

COUNSELLING NEEDS RELATED TO PRACTICAL SKILLS AFFECTING STUDENTS' PERFORMANCE IN PHYSICS BY GENDER IN SECONDARY SCHOOLS IN MBEERE NORTH SUB-COUNTY, KENYA

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Abstract

Science process skills acquisition plays an important role in the academic achievement of a student. Students are unable to fully utilise these skills thus leading to below average performance in physics practicals. The study sought to establish the guidance and counselling needs related to practical skills affecting students' performance in physics in secondary schools in Mbeere North Sub County. Descriptive research design was used in a study population of 7500 students from 45 public secondary schools in Mbeere North Sub County. The researcher selected 28 secondary schools proportionately and stratified them into two groups of boys and girls. A sample of 290 form three and four students was obtained. Questionnaires containing items on science process skills were administered and the raw data was coded and entered into the computer for analysis using SPSS version 23.0. The data was analysed by use of both descriptive and inferential statistics involving t-test where the hypothesis was tested at $\alpha=0.05$ level of significance. The study established that students lacked necessary science process skills and that there was a significant difference in counselling needs related to practical skills between boys and girls towards physics performance. Therefore, the study results can be used by education policy makers to prepare and instil appropriate science process skills programmes among the learners.

Keywords: Physics Performance, Science Process Skills, Gender, Guidance, Counselling

1. Introduction

Hofstein and Mamlok-Naaman (2007) argue that laboratory experiences have been given a leading part in science education. Many benefits are said to come from engaging students in practical activities (Lunetta, Hofstein & Clough, 2007). Practical experiments in physics work as an influencing agent in the learning of physics since they help in clarifying theoretical implications (Musasia, Abacha & Biyoyo, 2012). This understanding cements the foundation for fields like engineering, farming and medicine (UNESCO, 2009). The science process skills when clearly understood promote affective reactions and stress attitudes such as honesty, open and critical mindedness and humility which characterize the scientific enterprise (Akinbobola & Ado, 2007). Appropriate practical work enhances learners' experience, understanding skills and enjoyment of science. Hence, the knowledge of physics process skills is very important for proper understanding of concepts in science. Therefore, this induces scientific attitudes, develops problem solving skills and improves conceptual understanding among the learners (Akinbobola & Ado, 2007). Yusuf (2010) and Anyanwu (2012) noted that male schools performed better in science process skills acquisition followed by co-educational schools and least was female schools. Njoku (2000) adds that females in single school scored significantly higher mean in science process skills than females in mixed sex group. Wasanga (2009) suggested that poor performance in physics is noticeable amongst girls in Kenyan secondary schools and this hinders them from accessing physics based courses and careers. Musasia, Abacha and Biyoyo (2012) agree that girls' performance in physics is lower than that of boys. Therefore by girls doing more science practicals, theoretical implications are clarified.

Akpokorie (2000) observed that students portrayed poor performance in Physics due to difficulties experienced in acquiring the science process skills which include thinking skills, analysing skills and interpretation of facts skills. The teachers set out Programmed practical work to create motivation and interest for learning physics since students tend to learn better in activity based courses where they can manipulate equipment and apparatus to gain insight levels in the content. Despite efforts by education stakeholders and government, students have inadequacies in handling physics practicals both in internal and external examinations. These inadequacies may be attributed to diverse factors affecting students in handling physics practicals. To this end, knowledge about guidance and counselling needs in physics practicals among secondary school students was explored. Therefore, this study sought to establish the guidance and counselling needs related to practical skills affecting boys and girls students' performance in Physics in secondary schools in Mbeere North Sub County, Kenya.

2. Objectives

The study was guided by the following objectives:

- i. To establish the science practical skills needs affecting students' performance in physics.
- ii. To determine whether there is a statistically significant difference between boys and girls students' practical skills needs towards physics performance.

3. Methodology

Descriptive survey research design was used in a study population of 7,500 students from 45 public secondary schools in Mbeere North Sub-County. Descriptive research design was used for the study. The researcher selected 28 secondary schools proportionately and stratified them into two groups of boys and girls. Simple random sampling was used to obtain a sample of 290 students. Questionnaires containing items on science process skills were administered

and the raw data obtained was coded and entered into the computer for analysis using SPSS version 23.0. Frequencies, percentages and t-test statistics were used to analyse the data.

4. Results and Discussion

The following results were obtained:

4.1 Counselling Needs on Practical Skills Affecting Students' Performance in Physics

The analysis of students' responses in regard to practical skills needs is shown in Table 1

Table 1: Students' Opinions on Counselling Needs Related to Practical Skills in Physics

Opinion	SA (%)	A (%)	U (%)	D (%)	SD (%)
G/C can help me develop observation and measuring skills in physics practical.	44.7	43.6	4.3	4.3	3.2
G/C can help me acquire thinking and manipulating skills leading to better performance in physics.	45.7	44.7	5.3	2.1	2.1
G/C can help me develop self-confidence in handling of physics apparatus hence better performance.	50.0	34.0	11.7	2.1	2.1
G/C helps me apply and practise physics practical skills in other areas of my learning.	33.0	46.8	14.9	4.3	1.1
I get challenges in utilising practical skills hence G/C can help me get conversant with them.	25.5	27.7	23.4	17.0	6.4

Information in Table 1 indicates that majority of students are in agreement that guidance and counselling helps reinforce the science process skills in the teaching and learning of physics. Draghicescu, Petrescu, Gorghiu and Gorghiu (2013) explains that teacher counsellors support and stimulate the process of progressive development of the science process skills among students thus leading to increased academic achievement. The Table also indicate that 44.7%, 45.7% and 50.0% of the students strongly agreed that guidance and counselling can help them develop and reinforce observation and measuring skills, manipulating skills and self-confidence in handling physics practical respectively. The importance of practical work in schools science is that it provides learners with opportunities to use equipment to develop manipulative skills and problem solving attitudes needed for better academic performance in sciences (Nuhu, Hamira & Gwarkila, 2016).

Only 4.3% 2.1% and 2.1% of the students disagreed that guidance and counselling can help them develop and reinforce observation and measuring skills, manipulating skills and self-confidence in handling physics practical respectively. Besley (2002) argues that effective school guidance and counselling services remove barriers to learning that students face and consequently result in better academic results. Acquisition and reinforcement of Physics process skills through laboratory and workshop practice also provide a pathway for better academic performance in Physics subject and even other subjects. Students are able to acquire observational skill, time management skills in the laboratory, independent thinking, analysing skills and confidence in the laboratory. The experimental nature of science fosters teamwork and manipulative skills of object as well as promoting observational, deductive and evaluative skills (Ng & Nguyen, 2006). Counsellors also provide trainings that equip learners with skills by simulating similar conditions in the counselling groups. Students who have low motivation and interests in physics can seek the help of a counsellor to help them develop proper attitudes and skills towards acquisition of practical skills. Condly (2006) notes that

learners' readiness to learn influences on the acquisition of process skills. Counsellor helps learners to attain the maturity needed for comprehension of such skills.

In addition, results in Table 1 indicates that 33.0% and 46.8% of the students strongly agreed and agreed respectively that guidance and counselling helps in utilisation of science process skills like problem solving in other areas of learning. Millar (2004) agrees that practical work helps students link between objects and observable properties and also the domain of ideas on the others areas of learning. Motivation greatly influences the acquisition of such skills. The use and application of science process skills in other areas ensures that students perform well above average in other subjects and this contributes to the student scoring well in the final tests in physics. It has also been noted that physics process skills are useful in both science and non-science situations in life. Hence, there is need to motivate the learners so as to develop more interests in learning and acquisition of the process skills. Gbamanja (2002) adds that practical experiences in sciences ensure learner centred learning and effective interaction between learners and the learning materials.

The counsellor is helpful in creating interests among learners which in turn increases the motivation for them to acquire the process skills. The counsellor encourages learner to participate wholly when in a group setting as this facilitates the acquisition of process skills of thinking, analysing and interpretation of ideas. Ngetich (2014) explains that confidence in learners studying physics is realised when students transfer knowledge learnt in class to solve other related problems in academics and in life. This is due to the fact that physics helps learners develop analytical skills necessary for problem solving in various situations they encounter in life (Adeoye, 2010). However, 53.2% of the students admitted to facing challenges while 23.4% never experienced any challenges regarding utilisation of practical skills. Ferris and Aziz (2005) found out that student displayed a lack of physics skills during practical work. Assefa (2008) also noted that students' face problems mainly lack of skills in practical work. Therefore, teacher counsellor plays a vital role in the acquisition and reinforcement of such skills in secondary schools to ensure increased performance.

4.2 Comparison of Practical Skills Needs between Boys and Girls to Physics Performance

The study sought to determine whether there is any difference in practical skills needs affecting boys and girls students' performance in Physics in secondary schools.

Table 2: Overall Mean Differences between Boys and Girls on Practical Skills Needs to Physics Performance

Gender of Respondents	N	Mean	Std. Deviation	Std. Error Mean
Boys	155	4.0000	.85280	.06850
Girls	135	4.2074	.64757	.05573

Table 3: t-test Results on Comparison of Practical Skills Needs Affecting Boys and Girls Students' Physics Performance

Levene's Test for Equality of Variances						
		F	Sig.	t	df	Sig. (2-tailed)
Overall t	Equal variances assumed	.660	.417	-2.305	288	.022
	Equal variances not assumed			-2.349	282.903	.020

The results in Table 2 show that the means of boys and girls was 4.000 and 4.2074 respectively. The findings in Table 3 indicate that the calculated p value is less than 0.05. Hence, the null hypothesis was rejected. Therefore, there was a significant difference in mean practical skills needs between boys and girls. This is in line with Ugwuanyi (2017) who notes that there is a significant gender difference in acquisition of science process skills in Physics. Ugwuanyi (2014) also found out that gender had significant effect on acquisition of process skills in physics.

5. Conclusion

The study indicated that more females than male students lack necessary skills to handle physics practical and that there were significant differences in counselling needs related to practical skills between boys and girls. Guidance and counselling facilitates students' academic growth in reinforcing necessary science practical skills thus resulting in improved academic performance.

6. Recommendation

On the issue of practical skills, the guidance and counselling department in secondary schools should in conjunction with the physics teacher organise for guidance seminars aimed at helping learners develop and apply science process skills including problem solving skills. Gender-wise practical activities have been found to benefit girls in their physics performance. The Ministry of Education, Science and Technology (MOEST) in conjunction with the secondary schools to involve students in science engineering fairs plays as they play a vital role in raising students' interest and creativity.

References

- Adeoye, A. F. (2010). Impact of Systematic Assessment in Instruction on Secondary Students Physics Achievement at Cognitive level of Knowledge. *Eurasia Journal, Physics and Chem. Educ.* 2 (1): 44-52.
- Akinbobola, A. O., & Ado, I. B. (2007). *Hands-on and Minds-on Strategies for Teaching of Force: Guided Discovery Approach* (pp. 65-72). In: Udo, E., Uyoata, U, Inyang, N.E.U., Yero, H. & Bello, G. (Eds.). *Hands-on and Minds-on Strategies in the Teaching of Force*. Uyo: Afahaide & Bros Printing
- Akpokorie, B. T. (2000). *Junior Secondary School Integrated Science: Students' difficulties in Process Skills acquisition in Warri and its Environs*. Unpublished M. Ed. Dissertation, DELSU, Abraka.
- Anyanwu, E.K. (2012). *Development and validation of instrument for assessment of students' psychomotor skills in senior secondary school Mathematics*. Unpublished Masters Thesis. University of Nigeria, Nsukka.

- Assefa, B., et al. (2008) Action Research on Enhancing Academic Excellence in a Study Program. *Ethiopian Journal of Education and Sciences*, 3, 71-80. <http://dx.doi.org/10.4314/ejesc.v3i2.42008>.
- Besley, A. C. (2002). Into the 21st Century: The McCrone and McConnell Reports-Opening the Possibility for Introducing Full-Time School Counsellors into Scottish Schools. *In Scottish Educational Review*, 34 (1), p.61-75.
- Condly, S. J. (2006). Resilience in children: A review of literature with implications for education. *Urban Education*, 41 (3), 211–236.
- Gbamanja, S.P.T (2002). *Modern Methods in Science Education in Africa*. Total publishers limited, Owerri.
- Hazari, Z., & Potvin, G. (2005). Views on Female Under-representation in Physics: Retaining women or reinventing physics? *Electronic Journal of Science Education*, 10 (1), 1-33.
- Hofstein, A. & Mamlok-Naaman, R. (2007). The Laboratory in Science Education: the State of the Art. *Chemistry Education Research and Practice*, 8, 105-107.
- Lunetta, V. N., Hofstein, A. & Clough, M., (2007). Learning and Teaching in the School Science Laboratory: an Analysis of Research, Theory, and Practice, *In Handbook of Research on Science Education*, eds LedermanN and Abels., pp. 393-441. Mahwah, NJ: Lawrence Erlbaum
- Millar, R. (2004). *The Role of Practical Work in Teaching and Learning Science*. Washington, DC. October 2004. 25pp.
- Musasia, A. M., Abacha, O. A., & Biyoyo, M. E. (2012). Effect of Practical Work in Physics on Girls' Performance, Attitude change and Skills acquisition in the form two-form three Secondary Schools' transition in Kenya. *International Journal of Humanities and Social Science*, 2(23), 151–166.
- Ng, W., & Nguyen, V. T. (2006). Investigating the Integration of Everyday Phenomena and Practical Work in Physics Teaching in Vietnamese High Schools. *International Education Journal*, 7(1), 36–50
- Ngetich, J. (2014). *Factors influencing Girls' Low Enrolment and Poor Performance in Physics: The case of secondary schools in Nandi South District, Kenya*. Unpublished University of Kenyatta, M. Sc. Thesis.
- Njoku, Z.C. (2000). Images of females in science: A gender analysis of science and technology activities in Nigeria primary science textbooks. *Journal of Primary Education*, 1(1), 3-12.
- Nuhu, R., Hamira, Y., & Gwarkila, K. (2016). Assessment of Undergraduate Student's Performance in Physics Practical's of Adamawa State University, Mubi. *Sky Journal of Educational Research* Vol. 4(2), pp. 014-019.
- Ugwuanyi S.I. (2014). Assessment of secondary school students' acquisition of science process skills in Physics. *Unpublished First Degree Project*. University of Nigeria, Nsukka.
- Ugwuanyi, A. A. (2017). *Science Process Skills Acquired by Senior Secondary School Chemistry Students in Enugu Education Zone* (Doctoral dissertation).
- United Nations Educational, Scientific and Cultural Organization [UNESCO], (2009). *Policy Guidelines on Inclusion in Education*. Paris: UNESCO.
- Wasanga P.M., (2009). The role of examination results as a feedback tool: The Kenyan Experience, *First READ Global Conference: Developing a Vision for Assessment Systems*, September, 30 –October 2, pp 13-15
- Yusuf, M.A. (2010). The influence of school sex, location and type on students' academic performance. *International Journal of Education*, 2 (2) 81-85.