passed biology with quality grades. Put in another way, 58 percent of that year's candidates in biology failed.

At the case study site, Kabwe High School (a super grade 1 high school), the picture is somewhat the same to the national one. In 2002,of the 325 candidates who sat examination in biology, 110 (31.4 percent) failed. In the following year, 2003, out of 385 pupils who sat examinations in biology, 172 (44.7 percent) failed. Of the 418 pupils who sat biology examination in 2004,203 (48.6 percent) pupils failed the course. Arguably then, failure was consistently increasing with a significant percentage. The unimpressive state of affairs then, left something to be desired and the question remained-was there something science educators could do to reduce the number of pupils who fail school biology?

A close analysis of the data at ECZ statistics department linked the underachievement in biology to practical paper (III). This practical carries 40 marks, which is equivalent to 30 percent of the whole biology examination. The BPE involves the physical presence of materials such as apparatus, specimen materials and so forth. It provides means of assessing masterly of investigative skills.

As already noted, this paper is poorly done every year. For instance, the 2005/2006 biology practical examiners' general report showed that a large number of candidates, across the nation, scored zero in the paper' (ECZ, 2006 p.55).This implies that those learners had to make their grades from 70 percent remaining from the other two papers. It would be correct, without hesitations, to state that all those who scored zero were already ruled out for grades one and two since these grades fall between 70 and 100 percent. Clearly, the practical paper had automatically reduced their chances of scoring quality grades.

This failure rate should not be allowed to continue as it brings up psychological damage and discontent in all the stakeholders: the learners, teachers, parents and the government. It is important to note here once again that under-achievement in school may be a factor in the high unemployment rate suffered by many youths in Zambia today. It could be argued that the relatively high level of unemployment has some impact upon future economic status of these groups and therefore, in some complex way, the chances of their children in school.

For science education, the increase in failure rate has been particularly important because many of the prevailing problems, in this area, appear to be centered on failure rate. In other words, it was the unprecedented failure rate in school biology that brings wrong to science education and science related careers.

1.2. Statement of the Problem

Though the failure rate has been increasing year in and year out, in school biology, little was known about what pupils were actually going through in those laboratories during the examination. It was therefore important that this area was probed for any possible barriers to quality performance in the paper so that measures were put in place to remove or remediate the barriers or the difficulties respectively. The key questions being asked are: what do pupils encounter in the practical paper that obstructs them from quality academic performance? What was it, as many others have asked recently, was not being done the right way to attract such a rise in the failure in biology? My view was that learners were better placed to provide answers to the foregoing questions because they are the ones who had the first hand experiences of the paper. It was assumed that the learners came out of the examination room with a rich variety of relevant experiences that could, and should, be utilized to have the situation fully understood and to have some remediation action take. It was with this assumption in my mind that I took learners to be indispensable participants in this study. That is, there was no better way to gain these badly needed insights than by involving the major stakeholders-the pupils.

Nationally, from literature review, none of the studies conducted so far sought insights into how the biology practical work (BPW) at SCE was experienced from the test takers' perspective. For instance, Rugumayo (1998), Kapolyo (1990) and Haambokoma *et al.* (1998) investigated issues related to problems of materials, teaching and learning needs in biology. The 2002 base line study conducted for MOE by Haambokoma and others sought to identify among other things topics in biology, which teachers and pupils find difficult to teach and learn respectively. Most recently, in 2007,Haambokoma investigated the nature of errors pupils make in biology practical test of the SCE by evaluating the scripts. His investigation showed that learners made numerous errors related to underdeveloped practical skills such as in aspects of drawing and labeling of diagrams, presentation of experimental data, and so forth. Whilst I recognize the contributions of the abovementioned studies and many others not reviewed here to science education in Zambia, none of them has

examined the actual experiences of pupils in BPE during SCE, particularly in poorly performing schools. So, what the pupils go through, from their viewpoint, was not yet fully known.

1.3 Purpose of the Study

In view of the foregoing concerns and the perceived need to improve the quality of learners' performance in BPE and in school biology as a whole, the purpose of this study was to investigate the nature of learners' experiences and to draw inferences as to how these experiences contributed to (or detracted from) quality performance in biology practicals. The study was guided by the questions outlined below.

1.4 Research Questions

The research, which sought to answer the following questions, was based on the premise that learners themselves can identify and evaluate their experiences of different components of BPE. The following were the questions:

I) what was the nature of pupils' experiences in biology practical work during the school certificate examination?

ii) what could have contributed to the types of experiences manifested?

iii) did both boys and girls have similar experiences during the biology practical examinations?

iv) what were the implications of these experiences on academic performance in biology practical examination?

1.5 Significance of the Study

Issues related to BPE are many, challenging and interesting. This alone justifies research, but the possible contribution towards redressing the high failure rate in school biology resulted in moral and academic support for the study among science educators. At the School level, the practical advantages to be derived from an increase in our understanding of learners' experiences of BPE will be improved teaching-learning process and better preparation and management of BPE. That is, the findings of this study would give insights into and deeper understanding of the difficulties that pupils at Kabwe High School faced during the BPE at SCE. The School was expected to take cognizance of the various experiences and to take this knowledge to inform the design of teaching and examining approaches that would lead to prevention, alleviation and remediation of the difficulties on one hand. On the other hand though, it would assist teachers to learn of the good practices so that they are reinforced.

Additionally, the study was expected to allow pupil-respondents, firstly, to deal critically with the reality of the BPE, thus, enabling them to participate in the transformation of their curriculum at School level. Secondly, the respondents involved in the 2005 BPE did not own the experiences gained in this study but cascaded such experiences to upcoming learners. It was hoped that the way other learners would interpret the experiences would guide them into meaningful learning. Future research in this area of biology, especially at national level, would find the results of this case study useful and informative. Finally, It was hoped that if this study were to be repeated on a wider scale, evidence would be sufficiently insistent to have a major impact on assessment policy with regard to school BPW and how it was being examined.

1.6 Limitations of the Study

Firstly and foremostly nearly all surveys about knowledge, attitudes and behaviors towards sensitive issues such as SCE have the limitations in that the respondents base the responses on the self-declarations. Case studies are limited (Merriam, 1998) by the sensitivity and integrity of the investigator and the possibility for bias to affect the final product. Furthermore, as the narratives indicates, it was possible that learners did not say what they wanted to say or said what they had not want to say due to limitations on English language. Additionally, the post examination reactive effects and the interpretive nature of the study could have added their own limitations.

Finally, it is worth drawing our attention to the limitations of the method that was used in selecting the participants or more accurately the informants- purposive sampling. This method did not cater for the many variables that existed in the Zambian schools. The sample was not totally representative. Based on the aforementioned facts, the findings cannot be extended to a wider cohort beyond Kabwe High School.

1.7 Ethical Issues.

On account of the delicate nature of the study, which aimed at investigating Zambian grade twelve pupils' experiences in BPW during the high stake SCE, ethical concerns were given the seriousness they deserved. It was clear from the theme that the principle sources of data were the pupils and to some extent the examining system was also under scrutiny.

The ethical dilemmas were numerous and the investigator was more concerned with the protection of privacy and anonymity of the respondents. According to Cohen *et al.* (2000) privacy includes, issues such as," the manner in which participants' personal attitude, opinions, habits, eccentricities, doubt and fears are to be communicated to or withheld from others" (p.61). Therefore, in reporting the findings of the study and narratives, the researcher ensured that names of the respondents were not revealed. In this way, it would not be possible for other persons to identify the participant with any part of the information given in the study. Additionally, the responses do not have any apparent uniqueness that could jeopardize their anonymity. Absolute confidentiality was communicated to the respondents in writing and the right to decline was explained. In operationalizing the research questions through data collecting techniques, ethical concerns were upheld.

1. 8 Organization of the Study

Chapter 2 reviewed both local and international literature. In chapter 3 the research methodology was outlined. The chapter dealt with the research design, development of the main research tool – a letter (Appendix 1) evoking pupils' responses that would enable them tell about their 'lived' experiences in BPE of the SCE. Furthermore the chapter considered the criteria used to ensure quality data.

The results and follow up commentaries are presented in chapter 4. A large portion of chapter 5 was devoted to analysis and discussion of the findings. To preserve the respondents' voices, the chapter included as many respondents' narrative extracts as possible. The choice of the extracts depended on what (I felt) was to be emphasized. In chapter 6, the conclusions arising from the results, recommendations and implications of the study results were given. In addition to the main text, there are useful appendices.

CHAPTER 2: LITERATURE REVIEW

Chibesakunda (1983) explored problems of teaching science in Zambia with particular reference to language. He found that problems existed in teaching science and mathematics in Zambia due to language of instruction. His study established that learners failed examinations because they were afraid and confused with English and scientific words which were being used. The language issue according to O'Toole (1993) is compounded by requiring students learn another language in school, the language of science. He further adds that scientific terminology and the style of language used in science can cause difficulties for students as they attempt to learn science concepts. With the gradual fall (MOE, 1996) in the standard of numeracy and literacy levels currently being experienced in Zambia, English language might continue providing extra hurdles in the examinations. It is therefore important that assessment tasks must be modified appropriately to accommodate the needs of learners with limited proficiency. This does not, in my view; suggest that the curriculum should be diluted but that careful consideration should be taken by test- makers to develop fair and equitable examinations. The report further observed that pupils had little regard of learning science for it was difficult for them to memorize answers like they did in other subjects. It follows therefore that learners were not to be held entirely accountable for achievement unless they were given adequate opportunity to learn.

With a growing concern and interest to learn the position of the Zambian secondary schools in terms of resources and material contexts in which biology was being taught, Rugumayo (1987) established that materials and resources were scantily available in schools. This scantiness impacted negatively on learners with regards to practical work. They had no opportunity to manipulate equipment, make observations, record the results, interpret as well as draw conclusions and so forth. Pupils' achievements were generally poor. It was further pointed out that teachers needed help in a number of topics such as ecology and genetics. Recent studies conducted by Haambokoma and others (2002), revealed in some detail similar trends in the provision of materials and resources. Understandably practical work in the sciences is resource intensive but with special reference to biology, arguably though, a reasonable number of hands and minds-on activities can be supported by a school's local environment.

But does the use of readily available low cost materials in biology in under resourced schools have any impact in promoting practical activities? A research done by Tlala (2006) with Grade 10 pupils in Mpamalanga Province in South Africa revealed that the low cost materials obtained within and around the school contributed to meaningful learning and positively changed learners' attitudes towards biology practical work. It is therefore important that the biological science section must extend the walls of the school to the resources of the community. In fact, according to Tlala (2006) learners are invaluable in identifying resources within and beyond the school. Arguably then, the more independently learners can access what they need, the more they take responsibility for their practical work.

The abovementioned study further added that there was need for teachers to intensify their continuing professional development (CPD) activities on the use of the local environment as a teaching –learning resource. In Zambia, Haambokoma and his colleagues (2002) reported similar findings that teachers understood and believed in the need to use the environment and other locally available materials in enhancing quality teaching of biology but the report was quick to add that teachers were not acting according to their beliefs. Generally, teachers were not available to teach learners how to engage safely in investigations inside and outside the classroom. This practice was found to cause significant consequences for the learners.

The examiners in biology practical paper have issued reports showing the gravity of the problem and the consequences. Their 2004 report showed that for the years 1995 to 2004, leaners appeared to have faced similar difficulties. The report pointed out the fact that drawing and labeling of diagrams of specimens, calculating magnification, drawing inferences and the various aspects of food tests were poorly done by pupils. The report further showed that pupils were not adequately prepared in the areas cited above. Considering the crucial role of teachers in practical activities according to Lunetta (1991), their reluctance to engage learners in laboratory experiences for any reason was extremely disadvantageous to the learners. In other words, teachers were, to a large extent, responsible for content and process skill based pupil-practical difficulties.

Most recently in 2007, Haambokoma reported his findings on an investigated he carried out on errors pupils make in the Biology Practical test of the SCE. The 2005 examination was used. Perhaps it should be quickly added here that the present study was also based on the same 2005 examination.

The results of his study showed that candidates made a lot of errors in the areas of drawing and labeling of diagrams, observing, and recording, measurements of parts of specimens, calculating of magnification, comparing and contrasting specimens and food tests. The natures of errors were outlined and all of them seemed to point to pupils' lack of experimentation competencies.

When the examiners' reports and the recent findings made by Haambokoma are compared and contrasted it was clear from the similarities that something was not being done the right way in as far as school biology practical work was concerned. A vicious circle existed with a number of variables at play. The major variable was that learners were not given adequate opportunity to learn biology meaningfully. It follows therefore that if this circle was to be broken; teachers were indispensable participants in the design and implementation of remediation strategies.

In a few instances when practical work was given, the common method used was demonstration, which targeted only certain skills that the learners were supposed to know with regard to examination requirements. Often, these practical works were less investigatory but more confirmatory and were in a "cook book recipe" style. In this way, learners did not adequately develop skills that could be transferred to new situations. Haambokoma's (2002) report further pointed out that little practical work was carried out due to large classes that practically promoted teacher – centered teaching methods as opposed to the highly propagated learner –centered approaches. Furthermore, a Lack of materials, equipment, and in some cases laboratories made the situation worse. Learners had no opportunity to develop and demonstrate their competencies. Kapolyo (1990) and Haambokoma *et. al* (1991) had reported similar findings.

Furthermore, the 2002 baseline study report found that pupils had difficulties to formulate hypothesis, design practical work, and distinguish between dependent and independent variable as well as to deal with abstract concepts. Many reasons were advanced to explain the phenomenon, which included poor teachers' professional training. The study recommended the need for school based professional collaboration amongst teachers. It also recommended refining the pre-service and in-service training to focus on development of the application of science process skills.

Additionally, the report clearly pointed out that, some teachers and learners found certain topics in biology practicals difficult to teach and learn respectively. Specific areas cited were food tests, preparations of solutions and making biological drawings including magnification. It can only be

said that the educational system must act to sustain effective teaching. It must be born in every science educator's mind that learner achievement can be interpreted only in the light of the quality of the program they have experienced. Teachers must have theoretical and practical knowledge and abilities about science, learning, and science teaching. Otherwise obstacles to experimentation proficiency of pupils would persist.

Internationally, a lot of research had been done on biology practicals. According to Tarmir (1992), the emphasis of practical examinations is global. A study by Uno (1988) into pupils' difficulties in biology found that: lack of solid science background, an inability to think critically, a negative attitude towards the subject and lack of self – discipline and study skills contributed to poor results in biology practicals. The report further noted that practical work required learners to understand, apply and integrate what they learnt. It must be noted here again that there is need to call for a repertoire of science- teaching strategies. In conclusion, Uno recommended learner-centered approaches to practical work if pupil-practical difficulties were to be minimized.

In South Africa, De Beer (1993) explored the significance of practical work in biology to teaching and learning. His exploration revealed that practical work was characterized by routine procedures with 'cook book' recipe style. The learners' role was reduced to merely following the worksheets. So, confirmatory rather than investigatory practical activities were found to be common. He recommended that learners should be involved in the planning, designing and carrying out of the practical work. A Similar practice, as already commented above, was obtaining in Zambia and according to Haambokoma and colleagues (2002) it was arising from, among many other sources, heavy teaching loads, large classes, lack of materials and in some cases teacher lack of competence in the use of active learning approaches. It therefore remain as a challenge for science educators to design and restructure, in some cases, appropriate teaching –learning models that will take into consideration the challenges that both teachers and learners come face-to- face with during biology practical work. Inquiry - based laboratory instruction does a better job, according to Herron *et. al* (1999), in as far as teaching and assessment of learners was concerned compared to the traditional verification laboratory experiments.

Another research, in South Africa, by Collussi (1997), investigated the status of practical work in white dominated High Schools. Revelations were that teachers faced constraints arising from a lengthy biology syllabus. If learners were to be engaged in hands- on activities, completion of the

syllabus would prove extremely difficult. As a consequence learners were inadequately prepared in science process skills. His findings are similar to the Zambian experiences as reported by Haambokoma and others in 2002. It was reported that teachers employed lecture method to ensure completion of the overloaded syllabus before learners sat SCE. It could be argued that herein lies some of the shortcomings.

One would ask as to what teachers perceive to be the role of practical work during the instruction period. In South Africa, Dekkers and Maboyi (2003) sought insights into the issues raised above. They discovered that textbook practicals were either treated verbally or skipped altogether. But where practicals were done, demonstrations were preferred to individualized or group work. They found out, too, that although teachers had a liking for practical work, the frequency of carrying out practicals was very low due to some obstacles they encountered such as lack of resources, time constraints and so forth. In as far as formative assessment of practical work was concerned, there was no policy to guide it and therefore it depended on individual teachers.

Cossa (2006) reported similar finding to the foregoing. The indications were that at one of the Mozambiquane universities, Eduardo Mondlane, lecturers in Biological Science Department felt that because of the realities of their teaching environment they were not using different kinds of practical activities. They admitted the fact that they did not conduct practical work in ways that could optimize the benefits of practical work. Furthermore, they regarded many of the aims of laboratory work as being non important. According to Hudson (1996) practical work in school science had several objectives: to keep learners busy; to keep learners interested, and to teach them science skills. Furthermore it is interesting to note Hudson's concerns about the value of practical work in sciences. He contends that it was problematic, firstly, because it did not reflect the reality of practical work in industry and, secondly, because it did not develop sound understanding of the science concepts. For Domin (1999), hands-on activities will not only increase pupils' understanding but will also improve both pupils' attitudes towards sciences by allowing them ownership in their experiments and pupil ability to use formal operational thought.

Taking the foregoing into consideration, it could be safe to hypothesize that the beliefs outlined above about practical work were not peculiar to those lecturers cited above but that they shared some similarities with others involved in science education. Now, if this University were engaged in

teacher education, one would ask on the quality and attitude of their "products" with regards to BPW It is perhaps right to note here that the foregoing findings were to some extent revealing the possible sources of teacher lack of necessary competencies in conducting meaningful laboratory experiences.

Weinburgy and Englehand (1994) investigated gender, prior academic performance, beliefs and attitudes towards biology laboratory experiences. They discovered that gender had a significant effect on attitudes. Where learners displayed negative attitudes, there was unlikelihood that they invest their cognitive resources in the exercise. These findings highlight possible explanations to differences in performances between boys and girls in the Zambian context. MOE (1996) indicates that achievements were more satisfactory in boys than girls.

Lazarowitz and Tamir (1994) would go so far to claim that few teachers in any country use practical work as part of their instruction. They established that when practical work occurred, females had less access to science equipment and hands-on activities because males appropriated the equipment and relegated females to mere observers. Furthermore, they added that access to science laboratory classrooms was not universal. Their findings correctly sum up, too, the Zambian situation as was outlined by Haambokoma and others (2002). It could be argued that the situation relating to meaningful science education is far from normal in most high schools run by the Zambian government especially the newly upgraded ones.

Exactly what are the prerequisites for the acquisition of higher order process skills? Westbrook and Rodgers (1994) sought answers to the preceding question. The finding suggested that the development of higher order process skills required a substantial number of activities that are organized within a familiar milieu. Learners must consistently be subjected to both laboratory and intertwined non-laboratory activities involving investigatory designs. In their study, they set an experiment and control in the exposure of learners to practical work. In one class hypothesis testing and designing experiments were instituted. Learners were taught how to construct shared understanding of scientific concepts. Higher order process skills, including practical and technical skills were taught and practiced with more of learner participation. It was found that learners came to understand and applied standards of superior methodical practice. In the class where learners were taught the same things but with more of teacher – centered approaches such as "chalk - talk" approaches, acquisitions of higher order skills were insignificant.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Background

The chapter outlines the research design for the case study which investigated Five 2005 Grade Twelve Pupils at Kabwe High School on their experiences of biology practical examination of the SCE. It is worth noting at this point that at the time of research, examination leakages and other forms of examination malpractices were rampart in the country. However, everything possible was being done by all concerned with High school education and law enforcement agencies to deter learners from engaging themselves in malpractices. It may perhaps be added here that learners were not too ready to openly talk about examinations especially to strangers. It was against this brief background that the research design discussed below was reached at.

3.2 Research Design

Case study research methodology involving single- site studies was employed in this study. The study took a qualitative approach. Strauss *et. al* (1994), define qualitative research, as any kind of research that produces findings not arrived at by statistical procedures or other means of quantification. A case study approach was used in accordance to the purpose of the study. Case studies include the intensive description and analysis of a single phenomenon (Merriam, 1998) and are anchored in real-life situations. Case study research results in rich and holistic accounts of the phenomenon and offers results that can structure future research while advancing the knowledge base. The study intended to amplify the nature, sources and effects of pupils' experiences of biology practical examination of the SCE.

3. 3 Target Population

The target population consisted of all 2005 Grade Twelve (12) learners sitting biology practical examinations of the SCE candidates at Kabwe High school. The researcher used purposive sampling procedure to get an apt sample of the cohort at the school.

3. 4 Sample Size

In order to generate accounts of pupils' experiences one case study high school was purposely selected from 28 High schools in central Province of Zambia. Due to the relatively unconventional

approach to collection and presentation of data only total of five (5) grades twelve pupils participated in the study.

3. 5 Sample

The sample, which was drawn from Kabwe High School, was made up of two (2) girls and three (3) boys. The sample was exclusively regular pupils. Apart from allowing for inclusion of the respondents' narratives in the report, five respondents were thought to be adequate to provide data from a variety of perspective. The sample was part of the larger cohort registered for the 2005 SCE in biology. Consideration in the selection of the sample was given first and foremost to their willingness to participate. Gender and the level of achievement (as indicated continuous assessment results) were also considered. For instance, apart from being a female learner, respondent 1 was selected on the basis of her record of poor attainment in biology. Unlike respondent 1,respondent 2 was selected on the basis that she was a high achiever. The three male participants, who happened to be average pupils, were to the researcher's best judgment more likely to develop interest in the study and to provide co-operation. Overall, care was used to choose those participants who represented their peers and who had the potential to offer diverse perspectives. I was not the teacher for any of these respondents.

It must be remembered that I was dealing with high stake examinations therefore I needed a degree of trust from my respondents. I needed them to take me in their confidence. I wanted them to share their experiences unreservedly with me. It should be underscored however, that it is not being suggested that the responses were compromised. On the contrary, this design ensured a smooth extraction of unadulterated data.

3. 6. Sampling Procedure

The study was conducted at Kabwe High School in Central Province of Zambia. It is a government run school. It was carefully selected on the basis of convenience among the twenty-eight (28) high schools in the Province because (i) the school was recording a gradual increase in the failure rate in biology at SCE in the last ten years, (ii) it is a co–education government run high school, (iii) the ease of accessibility of learners and (iv above all, data collection would have met a lot of resistance elsewhere, firstly, due to the sensitive nature of the subject that was under investigation. Secondly, as it has already been pointed out in the introduction, the issue of examination malpractices, which was being followed up in the province, by officials from ECZ during this same period, would have

put this study at jeopardy had attempts been made to select some other school other than where the researcher was well known. Thirdly, for purposes of triangulation of data from other sources, participant observation was employed. This would not have worked very well at a completely new place.

According to ECZ (2004), these examinations have significant consequences for either the candidates or the school and can equally attract serious penalties to anyone who makes a mess of them. It was against the reasons stated above that the selection of the school was arrived at. One could argue that the selection of the school where the researcher was teaching could have compromised the responses, to the contrary, this arrangement impacted positively on the reliability of data gathered. This was because the process of data collection, to the best of the researcher's knowledge, was free of suspicion.

3.7 Research Instruments

3. 7. 1 Developing Inquiry Tools

A letter (appendix 1) requesting respondents to write about their experiences of biology practical examination during SCE was initially piloted on thirty one (31) grade twelve pupils during the July – August 2005 mock examination. This was done to check the demands, eliminate ambiguities, difficulties and obtain views about the wording as part of the instrument development and refinement procedures. Similarly, the interview schedules were face validated by the head of section, biology, to see whether the questions were likely to bring forth information sought after. During the mock examination, three learners were interviewed and like the inquiry letter, the interview schedules and interviewing techniques were tailored according to the feedback obtained. According to Denzin and Lincoln (2000) a pilot serves to increase the adequacy, trustworthiness and practicability of the data collection techniques.

3. 7. 2. Data Collection

Data was collected between 25th October and 15th November 2005. It was collected in three phases using different techniques for the purpose of triangulation.

Phase 1 : Pre- practical interview

Using the interview schedule that was modified after the mock examinations pre-practical interviews with the respondents were carried out a day before they sat the exit BPE. The intention was to have the respondents reveal their (i) level of preparation ii) perceived fears and confidences and any other

thing related to the BPE. The interview with each of the five respondents, with their permission, was audio- taped. At this point, pupils were not told that they were respondents to a study research. This was done as a precautionary measure to avoid them feel that they were being researched on as this could have affected their conducts during the practical examination the following day.

Phase 2: Participant Observation

Participant observation was used during the biology practicals of the SCE on all five respondents. The school conducted five practical examination sessions which stretched from 08: 00 to about 19:00 hours. Each session had a duration of one hour fifteen minutes. The respondents were spread across the five sessions. Observations were focused on a range of issues including (i) the handling of both physical and academic tools they were able and/or expected to use (ii) interactions with and/or influence of other people in the context- the invigilators and their fellow candidates. Critical incidents were noted though cautiously. The data gathered here were used for purposes of triangulation with data from learners' narratives. The observations were also used in designing questions for the focus group interview.

Phase 3 : Experiential Narratives

This was the main method used to generate data. A day after writing the practical, respondents were served with an inquiry letter, (appendix 1), that had been piloted during the 2005 mock examinations. To aid their recall of events, a copy of the examination paper was attached to the letter. Respondents were assured of confidentiality and that the information they were going to give was for academic purposes only.

Narratives may not conform to the positivists' paradigm, which emphasizes on objective presentation of data. However Clandinin and colleagues (2000) encourages its use as a data collection or generation technique as they give uniquely rich and subtle understanding of life situations. Furthermore they are insistent that narrative inquiry technique of data collection has occurred in many research studies in education when students' views on issues are being investigated. In Chapman's (1999) work narrative is considered to be a way of knowing essentials for understanding human experiences. For Bruner (1986) a narrative is a way of living out one's story and a way of story telling one's experiences. An investigation into selected grade twelve pupils' experiences of BPE at SCE required reflective and critical thinking so as to capture rich and diverse data. Narrative inquiry presented this opportunity.

3.7.3 Data Analysis

The investigator's discursive approach to data analysis was drawn from critical educational theory paradigm. According to Cohen *et al* (2000) the theory does not only search for an understanding and interpretations of research findings, but it also questions the existing structures. The theory seeks to liberate the disempowered, to redress the inequalities and promote the individual freedoms within a democratic society. It could be argued that pupils meet various difficulties year in and year out during BPE and these could have been responsible for perpetuating inequalities among school leavers. It was, therefore absolutely imperative that pupils' experiences in BPE must be discovered and use this knowledge to inform the design of various strategies that will prevent and remediate the difficulties.

In light of this argument, critical theory seemed to be in line with the context of this study. The study intended to understand experiences of pupils in School BPE and to provide a critical analysis aimed at encouraging appropriate transformation of ways practical work was being examined. The data obtained from the study, mainly from narratives, were read several times, analyzed qualitatively based on what the respondents wrote and then it was grouped into meaningful themes. Respondents were also consulted regularly to strengthen the credibility of the interpretations on the results.

3.8 Criteria of Quality

Several measures were taken into consideration and were then used to justify claims of trustworthiness of the findings of the research project. During the study, the researcher ensured that the method and data were credible by insisting on anonymity of respondents and therefore encouraging openness. Their openness increased the value of data gathered. Additionally, the use of narratives inquiry promoted flexibility in which the respondents critically expressed their opinions on the topic that was being investigated. This further helped to promote truthfulness in the responses of the respondents.

Because the researcher was interested in eliciting personal perceptions about the BPE, the respondents were engaged in discussions in a manner akin to cross-examination in order to test their honesty. This was an important step in ascertaining a dependable result report.

For this research, transferability will be determined by the degree to which would be readers and users will be impacted emotionally and intellectually in practices, in pedagogical thoughtfulness, and

so forth. If it will move the readers or users to action then it will have attained this component of criteria of quality.

The purposively sampled respondents sat BPE at different times of the day in different laboratories. The abovementioned arrangements increased opportunities of drawing insights into ways the practical examination in biology was experienced. (Although the researcher was not personally responsible for creating the different structures in which the respondents sat the examinations).

Participants' concerns as indicated in the narratives could have been unique to the respondents at Kabwe High School in some respect but there was a higher chance that they shared certain commonalities with their counterparts elsewhere. The researcher however did not feel comfortable to work towards generalizing or predicting data because to do so would have been adopting an altogether different role. Moreover, the small sample size of five respondents could not have allowed an extrapolation of the results to a wider cohort beyond Kabwe High School. The study was planned to be a groundwork study that can later be used as a basis of a country wide study.

The interpretive nature of the research approach presented noteworthy threats such as the enticement to be preoccupied with one's viewpoint and in the process failing to see situations from the stance of others. Therefore, the presentation of narratives within the report minimized this risk and as much as possible the respondents' responses were quoted in the analysis. This will provide the readers an opportunity to draw their own conclusions or check my conclusions.

CHAPTER 4: PRESENTATION AND RUNNING COMMENTARIES ON RESULTS

4.1 Introduction

In this section, I present the narratives written by pupils in response to the letter used as an inquiry tool. For ethical reasons, numbers 1 to 5 identified the respondents. As much as possible (other than being typed) the narratives were not tampered with or edited in any way. This was because I wanted even their level of writing to be part of data itself. For each of the pupil respondent's narrative the researcher presented a follow up commentary to highlight the main issues each pupil raised. A different font to differentiate pupils' narratives from the rest of the text was used.

4.2 Respondents' Narratives and Commentaries.

(a) Respondent 1

I wrote my Biology practical examination at 08.00 hours. We didn't do a lot of practicals and 3 weeks ago we had a group work and the boys were doing them we girls they would say bad comments. During this time I had concentrated on what the teacher-demonstrated to us 3 weeks ago because the teacher repeated that too much so I had thought it would come. Nothing came, I could not remember a lot of things even if we studied them with my friends especially when invigilators from other schools started moving around and mentioning the remaining minutes. I got confused. And Sir, the invigilator kept on passing where I was and the way he was looking at my paper I thought I had made a lot of mistakes so I had to change.

I left question 2 (b) because I didn't understand it. I tried to ask the teacher to explain it to me but refused. I didn't expect those questions to come in the practical exams; I thought they would come in the theory exams. So that's how come I left it. Above that, I did not learn about structural differences that appeared in the question. We didn't finish the syllabus so it was difficult. In case of drawing, I just drew the specimen as I had seen it in the textbook. It was difficult to draw. Then I saw how the boy seated on my other side drew the specimen, I rubbed and drew like his because I did not understand the word

longitudinal section. I had a lot of problems labeling the diagrams. Actually I left some parts without labeling.

Question 1, I confused the methods on testing reducing sugar and non-reducing sugar but i saw what James was doing so I followed. I have never used the pipette and another machine so I called the teacher to ask how to use them but he did not come. I saw the boy seated next to me and he was already doing question 2., I started panicking and I also started rushing and I made a lot of mistakes I could not do part of the experiment because the specimen was taken by the boy. I had to wait. The boys don't care, they like competition. Apart from that I did not learn about the structural differences between W33 and W32, which appeared in question 1. In the process that is how I broke the test tube. I was feeling, as though I had already failed, the boys like competition. I was discouraged and stopped writing. I know the exams were going to be difficult because I was not prepared. I was looking after my sick mother. Even if I failed biology, was not my favorite subject. I want to be a businesswoman. We did not cover the syllabus as we no teacher from grade 10 up to grade 11-second term so I lost interest. This is all I can write.

The narrative by respondent 1 opens by revealing the teachers' unethical tendencies in drilling pupils on items perceived to be in the examination and where the revision followed the same format of the final examination. With whatever intention the teacher might have had, the pupils usually concluded, that the repeated revision several times, could have meant the actual final paper. This was very deceptive to the candidates as was in the case of respondent 1.

By reading through the pre-practical interview excerpt and narrative, an impression was created that she lacked confidence in herself to carry out the practical tasks successfully. It could be alleged that the teacher's "deceptions" compounded the problem further. Respondent 1 demonstrated lack of confidence in several ways; firstly the movement of invigilators caused her significant confusion. Additionally, she changed what she had already written as a result of the perceived invigilator's dissatisfaction of her work. At another point, respondent 1 had rubbed off what she had drawn to copy what the other boy had written.

Secondly, she related an incidence where she tried to engage the teacher into explaining the question. Although this may have other indications, it was often a characteristic of less confident

individuals who seek guidance at every single stage. Closely related to the foregoing indicator was her continued comparison of what she was doing to others' work. As a result of this, she doubted her work forcing her to erase time and again. In this way, her work appeared quite dirty and often this is one way through which pupils lose marks. Apart from that, she started panicking thereby lowering her cognitive engagement in the practical tasks. She displayed her half-heartedness in this paper as evidenced by her poor organization of the methods, sub steps and generally her trial and error approaches to practical tasks. In addition to the afore mentioned personal weaknesses, the respondent indicated her low expectancy of success and the subject's low utility value to her career.

Other important issues respondent 1 raised /demonstrated were; firstly, the issue of failure to integrate theory and practice (practical requirement). She could have lost marks on the basis that she did not expect theoretical like follow up questions on the practical examination. This could have been due to lack of prior practical experiences where the format could have been adequately dealt with. However, it could have been as a result of misconceptions about practical work, which was perceived barely as a manipulation of equipment/ specimen and not of ideas. Secondly, the domineering and competitive attitude of the boys in such high stake examination seemed to have impacted her negatively.

The negative attitudes some of the boys showed towards female learners were a clear indication of strong stereotype notions that boys seek to exclude girls from school science. I suspect what was happening was to a very great extent culturally determined and needs a change in general attitudes in society.

To justify her numerous negative experiences she further cited the failure to complete the syllabus, inability to understand biological terms, household chores, lack of the biology teacher and lack of interest in the course as having contributed in forming barriers on her way to quality academic achievement in the practical work.

Overall, some aspects of this narrative indicated the respondent's deep- sited belief about a low self-efficacy, which generated worry and anxiety. Most importantly, her negative attitude towards the subject seemed to have formed a 'spring pad' from which all other negative influences operated. Next, let's consider the experiences of respondent 2 the second and last female participant in this study.

(b) Respondent 2

I did the biology practical exam in the Chemistry lab, at about 10:30hrs and that is the lab used for pure Chemistry practicals. I had no problems for I was familiar with it. I knew what practicals required of me. I had no problems with carrying out the experiment and entering the results. I forgot one thing here and there but the questions were familiar. I don't want to think about this anyway!

I would ask myself now what if I fail. But as I went through the paper everything was familiar, I was at ease. This helped me to answer much of the questions without much problems. I forgot one thing here and there especially those we were learning in recent weeks but whose questions during exams were familiar. I worked very hard, that I should have six points and I shouldn't allow a boy to beat me. I'll continue to work very hard so that I can pass paper (II) as well because I am aiming to enter the University. I want to be a veterinary Doctor. I made sure that I pass and I didn't like the idea of showing others answers because they might surpass me. I thought I must be among the best Towards the end of the examination, I realized on one question that I had used Copper (II) Sulphate in testing for reducing sugar instead of Benedicts Solution and I felt sad, but before I could re-do it, it was time up. I really felt bad. This was one of my bad experiences.

One other thing I saw was that my friend had stopped studying because they were given a leakage. So they concentrated on that, unfortunately, Sir, it was fake. I could see them stranded. I think they did badly. They left the lab very early within 50 minutes.

Another strange point I saw was when Mrs. X told us to remove our shoes, she searched us everywhere and the way, sir, it was done, it is like we are not human beings. Not all of us carry leakage.

I also saw people carrying out different procedures for the same questions, anyway, we differ in intelligence so obviously a lot of things were understood and done differently. But for me I continued with what I was doing. There were too many breakages of test tubes and copying from each other in the lab where I was because we were congested. One

other thing I saw was how the boys treated the other girls. It was bad; boys would just get the specimen even if the girls were still using it. I remember one boy told one girl that even if she failed herself she would be married and they said all types of foolish things. I however saw some of my friends trying to get help from the boys. For me, the boys encouraged me to work very fast and I managed. Yes other girls found difficulties to work boys from what I saw.

Reading through respondent 2's narrative, created an impression, that she was headed for success in this paper. She was an exemplar of girls in the ablest groups. She approached the practical examination with a different strategy that could have arisen from regular prior practical experiences. She had confidence in herself that she was able to carry out practical work in the examination.

The respondent was a higher achiever as indicated at sampling. With that in mind, it wouldn't be far fetched to assume that she took the examination not as a' trap' but as a challenge that would lead her to the next higher level of education. She also revealed that motivation; interest in the course and necessity of the subject in future career ambition was key to success. Arguably, where there was low motivation, there was low interest and where the course had nothing to do with the career requisites, as was in the case with respondent 1, learners tended to expend less effort. On the contrary, respondent 2 demonstrated an appreciably high level of preparedness, and hence, high cognitive engagement at the task.

Furthermore the respondent revealed other important areas of preparation for the examination, firstly, that of being familiar with the practical paper format and secondly the laboratory environment where she had written the practical examinations. She had been using the laboratory several times and this had impacted positively on her settling down during the practical test. Her revelation encourages teachers to keep practical exercises an integral part of the classroom practices despite the logistical difficulties that it presents.

With regards to examination malpractices, although they are not peculiar to BPE only, the respondent related an incident where her friends were at a loss as the 'leaked paper' they had been 'memorizing' turned out to be counterfeit. This revelation could help educators explain why the much talked about examination leakages still attract, in many cases, poor results. It is hence a lesson for 'future' pupils to bear in mind about the detrimental effects of malpractice on their performance.

Closely related to malpractices, was the insensitive conduct of the invigilators. To minimize unethical pupil-conduct such as 'smuggling' illegal materials into the examination room, respondents were subjected to thorough inspection. Although the respondent doesn't seem to underestimate the contribution of this practice to fair play, she was critical of the insensitive and rough way it was being conducted. She felt dehumanized. Additionally, the psychological effect of being searched could have translated, to those less confident respondents, as barriers to various important proficiencies demanded in the practical test.

Again though not strange to BPE only, the domineering, bullying, teasing and intimidating tendencies by some of the boys only pointed to a traditional notion of seeing girl as objects of having one major socially predetermined function-to be mothers. This was frustrating and an obstacle in as far as girls' participation in biology (science) was concerned. Despite such treatment though some girls still sought after help from the boys. This, in my view, tended to deepen male pupils' domineering attitudes towards girls on one hand while it weakened the position of the girls on the other hand.

Commenting on the influence of others, respondent 2 said: 'I also saw people carrying out different procedures for the same question; anyway, we differ in intelligence obviously a lot of things were understood and done differently. As for me, I continued with what I was doing'. The inference I draw from her comments are threefold; firstly, the tendency in learners to rigidly follow the experimental procedures to a greater extent that they fail to use alternative ways, secondly it appears that there were a lot of 'hidden' comparisons that took place amongst themselves. With the less confident pupils, these comparisons could have been destructive. Thirdly, respondent 2 also demonstrated that for confident pupils the influence of others in context was minimal, they remain focused. Though not exhaustive, the follow up commentary attempted to highlight main issues raised. In the next narrative an attempt was made to draw valuable insights from respondent 3, the first of the three male respondents to this study.

(c) Respondent 3

I wrote my biology practical exams at 12.30 hours, all this time from 07.30 hours we were kept in the hall. We were not allowed to go and eat. How can someone write on an empty stomach? I could not think properly. I was even very inactive. We stood in the lines for a

long time waiting to be searched of any leakage materials. This took a lot of time and i felt disturbed. Sir, I can tell you that some one had given us a fake leakage and inside the exam room I was a blank I could not do anything. The thing is, we had only about 3 practicals, since grade 10 so I didn't know a lot of things.

Some of us had to share the specimen, it was disturbing, I could not take my time to measure and calculate the magnification. It was even difficult to identify the structural differences since your partner is hurrying you up.

Although we had done about 3 practicals during learning, I was not sure of what to do, I was afraid I would make mistakes; it was even difficult to handle the apparatus and do some observations. At one time, I accidentally spilled the reagents on my question paper. I hope the markers, Sir, will understand. I knew we had done only a few practicals and I knew I would fail to carryout the practical work especially that we didn't finish the Syllabus. The questions were tricky especially question 2 that I didn't manage to answer. That question should have come in paper (II therefore I left it. I was not prepared for it.
The problem I encountered was that i had waited too long to take my turn to heat and due to crowding it was taking a lot of time so I just had to check the results from my friends. If I had waited I would not have finished.

As Mr. 'Y' a biology teacher was invigilating the way he was looking at how I had drawn the diagram, I felt I had made mistakes so I had to rub it and drew it in another way. I however found out that I was actually right in the first place I just wished I didn't change because now I will lost 5 marks on specimen W31 diagram. That was my fault. Anyway I will try to work very hard in paper ii. These were just practicals after all.

Sir, where I was sited there was very bright sunlight through the window and I could not change due to over crowding When I moved out to do the heating, I developed had a blackout hence I could not see. I feel this was unfair on my side because the room was not properly arranged.

Most of my friends were struggling doing the practicals and that is why we ended up discussing whenever we had a chance. Well I tried my best, biology is important for my career.

I find respondent 3's narrative as being interesting and insightful in many respects. First and foremost, the respondent condemned the long period of confinement and claimed that it contributed to some of the difficulties he encountered during the examination in biology practicals. It is important to note that confinement for this paper was necessary to minimize the sharing of the contents of the paper between those who could have written and those who were to write in the later sessions.

Certainly, the difficulties that come due to exclusion could be unbearable and the whole process presents a challenge to a school. The school was to examine about four hundred and fifty candidates and this called for several sessions. Basically, the many number of sessions seemed to invite confinement as the only option.

In addition to inadequate prior practical experiences that have already been discussed, the respondent indicated poorly organized and managed examination-taking situation. The overcrowded examination rooms and limited facilities added barriers to his smooth concentration. He added that, over crowded rooms fomented unethical pupil conduct such as copying from each other. The lesson that can be drawn from these scenarios is that, given the right number of candidates and adequate provision of materials, a number of pupils' ethical transgressions could have been avoided.

Respondent 3 admitted to having participated in 'memorizing' the 'leaked' paper. Apparently, he justified his involvement to lack of confidence in himself arising from inadequate preparations. Furthermore, the sharing of specimen materials, inability to use the prescribed or improvised tools caused numerous difficulties. For instance, he could not take his time to work sufficiently on the specimen with reference to the questions asked.

Reflecting on the conduct of the invigilators, respondent 3 indicated that their regular movements and suggestive looks were disturbing. He cited an incident where he changed the structure of the diagram because the invigilator's perceived "cues" were not in agreement. In my view, the issue revealed two sides of the problem; firstly, it revealed a lack of confidence in the pupil at one end

while on the other end it showed other forms of unethical teacher conducts. Ultimately, there was need to re-orient BPE invigilators towards creating an atmosphere that allows examinees an opportunity to demonstrate what they know without any obstruction.

Although respondent 3 appeared to be determined because of his biology related career ambition I found his comments: "I'll try and work hard in paper (ii) theory; those were *just* practicals after all" appeared to demean the contributions of the practical test paper to the overall performance in the subject. In my view, this misconception was one major cause of failure in this subject as candidates carelessly gave away 40 marks.

Peculiar to this study was the respondent's blackout caused by his being seated where there was intense sunlight. Recalling his frustrating experiences, he wrote: "when I moved out to do the heating I had developed black out hence I could not see. I feel this was unfair on my side". This was an illuminating insight in as far as laboratory preparation was concerned. Issues of such nature are often taken for granted and yet, as respondent 3 has demonstrated, they impacted quite negatively on the respondent's performance. Overall, respondent 3's narrative is illuminating

Respondent 4's narrative follows. He sat for his practical test at 14:00hours. Although some of his experiences were similar to others in the study, he in addition raised a number of unique insights that will contribute towards a fuller understanding of how various aspects of BPW of SCE were experienced.

(d) Respondent 4

I remember very well writing the biology practicals in the Physics lab from about 14.00 to 15.30 hours. I didn't like the time we waiting because this one will come with a rumor and another one with a different story so it was disturbing.

We were about 35. We hardly had space to move around and when writing, your friend was seeing the answers. We were overcrowded around the heating place and some friends were not even doing the experiment. This was one of the difficulties I faced.

Practicals are difficult because we don't have lessons on them. Teachers always complain about having no chemicals, therefore they do not have time to teach us. At times teachers say it is unsafe to be left alone in the lab as he was busy with APU in the afternoon and

often they would say we will do them in grade 12 but in grade 12 we don't. Our teacher Mr. X as you know him is not interested in that and us in doing the practicals. Even last year's pupils were complaining about him he doesn't know anything. I knew I would not do very well because we didn't do a lot of practical work. Because of panicking, I even broke down one test tube.

After about 10 minutes of writing, the invigilators realized that they had interchanged specimen W31 and W32. They stopped us and I started afresh. This caused more panic on my side. On the specimen, I didn't know which way to take the measurements so that I calculate the magnification. I hope I did the right thing.

For question 2, usually they would provide the procedure but this year in our paper they asked us to provide the procedure and to carry it out. It was a difficult question. But since it was food tests, I already knew what the results would be so I wrote the answers.

Question 1 was more less like a theory question paper, it had a lot of questions on the diagram and it was also difficult, especially some Biology terms. So I don't know whether what I wrote was correct or not. I was unable to give three visible structural differences between W31 and W 32. I couldn't see them but I wrote what I had in mind, may be because we didn't do a lot of practicals in our class.

At one time the invigilator came to stand next to me, I stopped writing because I was not free, and by the time he was leaving, I had forgotten the point. I had the answer to the question but I could not remember i but When we were handing in the answer sheets, everything came to my mind it was very painful. Invigilators were moving around too much, Sir; even the ringing of the phone by Mr. 'C' in the lab was disturbing.

Others are very intelligent and they managed to finish early but those who were not found it very difficult and tricky especially question 2. I saw a lot of us panicking and trying to copy from each other. It is very competitive so those who knew were hiding their answers.

Most of us are not concentrating because we see rich people who didn't go school and worse again we see a lot of our friends who finished school last year are in the streets selling things. There are no jobs.

It was interesting for me at least for the first time to do the food test and it all worked well although I had a few problems with the second part. The handling of materials and the use of some apparatus gave me interest and encouragement that I can do the sciences. Experience is the best teacher. I had no experience and I taught myself how to use some of the equipment given for use.

There were also problems in the sharing of specimens and the crowding over of the materials and heating areas. You find that as you are crowding, some people start to share the answers and some people do not even do the actual practicals they were writing from their heads. I don't know whether they had leakages or not. Another thing was that, we were doing practicals with those boys from classes who do pure Sciences and they wanted to show off as if it was an interclass competition. They were passing all types of comments to the girls. Next time, Sir, the invigilators should do something.

Respondent 4's narrative though lengthy was simple and straightforward since many of his encounters were similar to those of others already discussed in the study. The common experiences revolved around the issues of discomfort originating from poor environment, crowded rooms and the experiences of crowding over the few available resources, effects of inadequate prior practical experiences, poor gender relations, sharing of specimens and the problems associated with it, the strict and unethical conduct of invigilators.

The negative attitude towards the subject surfaced here, he associated the 'I don't care' attitude that prevailed amongst other students to two causes. Firstly, he appears to suggest that, currently, education was irrelevant in as far as social- economic progress was concerned. Secondly, lack of white-collar jobs seemed to have been one of the major concerns. Probably the foregoing concerns stemmed from a lack of immediate role models. Nonetheless, he seemed to have considered only one role of education ignoring others. This revelation about the respondent's negative perceptions and

misconceptions in that form is important as they might help in addressing the issues of BPW holistically.

Very closely connected to the above concerns, were the general disinterestedness and poor perceptions of the teacher by the learners. Additionally, the issue of teacher competence surfaced here. In my view, the foregoing factor contributed greatly towards pupils' underperformance. In some cases teachers did not carry out practical work out of negligence, they simply concentrated on theory probably due to the highly theoretical type of training they underwent. They lacked in experimentation proficiencies.

Another unique encounter, though more a critical incidence, the respondent brought out was the swapping of the specimens. It was not clear as to whether the previous sessions were exposed to this problem; if they were, then the consequences were far reaching. Basically, the pupils' responses to the questions were not going to tarry with the examiner's marking key. As a consequence, the respondents were going to be marked down.

The other insightful revelation he bought to the fore was on the issue of some examinees writing the practical paper without actually carrying out the practical activities. This issue was problematic and one could speculate that the repetition of the test items and examination leaks had a bearing on the problem. The nature of most practical activities was less investigatory than confirmatory. For example food tests were repeated nearly every year and were confirmatory in nature. So, for a test-wise examinee, it was possible to write up the paper without actually doing the practical activity on a specific question. Looking at the problem from the other side, it could be the positive effects of a true leaked paper. In such cases the examinee will have already practiced on the same test items. Some examinees due to a lot of difficulties encountered resolved to complete the practical paper "theoretically".

With respect to the 'competition', respondent 4 acknowledged that it occurred although in contrary form. It took the form of interclass competition. He pointed out that examinees from the pure science class wanted to show off, probably because they were taking perceived superior Science subjects in the school. It was clear that the domineering attitude from examinees in the pure science class, simply tended to heighten the examination pressure. Essentially the influence of the examination - taking situation could not be over emphasized in as far as academic performance was concerned.

Finally, do familial influences play any role in examination taking? Respondent 5's narrative provides a context to highlight and respond to such a question.

(e) Respondent 5

The first thing that happened was searching at the door. For me the search was alright because some pupils pass using leakages when it comes to jobs and colleges they will be picked and some of us without leakage will remain.

I had studied the whole night and the following day was the exam day. We were kept in the school hall with nothing to eat and I had my practical examination at 15.30 to about 17.30 hours. I was hungry, tired and feeling very weak. I had even lost interest. If I had written earlier, I think I would not have panicked the way I did. Waiting for me was difficult. I had never used the agric lab before, it was new for me, and there were very few stools so some of us were kept standing throughout. There were also a lot of pictures on the walls so to me they were disturbing.

I was scared and my heart was beating fast especially when I saw that the questions were lengthy and involving. I was afraid I would make a lot of mistakes and fail. Considering that we were not doing practical regularly, we had 2 practicals in groups in grade 10 and even then, these practicals were not marked. For food tests, the teacher just demonstrated but for question 2 the topic was covered a day before the examination, so I could not remember most things. When we started writing, I saw that the questions were really involving and lengthy. I was jumping some questions because I was not sure. I did not complete all questions. For the specimen W 31, I didn't know which way to measure the specimen so as to calculate the magnification. Drawing was difficult for me. I am not gifted. We were not taught how to make biological drawing so that is why I ended up drawing what I could remember in the textbook.

The effect of the leakage is true; there is no way you can watch your friends discussing the leakage paper and fail to participate. After all we had not finished the syllabus. However,

the leakage was a false paper wrong so the exam was difficult especially for my friends had completely stopped studying.

Sharing of specimen disturbed us. I gave my friend the specimen even before I had not yet finished. I couldn't draw properly or even do measurement. For me I did badly on this question.

Anyway, I will do my best to pass; I need to get good grades if I have to go to the University. My parents promised me a gift if I came out the best. I do not intend to do a biology related career but I need it for my certificate. Sir, Biology looks simple, but I have seen that, it needs a lot of explanations, as pupils we think it is easy so we end up concentrating in Physics and chemistry forgetting that it is equally a tricky subject. Anyway we differ the way we see and understand the problems and solve them. Others are gifted.

I saw a girl who just stopped doing any practical work but just started writing as though it was theory paper. In another incident, I saw the spilling of chemicals on the tables by one boy; I think his friend accidentally bumped on his bench because we were crowded in the room. The examination papers were wet. I don't know whether he was given another paper but he cleaned the bench.

Respondent **5,** unlike all other respondents was confined in the school hall longer. He was truly frustrated in the experience of waiting. Reading through his narrative, it appeared that the desire to complete the practical tasks successfully overweighed the physiological needs elicited by the long period of waiting.

Like others, he approached the practical examination with uncertainty arising from the perceived incompetence in various skills, inadequate prior practical experiences, loss of confidence due to non completion of the syllabus, inconveniences due to sharing of the specimens, emerged as factors behind the numerous difficulties encountered in the biology practical examination.

Additionally, he confirmed the existence of the suspected leaked paper that he later claimed as being a fake one. He justified his participation for fear of being surpassed by his friends who had the

suspected leaked paper. He associated his involvement to a leaked biology practical paper due to the non-completion of the syllabus.

The belief of giftedness in drawing was raised. This respondent found drawing difficult and he, like respondent 1, resorted to drawing what he could remember in the textbook. Certainly, this is one area where pupils lose marks He acknowledged that drawing was a skill upon which both teachers and pupils should spend some time to develop..

Uniquely, this respondent also related the familial influences on his determination in the practical examination (and the examination as a whole). He identified the place and role of rewards. What was more interesting was the link of the reward to the level of performance in the examination. This might explain why his experiences reflected total involvement in the practical examination.

Pupils in the subject of biology hold a lot of misconceptions. In his narrative, respondent 5 gave us the following insights: "Sir, Biology looks simple, but I have seen, that it needs a lot of explanations, pupils think it is easy so we end up concentrating in physics and chemistry, it is a tricky subject". These misconceptions might be responsible for the experiences of under preparedness, which most pupils find themselves in. They realize only after encountering numerous content-based difficulties that they should have given biology a lot of more time and the seriousness it deserved.

Regarding the physical environment in the laboratory, respondent 5 acknowledged that he had never used the agricultural science laboratory before. This in itself presented a problem. The unfamiliarity of the testing site was one obstacle to be overcome.

4.3 Summary Commentary

Varied learners' experiences recorded herein have, in my view, "exhumed" issues often taken for granted in as far as BPE were concerned. Although some of the issues they raised were quite radical it was necessary since it provides a climate for debate in which schools that are in the same situation as Kabwe High School are more likely to find sensible solutions to the issue of underachievement in biology.

There is however no doubt that there are other interpretation that could be constructed on the results. Different readers will find different insights and challenges in both the respondents' and the

researchers' narratives and commentaries respectively. In general, the case study results revealed the presence of significant pupil disturbances resulting from lack of prior practical exercises, unethical pupil and teacher conduct and limited resources during BPE.

The elaboration of these results (narratives) may not have been covered sufficiently but the narratives have been included as a way of maintaining the respondents' voices thereby preserving the valuable insights shared from their unique perspectives. The observations from the narratives, together with the others that have appeared elsewhere in the chapter are fully analyzed in the next chapter. The chapter also presents a discussion on the results.

CHAPTER 5: ANALYSIS OF RESULTS AND DISCUSSION

5.1 Introduction

In general, the preceding chapter presented both the respondents' narratives and the researcher's comments. The chapter showed that, there were a lot of issues that remained unaddressed in BPE at Kabwe High School. There is no doubt that the narratives are open to interpretations that could be considered valid. What is important is that, the study has brought into focus issues often taken for granted. For instance, the numerous and varied negative encounters with tools and rules, the disturbances respondents suffered as a result of poor examination-taking situation and so forth.

This chapter presents analysis of the results with respect to the four critical questions of the study. Also included in this chapter are analysis from narratives, clinical interviews (pre-practical) and focus group interview transcript. The implication of these analyses is for our understanding of the practices prevalent in the conduct of BPE. The choices of the extracts were guided by the case being illustrated or the arguments being presented.

5.2 Interpretive Framework

An attempt has been made to interpret and discuss the responses presented in the previous chapter with special reference to the assessment of school science adopted by the Assessment Performance Unit, Science Assessment framework (Department of Education and Science, 1979).The framework suggested that, context, concepts, content and process skills are the crucial aspects in the learning and assessment of school science. Similarly, Jordaarn and his colleagues'(2003) work on experiential processes categorized the nature of experiences as in the assessment framework cited above .

On analyzing the pupils' responses, I found that most of the issues respondents raised, struck some relevance to issues discussed in the assessment framework. The interpretation in as far as the research question one (1) is concerned will refer mainly to above aspects in reference to how the abovementioned aspects were experienced during the school certificate biology practical examination. Nevertheless, the researcher added other aspect of psycho-physiological-based experiences arising from among other factors, the high stake and accountability nature of the examinations.

5.3 NATURE OF PUPILS' EXPERIENCES.

Data obtained on the nature of pupils' experiences of biology practical work during SCE were categorized into the following:

- Conception - based experiences
- Contextual - based experiences
- Content based - experiences
- Process skill - based experiences
- Psycho-physiological (or personal) - based experiences.

5.3.1 Conception - based Experiences.

Respondents' conceptions on practical examination played a major role in determining how best they performed.

a) Conceptions and Attitudes

Some respondents and some teachers alike appeared unconcerned with the practical examination probably due to the misconceptions they held. They demeaned the practical examinations.

The excerpt from respondent 5's narrative highlights the point "Sir, biology looks simple but I have seen that it needs a lot of explanations, as pupils we think it is easy, so we end up concentrating in physics and chemistry forgetting that it is equally a tricky subject". Almost similar comments were made by respondent 3 who wrote: "anyway I'll try to work very hard in paper (II), these were just practicals after all'.

Others experienced a gap between the practical and theory and this was seen in the respondents' resistance to follow up theoretical questions. From the five respondents, three of them had their focus on practical work. It would appear that the questions were familiar except that they felt that the questions were misplaced. This revealed that, the biology practical work was perceived wrongly as being the manipulation of apparatus and specimens only. This and other (mis) conceptions might have acted as a barrier to experimentation proficiency. Take for instance respondent 1's comment: "...I didn't expect those questions to come in the practical exams; I thought they would come in the theory exams." Her lack of expectation of follow up questions was a barrier to good attainment in the paper. Respondent 3 made similar reflections "That question should have come in paper (II) therefore I left it. I was not prepared for it." Additionally, respondent 4 made similar comments

when he said "Question 1 was more less like a theory question, it had a lot of questions on the diagram. It was also difficult, especially the biology terms."

There are others who experienced difficulties in procedural understanding because it was held that practicals were usually 'cook book' recipe. This was where the candidate simply followed the procedure, performed the task, and recorded the observation and probably account for the results. Though only respondent 4 raised this misconception, it was critical. He wrote;`` usually they would provide the procedure but in this year in our paper they asked us to provide the procedure and to carry it out. It was a difficult question." It seemed to be a major problem in as far as practical work in biology was concerned. The aforementioned belief might be responsible for the numerous difficulties other respondents faced in as far as procedures were concerned.

Going by the above negative experiences arising from conception problems, respondent 2 experienced the practicals differently and she recounts: "I knew what the practicals required of me, I had no problems with carrying out the experiment and entering the results." In as much as she might have left a few questions "here and there" she seemed to have experienced a sense of satisfaction about the practicals. She knew the format and so it was easy for her to identify the problem format and generate a solution approach to fit it. She had the right conceptions about the practical work.

Respondent 3's concerns were explained differently in that he saw the examination as being tricky due to insufficient subject matter and he wrote; "the questions were tricky especially question 2 that I didn't manage to answer." The issue of perceiving a question as being tricky has already been discussed. Suffice to say that the respondents displayed a lack of perseverance on the tasks at hand.

Respondents' conceptions of BPW and its various aspects had played a key role in the manner they handled the practical examination, that is, from the period of instruction (preparation) to the actual execution of the practical examination. As already observed, conceptions may have impeding or to the contrary a positive reinforcing influence. Respondents who held ambiguous views about BPW had their various correct actions barred, had considerable confusion in their mind and as a consequence they lost marks.

problems in...and the crowding over the materials and heating areas. You find that as you are crowding, some people start to share answers...."

Taking the excerpts above, it was clear that, he experienced frustration that led him into copying. But the question is, was he copying what he intended to copy? Even if he copied, could it be assumed that they were copying the correct responses? The issues of copying probably need to be revisited as they may have offered a possible explanation between the high grades often obtained in the subject and the competence exhibited in the school graduates.

Respondent 4's narrative except gave further insights into the issue of the overcrowding and he wrote:" We were about 35. We hardly had space to move around and when writing, your friend was seeing the answers. We were overcrowded around the heating place and some friends were not even doing the experiment."

The inadequate supply of materials resulted into crowding and as pointed out by the respondent, frustration, due to delays by others, and copying, point out to some of the experiences encountered. Furthermore, it also revealed the weaknesses of the practical work examinations system that had no provision for on spot evaluation. Respondent 2 however, had a different experience she says. "... the boys encouraged me to work very fast and I managed. Yes other girls found difficulties to work with the boys from what I saw."

b) Influence of Limited Facilities.

The inadequate provision of materials and improvisation were experienced differently. Some were made to be 'observers'; others as 'demonstrators' whilst others were perpetual 'clients'. They consulted others whenever an opportunity availed itself. Consider the two narrative extracts below to illustrate the experiences cited above.

Respondent 3 had to wait for some time to take his turn to heat...wasted a lot of time...had to check the results from his friend." He went on to comment, elsewhere, with regards to sharing of specimens that: ``The only problem was in the sharing of specimens and crowding over the materials and heating areas. You find that you are crowding some people, start to share the answers and some pupils did not even do the actual practicals, they wrote from their heads.''

In high stake examination, according to Tobin *et. el* (2003), waiting often generates anxiety and panic. Therefore to avert this kind of tension, then, respondents like respondent 3 tended to engage themselves in all forms of malpractices.

Closely related to respondent 3's concerns about limited supply of materials, respondent 5's sentiments were, "sharing of specimens disturbed us. I gave my friend the specimen even before I finished. I couldn't draw properly or even do measurement. For me I did badly on this question". An excerpt from respondent 1 read: "I could not do part of the experiment because the specimen was taken by the boy. I had to wait." During the post practical interview, respondent 1 recalled and justified her failure to use the equipment provided. She cited lack of practice and introduction of the improvised apparatus. Her experiences might have been similar with others, but equally, they might have been unique. With regards to materials and equipment, the results indicated that, inadequate provision of materials had impacted negatively on the respondents' academic performance in the practical paper. Additionally, it acted as a catalyst to examination malpractices as evidenced by the respondents' own 'testimonies'. Tobin *et al.* (2003) recognizes the problems associated with material provision during high stake examinations as an equity challenge. That is, failure to provide adequate materials disadvantages some test takers, as they will not perform the same tasks in comparable laboratory facilities and materials.

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Among the most important components of an examination, according to ECZ was the test administration itself. The test administrators ensured that test takers conducted themselves acceptably and that all that went on in the examination was done ethically (ECZ, 2004). Enforcement of examination rules and regulations as well as the conduct of invigilators are considered below.

c) Examination Rules and Regulations

The respondents experienced the enforcement of the examination rules and regulations differently. For instance the thorough search for any illegal materials that was done on the candidates before entering the examination room. The following extracts illustrate the varied encounters.

Respondent 3: " We stood in the lines for long a time waiting to be searched for any leakage materials. This took a lot of time i felt disturbed." Respondent 5 had a slightly different view and he said: "... the search was alright because some pupils pass using leakages...." For respondent 2, the manner in which the search was conducted was her concern and she commented that "... Mrs. X told

us to remove our shoes, she searched us everywhere and the way, sir, it was done it is like we are not human being."

While respondent 2 and 3 felt disturbed and dehumanized, respondent 5 felt protected from undue competition from those who had 'leakage'. The manner in which the examination rules and regulations were conducted could either be helpful or destructive to the test takers. The examination guidelines stressed firmness and yet avoiding situations that were potentially disturbing to the candidates (ECZ, 1996).

d) Conduct of Invigilators

From the narrative excerpts, respondent 4 observed that the continuous movement of the invigilator and their conversations on cell phone caused loss of concentration. The excerpt reads; "...the invigilator came to stand next to me, I stopped writing... and by the time he was leaving, I had forgotten the point". Elsewhere he said "the invigilators were moving around too much... the ringing of the phone by Mr.'C' in the lab was disturbing." Respondent 3's encounter was slightly different in that for him it was in misreading the 'cues' from the invigilator who happened to be his biology teacher, he said "As Mrs Y, a biology teacher was invigilating the way he was looking at how I had drawn the diagram, I felt I had made mistakes so I had to rub it and drew it in another way". Regrettably, he later discovered that the initial drawing was correct and he lamented: ``... I just wish I didn't change because now I will lost 5 marks....'' Respondent 1 had a relatively similar encounter in which the frequent movements of the invigilators, occasional mentioning of the remaining time and the `cues' by the invigilators disturbed her. She wrote; `` ... I could not remember a lot of things even if we studied them with my friends especially when invigilators from other schools started moving around and mentioning the remaining minutes. I got confused. And Sir, the invigilators kept on passing where I was and the way he was looking at my paper, I thought I had made a lot mistakes so I had to change."

On the basis of the results presented, an assertion could be made that, a number of unethical teacher tendencies in test administration occurred. To a large extent, these tendencies impacted negatively on the conduct of pupil and generally on the test-taking situation. This could have in turn impacted negatively on the academic performance of the respondents.

e) Laboratory Preparation

Some respondents complained for being in the laboratories which were strange, others felt that the laboratories were not conducive for the practical examinations yet still others felt very familiar. The following excerpts highlight the various experiences. "I have never used the Agric Lab before, it was new for me, and there were very few stools so some of us were kept standing through out...also a lot of pictures on the walls...", read respondent 5's narrative, in part.

There are some respondents who took a lot of time trying to familiaze themselves with the laboratory environment. This could have been an impediment to respondents' task oriented attention. A good example was respondent 5's experiences where the pictures on the wall captured his attention.

Contrary to respondent 5, respondent 2 had a different experience in that she took her practical test in a familiar environment. There was nothing that could divide her attention on the tasks before her. The excerpt from her narrative read; "I did the biology practical exam in the Chemistry Lab and this was the lab we use for pure chemistry practicals. I had no problems for I was very familiar with it".

It is important that, pupils are familiar with the Laboratory environment or in general the examination room as this helps them to settle down easily. Furthermore, the results are clear that the large number of test takers had their privacy to the answer sheets reduced and additionally there was an increased difficulty in accessing already inadequately supplied materials and equipment. Consequently, this resulted into numerous unethical adaptive responses such as withdrawing from the activities, discussing the questions, sharing answers and so forth.

5.3.3 Content - based Experiences

A number of negative encounters illustrated herewith had originated from the subject (biology) content. Layton (1991) equated 'content' to student knowledge. The term student knowledge represents the whole range of cognitive understanding and abilities. In content therefore, there is an interactive knowledge base (everyday experiences, school related science content and general cognitive abilities), which generated respondents' actions during laboratory tests. Therefore, in light of the aforementioned interactions, the respondents' subject matter know- how determined the extent to which they took control of the practical activities. The following are considered.

a) Syllabus Coverage

The level of syllabus coverage plays a key role in determining pupils' confidence. Consider the following extracts from respondent 1: "... I did not learn about... which in question 1 appeared. We did not cover the syllabus...." For this respondent, inadequate content arising from non-coverage of the syllabus caused her face difficulties in carrying out the practical activities. Such difficulties led to not only demotivation but also reduced cognitive engagement in the whole practical paper.

For respondent 5, his concerns were: "For food tests, the teacher just demonstrated but for question 2 the topic was covered a day before the examination, so I could not remember most things". When content and concepts are just demonstrated, they may not be understood in the way they were initially intended. Secondly, the tendency by teachers to cover the topics late impacted the respondents negatively. In such cases surface learning occurs which may result in retrieval problems. The other effect is that pupils may take it that, the newly learned materials are important ones in as far as the examinations were concerned. That is, there is an undue attention to the 'new content' at the expense of the earlier acquired knowledge.

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Respondents complained that, the biological terms were either poorly presented or were not learned at all. With this lack of clarity of terms, respondents became uncertain how to proceed and according to Larkin (1980) they may either abandon the question or attempt to solve it based on their current knowledge. Respondent 1 and 4 s' comments illustrate the point (respectively):

''... I rubbed and drew like his because I did not understand the word longitudinal section.'' It was difficult especially some biology terms. So I don't know whether what I wrote was correct or not''.

In light of the above concerns, during focus group discussions respondents were asked to state what they found difficult about the biological terms. The respondents (R2, 4 and 5 shared four insights;

First, an insight about their *confusing nature,* which is, *student understanding*:

R4: "The terms were difficult because they are confusing"

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Second, an insight about *student learning*:

R2:..." they were not explained in our class".

Next, an insight about *lack of practice* on the terms:

R4: .." Yes if only we had used them in our practice...."

Finally an insight about their seemingly *non-English origin* of terms

R5: "Generally, most of them do not appear like terms from English language".

It is interesting to note Wandersee's (1985) concerns that biology with its vocabulary derived from Greek and Latin presents problems to students. He, in addition, noted that students ended up memorizing the subject matter. So, the findings of this study are pointing to the same difficulties and effects on the learners.

5.3.4 Process skill-based Experiences

Process skills involve aspects such as drawing, measurement, observation, recording data, plotting graphs, investigative skills, interpreting data and so forth. Low frequency of carrying out practical exercises led to under development of the process skills. The respondents' comments revealed a lack of confidence that might have generated anxiety based on fear that they might not be able to solve the problems. Generally, respondents felt incompetent to handle the practical work.

a) Drawing and Labeling

Drawing and labeling of specimens diagrams presented a lot of challenges to the candidates. An examination of the excerpts below suggests that teachers and pupils alike did not take time to develop the required skills in this area.

Respondent I "... just drew the diagram of the specimen as I had seen it in the textbook. It was difficult to draw. Elsewhere she wrote " I had a lot of problems labeling the diagram. Actually I left some parts without labeling." For respondent 5, the excerpt seems to reveal a misconception about drawing that it was as a result of giftedness when he said "Drawing was difficult for me. I am not gifted. We were not taught how to make biological drawings...."

The respondents' concerns revealed underdeveloped drawing abilities, which resulted into numerous errors in the paper. This was confirmed by Haambokoma (2007) who outlined common errors made by pupils in Biology practical examination of SCE. Probably it gives insights into biology teachers spending little or no time on pupils' drawing skills or on how the work will be assessed and graded.

As the respondents have shown, learners were intimidated by those questions on drawing and hence they resorted to copying from each other or drawing what they had remembered about the specimen in the textbook. Additionally, even when the diagrams were drawn, it was observed that respondents still made a lot of errors such as in drawing inappropriately small diagrams, shading, use of arrow heads, labeling parts that were not evident at all and too much untidiness.

b) Observational Skills

Observational skills on the actual specimen were not developed. In light of the aforementioned deficiency, the respondents with no desire to misrepresent results equate what they think, see, and sometime what they want to see, with what actually happens or presented to them. An extract from respondent 4's narrative may help to illustrate the point: `` I was unable to give three visible structural differences between specimen W31 and W32. I couldn't see them but I wrote what I had in mind....''

The foregoing insight strongly suggests that, examiners must no longer assume that, because the candidates reported the desired results that they accurately observed what the question was designed to demonstrate. Additionally as evidenced by the results, the respondents lost marks because of lack of observational skills.

c) Understanding Procedures

According to Bransford and colleagues (1999) procedural knowledge is knowledge of how to perform cognitive activities. Performing laboratory techniques needs this knowledge.

The respondents encountered specific difficulties in procedural understanding. For example the following excerpts illustrate some of the difficulties met. Respondent 2: "I realized on one question that I had used Copper (II) sulphate instead of Benedict's solution... but before I could re-do it, it was time up".

Respondent 1 "...I confused the method on testing reducing sugar and non-reducing Sugar but I saw what James was doing, so I followed...." Whilst respondent 2' s encounters were closely related to choice of materials and wrong test reagents, respondent 1 had her predicament stemming from the inability to distinguish the two samples (sugars) under investigation hence employing inappropriate methods. Most likely, all these difficulties could have arisen from learners' tendencies to memorize facts or procedures without understanding. In such cases (Bransford, 1999) learners are not sure

when or how to use what they know. These difficulties in procedural understanding acted as barriers to experimentation proficiency. This led to numerous errors.

d) Measurement and Calculations

Careful measurement, which is one of the key components of the scientific process (National Science Education Standards, 1996), is lost unless time is devoted to develop the skill. Respondents revealed critical insights about measurement. Take for instance respondent 5 who wrote: `` I didn't know which way to measure the specimen so as to calculate the magnification. Related to the foregoing dilemma, respondent 4 wrote..."On the specimen, I didn't know which way to take the measurements so that I calculate the magnification. I hope I did the right thing."

Again, the results seem to show that measurement as a skill needs to be developed or it will act as an obstacle to quality performance in biology practical work. Actually the 2005 biology practical examiners' report on which this study was done confirmed that candidates lost marks arising from failure to give correct measurements on their drawing which resulted into wrong calculation on magnification (ECZ, 2006). Haambokoma' (2007) study on common errors made in biology practical paper and he reported similar findings of the difficulties cited above.

5.3.5 Pscho-physiological - based Experiences.

Pycho-physiological arousal is a compound word that expresses the interaction between attributed meaning and the physiological reactions. The' high stake' final examination carries a cognitive attribution, which in almost all cases causes physiological reactions.

a) Confidence Level and Test – Anxiety

According to Tobin et. al (2003) test anxiety refers to physiological and behavioral responses that accompany concern about possible negative consequences or failure on an examination or similar evaluation situation. It is suggested that it could be exaggerated when pupils are uncomfortable with the examination–taking situation. Responses from participants show that this phenomenon existed and could have had negative effects on experimentation proficiency. Pupils indicated that they were scared and generally unease. Some studies conducted by Hembree (1988) relating to test anxiety and academic achievement found that, test anxiety does cause poor performance.

The following excerpts from the two respondents illustrate the psycho-physiological based experiences. Respondent 3: "Although we had done about three practicals during learning, I was not sure of what to do, I was afraid...." Respondent 5's shared similar concerns in which he wrote 'I was scared and my heart was beating fast especially when I saw that the questions were lengthy and involving. I was afraid I would make a lot of mistakes and fail."

It was evident from the narratives that some of the respondents indicated negative stress experiences elicited from anticipation of failure. Knowledge about certain inadequacies robbed the respondents of the much-needed confidence and therefore fears had set in. According to the study findings by Tobias (1985), worry interferes with attention and cognitive processing because the negative thoughts distract the individual from the task. As already observed, the respondents' conduct was greatly affected thereby reducing their experimentation proficiency.

It has been shown through a research study that test- takers' success in a stressful situation is influenced by the degree to which they are confident that they will succeed (Adams, 1986). An analysis of the current study results show that, four out of five respondents were less confident that they would succeed. If this was what was obtaining with in and the wider cohort beyond Kabwe High School, then specific intervention strategies should be worked out to reverse the trend.

However, what is stressful to one person is not necessarily stressful to another. When brought under control, like in the case of respondent 2, positive effects could be generated leading one to see an examination (potential stressor) as a challenge and an opportunity. She was very alert, vigilant and worked with task-oriented attention. Her comments illustrate the point-"I new what the practical s required of me, I had no problems...I was at ease. This helped me to answer most of the questions without many problems."

Evidently, respondent 2 was not scared of the BPE. She had reasonably good expertise on practical work. As indicated earlier on when the sample was described in chapter 3 she was of a high as being academic ability. she typified what Tobias (1985) found. Tobias' study demonstrated that when students have high academic abilities, good study skills and test taking strategies, more working memory capacity, they would be freed up to cope with any negative thoughts and worry generated by high-stake test anxiety.

These insightful psycho- physiological - based experiences that have been recorded and their sources may form a strong base to inform the design of programs at Kabwe High School that will minimize the difficulties among the learners in this area to appreciably low levels.

5.4. Factors that Contributed to the type of Experiences

From the data sources the question of what factors might have contributed to the type of experiences manifested were broadly grouped under personal variables and external factors

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5.4.1 Personal Variables

These are factors operating within the individual causing a change in the person. The following are the factors which were either directly or indirectly cited by the pupils; retrieval problems, fatigue/hunger (physiological needs) and attitudes.

a) Retrieval Problems

Consider the following excerpts from the respondents' narratives:

Respondent 4: "had the answers to the questions...could not remember but after handing in the answer sheets, everything came to my mind...."

Respondent 2: "I forgot one thing here and there especially those we were taught the previous week but...familiar. I don't want to think about this anyway." Respondent 1: "I could not remember a lot of things even if we studied especially w hen the invigilators started mentioning time."

The inability to store or recall information emerged as one factor that contributed to the type of experiences manifested by the pupils. Various factors such as fear, surface learned materials tend to increase forgetfulness.

b) Physiological Needs

These two physiological conditions, hunger and fatigue were mentioned in the narratives of those respondents who took their BPE late in the afternoon. Usually in such conditions, there is loss of alertness, vigilance and a failure to work with task-oriented attention. Maslow (1968) sums this up when he says it is unrealistic to expect students to show interest in classroom activities if they are suffering from physiological deficiencies. As mentioned elsewhere, this situation was caused by ECZ that allows multiple sessions. This arrangement disadvantaged learners that were writing in the last session, which extended to as late as 19: 00 hours. Respondents found themselves doing the practical work hurriedly with less care.

Consider the following excerpts from the narratives to illustrate the various pupils experiences: Respondent 3: I wrote my biology practical exams at 12:30 hours, all this time from 07:30 hours we were kept in the hall. We were not allowed to go and eat...was even very inactive." A Similar encounter was registered by respondent 5 who said "we were kept in the school hall with nothing to eat and I had my practical exam at 15:30 hours to about 17:30 hours. I was hungry, tired and feeling very weak...lost interest".

There is no doubt that the foregoing encounters of the respondents impacted negatively on their conduct during the BPE. These encounters could have equally impacted negatively on their performance in the paper.

c) Attitudes Towards Practicals.

Pupils' attitudes towards the subject of biology and BPW in particular, for one or the other reason emerged as a factor that was responsible for some of their negative experiences. As a matter of fact, a conducted by Gardner (1975) showed that students have negative attitudes to sciences. Johnson (1993) indicates the importance of attitudes by starting that they have a clearly recognizable influence on both science achievement and participation in the study of science and in the choice of a science - based career. For instance, respondent 1 *'s* negative attitude towards biology could have been responsible for her careless handling of the practical work; the lack of preparedness, halfhearted tendencies and giving up during the examination may point to some degree her negative attitude. She openly said "... even if I fail, biology is not my subject. I want to be a businesswoman...had lost interest in the subject.

Arguing long the same line, respondent 4 wrote: ``Most of us are not concentrating because we see rich people who didn't go to School and worse again we see a lot of our friends who finished school last year are in streets selling things. There are no jobs''. The foregoing sentiments are suggestive of an increasingly loss of interest by some learners in the subject of biology and schooling as a whole because they feel that the subject offers nothing after leaving school.

From the investigators' point of view, the question of attitude is of paramount importance. Positive attitude towards the subject on the other hand emerged as a facilitating factor to striving for success as portrayed by respondent 2. In her narrative she wrote; "I'll continue to work very hard so that I

pass paper (II) as well because I am aiming to enter the University. I want to be a veterinary Doctor."

A positive attitude stirs preparedness and fosters a sustained high degree of perseverance. The two narratives demonstrated the issue of interest value. A candidate who sees the course (task) as being important to her career choice develops greater self – regulatory effort (Wigfield, 1994). So there is a direct link between what one values and the persistence and effort applied. It is, therefore contended that concerted efforts should be made by the School to redress pupils' negative attitudes towards the subject.

5.4.2 External Factors

These are factors that operated on the respondents from outside. They are described in the following paragraphs.

5.4.2.1 Examination Administration

a) Invigilators

Although the invigilators play a key role in facilitating the smooth running of the examination, they have often been found to be disruptive. My observations agrees totally with the learners' viewpoints. It should be quickly added here that it is not being suggested that they should not stop the malpractices but it is their conduct that leaves much to be desired. Take for instance respondent 1 's concerns that "... the invigilator kept on passing where I was and the way he was looking at my paper I thought I had made a lot of mistakes so I had to change..." While recognizing and accepting that they were preventing malpractices it could be argued that their conduct, to a large extent, amounts to ethical transgression.

For respondent 4, in addition to disturbances arising from frequent movements, the ringing and answering of the phone within the laboratory, he wrote: ``At one time, the invigilator came to stand next to me, I stopped writing because I was not free, and by the time he was leaving, I had forgotten the point".

Ultimately, as the narratives have suggested, invigilators contribute to setting of the test-taking atmosphere, which is crucial to pupil performance. According to Broadfoot (1979) the nature of the test- taking situation has a direct influence on task performance. It would be advisable, to the School,

to take adequate measures to avoid creating unfavorable test-taking environment so that learners should be given any opportunity to exercise their full potentials during the BPE.

b) Limited Facilities

The failure to provide the right quantities of examination material/specimen caused many difficulties. In all the respondents' narratives, the issue of sharing specimens emerged as being a source of many difficulties. For instance, pupils found themselves hurrying up each other, crowding and so forth. These and other encounters impacted in one way or the other on academic achievement. For instance an excerpt from respondent 5's narrative reads: "I gave my friend the specimen even when I had not yet finished". Concerning the same observation, respondent 3 wrote that: "Some of us had to share the specimen, it was disturbing, I could not take my time to measure and calculate the magnification... since your partner is hurrying you up."

It could be argued that inadequate provision of specimen materials and other facilities robbed the candidates of the freedom to display their true know-how for which the examination was designed to measure. As a result, a lot more pressure was added resulting into careless work, breaking of equipment, misplacing materials, poor judgment in selection of materials and supplies for the task at hand. The candidates failed to think fast and logically.

c) Improvisation of Material and Equipment

Improvisation of materials and equipment is an inescapable alternative in most under-resourced Zambian Schools (Haambokoma *et al.*, 2002). However in an examination situation if it is not handled properly, it could cause a number of problems for the learners. Let's 'listen' to respondent 1 who said: "I have never used the pipette and another machine (which happened to be an improvised piece of equipment) so I called the teacher to ask how to use them but he did not come".

In addition to the difficulties encountered in the use of improvised materials and equipment, they may fail to give the same results, as do the setters' prescribed materials (ECZ, 1994). It is even more damaging to the pupils if the examination supervisors and invigilator do not advise the examiners on the improvised materials and equipment as the marking schemes are based on the prescribed materials and equipment (ECZ, 1994). It should be underscored however, that it is not being suggested here that Schools should do away with improvisations. On the contrary, it is simply being suggested that it should done cautiously to minimize learners' difficulties.

d) Swapped Specimens

Consider the forth respondent's narrative below.

"After about 10 minutes of writing, the invigilators realized that they had interchanged W31 and W32...They stopped us started afresh. I panicked. "

Although only one respondent mentioned about it, it was a critical incident worth noting. The respondent represented the entire group of learners who were writing in that laboratory. If the problem was not noticed, the whole group of learners would have lost marks. The mistake brought up panic and worked against the pupils as they were asked to re-start the question.

e) Overcrowded Examination Rooms

The practical examinations were written individually, but the manner in which they were conducted was undeniably not individual. A lot of encounters were noted in which some of the learners became "tutors", "demonstrators", "consultants" yet still on the other hand, others were reduced to "spectators'' and "conformists" to others' experimentation procedures and observations especially those of the high achievers.

Take for example the encounters of respondent 4,he wrote: "We were overcrowded around the heating place and some friends were not doing the experiment." and elsewhere he wrote: " you find that as you are crowding, some people start to share the answers...." Respondent 5 related an incident he witnessed which stemmed from an overcrowded examination room he wrote "...I saw the spilling of chemicals on the table by one boy; I think his friend accidentally bumped on bench because we crowded in the room...examination papers were wet." Whilst the large number of learners enrolled for biology were responsible for adding significant pressure on the conduct of BPE, it is perhaps useful to insist here that teachers should ensure learners are provided adequate opportunity to demonstrate their achievements.

F) Lengthy Waiting Periods

Two of the five respondents cited long periods of waiting as being stressful, disturbing and tiring. Such negative situations may be more damaging than the examination itself. The pressure generated led to loss of concentration especially among those learners who were less confident of success in BPE. According to Hembree (1988) in such settings, females become more susceptible to test

anxiety. It is therefore possible that the learners, in which this affective variable operated, had their levels of achievement in BPE lowered. The respondents' own words below exemplify .the situation that was prevailing: "I didn't like the time of waiting because this one will come with a rumor and another one with another story and so it was disturbing," wrote respondent 4. Similar sentiments were raised by respondent 5 that "if I had written earlier, I think I would not have panicked the way I did. Waiting for me was difficult."

Contrary to the views and experiences of others, respondent 2 found waiting to be good. Probably this had to do more about her appreciably high level of confidence that she was going to succeed. Adams (1986) established that students' success in a stressful testing situation is influenced by the degree to which they are confident that they will succeed.

5.4.2.2 Other Hindrances

From pupils' narratives and focus group interviews, linguistic inabilities, lack of motivation and intellectual variations were cited as some of the other factors that contributed to the experiences manifested. These factors are elaborated below.

a) English Language and Test Items

The investigator wasn't comfortable to probe into the language problem in depth but from the data sources, it was evident that it existed. It was also evident that this problem posed numerous negative effects on the learners' ability to understand and implement the task. Some of the respondents' difficulties during practical work were as a result of failure to understand not only the key biological terms but also the English language in general. The following excerpt elaborates what was encountered.

Respondent 1: "I left question 2(b) because I did not understand it. I tried to ask the teacher to explain it to me but he refused." A close inspection of the paper appeared to suggest that the questions were embedded too much in descriptions such that those pupils with weak linguistic skills could have failed to grasp the question. Consequently, a failure to offer reasonable solutions to the tasks at hand. It was not clear whether the difficulties laid in grammar, vocabulary or syntax. Whatever the case, teachers and setters need to be more sensitive to linguistic difficulties associated with biological concepts, as they can be a source of error and misunderstanding. This area however needs further probing.

b) Motivation

There was lack of motivation in some of the pupils and the reasons put forward were that, biology was not a necessity for the career choice and that education was not necessary for the advancement of their material well being. That is, they have few prospects for advancement in this field of sciences. According to Tobin *et.el* learners who lack motivation tends to display a weak need for achievement and so they exert less effort in the examination. For instance, respondent 1 who wrote, "...even if I failed biology, was not my favorite subject. I want to be business woman." Clearly, such an individual is demotivated and holds a negative attitude towards the subject. Probably this explains her noticeable lack of perseverance during the practical examination.

"Most of us are not concentrating because we see rich people who didn't go to school and worse again we see a lot of our friends who finished school last year are in the streets selling things... have no jobs" reads respondent 4 *'s* narrative in part. The respondent's motivation was tied to job opportunities. Lack of jobs (obviously white collar jobs) appeared to demotivate some of the respondents.

Another category of respondents however experienced purposefulness of the practical work. This was 'noticeable' in their perseverance. Respondent 3 *'s* narrative highlights the point. "Well I tried my best, biology is important for my career." The second respondent had a similar motivating factor and she wrote, "I worked very hard, that I should have six points.... I'll continue to work very hard so that I can pass paper (II) as well, because I am aiming to enter the University...veterinary Doctor." It is evident that, these respondents' biology related careers aspirations inspired them to work very hard.

c) Variations in Intellectual Ability.

This factor featured in both respondent 2 and 4's narratives: And respondent 4 said..., "others are very intelligent and they managed to finish but those who were not found it very difficult and tricky...."

This factor emerged as being responsible for some of the experiences manifested. Nevertheless, in such a selective system, lack of intelligence cannot solely be regarded as a fundamental cause for lack of success if all other conditions are favorable. Notwithstanding that, differences in

interpretation and execution of the tasks as well as the ability to finish were, according to those two respondents, associated to intelligence. This in some way calls for a system that nourishes intellectual curiosity during the teaching learning process.

d) Teaching to the Examination and Wrong Practices.

The Zambian education system is predominantly examination driven (MOE, 1996). The examinations exercise a powerful influence on what pupils learn and how they learn it. The examination pressure inhibits teachers' innovation and diversity in their practices. Consequently, teachers' instructional and assessment practices are highly influenced by the need to make sure students pass examinations at the end of schooling. Pupils resort to superficial and rote learning, they are encouraged to memorize and reproduce information. Furthermore they are also encouraged to compete against one another rather than focusing on personal improvements. Gipps (1997) observes that when both learners and teachers are faced with external examinations they opt for surface learning and teaching approaches, respectively, as the most effect effective, since little more than the regurgitation of information is required. Reading through the five narratives one gathers an impression that teachers did not take practical work as seriously as they did in the theoretical components. The teachers did not sufficiently expose the learners to practical work. Even the few practical exercises that were given, some of the respondents testified that they were not assessed. It was noted, too, that these practicals were stepped up only when the examination period approached with learning being reduced to concentrating at isolated facts and skills. It could be argued that the scenario described above account for many of the unpleasant experiences reported by the respondents.

5.5 Gender Specific Experiences

Data collected from respondents' narratives and focus group interview, on whether both girls and boys had similar or different experiences indicated that, in addition to the common encounters, girls had unique experiences. These were:

- Verbal harassment.
- Attitudes by male pupils

a) Verbal Harassment

From the narratives, it was clear that boys subjected, often though, their girl counterparts to verbal harassment. Let's consider what respondent 2 said about the incident she witnessed: "I remember

one boy told one girl that even if she failed herself she would be married and they said all types of foolish things." Whatever the foolish things were, it must have been embarrassing and disturbing. Secondly, it should be observed that comments such as "even if you failed, you will be married," give the impression that the female learners' rightful place was to look after a home. It may be difficult to evaluate the extent to which such comments impacted on her experimentation proficiency but what is certain is that it was ill intended. It could be offered as a useful suggestion to the School that 'safety' measures should be worked out with a view to creating an all-supportive test-taking situation.

b) Attitudes by Male Pupils

There is always a deep-seated stereotype tendency by boys to dominate girls. The tendency of bullying even in the examination room placed the female learners at risk of failing. This was true as reflected in the comment excerpted from respondent 4*'s* narrative which read: "...we were doing practicals with those boys from the other classes who do pure Sciences and they wanted to show off as if it was an interclass competition. They were passing all types of comments to girls." The domineering manner of some of the boys often took a different form for instance respondent 1 narrated her experiences with male test takers that: "I could not do the experiment because the boys were using the specimen. The boys didn't care, they like competition." Respondent 2 made similar a comment: "It was bad; boys would just get the specimen even if the girls were still using it."

Holding on or 'just getting' point to fact that the males did not seem to recognize the female learners as their equals. It is possible that the effects of being dominated, underrated or ignored added up only to withdrawal and avoidance of answering some of the question. Probably it was against this background that low levels of success occurred amongst girls in BPE. There are nevertheless certain steps to improve the situation that can be taken now among which is to avoid reinforcing these general attitudes as far as possible.

5.6.1 Effects of Pupils' Experiences on Academic Performance

Although the foregoing data are difficult to interpret with any precision and while they require substantiation, they add weight to the contention that significant barriers occurred in the biology practical examination rooms. The findings suggest that the respondents' experimentation know-how, and therefore academic performance, were greatly inhibited by the gap that existed between the "intended" and the "actualized" curriculum. That is, there was lack of congruence between the

curriculum, the teaching process and the exit examination. Furthermore, the results have shown that the poor conditions under which the examination was taken was a very serious impediment to quality academic performance in BPE. The most noticeable consequence of lack of practical exercises and limited laboratory facilities was the effect they had on pupil conduct of the examination. While the exact effect on pupils performance may as yet be poorly understood , I found, panic, loss of concentration and too much wastage of examination time to be widespread. From participant observations, hasty, inaccurate and often untidy incomplete work was noticed. It could therefore be safe to conclude that a wide gap existed between pupils' general academic abilities and their actual performance in BPE at Kabwe High School.

5.7. Discussion

The present study has provided descriptions of what the 2005 grade twelve pupils, at Kabwe High School, encountered in exit BPE. All the five learners involved in the case study indicated in one way or the other that sitting SCE in biology practicals presented some difficulties. Some of the difficulties faced were of a kind that was often taken for granted. Firstly and foremostly, it should be noted that during the process of learning school biology, it is generally hoped that learners will acquire familiarity with certain materials, ability to use certain facts and rules, the understanding of general principles or laws and the knowledge of how to apply them. Furthermore, particularly in biology, it is hoped that they will acquire certain manual skills. However it was clear from the study results that some parts of the aforementioned essential component of learning were missing and this was where many problems the learners encountered, during BPE, appeared to have started. It should be underscored here that a spiral form was created in which deficiencies created at one stage led to the next other even more complex problems.

It would be reasonable to infer, from the study results, that the instructional context was at variance with the practical examination requirement. Teachers taught to the examination with due emphasis on theory. Learners rarely carried out practical work and the few practical activities that they were exposed to were organized only when they were approaching the examination. Furthermore, these practical exercises were mainly in form of verification as opposed to investigatory ones. It was learnt, too, that even the few BPW conducted assessment was not made on them, that is, there were no corrective feedbacks highlighting the portions of procedures requiring corrections, those they implemented correctly and those requiring modifications. Because they lacked in these areas, most of the pupils struggled with memorized procedures often not being sure when or how to use what

they knew. However respondent 2 gave us a near exemplar case where we saw positive effects of meaningful prior practical experiences. This raises a question to teachers as to what the costs and benefits of teaching procedural knowledge without engaging pupils in situations these procedures are appropriate?

This calls for teachers to enhance teaching practices where teachers are no longer dispensers of knowledge but providers of situations from which pupils can derive their own understanding. It wouldn't be far fetched to conclude that technical problems in BPW among the learners would persist if current teacher classroom practices (Haambokoma *et al,* 2002) continue. This variance between the biology teaching-learning context and the structure of the external practical examination leave much to be desired. Ideally, the goals and experiences of the curriculum should match with the BPE paper prerequisites.

It should be added that as a result of this disorganization in the handling of BPW, learners found it new. The basic process skills were underdeveloped and therefore learners did not only display ineffective strategies in handling practical work but they also demonstrated a lack of confidence to carry out practical work successfully. This is why probably most of them were easily distracted by either their fellow candidates or by the invigilators. It is important that science educators take careful consideration of the confidence - competence complex. It remains for us as teachers of biology to ask ourselves; what classroom practices enhances confidence and competence in the learners?

When pupils have not prepared adequately for the examination, they tend to lose confidence in themselves and hence they develop fear of failure, which heightens anxiety. The degree of confidence and anxiety are the two variables that often determine success in such stressful situations. According to Everson *et al.* (1991) it is well established that, 'test-anxiety' is more established in females than in males and that boys are more confident of being successful in stressful situations than girls. It could be safely suggested that the combination of these two and other personal variables could have acted significantly to compound the disadvantages faced by female learners in BPE.

Furthermore, it should be observed that the concentration on practical activities a few days before the practical examination added further dilemmas in most pupils. By nature, these activities emphasized on how to complete tasks, drill and practice, as a result, pupils engaged themselves into rote memorizing as against grasping the principles and rules underlying the activities. It was evident

that, a number of respondents were not sure of the procedures and even where they were sure, steps were misapplied. In addition, a number of them had difficulties in integrating theory with practical work. There was too much inadequate preparation for the practical work leading to fear and forgetfulness during the examination.

It may perhaps be added here that as a result of too much inadequate preparation, the fear of failure 'forced' some of the learners to involve themselves in examination dishonesty. In many cases, learners are concerned to get on to the next step of the education ladder irrespective of his or her ability to move further up it. One could argue that the misdemeanor was not entirely their fault but whatever the case, society requires examinations to be selective of those who do proceed. The more efficient the examination is at correctly selecting those that go on, the more society will approve of that examination. In a nutshell, society demands integrity throughout the process of assessment. On account of these and other reasons the practice of examination dishonesty was far from being condoned.

Other learners, it would appear, reacted to their low levels of preparation for the BPE by belittling the contribution of the practical component to the final grade. The ' I don't care' attitude towards BPW was prominent and it was an issue with which to contend. These and other practices and reactions, as the study has demonstrated could, potentially, have combined to depress the scores in this subject of school biology. The lesson I drew as a science educator was the need to be insistent on practical exercises, within and outside the classroom, not just because the component was to be examined at the end of schooling but that it was necessary tool in altering the misconceptions and negative attitudes towards the subject of biology.

With respect to contextual embedded experiences, it must be understood that the external examinations formed the larger context. It is therefore important to draw inferences as to how the lesser 'contexts'-the various factors within the examination room-impacted on learners. The examination situation was, as already noted, characterized by inadequate provision of facilities. Worse still even the limited facilities that were made available were found to be poorly presented to the learners. As a result, learners met a chain of barriers to their experimentation proficiencies. As a way of avoiding these barriers, I suppose, some of the pupils were found to complete the examination tasks without carrying out tests. This practice was made normal among the test-takers by the verification and prescriptive rather than an investigative nature of the BPE paper. That is,

since the pupils "knew" what they should have seen, they were able can generate "correct" results of an investigation they never demonstrated. It could, without hesitations, be stated that some sources of underachievement in the paper laid in this practice.

It appears, incidentally, from the evidence so far available, that the current format of the BPE paper displays far less awareness of the foregoing point than does other practical papers such as chemistry and physics.

Examination-taking situations are very important in that they have an undisputable influence on pupil performance. According to Tobin *et al.* (2003), examination-taking situations present equity challenges. It remains for the teachers and all those who are involved in the preparation and invigilation of the practical examinations to ensure that favorable 'contexts' prevail. It is important that the school should strive for equity in both the provision of materials and in examination administration so that all their candidates are provided an opportunity to perform the laboratory tasks in comparable laboratory facilities. Such a step would contribute towards improvements in SCE results in school biology at Kabwe High School.

During the period of investigating sex differences in the performance of candidates in MSCE mathematics and science subjects, Kadzamira (1987) reported the occurrence of anti-female biases such as the ones that have emerged from this study. It is therefore important that examination administration and the examination-taking situation should be supportive and encouraging rather than isolating and discouraging girls.

With regard to process-based experiences, we must state that pupils felt insufficiently prepared for the examination arising from the poorly covered subject matter. The level of expectancy of success and therefore self-confidence declined, integration of theory into practice became a problem and finally a deficiency in process skills was exhibited. It was common to find that procedures were applied inappropriately and this led to failure, by pupils, to detect the errors and identify the specific causes of misapplications.

Conception-based experiences were manifested in pupils through their questioning of the theoretical follow-ups in the practical work where they required providing procedures. When pupils were asked what they had expected in relation to inclusion of follow up questions, responses suggested that they

saw practical work as the manipulation of apparatus only and not inclusive of ideas. This misconception led to a number of respondents failing to integrate what they were given during the instruction period to the practical situation. Probably, this still points back to the lack of prior laboratory experiences which could have exposed the learners to the examination format and requirements.

Although comparative studies on boys' and girls' performance in BPE were not part of the study, Kadzamira's (1987) findings are that, boys out performed girls in all the sciences. Similar reports were made by MOE (1996), indicating that, evidence exists to suggest that girls' academic performance in the sciences has not improved and that the gender gap seems to be widening. A lot of factors may be at play in widening the gap in as far as academic performances in the Sciences were concerned. In BPE (and hence in biology as a whole) the present study suggests that test taking situations; competitive, strictly formal, highly timed despite being poorly resourced laboratories and other inhibitive 'contexts', which seem to be severe for girls, may be responsible for increased failure rate in BPE (and school biology as a whole).

The difficulties met are a clear indication that the process of education and assessment of learner performance within the curriculum in their present form require considerable improvement. The most urgent requirements are to ensure that the teaching of biology (and any other science) does not suffer but on the other hand derives benefits from the existence of examination and to devise methods by which confidence may be established that the examinations succeed in fulfilling the purposes for which they are intended. It is important not just to teach to the examination but also to hold on to the principles of good classroom practices. Examinations can have a valuable and important role to move learners in their meaningful learning.

During the presentation of the ministerial statement to parliament for the academic year 2005/2006 Grade 12 results, on which this research was based, the Minister of Education indicated a 10 percent drop in pass rates compared to 2004/2005 SCE results. The drop was associated with; i) lack of qualified teachers, ii) inadequate teaching and learning facilities, iii) a decline in examination leakages and iv) persistent strikes by teachers (*Times Of Zambia* 18th March, 2006 & *The Post*, 19th March 2006). The research findings of the present study agree with the Minister's statement though nearly all the reasons given were associated with one side of the educational triangle-the teaching process while curriculum and assessment were ignored. I want to agree with Lawrenz an American

educator who said "...science educators have paid attention to science curriculum, teaching techniques: however the third side of the triangle, assessment, has taken a back seat" (Lawrenz, 1991: p.15). This is the point of departure for this thesis.

Thus, arising from the findings of this research, which in general showed that significant barriers and difficulties occurred within the examination room, I wish to put a thesis that many drawbacks in high school biology achievement rested in the current examining practices at the school. In relation to this research, I am of the opinion that the BPE at School Certificate Level at Kabwe High School were not being administered the right way. The study has revealed some curious anomalies and disconcerting facts concerning the probability of success of the pupils who take the practical examination in biology. The conditions under which the examinations were conducted were faulty and deeply flawed than was generally realized. This resulted into poor pupil conduct that could have been, through a series processes, contributing to increased underachievement in school biology.

My claims are based on a number of factors; to begin with, it is evident, from the findings, that the Zambian education system is still predominantly examination driven. Thus the success of the education system is judged by the performance in the examination, which is taken as evidence that learning has occurred. An examination is treated as an end to learning. Consequently, as the study has shown, examinations impoverish learning, that is, they leave the teaching-learning process and the curriculum unprotected. The practice leaves something to be desired. There is need for an examination system that will protect, support, shape, and guide the curriculum and the instructional process.

It is particularly noticeable that the change of secondary schools to high schools coupled with the institutionalization and promotion of Academic Production Unit (APU) classes brought about increased number of candidates in the subject of biology. At Kabwe high school, for instance, in 1987 only 126 pupils sat School Certificate BPE against 534 candidates in 2005.Whilst this is a commendable achievement by the school with regards to the aims of MOE (1996) and in striving to attain the Millennium Development Goals (MDGs) on education, the change in numbers has not been followed by reasonable and corresponding improvements in the examining system, as well as in infrastructure, and yet the increased numbers have presented equity challenge. For instance I find the insistence, by ECZ, that BPE should be written within a 24-hour period a big challenge to the school as at present. It seems certain from pupils' experiences that the practical examination in its

present form and with its pass standard is quite unsuitable for the bulk of the pupils the school handle.

For Kabwe High School in particular, this arrangement results into several sessions that often end quite late. Limited laboratory facilities and other related artifacts also impacted large numbers negatively. As was evidenced by the findings, respondents came face to face with numerous inescapable problems associated with overcrowded examination rooms, sharing of limited facilities and supplies, high levels of improvisation, long period of waiting before some could take their turn and so forth. These and other encounters, which could be avoided by making significant improvements on the current form, are, arguably, responsible for debarring learners from success in BPE (and school biology as a whole).

It is not being necessarily argued for a shift from the current form of examination or dilution of the curriculum but calls for appropriate restructuring and harmonizing the preparation, administration and management of BPE with the reality on the ground. Those examinations rules and regulations that have been cited as presenting equity challenges such as seen at Kabwe High School should be considered obsolete because they do not reflect the progress being made in the education system. It is also important to keep in the forefront of our minds as we search for solutions that it is not being suggested here that we eliminate the pass-fail concept.

I draw expectations that the increase in the failure rate in biology can change significantly if the components of the examination –taking situation were improved. Their improvements will come only if the current examining practices and conditions are critically looked at nationally. If this area of the education system is not given the attention it deserves, it will continue to undo the efforts and considerable gains achieved by the teachers of biology. There is then an urgent need to rethink our examining practices if the academic interests of the learners are to be served.

CHAPTER 6:CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

Having analyzed and discussed the results, this chapter draws some conclusions, makes some recommendations and implications of the study are outlined.

Conclusions.

It is evident from this study that pupils leave the biology practical examination rooms with a rich variety of relevant experiences that could and should be employed in addressing matters related to the increased failure rate in biology.

Outcomes of the study have shown that pupils at Kabwe High School found practical work new during the examinations. They had problems in handling physical tools, data manipulations and in applying alternative strategies for dealing with practical work. There was low frequency of practical activities in classrooms, which was also identified by Haambokoma *et al.* (2002). Furthermore, it was found that even the few practical activities which pupils were given, assessments were not made. According to Morais and Miranda (1996), pupils who are not assessed are robbed of the opportunity to understand the evaluation criteria, which has a great influence on performance especially on complex competencies. There is too much inadequate preparation for BPW at Kabwe high school to avoid poor conduct of the BPE.

The study has shown that practical exercises were left to the end where they were treated quite quickly and insufficiently. Haambokoma *et al.* (2002) drew our attention to the existence of this tendency. Despite the low frequency of practical work, pupils were still subjected to testing. They were tested on what they were not taught and therefore their competence was lowered down. That is, low levels of competence skills hampered them a lot during the examination period. Discussing on pupil success, Schmidt *et al.* (1999) indicate that, the main determinant of success is whether or not the material under question was taught. Assessment of practical work then has to be in a suitable form, it must be structured correctly in relation to subject matter and purpose for it to be truthfully valid.

The third concern was that pupils were distracted from the intended tasks due to a series of difficulties respondents had to deal with such as; I) poor invigilation methods ii) overcrowded examination room iii) improvised apparatus which often give wrong results iv) inadequate provision of materials which led to sharing and crowding around specimens and other facilities and v) the long periods of waiting before taking their turn. In one way or the other the abovementioned inadequacies stood in the way of learners to quality achievement in BPW of the SCE. It could therefore be concluded that limited facilities and poor BPE management contributed to the mediocre examination scores in biology.

It was also evident from this study that test wise pupils took advantage of the 'marred' examination - taking situation to raise their scores by unethical means. Some respondents reported witnessing some candidates using strategies that did not reveal any effortful engagement in the actual practical activity. It came out clearly that pupils were less investigatory in the practical activities. These findings were in agreement with what Yarracoh (1991) found with respect to high – stake examinations that examinees' true levels of attainment are highly distorted. In the context of this study, some pupils, at Kabwe High School, might have scored highly in the paper yet they did not do the practical activity. On the other hand, others could have done far better had the aforesaid barriers not prevented them from displaying their proficiency.

Pupils described the struggle they had of decoding the words and extracting the questions, which were embedded in written descriptions. It could be that the test items were poorly set or that respondents had weak language (English) skills. The problem was compounded by unfamiliar biological terms. The foregoing language problem, it could be concluded, seemed to have thrown up additional barriers for pupils. These problems present gaps for further probing.

The study further showed that during the instructional periods, pupils were rarely engaged in practical activities. The schedule of practical activities was poorly organized. Teachers concentrated on practical activities just before the final examination especially when the practical advance copy was in school. This practice had a number of effects on the learners. First, learners took it that, whatever was done during instructional period was what was obviously in the test and this promoted rote memorization. Second, pupils approached the practical activities with fear because they lacked confidence to carry out BPW in the examination.

The study also highlighted on different views and attitudes held by pupils as regards to practical work in biology. It showed that some pupils not only saw practicals in biology as a way of enhancing their understanding of theoretical concepts and ideas but also as an essential component of science education. From the data generated, it was evident that such respondents had positive experiences of the examination. Others however, to the contrary, viewed practical work as simply the manipulation of apparatus and not ideas, and when they were requested for the theoretical aspects on the practicals, they were at a total loss. It appears therefore that learners did not fully understand the purposes of practical work in school biology.

In the same vein, some pupils demeaned practical examinations. The pupil's negative views on the practicals probably it had to do with the teachers' laboratory and classroom practices that had tendencies of undermining its importance and usefulness. The findings concur with those of Byne and Johnstone (1988), that when pupils do not see the usefulness or relevance of a subject or a component of it, they do not find it appealing. This tendency was observed in the laissez-faire attitude exhibited by some of the pupils during the examination. Therefore, the tendency among pupils to demean the contributions of biology practical test to the overall grade could be responsible for lowering performance on the national examination.

Closely related to the above is the issue of attitude, which in my view played a major role in the pupils' experiences, whether positive or negative. Shaw and Wright (1968) would go so far as to claim that an attitude involves affective reactions on an object or situation based on belief of the individual. As revealed in the study, some pupils did the biology practicals (and the subject as a whole) only for certification. They had no use for it. That is, the subject did not seem to be of any career value. Wrong attitudes are problematic because they affect interest and interest is determined by commitment to the task and purpose. Therefore, attitudes add value, appreciably, to the level of success in the paper.

Further, the study has shown that some of the difficulties pupils confronted in biology practical examination of the SCE differed in respect to gender. There are some evidence in the study showing that the girls' encounters were much more inhibiting than the boys'. Actually the participants of the study revealed that boys were at times fomenters of most of the additional unpleasant encounters for girls. If gender equity in science education were of national concern, it would be important to analyze possible biases in the nature, organization and administration of the BPE. In mixed schools

therefore, girls are far more disadvantaged than boys in biology practical test situation. From the above, it may be argued that assessment results from practical work in this subject do not totally reflect pupils', more so the girl child's, caliber. This is study has highlighted the existence of significant impediments to quality academic performance in BPE at Kabwe high school.

In conclusion at the time of learning, it was learnt, pupils were rarely engaged in meaningful practical activities and therefore they found BPW new. Whilst engaging pupils in laboratory activities presents challenges of various kinds, it would be advisable for teachers to continue negotiating through the obstacles. At hand is ample documentation in this study suggesting that learner ability to carry out practical work in biology was superficial founded simply on memorized procedures rather than on understanding of the concepts behind them. As a result they experienced problems related to handling of physical tools and data manipulation. Furthermore they failed to apply alternative methods when they were faced with new situation. In terms of examinations, overall, there is a need to stop trivializing the contributions of practicals to the overall grade at SCE. These facts should call for improvements in teachers of biology and their pupils in as far as attitudes; classroom and laboratory practices are concerned.

Limited laboratory and other facilities, which were presented during BPE, against the large number of learners added more barriers to success in BPE. That is, learners' proficiencies in BPW were severely obstructed. The examination-taking situation was worsened by the invigilators' ill conduct of examination. In other words, it could be safe to say that, BPE were ill organized and managed. As a consequence of this then, learners were robbed of the opportunities to demonstrate their achievements.

Finally, it could be contended therefore that concerted efforts should be made at Kabwe High School to remove the various sources of unpleasant experiences exposed in this study. Priority should be given to a paradigm shift to one that strives to expose learners to meaningful practical activities, stepping up the acquisition of resources and providing training to invigilators to improve proper decision making in organization and management of BPE.

Recommendations

What then is the way forward? Based on the study results, the following recommendations are aimed at addressing learners' negative experiences during BPE at Kabwe High School.

1. The School should improve the provision of materials and other laboratory facilities, in the biology section, for both the teaching-learning period and the actual biology practical SCE.
2. The Head of Department for Natural Science and the teachers of biology at that School practicals should design teaching strategies to prevent and remediate the various difficulties pupils met in this area of biology such as to:

   (a) develop a supplementary practical work syllabus that will introduce BPW early enough to enable learners acquire and develop process skills.

   (b) expose learners to highly competitive formal testing environment in biology to acquaint the learners with various issues and difficulties related to practical work.

   This, in my view, will enable learners to be less inclined to fall victim to some of the problems reported in this study.
3. Continuous and sustainable teacher professional development activities should be stepped up in the Science department at the school. These forums should provide teachers opportunities to share new techniques, approaches and other experiences in as far as teaching and handling of school biology was concerned.
4. The guidance and counseling unit in the School should institutionalize programs that will enhance pupil confidences and improving learners' study habits.
5. The School manager should facilitate the training of invigilators in issues related to administration of BPE so that the various teacher-ethical transgressions reported in this study should be minimized.
6. Teachers of biology at the School should engage pupils in identifying and breaking down barriers that have prevented success in biology practicals at SCE.
7. There is need for the school to make some considerable modifications of the present ways of administering the BPE to take care of the numerous difficulties this study has exposed.
8. There is need to improve the resource base in the biology section of the department. In addition, teachers should always see the immediate environment and that in the community as an extended part of the classroom. This has a potential to improve teachers' classroom practices with regards to hands and minds-on activities.

In summary, there is need to ensure an examining system and conditions that will attempt to grant opportunities to all on the grounds of ability rather than privilege. If we, the science educators took these small but sure steps, diligently, we will be removing the risk of injustice to the learners and this, after all, is a matter of great importance.

Implications of The Study

Through out this study the evidence for significant difficulties faced by pupils during BPE have been considered. Whilst the casual factors and possible occurrence elsewhere still require more research it is clear that evidence from the pupil- participants at Kabwe High school reveal huddles that were more extreme than normal. There are many illuminating sidelights on practical points in the study of learners' experiences and the interpretation of results.

Implications for teachers of biology are clear. In order to best prepare candidates to be authentically assessed, teachers themselves must be innovative in ways they approach examinations. Teachers should therefore be mindful of the many often taken for granted areas in the teaching of BPW, preparation and the actual administration of BPE. It is important for teachers not to just to teach to the examination but to hold on to the principles of good classroom practices. It is important for teachers of biology to realize that it is not just coverage of the topics that need to be taken into account in our present situation; it is also the importance of each topic in an overall structure of biology, as a school subject. A heightened awareness of pupils' experiences should motivate teachers more than ever to design practices that mitigate the problems.

On a more personal level, I have learned many things I intend to apply the next time I teach biology. The study revealed the narrow view learners hold about practical activities. BPW was not discussed in depth, and as a result learners did not develop a conceptual understanding of their importance. I learned that instruction should include a greater focus on pupil owned hands and minds –on activities. Additionally, I must be attentive that no practice limits any learner's access to biological science knowledge and success except their abilities.

A concern for the subject of biology and the increasing failure rate that exists currently can only be made with continued research both into the past and present occurrences. Therefore, future research should focus on pupils' experiences of BPE in heterogeneous contexts. That is, the study may include capturing a sample size large enough to be representative of the whole country, taking into

account variables such as school run by government, grant aided, special and community schools, rural, urban, mixed, single sex, and so forth. Additionally, more specific data gathering instruments such as open-ended questionnaires may be employed to gain greater insights into the nature of learners' experiences. This should be done with a view to design strategies that will assist in the remediation of the difficulties associated with the handling of BPE thereby contributing in reversing the ever-increasing levels of underachievement in this subject component.

Finally, pupils' experiences have in turn brought us wisdom to understand change and on a more optimistic note, it seems extremely unlikely that the failure rate in school biology would continue to rise at Kabwe High School. It is hoped that through CPD activities, in the science department, dissemination of the study findings would result in designing workable strategies to have the isolated difficulties remedied.

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APPENDICES

Appendix 1: Narrative Inquiry letter

THE UNIVERSITY OF ZAMBIA
SCHOOL OF EDUCATION

C/O Natural Sciences,
Kabwe High School,
P.o Box 80073,
KABWE.
20th October, 2005.

Hello _____

My letter to you is a research study aimed at seeking your experiences about biology practicals during the school certificate examination. I am in this respect requesting you to write a narrative or reflection of your experiences. Do please ensure that your experiences consist of events, which happened in the laboratory during the practical examination. Basically, I am asking the following: did you meet anything really difficult? If you did, how did you go about it? Or how would you have gone about it? What did you find interesting and important? What about the tools and materials, were they adequate and familiar? What were your thoughts and feelings during the practical examination? It should consist of a description of certain events that you remember took place. You may put anything you want to include that happened to you just before and during the examination.

.

I have chosen on you because I need people who will be honest and free to express their thoughts and opinions. I trust and have confidence that you will co-operate and stay with me throughout the research. Be assured that any information you will give shall not be used for any other purpose other than academic. Please be assured that your names will be withheld and only code – names will be used in the report (unless agreed upon). You are free to decline my request. I do know you are busy and have little time to spare, however, I strongly appeal for your assistance and cooperation whilst you are considering my request. Find here attached the examination question paper that you wrote for your reference.

Your teacher,
Mudenda V.(Mr.)

Appendix 2: Pre – Examination Interviews

The aim of the interview was to engage the participants on their levels of preparation, confidence towards the practical examination, study habits, anticipation, and any other biology related practices.

The interviews were held a day before the actual practical examination. All the five participants were met separately. The ethics were taken into consideration and the interviews were brief and held in a relaxed atmosphere.

Interviewee: Respondent 1(R2)

Interviewer: Research (R)

R With the biology practical test coming on tomorrow, tell me how prepared you are?

R2 Still preparing. You cannot be sure with practicals.

Why?

R2 Sir, we didn't do much practice we did only three or four practicals in groups, so there you know group work, it is difficult.

So how are you preparing?

R2 Just reading and practicing diagrams.

R Which diagrams?

R2 Just practicing, sir and reading especially on food test.

Why food test and....

R2 (Interrupts) yes, food tests because every year they bring food tests and there are rumors already that even this year....

R (Interrupts) so what do you anticipate?

R2 A difficult question and (laughs) but we'll try.

R Thanks.

2. Interviewee: Respondent 1 (R1)

Researcher: (R)

R: I know you are getting ready for the practical test tomorrow...

R1: (Interrupts) yes sir, but things are tough.

R: which things?

R1: The biology, we don't know what's coming. Others are saying this and that...

R: (Interrupts) What exactly are they saying?

R1: Ah, sir these leakages.

R: Tell me how prepared are you.

R1: Sir, ah, don't know ....(pause)

R: Ok, I wish you all the best.

3. Interviewee: Respondent 3 (R3)
Interviewer: (R)

R: R3, I know you are doing your best to prepare yourself for the practicals.

R3: Yes sir but it's tough going....

R: (Interrupts) tough going in which ways?

R3: Ah sir, we had no practice and we haven't even gone to the last of the syllabus (Pause)... I don't know.

R: so how are you preparing?

R3: Reading and trying to draw the diagrams. Some of us are not good at drawing.

R: Which diagrams?

R3: Sir rumors are confusing. Some are saying maize, tomatoes and beans, so I don't know.

R: Tell me more about these rumors. What are they?

R3: Ah no Sir.

R: Ok, thanks. I wish you all the best.

4. Interviewee: Respondent 4 (R4)
Researcher: (R)

R: Yes the biology test is just tomorrow; tell me, how are you prepared?

R4: Still preparing Sir, and I am trying.

R: Trying?

R4: Yes because we didn't do much. So these practicals will be new to us.

R: So you must be ready?

R4: I can't say am ready, I'll just go and write since you can't avoid it....

R: if you had chance to avoid it....

R4: (Interrupts) yes I would not write it. We didn't do much of the practicals and we haven't completed the syllabus.

R: So you are not confident that you will pass the practicals?

R4: I am not sure but I'll try my best in paper (2), at least that one you can write something not practicals.

R: Yeah.

P: Sir even the apparatus we don't know how to use them, the only time we handled apparatus was during mock. That is all. So now it's a problem. I' try anyway.

R: Thank you very much; I wish you all the best.

R4: Thank you sir.

5. Interviewee: Respondent 5 (R5)

Researcher: (R)

R: I am interested in your preparation for the practical test. How is it going?

R5: So, so, we are trying although...(Pause)

R: (Interrupts) although what?

R5: Yea can't be sure. Practicals are difficult. We have not been doing practicals.

R: You didn't do any practical work?

R5: (Interrupts) not that sir, but we didn't do a lot, may be only three and it was not enough. The teacher just liked to demonstrate....

R: (Interrupts) Yes.

R5: So am not really prepared, not too sure what to do but we are studying.

R: What areas are you studying?

R5: Obviously Sir every year there are food tests, and drawing... but drawing, some of us are not good.

R: So which part of the food test are you concentrating on?

R5: All, except these rumors which people are saying test for sugar. (Pause)

R: So if the rumors are true are you assured of getting everything?.

R5: I don't know we are just memorizing.

R: Ok, thank you. I wish you all the best.

R5: Thank you sir.

Appendix 3 : Focus Group Discussion

The focus group discussion engaged the participants discussing their experiences of the biology practical test (paper III). The discussion had centered on:

- ✓ The interesting things the pupils encountered during the practical test.
- ✓ The difficulties met during the practical test.
- ✓ How they went about solving / handling those problems or
- ✓ How they might have gone about handling their problems.
- ✓ What tools/apparatus were present in the practical test and in what ways were they experienced.
- ✓ How the rules and aspects of invigilation were conducted.

The discussants were respondents 1 to 5.

R: How were the practicals? How did you find the practicals?

R3: Sir, I tried but there were a few difficulties…

R4: [interrupted]. It was difficulty because we were not doing practicals during learning.

R3: we had only about three (3) practicals so most of the things we new.

R2: May I mention the behavior of boys sir, the boys were threatening the girls and saying all Kinds of things.

R: How were they threatening girls?

R2: You know sir, when boys start saying, "you have already failed, what you're doing is wrong and you will not make it you know that is threatening."

R: are you sure this thing was happening?

R2: yes sir. It is bad.

R5: yes its true, but its just because girls also like to get help from the boys so…. [Pause].

R2: No sir that may be true but does it means that girls like to get help from boys?

R: Any way, what about the issue of specimens being swapped or interchanged?

R4: Yes the lab where I was, the invigilator did that. I think it was only after sometime that they realized about the problem.

R: Did it affect you?

R4: yes sir, because some of the pupils had already started answering the questions and we had used up some spaces. So when we were told of the mistake we started to rub and start afresh. The work was dirt, and I started panicking.

R: how did you relate with the invigilators?

R2: they were ok but I didn't like the searching when we were getting in …

R5: [interrupts] yes it was ok to those who didn't want to be searched I because they had leakages.

R2: [interjected] no, sir, some of us had no leakages but we were being told to remove shoes and they searched us.

R4: I can say they were very helpful but invigilators were moving around too much, even talking on phone and this disturbed us.

R3: yes the movements were too much and at one point as I tried to avoid him i spilled some reagents on my paper.

R: what about your other friends, were they helpful?

R2: Ooh sir, [pause] sometimes you find that you need to heat your solutions but from nowhere you find that there are other people at the water bath, and this brought wasting a lot of time. But on the other hand the boys were arranging for me.

R1: like in my case sir, I could not fully finish the use of the specimen because of sharing R: sir, the problem is sharing the specimens and equipment and where we were supposed to have four test tubes instead we only had two each. This was disturbing because we needed to compare.

R5: The sharing of specimen and equipment encouraged people talking and copying from each other. And you know sir, there are boys who take these exams like a competition therefore they delay you deliberately,

R: What would be your recommendation about the biology practicals.

R2: if we were doing these practicals regularly I think they could not be difficult, very interesting and I think that could have been many girls writing alone.

R3: [interrupts] yes practicals should be done often and teachers should try to finish the syllabus. You find towards the exams that is when they give you practicals. This is when it is difficult to learn..

R: What about the issue of exam malpractice.

R3: [interrupts] for instance, in our class we had two practicals on the food test and it was last week. You find pupils start memorizing saying it is a leakage .As for me it is better to have a syllabus for practicals from grade 10.

R: Respondent 5, what is your comment?

R5: yes sir. I think it is better that practicals take two days than only a day since some of us were made to wait from 07:30 to 15:30hrs. I was disadvantaged. I would have done better if I had written just in the morning.

R: Respondent 4, in your narrative you indicated that you had problems with some biological terms.

R4: Yes sir, the terms were difficult because they are confusing and.. (Interrupted)

R2: Although I had no problem about them, I think they were not explained well in our class.

R4: Yes, if only we had used them in our practical (pause)

R5: Generally most of them do not appear like terms from English language, so they were confusing.

R: Thank you very much for this wonderful discussion I wish you all the best in the theory papers.

R1-5: you are welcome [laughing]