

**ANALYSIS OF PRAGMATIC STRATEGIES FOR
IMPROVING CHEMISTRY PERFORMANCE IN
SECONDARY SCHOOLS IN MIGORI COUNTY, KENYA**

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DECLARATION

This research project is my original work and has not been presented for a degree in any university.

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DEDICATION

This research work is dedicated to my family. To my son Herbert Zuph Omondi and my wife Martha Atieno Ochindo.

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I thank the Almighty God of heaven and earth for His divine providence and mercy that enabled me develop this project to its conclusion.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASEI	Activity Student Experiment Improvisation
G.O.K	Government of Kenya
K.C.S.E.	Kenya Certificate of Secondary Education
KESSP	Kenya Education Sector Support Program
KNEC	Kenya National Examinations Council
KUCCPS	Kenya universities and colleges placement service
PDSI	Plan, Do, See and Improve
SMASSE	Strengthening of Mathematics and Science in Secondary Education

ABSTRACT

This project has used philosophical analysis to look into the challenge of poor performance in Chemistry in Migori County in terms of other factors dependent on the learner, the teacher and the environment. The researcher has analysed how the learner manages their study time as they prepare for examinations, their language use, absenteeism from school and lateness for lessons. The teacher has been analysed in terms of their qualification, motivation and preparation and how these have contributed to poor performance in Chemistry in Migori County. The effect of the environment which include lack of facilities, poor school management and factors from the learner's home have been analysed as the possible contributing factors to the dismal performance. This was done with a view to applying pragmatic strategies in suggesting possible remedies.

The researcher has presented the current interventions put in place by the government of Kenya with the aim of improving performance in science subjects. The researcher has further suggested ideas that can lead to the improvement of performance in Chemistry within the area under investigation. These suggestions have been presented within the framework of the four dimensions of education namely the cognitive, normative, creative and dialogical dimensions of education. The researcher has further presented pragmatic strategies for improving performance in Chemistry.

Finally, a further recommendation that can lead to good performance of Chemistry in Migori County, Kenya has also been analysed philosophically.

CHAPTER ONE

INTRODUCTION

1.0. Introduction

This work presents a philosophical research in the field of education. The researcher uses philosophical analysis and the philosophy of pragmatism to explore the performance of Chemistry in Migori County, Kenya.

1.1. Background to the study

Academic programs in schools contain progressive assessments and final evaluative assessments as their fundamental elements. This is because the most common means of measuring achievement in education is by way of examinations or continuous assessment tests (Ward, Stocker & Ward, 1996). A learner who is able to score a top grade in the educational system is seen by peers and other people alike as being gifted and useful to the society.

How well or poorly a learner performs in an exam is affected by three major determinants that are related to the role the learner plays in their own learning, the role of teachers in learning, as well as the impact of the environment on the process of learning and examination, taking. The teacher can use such tests to monitor learner's progress and assess whether teaching is effective or not. The teacher will be able to identify any difficulties that learners face in the process of learning as displayed in below average performance. Munyaka (2008) reports that teacher-related factors such as qualification, motivation and preparation contributed to poor performance. This assumes that average performance means half the possible total marks obtainable in assessments.

Ouma (2018) reports that learners who sat for KCSE in 2017 failed because they did not follow instructions, they had poor time management and they rushed to answer questions

before understanding them. Although the learners' abilities are taken into account in the process of test development as indicated in Elementary Education (2009), a good number of them still post poor results. Munyaka (2008) also reports that learner related factors are responsible for poor performance. These may include language use, absenteeism from school and lateness for lessons (Reche, Bundi, Riungu, & Mbugua, 2012).

Mondal (2017) asserts that the environment is a factor in the achievement of learners. Munyaka (2008) reports from her study findings that there were factors in the school environment that are responsible for poor performance in schools. These include lack of facilities and poor school management. The environment encompasses the physical environment, that Warfield (2016) states that, its effect on learning can be quantified to be as much as 25%. This physical environment, in this case, includes classroom organization, cleanliness and even lighting system.

The other aspect of the environment is the social environment that manifests in the form of expectations for the learners from investors in the education sector and even the home. One of the greatest investors is the government which does require the other stakeholders to achieve certain goals as measures of the expected achievement. Goals are set with a view to increase motivation and achievement (Roediger & Karpickle, 2006). Akinpelu (1981) also contends that human beings are able to set their goals and objectives and struggle through the use of their intelligence to obtain them

In Cuba, for instance, the main goal of education is to eliminate illiteracy (Owen, 2008). In such a case, a great premium is placed on any gains towards literacy and all the activities in the learning environment are assessed on the extent to which they contribute to literacy. As reported by the Finnish national agency for education (EDUFI, n.d.), Finland's education has seen the spending of a higher proportion of its national budget on funding of education in

which case education is free at all levels. In the schools of Finland, learning and performance that lead to technological advancement are most preferred. Science subjects (Environmental & Natural Sciences, Biology, Physics, Chemistry and Health Education) are compulsory for pupils until the age of eighteen (McIntyre, 2015).

Chemistry is as a core subject in scientific and technological development and in Nigeria as reported by Adesoji and Olatunbosun (2008), it is accorded a central position in science-related courses. The more industrialized and technologically advanced societies have Chemistry as central to their economy (Burmeister, Rauch, & Eilks, 2012). The subject has practical experience in many topics with an objective of creating an enabling environment to stimulate learner's good performance in the examination (Read & Kable, 2007). Based on AllChem Report (2016), Chemistry is a steadily evolving discipline and has seen it is a central subject in an economy, environment and culture in Europe. Germany, for instance, has since 2004 carried out reforms in her education of the sciences (Chemistry, Biology and Physics) towards a mastery of the skills by the learners rather than rote memorization of concepts (Eurydice, 2006). This is with the goals of developing the science subjects that are central to her economy.

Chemistry, as one of the basic sciences, embodies knowledge that is necessary for one pursuing any other sciences for example physics, biology, physiology, technology, pharmacology and mineralogy just to mention a few. Chemistry has made it easy to develop synthetic dyes, nylon that is of great help where natural ones are limited. Its knowledge can be applied to waste recycling and coal extraction (Srivastav, 2013). Knowledge of the subject is pivotal to understanding what matter is made up of and how it behaves in the environment. Knowledge of the subject is important as it is the central science in modern technology. It further has the important aspect of practical work done in the laboratories that allow the learner to see the theories presented in books in real life experience. Right from the atomic

concepts to their interactions at the molecular level, important items are producible for example, the making of soap depends more on Chemistry than any other subject. Experiments are central in the learning of Chemistry.

The scientific method is used in the learning of scientific knowledge (The Elimu Network, 2016). This method offers important falsifiable, reproducible and measurable evidence as used in the definition of knowledge as justified true belief (Ozmon & Craver, 1981). Falsifiability is the property of a scientific concept that allows subsequent investigators to adjust the findings based on newly found evidence (Theobald, 2006). The evidence is a backing that qualifies an argument.

One of the goals of Chemistry education is to enable the learner to use the knowledge and skills acquired to solve problems in everyday life (Muange, Ogotu, Wambua, Emoru, & Mango, 1987). How does one tell that a learner has achieved the capability of solving problems? Evidently, it only suffices in cases where there are problems to solve. The learning of Chemistry presents the learner with the approach of solving problems as an important guide for the learner in the face of problems and situations in life that will require such an approach. The assessments, in this case, must place the learner in real situations which they have to tackle especially by use of the experimental method. Learning through practical inspires a person's imagination and induces self-confidence (Shawal, 2016). The work of the teacher in such a practical learning set-up is to participate in the process of problem identification whereby the teacher may even propose a problem situation and even as far as suggesting the probable general solutions and then the learners are tasked with experimenting in the absence of the teacher. This fits in very well with science subjects especially Chemistry which is a practical oriented subject and at the same time, allows learners to have ownership of the outcome of such experiments.

The Government of Kenya published goals of education as being the desired results of the education system (G.O.K., 2013). This is what Akinpelu (1981) describes as the value which extends beyond the individual since the society expects its welfare to be changed as a result of good achievement from the formal educational set-up. Two of the national goals of education in Kenya which direct activities in Chemistry as a subject are first: “the promotion of social, economic, technological and industrial needs for national development”; and second, “the promotion of individual development and self-fulfilment” (G.O.K., 2002). A learner will be considered to have been well educated if they can display an achievement of the goals mentioned. These goals are long-term in the sense that they can only be assessed later in an individual's life or academic advancement.

Learners who post good results in K.C.S.E. examinations are considered as being qualified to pursue courses offered in tertiary institutions. Those with a minimum of mean grade of C+, are eligible for degree courses, minimum of C- (minus), for diploma courses while those with minimum D are eligible for placement to craft certificate courses (KUCCPS, 2018; Business Today, 2018). Individuals who complete training in the tertiary colleges courtesy of their good performance in Chemistry are competitive in the job market both in the country and even beyond. Performance of learners particularly at the K.C.S.E. level, therefore, concerns all interested parties, especially the government of Kenya, the parents and the learners themselves.

The significance of Chemistry in the industrial development and technological advancement makes it a highly competitive subject. As observed by Riak, Mbugu, Tsunami, Ochuodho and Henry (2004), the subject is significant for Kenya in her endeavour to achieve the development goals embodied in vision 2030. Radcliffe (2018) rightly observes that for a country to have an advantage over others in the economic development, she needs to have a

workforce that accords it such an advantage such that at the individual level, people's intellectual skills can create products and services that benefit the economy.

Chemistry cuts across all the other branches of science as well as Agriculture (a technical and applied subject) (Odawa, 2011). A good example is seen in biochemistry which is a concept taught in biology but whose definition indicates the study of chemical reactions of substances in living things (College to Career, 2015). Chemistry and physics both study matter. This makes it influence the industrial development of a nation that depends heavily on these subjects as well as the private life of individual citizens as rightly observed by Odawa (2011).

At forms three and four at secondary level, the subject is optional, but a majority of the learners take it due to its importance in most of the career courses especially those which are science oriented (Clark, 2015). However, performance has continued on a downward trend nationally (Table 1.1) as well as at the level of Migori County (Table 1.2). Table 1.1 provides data on the national performance of K.C.S.E. candidates in selected subjects for the period from 2012 to 2016.

Table 1.1 K.C.S.E. national results analysis by mean scores in selected subjects for 2012 – 2016 period.

Year	Math	Chem	Bio	Phy	Agric	Geo	Eng
2012	5.60	5.98	6.09	7.81	7.26	7.43	6.89
2013	4.98	4.54	6.45	7.12	6.93	7.07	5.54
2014	4.24	5.01	6.18	6.46	6.76	7.14	5.87
2015	4.39	5.24	6.43	6.87	6.66	6.79	6.13
2016	3.11	2.84	3.56	6.57	3.45	5.73	3.49

Source: Migori County Education Office (2017).

From Table 1.1 Chemistry registered a very low mean throughout the period under study.

Table 1.2 below presents the case of Chemistry performance in Migori County.

Table 1.2 Migori County K.C.S.E. mean results analysis of selected subjects for the 2013-2016 period.

Year	Math	Chem	Bio	Phy	Agric	Geo	Eng
2013	3.76	3.13	4.38	3.68	3.25	3.38	3.91
2014	3.50	3.31	4.75	5.40	6.83	5.74	4.66
2015	3.76	3.11	4.65	3.23	5.40	4.03	4.58
2016	3.67	2.68	4.82	3.82	5.56	4.38	4.83

Source: Migori County Education Office (2017)

Table 1.2 shows that the performance in Chemistry for Migori County a mean of D was below the other subjects except for Mathematics equally with a mean of D in the period of 2013 to 2016. The performances in Chemistry in Migori County were lower than the national averages over the years 2013 to 2017.

In the tables above, the range of performance is in the basis of a twelve-point scale, with 12 points equivalent to grade A, 11.00 to 11.99 points equivalent to grade A-, 10.00 to 10.99 equivalent to grade B+, 9.00 to 9.99 points equivalent to grade B, 8.00 to 8.99 points equivalent to grade B-, 7.00 to 7.99 points equivalent to grade C+, 6.00 to 6.99 points equivalent to grade C, 5.00 to 5.99 points equivalent to grade C-, 4.00 to 4.99 points equivalent to grade D+, 3.00 to 3.99 points equivalent to grade D, 2.00 to 2.99 points equivalent to grade D- and 1.00 to 1.99 equivalent to grade E (KNEC, n.d).

The government of Kenya has attempted to put in place intervention measures aimed at improving the performance of learners. Some of the measures are: the review of the curriculum with a view of reducing the workload on teachers and the burden on learners; the use of SMASSE in-set training programmes to enhance content mastery on the teachers and; giving more support to the quality assurance and standards department to enable an improvement on curriculum implementation as reported by the Kenya education support programme (KESSP, 2011). These strategies have not been of value to Chemistry performance in Migori County. The researcher safely makes the assumption that the dismal performance seen in Migori County is a real problem for the learners especially in regards to their life after school that depend on the experiences gained at school.

The researcher analyses the pragmatic strategies for improving performance in Chemistry in Migori County. This is based on the assertion by Shawal (2016) that the philosophy of pragmatism advocates for practical utility as a guide to the methods of teaching and assessment. He is being guided by the strategies that appeal to the epistemological dispensation of pragmatism. The researcher relies on the principles of pragmatism as discussed by Kallen (1911), which are the humanistic treatment of being, epiphenomenalistic pragmatism, the aspect of value as presented by Dewey (Anderson, 2014), reinforced practice (Kimble, 1961). The researcher identifies the factors in the learning environment responsible for the poor performance in the subject with a view to improving the results obtained by the learners in the national examination.

1.2. Statement of the problem

The statistics indicate that performance in Chemistry has been very low particularly in Migori County, Kenya. Chemistry is useful both in understanding how to manufacture basic items such as detergents and also as a subject leading to other related careers. It is introduced at secondary school for the first time; this is what sets it apart as unique from other subjects.

The learner is therefore expected to begin with a good performance from the first encounter with the subject. The study uses philosophical analysis to examine the factors related to the learner, teacher and environment that affect performance in Chemistry at the national examination level. The researcher also explores the pragmatic strategies with the purpose of making suggestions for improved performance.

1.3. Purpose of the study

The purpose of the study is:

- i) to analyse the role of the learner in the following aspects: how they manage their study time as they prepare for examinations; their language use; absenteeism from school and; lateness for lessons.
- ii) to analyse the teacher's contribution to poor performance in terms of their qualification; motivation and; preparation.
- iii) to analyse the effect of the environment which include: lack of facilities; poor school management and; factors from the learner's home.
- iv) to use pragmatism philosophy to suggest intervention strategies that can be used to improve learner's performance in Chemistry in Migori County.

1.4. Objectives of the study

The research focuses on the following objectives:

- i). to analyse the role of the learner in the performance of Chemistry at K.C.S.E. in Migori County.
- ii). to analyse the role of the teacher in contributing to the effective performance of Chemistry at K.C.S.E. in Migori County.

- iii). to analyse the effect of environmental set-up in the performance of Chemistry at K.C.S.E. in Migori County.
- iv). to develop pragmatic intervention strategies that can be used to improve learner's performance in Chemistry in Migori County.

1.5. Research questions

The research is guided by the following questions:

- i). What is the duty of the learner in the process of ensuring good performance in Chemistry is achieved and how has the learner contributed to the poor performance in Migori County?
- ii). What is the role of the Chemistry teacher in Migori County in as far as good performance is concerned?
- iii). How does the environment contribute in either improving performance or demeaning the outcome of Chemistry learning in Migori County?
- iv). In what ways can pragmatism as a philosophy help in assisting the stakeholders in Migori County improve the performance of Chemistry at the National examinations at the end of Secondary school cycle?

1.6. Significance of the study

The findings will contribute towards the improvement of performance in Chemistry for Migori County and by extension, the entire nation. The findings of this study will also be beneficial to classroom teachers when deciding on the best methods that will guarantee good performance amidst an improved teaching quality. School management will be able to ensure an environment that enables the improved teaching and better performance in Chemistry. Learners will get to know the study habits and the study patterns that would enable them to

have better performance in Chemistry. Policy formulators will know the weaknesses inherent in the interventions so far put in place in as far as poor performance in Chemistry still remains a problem and further work towards ensuring the drafting and implementation of those strategies that will be sure to promote good performance in Chemistry. Finally, the study forms a basis for further philosophical research in determinants of performance in Chemistry subject and other science subjects.

1.7. Limitations of study

The performance of a learner in Chemistry may be affected by the learner's mastery of English language and ability in Mathematics. This is because the English language is used as the basic language of instruction and testing and several topics in Chemistry have concepts that require calculations. Schools in Migori County are differently endowed in terms of learning resources that may pose challenges in learning in the schools that have fewer resources. Further, the study borrowed heavily from Pragmatism philosophy and as such other schools of thought may yield conflicting points of view.

1.8. Delimitations of the study

Four science subjects are offered in the Kenyan 8-4-4 curriculum. These are Biology, Mathematics, Physics and Chemistry, each of these subjects presents issues with poor performance of learners in one paper or another. However, only Chemistry is narrowed on for the investigation due to its continued poor performance in Migori County and also its being a new subject to learners at the secondary level. Further, there are 47 counties in Kenya but only Migori County is chosen for the study. This is informed by the continued declining performance of the County compared to the national mean scores.

This study is further narrowed down to the philosophy of education as a discipline.

1.9. Theoretical framework

The study is based on the theory of Pragmatism. According to Kumar (2015), pragmatism puts a lot of weight in humanism which is a core concept in democracy. Bawa (n.d.) notes that one of the educational aims in a democracy is geared towards inculcating individuality in the learners while also making them see their social position in the wider society. The learner should exploit their abilities to such an extent that it enables them to contribute positively to their democratic society.

The pragmatist view of truth is in line with utilitarianism as pointed out in Utilitarianism (n.d.) which believes that an action is measurable on its general consequence on the people who depend on it. Koliba (2000) notes that the achievement of learners in academic work both in terms of the content learnt and the performance at the end of the course prepares them for the democratic life in the community. This the practical sense instilled by the pragmatic view of truth and values which considered, in this case, makes a good performance of learners in Migori County useful in the wider context of the general benefit everyone else in the county will derive.

The philosophy of pragmatism is taken as very useful to this research owing to its appeal to the learning of Chemistry which is a practical based subject. Sooraj (2017) asserts that science ascertains truth through experiment. This way, the truth is only acceptable as a consequence of its being beneficial in practice and verifiable experimentally. Pragmatism finds this criterion useful in every aspect of life to the extent that it can be used in finding solutions to problems of humans. This makes learning become real to the learners as noted by Kumar (2015). Shawal (2016) further notes that the practicality appealed to by pragmatism is useful in turning the education of learners into an experimental adventure. The advantage of this approach is that learners will end up gaining the useful virtue of self-confidence as they create value through their own activities. Shawal (2016) notes that what

makes up pragmatism philosophy is the value with practical consequences gained from educative experience.

As pointed out by Akinpelu (1981), pragmatism philosophy is relevant in the current age where people are more interested in the material benefits or practical consequences of any activity that is undertaken. Kumar (2015) further points out that pragmatism regards material interactions as true out of which stems mental process and consciousness. The development of a human being for that matter is only possible in the context of interactions with the society under the supremacy of the person. Verma (n.d.) notes that pragmatism philosophy holds that reality is undergoing molding in the context of the growth of an individual. There has not been a state of absolutism as far as reality in the face of pragmatism is concerned.

The stakeholders in Migori County are most concerned about whatever interventions that will have practical consequences in the education system in the County and their living standards in general. Migori County being in Country Kenya, experiences the economic challenges that affect the country at large, hence the element of pragmatism allowing change of values with change of time makes it very useful. Learners in the schools in Migori County are viewed as members of the wider society and as noted by Gutek (1997), the education they are taken though is seen as a preparation of the adult population of the society.

The learners of Chemistry in Migori County have the duty to achieve the goals laid out to upon them by their society which is to score a high grade. Pragmatists believe that the goals are always determined by the individual, not by any organization or any structure. The aim of education is to teach a learner to be comfortable in their learning environment to an extent that children are living their lives (Dewey, 1906). The learner uses the societal goals to derive the individual goals that will enable them to achieve these universal goals; universal in the sense that they apply to all learners in the whole national education system. Therefore,

pragmatic orientation will task the learners into striving to be their best in terms of achieving their best based on their self-set goals.

The system of education in Kenya in which Migori County belongs produces graduates who are placed in different careers. The better the grade, the better the career prospects, and learners who score low grades are deemed to have attained low value in the education system. Such placements are the actions that attach value to the attainments in the education system. Any system of education that improves the performance of learners directly impacts the value they attain. The learner attempts the tests and waits for an independent public system of marking and grading. Such a public system is independent of the individual learner (Ozmon & Craver, 1981).

Hossain and Ali (2014) assert that society is not independent of an individual, in the sense that the individuals are the atoms and subunits of the society. Through correspondence, individuals derive their individuality from the society and at the same time, the society manifests a collection of interacting individuals. The society provides the platform for the formation of groups, interacting as well as opportunities for leadership. This is seen in Migori County when the parents allow their children to act independently of their parenting in schools with the hope that important goals of perpetuating a good society into the perceived future will be instilled in them. This makes pragmatism relevant to this study since the learners do not learn Chemistry for some private use but for societal satisfaction.

Verma (n.d.) notes that pragmatism accepts as true, dynamism in the world. The kind of dynamism that does not accept finality in anything that is taken as reality. The world is in the continual process of making its aspects different in the course of time as well as aspiring for a better state of affairs. This dynamic flux of adjustments in the world has human life entangled in it and at the core of it. The aspect of practicality and action rather than thought is held in

high regard in pragmatism such that the mental pieces of reality are a summary of the physical experiences that human life undergoes. If Chemistry subject in Migori County is taught and examined in a practical manner then the achievement that the society expects from individual action will be a reality and the ambitions of the parents on their children will be greatly achieved.

1.10. Assumptions of the study.

The study makes the following assumptions.

- i). That the performance of learners in arts based subjects, which the learners also learn, have minimal effect on the overall performance in Chemistry.
- ii). The learners in the schools under study had attained the minimum entry requirements for public secondary schools.
- iii). The teachers who are deployed by the government in the schools under study had the minimum qualifications necessary for their responsibilities in Kenyan secondary schools.

1.11. Organisation of the study/ Review relevant of literature

In this research project, the work is organised into four chapters. Chapter one constitutes introduction that contains background to the study, statement of the problem, purpose of the study, objective of the study, research questions, significance of the study, limitations and delimitations of the study, introduction of the theoretical framework and organization of the study/ review of literature. Chapter two deals with an analysis of the role of the learner, the teacher and effect of environment on the performance of the learners. Chapter three presents interventions so far undertaken by the Government of Kenya together with ideas and

intervention strategies proposed by the researcher that will help to improve performance in Chemistry. Finally, chapter four contains the summary, conclusions and recommendations.

1.12. Research methodology: Philosophical analysis

The methodology that is applied in this study is philosophical analysis. Menn (2002) presents ideas of Plato and method of analysis in which Plato argues whether any analytic arguments tend to originate from the principles or is directed towards the principles which in this case is the originator of such an argument or from which it stems. The possibility of any element of the argument existing before the argument begins is refutable to the extent that there would not be any consciousness of the same in a prior state. Plato and Aristotle present two case scenarios one of which is the possibility of arguments in line with the natural order of events and the second case is that against the said order of events. The researcher finds the first case more applicable to the case under study because it stems from the natural occurrence that there is already an evident dismal performance that needs to be objectively reversed. The second case would mean a situation of nothingness prior to anything that would be problematic in the case study. An appeal is made only to the second case in the extent that it will help unravel the elements in nature unknown to the obvious as a way of correcting the problems seen in the natural order which is the poor performance in this case.

Beaney (2003) defines analysis as setting apart and retrieving the initial elements that can be used to support a reality that is already held. An attempt to put the pieces back together having gathered enough data presents a process of synthesis. He further states that analysis involves the process that ends up with a display of the structure of the thing analysed. The ‘things’ relevant to the poor performance in Migori County are related to the role of the learner in their own learning and exam taking habit, the input of the teacher in the whole process of knowledge acquisition and performance and also the aspect of environment that enables the learner to learn and perform as well as the teacher to play their role well. The

researcher expects to use the synthesis of the foregoing aspects in putting together pragmatic strategies for a better performance in Chemistry in Migori County.

Frege as referred to by Beaney (2000), discusses function-argument analysis in which he uses a proposal that sentences can yield functions and arguments. A function is expected to create an outcome just like the cooperation of the teacher, the learner in an enabling environment is expected to result in achievement of the set goals. A consideration of each factor in isolation constitutes arguments. One may argue for example that the learner in Migori County has poor entry behaviour in that they may experience difficulty grasping the content taught. Such an argument that focuses on the learner without bringing in the other factors indicate the process of argument.

Moore considers analysis in the context of reducing the complexity of concepts by simplifying the constituent parts (Beaney, 2014). It is only after fully defining the constituents that an apprehensible meaning of the whole can be inferred. If for instance the concept of performance is subjected to such a scheme of analysis. Anyone who does any act to satisfaction will be considered to have performed against the background of an expected standard of performance. In this case, a student who merely has a memory of concepts but is not able to display such a knowledge in action will be considered to either be a poor performer or an underperformer. Taking into consideration the assertion by Moore, the only two aspects that performance can be reduced to at secondary school level is the ability to remember concepts, demonstrate them in a practical set up and answer set questions correctly. Once these two aspects are understood at their irreducible minimum then the concept performance is considered to have been analysed.

The concept of performance in Chemistry in Migori County is considered to be clarified in terms of other factors which could be dependent on the learner, the teacher or the

environment. Soames (2003) notes that whichever way it is observed, philosophy is always analytical Chemistry. Analytic philosophy places emphasis on analysis. That is the transformative or interpretive dimension of analysis.

The researcher bases his analysis on the factors related to the learner, teacher and environment that affect performance in Chemistry in light of the questions such as: What is philosophical analysis? What is it the object of analysis? What qualifies a correct analysis? How informative is a correct analysis? What is the difference between poor performance and good performance in Chemistry? How is the performance in Chemistry influenced?

1.13. Conclusion

The foregoing chapter has made it explicit that performance in Chemistry in Migori County has been low enough to warrant a philosophical analysis. The next chapter will delve further into analysing the role of the learner, the teacher and the effect of the environment on performance in Chemistry in Migori County.

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CHAPTER TWO

ANALYSIS OF THE DETERMINANTS OF PERFORMANCE IN CHEMISTRY

2.0. Introduction

This chapter focuses on an analysis of the possible contributing factors to the dismal performance observed in Chemistry subject in Migori County. The learner's role is analysed in terms of how they manage their study time as they prepare for examinations; their language use; absenteeism from school and; lateness for lessons. The teacher's contribution to poor performance is analysed in terms of their qualification; motivation and; preparation. The effect of the environment is analysed in terms of lack of facilities like laboratories; poor school management and; factors from the learner's home. These factors are analysed in light of the philosophy of pragmatism. The researcher tries to answer questions concerning issues such as: What is the role of the learner in their performance? What is the role of the teacher in learners' performance? And how does the environment impact on the performance of the learners in Chemistry?

2.1. The role of the learner in the performance of Chemistry

Proper or improper time management among learners in Migori County is one of the characteristics that make it a determinant of performance. As reported in WordPress (2018), human being's (including learners') consciousness of time is one of their distinguishing features especially in comparison to other animals. Even though schools have devised the system of using bells to signal end and beginning of events in the school system, it's generally agreed among philosophers, as indicated in WordPress, that time is continuous and that it has an intrinsic direction or order. This is such that events of the past intertwine with the presents and lead to the future in a continuous fashion.

However, much lessons are allocated periods which could be in terms of minutes, there is a general agreement as asserted by Prosser (2016) that time is objective, and not subjective or dependent on its being consciously experienced. That even the said lessons start and end within an objective arrangement of the flow of time. Time allows humans to quantify the essence of change by enabling an assignment of dates on events, specifying the period taken by such events, and the logical sequencing of schedules like in the general timetables used in schools.

As learners move from one to four, most of what they experience in the course of secondary school life is irreversible. The time allocated for a lesson for example in a week will never be recycled once it passes. What Davies (2005) refers to as the arrow of time that makes people conceive the fact that past events shall not reappear in their very form as they were in the past, gives an impression of time passing and of people's progressing through different moments. This makes it clear that a learner who will not spend their time valuably will have a challenge at the final national examination.

The main use of language as indicated by Holyoak and Morrison (2005), is to transfer thoughts from one mind to another. Many people including the learners in Migori County share what they think in language and the absence of language, therefore, would be the absence of thought. Much of the communication among learners and between their teachers is meant to modify their thoughts. A report by Oduor (2017) showing the performance of candidates between 2014 and 2016 indicate that learners failed some questions because of inadequate English language skills. The report reveals further that some learners used 'sheng' (colloquial language) in communication and written language. Poor command of the English language which is the main language of communication in Chemistry is a factor that can lower performance of candidates.

Regular school attendance is essential to learning. Attendance is critical in successful school performance and in ensuring each learner reach their greatest potential. Progressive academic performance corresponds significantly to attendance such that the more a learner is in school and the more a learner is exposed to interactions with teachers, the better the chances are for the learner to be successful. Kithokoo (2011) rightly observes that learner absenteeism is a real challenge in Kenyan schools that affect their learning as well as how they perform in the summative examinations. Odumbe, Simatwa, and Ayodo (2015) equally observe that absenteeism of learners from school is a real problem in Migori County. Absenteeism of learners leads to a lack of continuity in learning, negatively affecting the overall performance and mean grade of the schools in national examinations.

The learner as an individual is expected to be at the centre of teaching and learning even in cases where the learning is not designed to be learner-centred. As has been discussed by Hannafin and Hannafin (2010), a learner-centred learning consists of the independence allowed for the learner in the choice of the content to be learnt, a methodology for learning and a test regime that best appeals to them. This is opposed to the teacher-centred learning whereby the aspects of learning are subjected to determination by the teacher leaving the learners at a position of reception of what the teacher decides as being good for them. The aspect of learning that is considered learner-centred indicated in this paragraph is perfectly in line with what pragmatism expects of an individual learner in the continuum of learning and performance thereof.

As a means of achieving the value requirement of pragmatism, all programs are organised in the teaching/ learning environment towards benefitting the learner in terms of developing their human capital which means the collection of knowledge or habits that is expected to play a pivotal role in their future productivity (Capital, 2018). As argued by Battle and Lewis (2002) that learning is expected to be vitally necessary for the development of human capital

in the learners and is expected to improve their well-being and allow them to utilize opportunities for better living. In the process of learning, they will acquire knowledge and skills that will enable them to increase their fruitfulness with the long-term effect of improving their quality of life. The quality of a learner's performance is then a top priority for educators and learners alike.

What learners engage in at school contributes either directly or indirectly to the outcome of the learning process. Any human activity is evaluated in terms of its results. This is done by way of examinations at schools. The teachers use the results from these examinations to conclude whether valuable learning occurred in the course of their interactions during teaching and learning.

The learner is expected to manage their own affairs as preparation for life after secondary school. In the process of learning, the learners begin to recognize patterns, comprehend ideas, plan, solve a problem and use language (Hirst, 1985) to communicate. Through the same process, the learner develops the ability to make decisions that affect their own lives. It is through such communication that the teachers and parents can assess whether the learning undertaken was worthwhile.

Based on the data available (Table 1.2), and due to the low mean marks posted by the learners, it indicates that the learners in Migori County have had challenges in remembering descriptions and relating concepts that form the bulk of test given to them at the national examination level. This is with the assumption that such tests cover the fundamental areas that form the elements of the communication needed from the learner.

2.2. The role of the teacher in learners' performance

Akinpelu (1981) considers the teacher to be the organiser and moderator of the child's learning. Shim (2007) rightly puts it that the teacher is so central to teaching and learning so

that it is not possible to have them in the absence of the teacher. Even in cases where the entire consideration in learning focuses on only the role of the learner in their own learning, the role of the teacher cannot be ignored as an important guide. Shim (2007) confirms the intricacy of the teacher's involvement in the learning and growth of the learner. The teacher comes in handy to ensure that learners understand concepts properly, thinking logically, and act morally. Teachers are actively involved in assisting learners in their thought process whenever they need to express their ideas.

MacIntyre and Dunne (2002) insist that teaching does not have an internal purpose on the part of the teacher but rather a process of offering service that is important and necessary to the learner and by extension the society at large. This puts the responsibility on the teacher as they carry out activities in the learning environment which predominantly involves teaching as a central aspect. The teacher will guide the learner into activities that are set by the society as contained in the curriculum. In the process, Shim (2007) says that the teacher will be in a good position to derive happiness as they get satisfied with the good outcomes for their learners. The teacher will also have a chance of achieving fulfilment of their capacities. The teacher is also able to learn new concepts while preparing and delivering lessons. Teachers discover new facts when they involve themselves in thinking things over and looking at the same things from different perspectives.

The teacher will be able to become cognizant of their personal inabilities and imperfections. They will engage in a concerted effort aimed at gaining self-improvement out of which they will benefit an attainment of growth in the realm of spirituality, morality and aesthetically as discussed by Hogan (2003). This means that teaching can be viewed as an all-around activity touching on all the faculties of growth of the human teacher.

Teaching can be viewed as a means the end which as noted by Hogan (2003), are the attainments learners realize at the end of the learning cycle as an evidence of the learning undergone. It's, however, less encompassing to take teaching as only a means to an end because teaching and learning are so intricate such that the teaching by the teacher results in learning by the learners both activities proceeding at the same time though at different rates. Shim (2007) categorically asserts that learning and teaching are not independent, if it were so then learning could not be talked of. Even when one is in self-contemplation, they interact with their inner self, the inner teacher.

Hogan (2003) explains that the acts of teaching and learning are intricately associated such that one cannot occur without the other. This makes teaching not to be only a means and learning only an end. The teacher ought then to understand the nature of the role of teaching so as to be able to operate in a favourable manner to enable teaching to be a driver for learning and learning a recipient of teaching. This will enable the teacher to lead their learners in the right direction.

Shim (2007) asseverates that the role associated with the teacher has characters that the teacher ought to select to influence their approaches to teaching. The teacher has a very important duty of driving the process of learning and assuring good performance in the learners. The results obtained by the learners are used to tell how far the learners have benefitted from the process of learning and also conclude whether there were any difficulties that the learners encountered in the learning process.

Musili (2015) noted the teacher can decide what amount of effort to put in their teaching with the aim of either being seen as successful and getting a promotion or retention or otherwise be seen as a poor performer and get transferred to another school. The underlying factor being motivation on the side of the teacher. Teachers who feel satisfied at their current school

or with their current students are likely to opt for a longer stay at the same station. Based on the result as seen in table 1.2, it shows the likelihood that teachers in Migori County may be less motivated to work. It is in that scenario that the learners fail to benefit from their efforts. Musili (2015) contends that teaching is at the top of the factors for performance in a secondary school. Learners closely imitate their teachers whom they consider as role models. Teachers have the duty to influence the learners to their favour as teachers and towards the subjects they teach. In their endeavour to ensure good performance, teachers set standards which pass as class goals drawn from the school goals and that of the Ministry of Education. Such standards set the course for performance, they carry out assessments whose results are used to guide the learners ensuring their success. Kirima and Kinyua (2016) note that even though the government of Kenya has put in place measures to ensure motivation of teachers, the extent that can assure improved performance has become far-fetched especially in Migori County.

Teacher qualifications is a product of the level of learning of the teacher, which could be a diploma, degree, masters and doctorate levels, and their experience in the subjects they handle. The studies analysed by Musili (2015) confirm a correlation between teacher qualification and performance such that higher levels of learning did not guarantee better results posted by the students as long as they had the minimum level of certification required to teach at the secondary school level. But, a more experienced teacher was noted to enable learners to achieve good results. This is due to their use of favourable management of the classroom and the choice of better methods of teaching that guarantee good results.

Preparation by the teacher begins from the attainment of the necessary minimum qualifications for the level of teaching in question. It encompasses also the necessary professional documents that are necessary for delivery of the lessons in a class set-up. A report by the American Association of colleges for teacher education (AACTE, 2012)

indicates that there is a positive correlation between student achievement in examinations and the level of preparedness of the teacher.

2.3. Effects of the environment on performance

Learning takes place within a set-up that constitutes the environment. Learners rely on the school environment as places, from where they seek practical solutions to everyday problems. This makes it paramount that precaution should be taken to ensure that the environment is one that contributes to good performance. Elements of the environment may include classrooms, libraries, laboratories, sanitation and playgrounds (Duruji, Azuh, & Oviasogie, 2014). Classroom, for instance, is the environment within which the learners develop their future (Ryan, 2013). The resources in the classroom, which include black walls, whiteboards, desks and other learning materials, are meant to contribute to improved learning and good performance. Raimi (2002) asserts that Chemistry, being a science subject, relies so much on the presence and use of a laboratory. When made use of adequately, the laboratory has the capacity to motivate learners to like the subject, devote their time to it and hence perform well in it at the end of the secondary school cycle. Farounbi (1998) supports the use of laboratories in teaching as this allows the learners to learn by doing, a very good motivator of retention of the content learnt. There is a high likelihood that learners will remember and perform well in concepts that are taught in the laboratory where they are accorded a hands-on experience.

Taofeek, Onifade and Bello (2016) confirm that lack of adequate class spaces attributed to smaller class sizes lowers learner participation in learning hence hindering their achievement. This points at a possibility of class sizes hindering achievement in Migori County in Chemistry that require practice to be experienced at the level of each student. Dalton (n.d.) asserts that a classroom can either frustrate or encourage learning, he recommends a classroom that is arranged with learning materials and an ordered place for learning. This

points at the classroom as a challenge bedevilling academic efforts by educational stakeholders in Migori County.

The home environment provides the predisposition that prepares the learners for the academic work at school. The home environment can either be supportive or an impediment to performance. Doley (2018) notes that the home provides the necessary emotional preparedness that the child needs to the extent of determining how they will express themselves at the point of testing. All students in secondary schools of Migori County come from homes that have characteristics that have an impact on their abilities to learn and perform well.

2.4. Conclusion

The learning environment is composed of learners, teachers and the physical aspects of the environment all contributing to the outcome of the learning process. Such an outcome is displayed in the form of grades in an examination. The better the grade, the more beneficial is the interaction of these factors the opposite also being true.

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CHAPTER THREE

IDEAS PUT FORWARD TOWARDS IMPROVING PERFORMANCE IN CHEMISTRY.

3.00. Introduction

This chapter presents intervention strategies put in place by the Government of Kenya as measures intended to improve performance in Chemistry. The researcher then presents suggested pragmatic intervention strategies, in light of the dimensions of education that can help improve performance in Chemistry in line with the roles of the learner, the teacher and the effects of the environment on performance.

3.10. Government interventions

The interventions so far undertaken by the Government through the Ministry of Education directly affecting Chemistry performance are funding curriculum implementation programs; implementation of SMASSE training that has had key classroom practices; and assessment modes.

3.11. Financial support to school

Ngware, Onsomu and Muthaka (2007) report that the government of Kenya has been supportive to the education sector such that the financial years 2004 to 2005 and 2005 to 2006 brackets saw an investment amounting to 27% and 26%, of the total government expenditures respectively. The government aimed at increasing enrolment of students in schools and achieving a total transition from primary level to secondary level.

The government of Kenya in 1989 adopted and implemented a policy of sharing of costs (Owino & Abagi, 2000) involving the government, non-governmental organizations, religious organizations, interested development partners, individuals, communities and the private sector. The challenge of this policy was that over time, the costs that were

apportioned to the parents and individuals became unbearable (Owino & Abagi, 2000) amidst the changing economic times. The result of this is an emergence of a number of students who are not able to get the assurance of continuous stay at school to learn.

The government has played a pivotal role in teacher development right from training, deployment and their management at work. This has been made possible through the introduction of policies friendly to the goal of attaining an improved quality of education. The government provides funding for infrastructure, scholarships and bursaries to needy learners as noted by Reche, Bundi, Riungu, and Mbugua (2012) that there are funds directed at school accounts with a clear plan of implementation to ensure that all learners manage to be at school to prepare and perform well.

3.12. SMASSE training

SMASSE strategy was initiated to help solve the poor performance in science subjects (Chemistry included) (SMASSE Project, 1999). SMASSE operates through training of teachers in service and selection of teams per region for further training and implementation of strategies for ensuring effective learning and strengthening of lesson content delivery skills of teachers (Nui & Wahome, 2016).

Kioko (2014) reports that the ASEI-PDSI used in SMASSE is supported by five basic pillars:

- i). a shift from knowledge-based to activity-focused;
- ii). Learning that is centred on the student rather than the teacher;
- iii). A shift from teaching methodology that is theoretical and lectures to use experiments and student-based research;
- iv). A shift from large-scale complex experiments to small-scale improvised experiments.

The lesson conducted in this method is evaluated by the teacher during and even at the end of the lesson with an input of evaluation from the learners in the form of feedback. Other colleague teachers are involved in lesson preparation, observation, analysis and improvement.

This was also meant to enable learners to see that the performance in a subject is a collective activity that also depends on their readiness to do well during and after the lesson presentations. Finally, the teacher reflects on the performance by evaluating reports from learners and how effective the lesson objectives have been achieved. Nui and Wahome (2016), maintain that feedback in lesson conducted using ASEI-PDSI have feedback from students and other collaborating teachers that come in handy while preparing subsequent lessons. This method is very useful for chemistry in particular because of the many practical work that appears in almost all topics across from form one to form four.

3.13. Assessment modes.

The curriculum is structured in such a way that allows end term and midterm exams(G.O.K., 1999). Some schools offer beginning of term exams. These tests and assessments become meaningful when the learners get their feedback and appropriate correction and revision are made.

In summary, the interventions proposed by the Government through the Ministry of Education and other stakeholders are being implemented (G.O.K., 2003). However, much of their anticipated benefits particularly with regard to enhanced learners' performance in Migori County are yet to be achieved as has been noted in the data in Tables 1.1 and 1.2.

3.20. Suggested ideas that can improve performance in Chemistry in Migori County.

Kimble (1961) asserts that good performance in Chemistry can only be guaranteed by reinforced practice. Since performance is about the learners with reinforcement from the teachers in an enabling environment, the learners must, on their own, develop a workable schedule that will allow them to have adequate practice as a way of ensuring improved performance. Mathew, Mathew and Peechattu (2017) assert that the teacher is an indispensable factor in any learning environment. It is through them that the learner is able to be guided through the process of unveiling their true potentials and by extension true

knowledge. The effectiveness of the teacher will be measured by how far the knowledge, skills and values have been transferred to the learner.

Brennen (1999) observes that just like the changing of an environment which prompts new needs in the learner's educative experiences also change. The philosophy of pragmatism advocates for changing of the methods of delivery of learning in line with the changing circumstances that will help the learners to solve their problems. The educative experiences should focus on the individual learner at their level and at the same time picturing them as a member of a society in the department and the world outside school. When learners are allowed to have practical educative experiences like museum visits (Kariotoglou, 2002), science fairs (Primerakis, Pierratos, Polatoglou, & Koumaras, 2011) and press science (Halkia & Mantzouridis, 2005), they are able to view the practical aspects of their learning. In these activities, the subject matter is the gratification of the current desire of the learner in exploration. In the course of the activities, the learner is able to create value as they experience.

Kallen (1911) observes that an appeal to the humanistic treatment of being is a strategy in learning as well as epiphenomenalistic pragmatism. Others are the aspect of value as noted Dewey (Anderson, 2014) and reinforced practice (Kimble, 1961). The researcher presents these strategies with reference to the analysis of education by Njoroge and Bennaars (1986) into cognitive, normative, creative and dialogical dimensions.

3.30. The cognitive dimension of education

Njoroge and Bennaars (1986) state that education is increasingly seen as an economic enterprise where human products are manufactured to serve or function in the various sectors of national economies. This indicates that the finished product, which in this case is an educated individual, becomes very important in such an economic environment. The learner

as an experiencing organism will need to apply their intelligence to solve problems which in this case includes fitting themselves into the various categories of the economy with minimal effort. This becomes easy with a background of good grades from education system capable of winning them recognition in the economic field.

As discussed by Kallen (1911), the humanistic treatment of being as a pragmatic strategy lays greater emphasis on the mind of a human being and the contents thereof fall far into the background. This means that the knower is greater than the known. The knower is the finished product as referred by Njoroge and Bernaars. Humanism sees the cosmos as the outcome of progressive modifications by striving spirits, as they strive to create harmony while making use of conception as part of the constitution of reality. These spirits (the learners of Chemistry in Migori County) being concrete and personal are made of the will. They are able to modify their belief under conditions of desire, need, purpose, selection, and use. They learners will desire the good grades but must also see the need for such grades which comes in the form of use of such good grades in the job market. They will then develop in themselves the purpose to perform well.

The experiences they undergo while at school impress upon their spirits and influence with the potential to modify their thinking. As they interact and experience, they determine their likes, dislikes, and the future direction of their educational outcomes. Sooraj (2017) observes that the life of a student is intertwined closely with the environment. Soper, Fano and Hammonds (2015) Assert that the educative experiences subjected to learners in the school environment allows them to develop into ordered members of the society and as such, the needs and concerns of the society are reflected and incorporated in the curriculum.

Njoroge and Bennaars (1986) assert that the most marketable products are those equipped with highly specialized knowledge in science and technology. This puts Chemistry as a

subject in a strategic position as a science subject and also as a subject with high technological appeal because the knowledge about the atomic structure influences every aspect of technology. Having indicated that the school produces finished products to be placed in sectors of the economy, Njoroge and Bennaars (1986) further indicate that there is a need for a rigorous testing in internal tests and the final KCSE, then finally certificates are awarded to label the products.

Why would such a rigorous testing become so necessary in Chemistry? Njoroge and Bennaars (1986) indicate that to know something is to believe with certainty that what is known is the case, that such a case is true and that there is sufficient ground to justify knowing it. Chemistry as a package of knowledge serves to satisfy this condition for what is known with its application of the scientific method. The teachers and authorities will only be certain that the learners have come to the acceptable threshold of such knowledge by testing, retesting and finally administering a cumulative test.

Meritocracy as applied in Singapore (Tan, 2008) holds that positions of leadership are a preserve of those that perform well in a series of rigorous examination series. These examinations are also useful in identifying and measuring individual abilities (Kazin, Edwards, & Rothman, 2010). Singapore, for example, has meritocracy as one of its guiding principles for domestic public policy formulation, placing emphasis on academic credentials as objective measures of merit (Dow, 2006). This has been replicated the world over and a good result of a learner in one country is recognizable in another country.

Bipasha (2013) notes that attention span of learners reduce with time such that at the end of the lesson the learners will recall more the contents delivered during the first ten minutes of the lesson and remember much less the content taught after their attention has drifted.

As suggested by Bonwell and Eison (1991), once learners are engaged in active work like in the case of occasional group work throughout the lesson then their attention will be maintained. When a variety of materials are used in classroom learning, the learners will be assisted to perform well. The adequacy and use of teaching and learning materials affect the effectiveness of a teacher's lesson. They help to create the reinforcement needed to help the learners perform well. Schneider (2003) confirms the direct link between learning and adequate use of learning materials.

3.40. The normative dimension of education.

Education, according to Njoroge and Bennaars (1986), promotes the full development of the talents and personalities of individuals as well as promoting national economic development. These two aims are intertwined, in that, the moment talents and personalities are fully achieved, then the same individuals, being contributors in the country's economy, are able to use such capabilities to make positive impacts in the economy. These are considered as the desirable, worthwhile or valuable elements of education (Njoroge & Bennaars, 1986). The modern education system is inspired by rules of science, technology and a rationalized economy. These are the very elements of the national economic development that need to be promoted by individuals who acquire education.

Kallen (1911) asserts that epiphenomenalistic pragmatism turns consciousness into another kind of existence, setting it on top of the experiences. This still makes the further emphasis that the Chemist as an expert in Chemistry is given more importance than the Chemistry content. It considers consciousness to be an expression of operation which itself does not operate. This means that information diffuses into consciousness such that what remains is consciousness since the content has been used up in becoming informed. This makes consciousness the limit or end of existence. Once the learners of Chemistry in Migori County

have reduced the Chemistry curriculum to consciousness, what remains is not the notes in the books but the educated person.

At the top of the learning and knowing Chemistry are the aspects of the method, meaning and truth as the silent forms of reality. Those parts of the content that are attached to the interest of the individual can truly survive as mental content (Kallen, 1911). Festus (2007) contends that performance is the fundamental goal behind every life struggle. Slee (1964) affirms that this very thought of a possibility of becoming what the learner wants serves as the stimuli that trigger their learning actions. The same point is confirmed by Wilson (1985) who reported that the efforts learners direct to their academic work in science correlate highly with their science achievement.

The extent to which learners in Migori County will find learning of Chemistry worth investing their energy in depends on how such activities influence their aspirations as affirmed by Nwamuo (1986). This will go a long way to influence their behaviour as observed by Aiken (2000). Ewell (1998) recommends assessment in which less of standardized tests are used while more tests in the realm of performance are used, less models that are teacher centred while more development indicators drawn from students are used, and the use of more methods of content delivery that borrow heavily from the natural setting of the learner's environment.

Korir, Margaret, Bett and Thinguri (2014) noted that there were still cases of student absenteeism from schools. These absenteeism cases were attributed to a failure in exams in rural setups typical of a large part of Migori County, some learners finding school boring as compared to engaging in other out of school activities like mining and farming especially in the sugar belt where farming is lucrative. Such absenteeism cases deny the learners the quality opportunities presented in schools for their academic development.

3.50. The creative dimension of education

Njoroge and Bennaars (1986) assert that creativity must be encouraged as a way of expression and method of learning. Developing creativity follows the system of value judgement by the learner as per the resultant appeal of that which is the object of creativity. As pointed out by Anderson (2014) in the work of Dewey, value judgments redirect conduct. The success of guiding conduct towards solving intended problems form the evaluative criteria for such value judgements or even the possibility of alternative options yielding more acceptable results. The child must be left free to experiment and express what they consider as valuable at the individual level.

Methods and procedures used in learning must elicit voluntariness on the part of the learner. According to Bruning and Forster (1997), Peirce radically rejects the spectator theory of knowledge in that it is not possible to focus on any aspect of experience independently of interpretive elements. The learner should be made aware of his task, that of an actor, a producer and a creator. It further stresses that education should be work-oriented since work makes a person human. Colis and Moonen (2001) suggest an approach whereby the teacher in introductory science classes especially at form one engages the learners in bringing out whatever misconceptions they could have as part of an assessment of entry behaviour. This way they will end up naturally discussing the process of doing science and the implication of scientific innovations in the society. This will create the democratic space recommended by pragmatism.

The use of discussion (Vey, 2005) is important in arousing the potential of critical thought in the learners and infuses in them the important aspect of individual responsibility in the process of problem-solving. This will help the learners avoid mere accumulation of factual information without connecting such information to the challenges in the environment. This

method has the potential of placing every learner in their rightful place in the wider society as they will see the societal issues from their individual perspectives which will be as diverse as the number of learners in the class.

Learning involves experience which can be at the individual level as the individual grows or at the level of interaction with the environment. Aedo (2002) while referring the work of Dewey on experience explains that the experience at an individual level is a factor of curiosity that is aroused when the individual interacts with the material of growth which in this case comes in the form of contents prescribed in the syllabus. The contents relate the inner dictates of the individual and the needs of the environment during which a situation is created that is expected to result in learning as the individual realigns their inner qualities with the dictates of the environment. The result is the creation of a different and better person along the learning cycle. This makes teachers prepare lessons by taking into consideration the inner dictates of the learner instead of some external requirements that may not have considered each individual student separately and individually in the environment.

Laboratory instruction motivates learners to learn science (Kotsis, 2011). In addition, a study by Liapi and Tsaparlis (2007) points to the significance of experimental work performed by the learners themselves, in order to stimulate their interest in chemistry and positively affect their results. The teachers also ought to design the experiments with elements that connect the content learnt with everyday life. Problem-based learning (Baratsi-Barakou, 2009), discovery (Kafetzopoulos, Spyrellis, & Lymperopoulou-Karaliota, 2006) and science-society interrelation (Seroglou, 2002) are the other examples of interdisciplinary teaching approaches that positively influencing learners' achievement and enhancing their motivation to learn chemistry.

The pragmatist views the learner as a whole organism constantly interacting with the environment. The school is both a part of this environment and a special manmade environment designed to provide the best possible educative experience to the learner. For this reason, the learner is especially involved in interaction with the school. Using learner centred constructivist based instructional methods is widely accepted, since teacher centred, traditional instructional methods have given insufficient opportunities for learners to construct their own learning. Eliciting learners' individual capabilities, intelligence and creative thinking can only be achieved through learner-centred instructional methods.

3.50. The dialogical dimension of education

In their explanation of the dialogical dimension, Njoroge and Bennaars (1986) point out that to study science is to become familiar with the language and methods used by scientists. Therefore, in Chemistry, the learners need to be familiar with the language of Chemistry which consist mostly of chemical equations and the methods in Chemistry which predominantly involve practicals in the laboratory. Being familiar will not just involve being aware of the contents but being in a position of reproducing the same in an examination situation that would ensure good performance.

This familiarity will also mean entering the world of science created by Chemists most of whom are the Chemistry teachers. In the end, the methods used in science become publicly shared (Njoroge & Bennaars, 1986). However, an individual may be familiar with the concepts of science but may not be able to express them adequately in a publicly approved manner, as such the individual will not be called a scientist. The learner who cannot perform well in the standardized examinations demonstrates that they are not able to live up to the expectation of being scientists. Does this then mean that the learner who fails in Chemistry will fail to be a Chemist? Examinations are very important instruments used in placement. This means that learners who score a particular range of grades will be considered fit to

pursue a particular course or field of study (the Chemistry field included). In the end, the learners with the acceptable grade (the range of grade required for a course) will be considered to have gained enough content to allow them to be Chemists.

Aedo (2002) while referring to the work of Dewey on experience tasks of the interactional aspect of the experience. In this case, the student's learning and performance is affected by internal factors together with the environmental aspects surrounding the person. The environmental aspects may include the aims set out in the curriculum, the nature of the physical learning environment or even the characteristics of the person with whom the child interacts in the environment that form part of the society teaching the future generation.

No teacher gets into the field of teaching and learning with the aim of graduating failed learners. Therefore, the learners are initiated by the teachers into the forms of experience required in their fields of specialization during learning. In the same field, the learner is expected to focus on individual performance as the examination sets the stage for competition in which the best grade will be chosen and the least advised to choose on another area of study that may not require the subject in question. In a dialogue situation, individuals speak to each other and such a communication becomes easy, possible and complete if it happens in a level ground in which people speak in equal terms (Njoroge & Bennaars, 1986). This implies that at the end of the secondary school learning, the learner has fully come to terms with the objectives of the teacher, understood them and achieved them, then the teacher will make a judgement by declaring such a learner the best and therefore fit to be a scientist (Chemist).

For any meaningful communication to take place, especially between the teacher and the taught, there needs to be an environment of motivation whereby the taught has the inner drive to keep listening and responding to any promptings from the teacher. According to Glynn,

Taasoobshirazi and Brickman (2009), the right motivation enables the learners to find academic activities relevant and worthwhile. At the secondary school level, Pajares (2001) notes that learners achieve good results because they participate actively in a class by asking questions, seeking advice, studying, and participating actively in study groups.

The teachers should vary their teaching styles and show the learners how applicable the topic is to them in everyday life and career interests, then the learner will find the topic useful hence motivated to learn and perform well in it. This forms part of the treatment that Muleyi (2008), records that go a long way to influence how well they perform in their examinations. This puts the burden on the teacher that the learner should see the connection between the scientific literacy to their current and future lives (Aschbacher, Lee, & Roth, 2010). A learner may have low achievement in the examinations which may be attributed to characteristics on the side of the teacher, these are, when the teacher gets late for lessons or absent themselves altogether when the teacher is not able to complete the stipulated syllabus coverage in time (Etsy, 2005). According to Oredein and Oloyede (2007), assignments given to learners should be well explained, corrected and reviewed during class time and used as an occasion for feedback to learners.

Learners can be encouraged to work in groups (Johnson, Johnson, & Smith, 1998). This will develop positive interdependence whereby everyone on the team suffers the consequences of failure by one of them. This also encourages individual accountability. Role modelling is also a concept that the learners cannot possibly escape. The classroom where performance is determined forms a very basic social environment in the school in which learners want to develop their identities. One would find in the social media groups such as "the class of 2013" for example to refer to the group the members identify themselves so closely with. They will also want to attain the grades that would not lower their acceptance in such groups. This is supported further by Felder and Brent (1999) who assert that the peers, teachers and

even parents of the learners act as role models to them. Modelling influences cognition and behaviour of the members of the peer (Ryan, 2000) and create an environment in which they make choices (Ryan, 2000).

Lockwood and Kunda (2002) explain that positive role models represent outstanding success and most expectedly create a sense of encouragement for others to follow in their footsteps. The teachers of Chemistry in Migori County will do well to expose the learners to both role models in Chemistry for the benefits that accrue from them. The peers by their words and actions (Howard, 2004), can also influence their members to engage in activities that may be negative to growth in academic excellence. Teens will work towards avoiding ridicule from their peers (Burns & Darling, 2002). With such a knowledge, the teachers will be in a good position to control teenage behaviour for better performance.

3.60. Pragmatic strategies for improving performance

The researcher discusses the pragmatic strategies that will help to turn around the poor performance of Chemistry in Migori County to a better performance. These are the humanistic treatment of human beings; the aspect of value; and reinforced practice.

3.71. Humanistic treatment of human beings

Chemistry subject being a key prerequisite for industrial development is at crossroads because as noted by Chen and Schmidtke (2017) the industrial world gives little attention to the human agents of production as compared to the attention given to the mechanical establishments in production. What has to take into account even in such cases is that the willingness of humans to enable the machines and other non-human agents to operate well needs entirety human characteristics of cooperation, free will and willingness to participate in the production process. The aspect of individuality of the human agents cannot be overlooked.

The Chemistry teacher that guides the reaction between say potassium with water will need to let the learners know the dangers involved in the process and expect cooperation on the part of the learners to avoid the dangers and at the same time make correct observations and conclusions. The teacher will need to use the presentations of the learners as the true perspective of the learner in the lesson and use such to develop better teaching methods. Chen and Schmidtke (2017) mention constructivist elements in teaching and learning for good performance. These elements are expounded more.

First is that learning is inseparable from context. We expect learners, for instance, apply the Avogadro's constant in a calculation. Such a concept if separated from the present and perceived future needs of the learners then it remains just a theory in Chemistry books that to a learner may have been printed to fill the book or occupy their time while at school. Chemistry must place the student in the social, political and economic realities surrounding the classroom for it to have a genuine impact in leading the learner towards better performance in the examinations and life in general.

The second element is that the teacher needs to act like a carpenter who trains an apprentice on the job through guiding by doing and letting the learner do. Demonstrations in Chemistry lessons come in handy at this stage but that is not enough as the teacher may just demonstrate without allowing the learners to also perform the action itself. This ends up looking like a practised lecture because the teacher can as well tell them that the colour of a transition metal is red and because they know the colour red, it will be enough for them to form the concept of an imaginary metallic thing that is red in colour. They need to touch the apparatus and the reagents with guidance from the teacher, do as the teacher does or shows and this makes an apprenticeship in learning for a better performance.

The third element places the learner in the context of problem-solving. This is learning that is entirely situational. The learner is given a role that is contextualised. In this case, the learners may be grouped and given tasks to undertake the end of which is the solution to a real problem in the life of the learners. The learners are given freedom to switch roles in their groups so as to participate as they see the problems from different perspectives.

Lastly, the teacher should engage the learner with assessment methods that are geared towards testing their cognitive achievements that are worthy, substantial and that has a purpose. The learners may fail in Chemistry examinations in cases where the tests seem to test concepts that have little value in the eyes of the learners. As long as they see the worthwhile consequence of the ability to do well in the examination, they will put their efforts in passing such a test. Such examinations must be seen by the learner and the society to be so significant that missing the examination or performing poorly will result in denial or missing some important aspect in the life of the learner and the society at large such that it remains so significant in the life of the learners. The tests must be meaningful to the learners to an extent that it will keep imploring the learner to see its aspects in their life in general.

3.73. The aspect of value.

At the individual level of the learner of Chemistry in Migori County, it is important that their aspect of values is taken into consideration while planning the educative experiences that will guide them towards better results. Mitcham (2005) asserts that value can be viewed at a personal level within the context of societal values, and it consists of negative and positive aspects. For instance, learners value pleasure to an extent that if it is gratified to their expectation, they will feel they are well taken care of. The learning of Chemistry should address the desires of the learners for it to become a motivation for success. The teachers and education administrators should put in practice the elements of the Chemistry syllabus that

please the learners such that they will always desire and look forward to the Chemistry experience in their life. Chemistry becomes a want when learners cannot do without it. If Chemistry is presented to the learners in a way that makes it clear to them that the basic needs are solely anchored on the subject then they will view knowing it and performing in it a basic need itself. If good performance in chemistry is an indispensable element of growth, acquisition of truth and makes the life the learner beautiful, then it becomes valued.

The other consideration is that educators seek to make knowing Chemistry and performing well in it an end in view (Mitcham, 2005). This makes it take the position of the absolute goal that every learner strives to achieve in their life at secondary school. This makes a good performance in Chemistry a valuable achievement. In case the same good grades become a means for achieving much higher goals that it, then its worth is intricately connected to the future of the learner. The good grades then become values in themselves as well as values in achieving other values.

3.74. Reinforced practice.

The notion of practice in pragmatism as presented by Simpson and Elkjaer (2006) involves four elements that the researcher will expound.

First, the learner is a middle element between sensation and action. Both processes need the important element of thought that will convert one into the other. The sensational phase is converted to action phase and the action phase may prompt another sensation phase that creates a circular loop that is evident in Chemistry practical work. Experience then has the active aspect when the learner manipulates the implements presented for learning using the senses, as well as the passive aspect that involves only the thought phase that will only be seen at the end of an action. The teacher ought then to impress upon the passive part of experience out of which what will come that which will be marked as either correct or wrong by the

teacher. When the learners are given the basic elements of thought which could be the class notes, the learner uses these to form the mental schemata that they will use to approach the practical work in the laboratories.

Second, the teachers ought to present the contents of Chemistry in the forms of problems in the life of the learners. The learners are then guided through alternative solution pathways possible for the problem. This way, the student's mental construct of the problem solution will fit into one of the possible solution options presented. In a chemistry class, for instance, the learner will be presented with the problem of separation of mixtures that they encounter in daily life. Different options presented to them which must draw from their daily experience will assist them in their thought process of finding solutions to the problem of undesired mixtures in daily life. The learner finally emerges as a very important agent in solutions to humanity's problems.

Third, actions undertaken by an individual habitually or repeatedly and consistently finally build their habit. This makes a habit the consolidation of repeated acts that have become part of the individual that acts. The habit of solving problems in Chemistry is a very necessary ingredient in the process of solution building by the learners. Habit could be an overt response as a result of what one is accustomed to or expectation of a particular result that can stem from such a habit. The introductory lesson of Chemistry will lay bare the required precautions that learners must observe when dealing with Chemistry concepts and apparatus. The teacher will then employ the necessary motivation to create the learner who has made the act of following the concepts a habit. A repeated examination regime that borrows from past tests is an example of a way of instilling the habitual character in the learner.

Lastly, the human being in the person of the learner is one who is in the process of growth and becoming a better self with the passing of interactions. The learners in schools in Migori

County originate from homes with the basic interactions with the home environment has created some impressions in their minds. Further interactions in the school environment will bring to birth a person realigned base on the concerns and expectations in the school environment. Such an environment is a combination of the national goals of education, the goals of academic achievement set by the school, the expectations of the Chemistry teacher in a particular class and finally the goals of an individual learner as a result of their vision of what their future should be. These elements of the school environment create a transactional arrangement within which the learner gets transformed into a representation of the expectations of the society as a whole that they are part of.

3.70. Conclusion

This chapter presented intervention strategies put in place by the Government of Kenya as measures intended to improve performance in Chemistry. The researcher presented the arguments in line with the dimensions of education by Njoroge and Bennaars and the pragmatic strategies put forth to help improve performance in Chemistry in line with the roles of the student, the teacher and the effects of the environment on performance. The next chapter then presents a summary, conclusion and recommendations of the study.

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CHAPTER FOUR

SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.00. Summary

The research presented an analysis of pragmatic strategies for improving chemistry performance in secondary schools in Migori County, Kenya. Pragmatism as a modern school of thought has been used in the development of the work. According to Shawal (2016), the philosophy of pragmatism advocates for practical utility as a guide to the methods of teaching and assessment. The researcher relied on the principles of pragmatism as discussed by Kallen (1911), which are the humanistic treatment of being, the aspect of value as presented by Dewey (Anderson, 2014), reinforced practice (Kimble, 1961). The researcher identified the factors in the learning environment that contribute to poor performance in the subject with a view to improving the results obtained by the learners in the national examination.

The research analysed the role of the student in their learning and performance, how they manage their study time as they prepare for examinations, their language use, absenteeism from school and lateness for lessons. The research also analysed how the teacher contributes to poor performance. Their qualification, motivation, workload and preparation. The effect of the environment which include lack of facilities, poor school management and factors from the learner's home as the possible contributing factors to the dismal performance observed in Chemistry subject in Migori County.

Akinpelu (1981) asserts that the process of education aids the learners to discover previously acquired knowledge. This is made possible through the reasoning process. Chemistry subject allows learners to see the theories presented in books in a real-life experience. They will practically discover for themselves the previously acquired knowledge as they see their interplay in experiments. Dowden and Swartz (2018) assert that a proposition will be taken as

true if the belief in it is useful. That which rational inquirers would come to believe is considered truth. This makes truth the desired outcome of every rational inquiry. It is a function of carrying out investigations.

Pragmatism sees the process of knowing as involving the organism and environment in which the key concept is experienced whereby the persons endeavour to live, to grow and to develop. Knowing is the process between the learner and the environment and that knowledge must come out of an experience. The Socratic Method is seen by Akinpelu (1981) as the method of teaching that can yield the knowledge desired with its use of well-framed questions that generate the right answers.

In the process of experimentation that is supposed to give rise to the desired truth, the learners in Migori County are challenged by cases of absenteeism from school, lateness, use of a language other than the English used in instruction and examination. Ability to grasp and remember facts in Chemistry require a reinforced practice that yields experience. This is why the researcher chose to use philosophical analysis in light of the philosophy of pragmatism to examine the processes of learning Chemistry in Migori County. Ideas that can improve performance in Chemistry have also been presented. Kristmanson (2000) advocates for the creation of an environment for the learners that enable them to make mistakes in a risk-taking endeavour during learning.

As a science subject, Chemistry promotes creativity. It is important in technological advancement as was observed by Adesoji and Olatunbosun (2008) in the Nigerian education system. Even the more industrialized and technologically advanced societies have Chemistry central to their economy as was noted by Burmeister, Rauch and Eilks (2012). Its practical nature offers an experience capable of creating an enabling environment that stimulates a

learner's good performance in the examination (Read & Kable, 2007). This is why the researcher analysed Chemistry performance.

The learners in Migori County secondary schools should be ready to learn and do all that the Chemistry curriculum entail while at the same time taking enough care as stipulated in the laboratory rules. The teachers of Chemistry must go a long way to stimulate in the learner a liking for the subject and the need in them to work towards a better performance at the summative examination offered at the end of form four.

4.10. Conclusion

In addition to the examination result, documents that are obtainable at the end of secondary school, the ability to display knowledge is even more necessary in a graduate of the system. Such an ability to show what one has learnt is the hallmark of being an educated person. In the argument of John Dewey (1906), an educated person has acquired the structure of knowledge and functional skills. This is further confirmed by Gutek (1997) who defines education in terms of acquisition of a what he calls a family of processes that is able to make a person socially, morally and intellectually sound.

The learner of Migori County who has acquired knowledge in Chemistry is able to find a social, moral and intellectual use of the knowledge so acquired when interacting with other people in the environment and at the point of employment. Medicine being one of the professions that Chemistry can lead one to, is held with high esteem in the society and they are considered to be financially stable as observed by Ojuka, Olenja, Mwang'ombe, Yang, and Macleod (2016). The learners in Migori County have no option but to learn Chemistry due to its importance as well as the fact that the Government of Kenya has made it a compulsory subject.

4.20. Recommendations

The following are the recommendations that the researcher has made from the study as a means of checking the poor performance in Chemistry in Migori County: the learner should be sensitized on the need to make wise use of time as they prepare to take examinations; the learner should be reminded on the necessity to use proper and correct language in their engagements as the same language influences their ability to adequately respond to questions in examinations; the learner should be assisted towards ensuring that are not absent from school during which important preparations are made for examinations; the learner should be sensitized and guided on the need to ensure they avoid getting late during learning when important preparations are made; only qualified teachers in Chemistry subject should be engaged in teaching as a motivating factor to the learners; the government of Kenya should put in more strategies that will be geared towards motivation the teachers; the teacher should put more effort during lesson preparations to enable them incorporate elements that will improve performance of the learner; the school through parents association should ensure that adequate facilities are available for learning; the school board of management should be keen of the type of leadership used in the school that will contribute in positive motivation to the teaching and learning process; the subject teacher should ensure the arrangement in the class is one that ensures adequate attention is accorded every learner as a way of ensuring that learning is monitored; the setting of goals and expectations by parents should take into account the ability of the learners in achieving such set goals to avoid imposing excessive stress on the learner beyond their ability.

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