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Effect of Cooperative Mastery Learning Approach on Secondary School Students' Motivation in Kirinyaga County, Kenya

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Abstract:
Through this current study the effects of Cooperative Mastery Learning Approach in Physics for secondary school students have been measured. The research area is Kirinyaga County. Solomon's four quasi experimental group design was used. A sample of 180 respondents was obtained from an accessible population of 5850. Simple random sampling was used to draw the participating four schools from the purposively selected Sub- County schools. The assignment of selected schools to either experimental or control group was done by simple random sampling. The research instrument that was used was a students' motivation questionnaire (SMQ). The Reliability was tested by subjecting the instrument to a pilot study in a school in Embu County. Reliability coefficient for students' motivation questionnaire was 0.795. Statistical Package for Social Sciences (SPSS) version 25.0 was used for data analysis. The raw data obtained was analyzed descriptively using Mean, Standard deviation, percentages and inferentially using non-parametric tests (Kruskal-Wallis test, Mann Whitney U test and Posthoc Analysis). The level of significance for acceptance or rejection of null hypotheses was at α = 0.05. Statistical significance has been observed between students taught using cooperative mastery learning and conventional teaching approach.

Keywords: *Motivation, cooperative mastery learning approach and conventional teaching approach*

1. Introduction

Science education in a global and local perspective should foster understanding of concepts among students as a result of their intellectual commitments and practices. Such knowledge of science concepts is necessary in developing students' skills and abilities in preparation for their exposure to the outside world (Gonzales & Reyes, 2016). Science education is a key driver for development because technological and scientific revolutions underpin economic advances, improvements in health systems and infrastructure (Chioma, 2015). Scientifically produced products are transforming business practices in many economies as well as the lives of all who have access to the effects.

According to Kola (2013) science driven improvements in sectors such as health services have improved the lives of people through access to timely and quality medical services. The challenge in teaching science is to create experiences that involve the student in his or her own understanding and application of the scientific concepts required to make sense of the experiences in the environment. Secondary Schools attempt to achieve the educational goals through instruction within the school disciplines. Physics education is, therefore, about achieving educational goals through a context of physics (Meheux, 2017). Physics being one of the STEM subjects is taught in secondary education and serves as a preparation for further training and prepares students to be useful citizens within the society. Physics is taught through learning activities in schools by a set of activities that are designed to support student learning (Prima, Utari, Chandra, Hasanah, &Rusdiana, 2018). The principle of learning physics is to prioritize scientific processes to produce products and to be based on scientific attitudes.

Physics education therefore enables the learner to acquire problem-solving and decision-making skills that provides ways of thinking and inquiry which help them to respond to widespread and radical changes in industry, health, climatic changes, information technology and economic development. These changes demand knowledge of scientific principles in order to tackle them (Otieno, 2015). The teaching of Physics provides the learners with understanding, skills and scientific knowledge needed for scientific research, fostering technological and economic growth in the society, where they live thus improving the standards of living (Wambugu, 2006). Though physics is essential for industrialization, there has been a low motivation towards physics by secondary school students (Njoroge et. al 2014, Prima, Patri&Rustaman, 2018). Although the government has done its part the role of the teacher in the classroom is important in enhancing effective teaching and learning of physics.

The primary purpose of teaching is to bring a fundamental change (Tebabal&Kahssay, 2011). There is a shift from teacher centered to learner centered approaches in an attempt to achieve the objectives of secondary school education and improving students' motivation in physics. Teaching is only meaningful if learning takes place. Hence, modern teaching approaches need to focus on the learner. Learner-centered approach is an instructional process, in which the learners are kept at the center of the learning process and they share much responsibility while the instructor helps them to create an environment in which students can make connections of points (Gengle, Abel & Mohammed, 2017). The focus of learner-centered approaches are the students and the teacher act as a guide. Learner-centered teaching allows the students to actively participate in the decision-making process about what to learn, how to learn and how much to be learned (Abdurrahaman, 2010). Vasiliki, Panagiota, and Maria (2016) asserted that teachers should select and apply teaching approaches that are compatible with the needs, interests and the abilities of the learner. For effective and successful teaching to take place, the students need to be engaged with activities. According to Khan (2017), the teacher is not the sole source of knowledge; therefore, it is important that the teachers see the students capable of contributing to own learning. An increasing amount of research points out that the interactive process between individual student and the teacher is very important in determining the nature and quality of learning and development that result from instruction (Ayeni, 2011). Teaching approaches employed by teachers in the course of teaching and learning of physics should therefore be interactive so as to create an environment that encourages students to interact with materials and construct meaningful knowledge that may enhance students' motivation to learn.

According to Arimba (2012), teaching approach has an effect on affective domain such as student motivation. Motivation is the potent force in the teaching and learning process which makes students strong, active, involved in activities and responsibilities, and determined (Saki &Nadari, 2018). The power of motivation in education is the impetus, drive, energy, tendency, direction, and persistence to achieve academically (Saki &Nadari, 2018; Sikhwari, 2014). Students have distinctive goals to attain and students take different efforts to accomplish educational objectives. Different orientations drive students' motivation for realizing aims (Al-Dhamit&Kreishan, 2016; Saki &Nadari, 2018). Motivation is mixed at the early developmental stages of children. Biologically, children have an inherent learning motive and interact with the environment (Saki &Nadari, 2018). Saki and Nadari (2018) noted that children's motivation gets stronger in the process of growth. Parents, teachers, and the community play a role in guiding children' motivation for learning a task by persistence, orientation, prioritizing, and forming behaviors conducive for studying (Saki &Nadari, 2018). Despite enriching teaching settings and the genetics of intelligence, without motivation, children's academic performance cannot be achieved.

Learning motivation is associated with being curious, and wanting to challenge and master content (Chyung, Moll & Berg, 2010). As a motivational factor, it is believed to be an important element of self-regulated learning and associated with deep learning in students leading to higher levels of student success (Yukselturk&Bulut, 2007). Students also are more likely to be aware of the complexities, inconsistencies, and unexpected possibilities associated with what they learn, develop more positive attitudes about what they learn, and be more willing to use what they learn in the future (Kapp, 2012). Motivation is a key determinant in student success across a wide array of disciplines (Kusurkar*et al.,* 2011). Since motivation appears to be directly linked to success, determining what motivates students is of great interest in education. Motivation is generally divided into two categories: intrinsic motivation and extrinsic motivation.

According to Wenze*et al*., (2019), intrinsic motivation stems from one's desire to perform a task for its inherent satisfaction, whereas extrinsic motivation is defined as performing a task due to an external control such as achieving a reward or avoiding a negative consequence. Among the studies that have been performed regarding motivation and performance in students, there is clear evidence identifying the necessity of motivation (Kusurkar*et al*., 2011). Among the gathered motivating factors, both intrinsic and extrinsic motivators influence students' learning (Lin & Wong, 2014; Sanmugam*et al*., 2016; Waheed*et al*., 2016). While it is clear that many intrinsic and extrinsic factors motivate students' success, it is of interest to identify the particular methods by which success is attained. One of the major methods by which motivation promotes students' success is by influencing students' study habits. It has been shown that highly motivated students spent greater amounts of time studying (Ludeke& Zuniga, 2017; Alzahrani*et al*., 2018). According to (Kusurka*et al.,*2011; Lim & Chapman, 2015; Sockalingam*et al.,* 2016) highly motivated students also practice reflection in learning which is an essential skill for learners to develop in order to practice a deeper approach to learning.

Motivation affects student learning and plays an important role in directing behavior towards a certain goal, increasing the effort and energy towards a goal, increasing the initiative and perseverance of an activity, and improves individual performance (Ormrod, 2000). Motivation is the key factor in keeping students in their learning process and have been found to be the most significant factor that influences academic success (Pintrich&Maehr, 2004). Self-motivation is essential to generate the potential for excellence and is inter-related with the spirit and desire to succeed as well as having a strong impact on one's success and achievement (Singh *et al*., 2002). Students who have high or strong motivation have been found to possess a more positive attitude towards Physics and are willing to learn the subject more effectively (Pintrich&Maehr, 2004, Ali, Ismail &Sedef, 2010). Therefore, understanding motivation is necessary in designing an instructional process that can motivate students towards a subject. In the field of science education, motivation is recognized as an important construct (Glynn *et al.,* 2007, Sarıbıyık, Altunçekiç&Yaman, 2004). According to Cavas (2011), motivation plays a significant role in learning that caused considerable impact on students' science achievement (Pintrich&Schunk, 2002, Othman, Wong, Shah, Christirani&Nabilah, 2009). Deprived of motivation, even the most gifted learners may not be able to succeed in accomplishing educational as well as life goals (Vatankhah&Tanbakooei, 2014). Existing literature supports a positive correlation between motivation and academic performance (Adegboyega, 2018; Paulino, Sa, & da Silva, 2016). According to Muola (2010), students who are motivated to learn are keen to engage in activities they believe will help them learn, such as attending carefully to the instruction, taking notes to facilitate subsequent studying, checking their level of understanding and asking for help when they do not understand the material. Researchers (Kamisah, Zanaton& Lilia, 2007) found that motivation as a predictor to students' involvement in science.

Many studies have revealed that student's motivation towards science learning decline throughout their years at school (Galton, 2009; Osborne, Simon & Collins, 2003). Motivation interacts with cognition to influence learning (Taasoobshirazi& Sinatra, 2011).

Students with high motivation keen to learn more and new things (Brophy, 2010; Saleh, 2014, Gagne &Deci, 2005, Sarıbıyık, Altunçekiç & Yaman, 2004). The motivation of students is one of the paramount factors that affect the learning process. If teachers give suitable feedback to the students, initiate students' interest, make them understand the importance of the content, and have students share ideas in classroom discussions, then the students' motivation increases as well as achievement (Glynn *et al.,* 2007; Smith & Schmidt, 2012). Student's motivation towards science learning may be affected by various factors. When learning physics, it is found that the lack of seriousness of most students in learning physics is that students do not play an active role in the class and still depend on the teacher (Sari &Sunarno, 2018). Most students' do not have right learning motivation and a positive attitude in learning physics (Prima, Putri, &Rustaman, 2018). Thus, a teaching approach that a teacher adopts may motivate students to learn and therefore affect their achievement in physics. Research gives strong indication of different factors that seem to influence positively the motivation of students to learn (Ozbas 2016; Nodia 2010 &Cavas, 2011). One of the factors is teaching approaches. Studies on effect of teaching approaches have been carried out in an attempt to curb the low motivation of students towards physics (Otieno, 2015; Wachanga, 2002; Wambugu, 2006; Njoroge*et al.,* 2014). A study by Keter, Barchok&Ng'eno (2014) investigated the impact of cooperative mastery learning approach by gender in Bomet County. A study by Keter (2013) on effects of cooperative mastery learning approach on secondary school students' motivation and achievement in chemistry in bomet county.

Keter (2018) investigated the effects of computer based cooperative mastery learning on Keniyan secondary school students. Motivation affects students' achievement (Shihusa&Kerora 2009).

2. Statement of the Problem

The impact of cooperative mastery learning approach on the motivational level of students for Kirinyaga County, Kenya.

3. Objective of the Study

The objective of the study is to examine whether there is a difference in motivation in physics between students taught using co-operative mastery learning approach and conventional teaching approach.

4. Hypotheses

- .H_{01}: Motivation level does not change with co-operative mastery learning approach or conventional teaching approach for students studying physics.

5. Methodology

The study used Quasi-experimental design (Nachmias&Nachmias, 2004). It allowed the researcher to exert complete control over the variables and to ensure that the pretest did not influence the results, (Shutttleworth, 2009). Solomon four-group design involves four groups. The Experimental group E1, was pretested (O1), receive treatment (X) and post tested (O2). Control group C1, was pretested (O3), no treatment and received posttest (O4). Experimental group E2, received treatment (X) and posttest (O5). Control group C2, only received posttest (O6). C1 and C2 was taught using conventional teaching approach while E1 and E2 was taught using cooperative mastery learning approach. Posttest O5 and O6 eliminated the interaction between testing and treatment.

The units for sampling were secondary schools rather than individual students because secondary schools operate as intact groups (Borg & Gall, 1996). The republic of Kenya consists of 47 counties. Kirinyagacounty was purposively selected from the list of counties that are performing poorly in physics. Kirinyagacounty consists of 160 single gender and mixed schools. Purposive sampling technique was used to select the schools with the desired characteristics from the list of mixed schools in Kirinyaga County. The desired features for the schools that qualified for the study was class size of more than forty-five form two physics students and mixed Sub- County secondary school. The sub county schools were selected because nearly all schools in the county fall into the sub county schools' category (over 68% of schools in the county) thus, by picking the sub county schools, the findings were more generalizable to the whole county. A total of four schools were drawn using simple random sampling from a list of mixed sub county schools. The assignment of selected schools to either experimental or control group was done by simple random sampling. The stream that was considered for analysis where the sampled school had multiple streams was selected using simple random sampling. The ministry of education science and technology recommends 45 students per class. The schools that were sampled were assumed to have an enrolment of 45 students per class. Frankel and Wallen (2000) recommend at least 30 cases per group for experimental research. The researcher picked four schools randomly.

The students' motivation questionnaire was used to measure student's motivation towards physics. Motivation towards physics was measured along four dimensions: perceived confidence had seven items, perceived choice had seven items, perceived interest/enjoyment had eight items and perceived pressure/tension had five. The Questionnaires was made up of 27 close-ended question items developed utilizing Five-point Likert scales extending from strongly Agree with score of 5 points and strongly disagree with a score of 1 point where the students were required to state whether strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), or strongly disagree (SD). The higher number of the scale represents an agreement with the item on the scale. In this study a perception of the student was taken to be a measure along the continuum from the strongly negative to a strongly positive effect.

6. Results and Discussion

The experimental group (E1) and control group (C1) were exposed to SMQ pre-test before the start of the treatment to ascertain whether the students selected to participate in the study had comparable characteristics before the study. The Mann-Whitney test was used to analyze whether there were significant differences between mean ranks in SMQ of experimental group (E1) and the control group (C1). The results are as shown in the Table 1.

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Sig.
Experimental Group 1	45	43.52	1958.50	923.500	1958.500	0.719	0.472
Control Group 1	45	47.48	2136.50				
Total	90						

Table 1: Mann-Whitney Test Results of the Pre-test of Student Motivation on Experimental Group 1 and Control Group 1

The findings show that the mean ranks were 43.52 for Experimental group (E1) and 47.48 for control group (C1). The Mann-Whitney Test results in Table 1 reveals that pre-test of SMQ mean ranks of both groups E1 and C1 were not significantly different at 0.05 alpha level ($U=923.5$, $p=0.472$, $p > 0.05$). Thus, experimental group (E1) and control group (C1) were similar on SMQ measure, implying that the level of motivation prior to administration of the intervention of the two groups were similar; that is the groups had comparable characteristics before administration of treatment. Thus, the two groups contained learners with similar characteristics hence suitable for the study.

The hypothesis of the study sought to find out whether there was significant difference in the level of motivation to learn physics between students who are taught using cooperative mastery learning approach and those who were taught using conventional teaching approach. Motivation was taken to mean the effort which the learners put into learning as a result of their need or desire to learn. In this study motivation to learn was taken to mean students effort put in as a result of their desire to learn physics as a subject. Operationally, motivation to learn physics was defined as a composite variable derived from mean ranks of students' responses on 27 items measuring the construct on a five point-Likert scale, that is Strongly Disagree (SD)=1; Disagree (D)=2; Undecided (U)=3; Agree (A)=4 and Strongly Agree (SA)=5. All the four groups took the SMQ post-test. To analyze whether student differ in motivation when taught using cooperative mastery learning approach and conventional teaching approach, Mann Whitney U test was run. The results are as shown in Table 2.

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Sig.
Experimental Group 1	45	55.54	2499.50	560.500	1595.500	3.649	0.000
Control Group 1	45	35.46	1595.50				
Total	90						

Table 2: Mann-Whitney Test Results of the Posttest of Student Motivation on Experimental Group 1 and Control Group 1

The findings in Table 2 shows that the mean ranks were 55.54 for Experimental group (E1) and 35.46 for control group (C1). The results shows that the level of motivation of the students in experimental groupE1 and control group C1 differed after the intervention. The experimental group E1 that was taught using cooperative mastery learning approach had higher mean rank than control group C1 that was taught using conventional teaching approach. The Mann-Whitney test results in Table 2 reveals that post-test of SMQ mean ranks of both groups E1 and C1 were significantly different at 0.05 alpha level ($U=560.5$, $p=0.000$, $p < 0.05$) indicating that there is a statistically significant difference in motivation between students taught using cooperative mastery learning approach and conventional teaching approach. To analyze whether student differ in motivation when taught using cooperative mastery learning approach and conventional teaching approach, in experimental group 2 and control group 2 Mann Whitney U test was run. The results are as shown in Table 3.

Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Wilcoxon W	Z	Sig.
Experimental Group 2	45	54.41	2448.50	611.500	1646.500	3.237	0.001
Control Group 2	45	36.59	1646.50				
Total	90						

Table 3: Mann-Whitney Test Results of the Posttest of Student Motivation on Experimental Group 2 and Control Group 2

The results of Table 3 shows that mean ranks were 54.41 for Experimental group (E2) and 36.59 for control group (C2). The results shows that there was a great difference in the level of motivation of students in experimental group E2 and control group C2 after the intervention. The experimental group E2 that was taught using cooperative mastery learning approach had higher mean rank than control group C2that was taught using conventional teaching approach. The

Mann-Whitney test results in Table 3 indicates that post-test of SMQ mean ranks of both groups E2 and C2 were significantly different at 0.05 alpha level (U=611.5, p=0.001, p < 0.05) revealing that there is statistically significance difference in motivation in physics between students taught using cooperative mastery learning approach and conventional teaching approach. Table 4 shows the independent samples for Kruskal-Wallis test summary of the post test for the four groups.

Total N	Kruskal-Wallis H	df	Sig.
180	26.297[a]	3	0.000

Table 4: Independent Samples Kruskal-Wallis Test Summary of the Post Test for the Four Groups

The findings in Table 4 shows results of a Kruskal-Wallis test. A Kruskal-Wallis test showed that there was a statistically significant difference in the level of motivation in physics between students taught using co-operative mastery learning approach and those taught using Conventional teaching approach, H (3) =26.297, p=0.000. Therefore, the hypothesis was rejected, which stated that there is no statistically significant difference in the level of motivation to learn physics between students who are taught using cooperative mastery learning approach and those who are taught using conventional teaching approach. The results suggest that cooperative mastery learning approach as an intervention had positive effect on student motivation on experimental groups E1 and E2. The p-value being less than 0.05, a post hoc test needed to be conducted to determine where difference existed. Post-hoc test using Bonferroni adjusted alpha levels was used to compare all pairs of the groups. The results are shown in Table 5.

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Control Group 1-Control Group 2	-17.056	10.983	-1.553	`0.120	0.723
Control Group 1-Experimental Group 1	39.500	10.983	3.596	0.000	0.002
Control Group 1-Experimental Group 2	51.533	10.983	4.692	0.000	0.000
Control Group 2-Experimental Group 1	22.444	10.983	2.044	0.041	0.046
Control Group 2-Experimental Group 2	34.478	10.983	3.139	0.002	0.010
Experimental Group 1-Experimental Group 2	-12.033	10.983	-1.096	0.273	1.000

Table 5: Post Hoc Comparisons of Posttest of SMQ Means for the Four Groups

The findings in Table 5 shows the pairwise comparisons of groups. Post hoc analysis using a Bonferroni adjustment alpha level of 0.05 were used to compare all the pairs of groups. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. The finding shows that the groups C1 and C2, E1 and E2 were not significant (p= 0.723, p =1.000) revealing that there was no significance difference in students' motivation in physics in the control groups (C1and C 2) and also experimental groups (E1 and E2). The findings show a significance difference in groups C1 and E2, C1 and E1, C2 and E2, C2 and E1 (p=0.000, p= 0.020, p=0.010, p=0.046) indicating that cooperative mastery learning approach had a positive influence on students' motivation for learning physics. The results of the study in-line with Keter (2018) and Keter (2013) regarding the effects of cooperative mastery learning on secondary school students' motivation and achievement. The findings of the study are in line with Keter*et al.* (2014) and Arimba (2012), that indicated that teaching approach has an effect on affective domain such as student motivation.

7. Conclusions

The study has successfully shown the difference in motivation level in physics for using cooperative mastery learning and conventional teaching approach. Students with cooperative mastery learning approach secure high rank in motivational scales. This study clearly indicates that cooperative mastery learning approach is more effective than the conventional teaching approach for physics.

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