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Assessment to Determine Mathematics Teachers Influence On Learners' Self-Efficacy and Performance in the Topic of Probability: A Case of Selected Secondary Schools in Meru County, Kenya.

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Abstract
Background: *Though Mathematics is an important and major subject taught in schools, the performance in the subject has been very poor. Learner's Self-efficacy on the topic of probability may determine their ability to tackle questions. There is insufficient empirical data on the influence of learners' self-efficacy on academic performance in the topic of Probability in Meru County. This study therefore sought to establish the relationship between teacher's influence on learner's self-efficacy and performance in the topic of Probability. in teaching.*
Material and methods*: Data collection instruments were survey questionnaire and an interview guide. A pilot study was conducted to check on validity and reliability of the instruments. Data analysis utilized statistical measures of central tendency and dispersion. Simple regression analysis was used to determine the statistical relationship (y=a+bx) between self-efficacy and performance in the topic of Probability. The study was conducted in Meru County and targeted form four students and Mathematics teachers. Stratified sampling was used to select 5 secondary school Mathematics teachers and a sample of 1216 randomly selected learners from their classrooms. Further, Pearson correlation coefficient (r) was computed to determine the extent of the relationship between learners' self-efficacy and performance in Probability.*
Result: *The findings of this study will be crucial in helping educational stakeholders to develop suitable pedagogies to address learners' weaknesses and challenges, and provide strategies for improving learners' self-efficacy in Mathematics and other subjects as well.*
Conclusion: *This relationship was considered to be a perfect positive relationship with a value of +1%. The study hypotheses were tested using Chi-Square and t test. It was anticipated that leaners' self-efficacy was low, and correlated to the dismal performance in the topic. SPSS and Microsoft Excel were used to perform the data analysis.*
Key Words: Teacher, Probability, Self-Efficacy

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I. Introduction

Mathematics and languages are major subjects in secondary schools and are compulsory in Kenya (Kihumba, 2011). Mathematics is applicable in a wide variety of disciplines including engineering, economics, administration, banking and law, among others, are founded on mathematical applications. Thus it is a major field of learning which enables learners to empirically employ the concepts in their day-to-day activities. Mathematics is classified into theoretical and practical mathematics; practical mathematics includes topics like Trigonometry and Probability. Secondary education is the phase in the education continuum responsible for the development of young people in preparation for their future roles (Stronge, 2013). This level facilitates the

development of learners in preparation for tertiary level and other levels of education. It is also at the secondary level of education where values, norms, beliefs and attitudes which were formed at primary school level are firmly ingrained alongside acquisition and mastery of more knowledge and skills (Biggs, 2017).

Secondary level of education is the stage in the education process that helps in developing young people in preparation for their future roles (Arup & Aditi, 2016). The individual values, norms, beliefs and attitudes formed at primary school level are firmly ingrained alongside the acquisition of more knowledge and skills hence able to fit in the society. Secondary level facilitates the development of learners' abilities to prepare them to gain skills necessary to perform in the job market. Secondary school education is an essential bridge to tertiary and vocational education where most countries in the world start their professional specialization. National performance in Mathematics, especially in the topic of Probability in Kenya has been deteriorating over the last 10 years (Government of Kenya, 2017). The performance in Meru County in mathematics dropped from 28.3%in2016 to 25.8 % in 2017 (Meru County Education Office, 2017). One of the factors that affect performance is self-efficacy, which is an attribute that predicts an individual's learning outcomes in specific study areas more comprehensively than skills alone (Alexander, Nuchols, Bloom, & Lee, 2010). Even when the fluctuations in performance in Probability can be explained by fluctuations in student's self-efficacy on the topic, it is not clear how and to what extent self-efficacy on this topic affects students' performance in Meru County.

This study investigated self-efficacy and its effects on performance in Mathematics in the topic of Probability in Meru County by first measuring, how Mathematics teachers' influence learners' self-efficacy and then determined the relationship between learners' self-efficacy and performance. The study sought determine how Mathematics teachers influence learners' self-efficacy in the topic of Probability in Meru County secondary schools

II. Material and Methods

Research Design

This descriptive research adopted both qualitative and quantitative strategies to establish the impact of learners' self-efficacy on performance. Kothari (2004) explains that a descriptive research is one that aims at describing the characteristics of a population. The study thus determined the self-efficacy of the learners and how this correlated to performance in the topic of Probability. The design was crucial in helping to compare the various responses, check their errors and objectively select those which were more significant in helping draw several inferences on learners' SE and performance. Flexibility of the design to employ various scientific approaches towards analyzing results ensured that the results indicated here could be more reliable and valid.

Target Population

The study targeted all Mathematics teachers and learners from the 211 public secondary schools in Meru County. The population of public secondary schools' learners and teachers in Meru County is 54,682 and 4,927 respectively (CIDP, Meru). However, this study only targeted 12,491 form four learners and 456 Mathematics teachers in public secondary schools.

Sample Size

An optimum sample is one which satisfies the essentials of efficiency, representatives, reliability and flexibility (Kothari, 2014). Thus the required sample size for the schools was 152 schools out of the 211 public secondary schools as depicted in table 3.2 Sampling of schools will follow Sub-County geo-political classification such that a proportionate number of school in each cluster will be selected from each sub county.

Sample Size Calculation

Data screening was done by scrutinizing the completed questionnaires and face validity of the responses in an effort to identify and minimize, as far as possible errors, incompleteness, misclassification and gaps in the information obtained from the respondents. This helped in providing reliable and dependable inferences from the data collected to give valid findings, conclusions and recommendations. Students' demographic data was computed and represented on frequency distribution tables. The Likert scale items were used to estimate the learners SE. The mean and standard deviation for the SE was also computed against the student's performance. The demographics of teachers were also presented using frequency distribution tables. The teacher's factors that influence SE in Probability such as their persuasion, mastery of content, vicarious nature and psychological status were coded, categorized and analyzed using simple regression analysis to obtain the regression coefficients. Correlational analysis was conducted to see if SE is determined by family background, peers and the learners' psychological mind set. Pearson's moment correlation (r) was used to establish the relationship between the learners' self-efficacy and performance in the topic of Probability. Data was analyzed using the (SPSS) V 20.0 and Microsoft Excel 2007 software.

Procedure Methodology

Convenient sampling method was used to select the study area (Meru County) as a representation of other counties. It simplified the data collection process for the researcher in terms of coverage and cost (Kombo & Tromp, 2006). Thus the researchers' familiarity, security, and accessibility to the respondents justified the use of convenient sampling technique. Cluster sampling was used to select the schools based on category of national, extra-county, county and sub-county schools. The method was suitable because the data from the specific aspects of study elements like indicators of SE, determinants of SE and influence of the teachers on SE and performance were collected separately and the results were compared with those of other elements as is intimated by Sharma (2006).

III. Results

Influence of Mathematics Teachers on Learners in the Topic of Probability

Table 1 below shows the representation of responses with regard to how Mathematics teachers influence learners' SE in the topic of probability in Meru County secondary schools. Data from questionnaire, interviews and FGDs research was considered for it largely contained views on how teachers impact SE on learners in Probability.

Table 1: Influence of Mathematics Teachers on Learners' SE

Teacher Aspect/factor	Scale (x)	Influences (y_1)	No Influence (y_2)
Teaching Methodology	7	1218 (99.7%)	0 (0.0%)
Mastery of content	6	1207 (98.9%)	4 (0.3%)
Class attendance	5	1201 (98.0%)	6 (0.5%)
Psychological aspects	4	1197 (98.3%)	7 (0.6%)
Behavioral aspects	3	1185 (97.0%)	8 (0.7%)
Teacher motivation/persuasion, rewards	2	1211 (99.2%)	0 (0.0%)
Socialization with students	1	1165 (95.4%)	5 (0.4%)
Total (N=1221)			

Source (Author, 2019)

This study established that Mathematics teachers influenced their learners' SE in the topic of Probability in Meru County. The figures in table 4.6 (above) show various teacher aspects/factors that influence their learners' SE either negatively or positively. Teaching methodology, mastery of content and class attendance had a representation of 99.7%, 98.9% and 98.0% respectively. Psychological aspects like logical flow of ideas, mindset, perception etc. and behavioral aspects like personal conduct and communication skills accounted to 98.3% and 97.0% respectively. Teachers' motivational efforts to learners through persuasion, rewards and extra teaching time were represented by 99.2% of the respondents. Respondents also viewed that teacher's socialization with their learners had a highly significance on their SE in Probability with a representation of 95.4%. On average this study shows that 98.1% of the total respondents believe that a teacher influences learners' SE in Mathematics and particularly the topic of Probability. There were insignificant respondents who did not see any connection between a teacher and SE in Probability. The average of this amounts to 0.3% revealing that a teacher is an important element in determining a learner's SE in Probability as intimated by Benson & Whiteworth (2014) and Burt (2010) that the dedication of an effective teacher equips the learner with a range of knowledge, beliefs, personality and cultural variables that are an outcome of their relationship (Dekker & Jolles, 2015).

The regression line y=a+bx (where y is the influence, a is the intercept, b the slope and x is the teacher aspect/factor) was established to be y=1173.9+5.6x while the Pearson's moment correlation coefficient (r) was+0.72 which is also a strong positive correlation. This implies that there exists a positive link between the Mathematics teachers' aspects on their learners' SE in Probability. On the other hand, the regression line indicating that the teachers' aspects do not influence learners' SE in Probability was also established to be y=5.57-0.3x and (r) was -0.2 (a weak negative correlation). Comparing the value of (r) =+0.72 and (r) =-0.2 as the former then there is a link between Mathematics teachers' aspects/factors and learners' SE in the topic of probability in Meru County. These results affirm Coloma (2015), Casti (2016), Bray & McClaskey (2015) and Gorroochurn (2012) studies that established that different teacher' attributes affects the learners' SE in a given subject. These aspects include but not limited to the skills possessed by the teacher, teaching methodology/style, motivational aspects, behavioral aspects, psychological aspects, teacher-students' interactions and individual strengths and weaknesses exhibited by a particular teacher. The results therefore confirm that highly motivated teachers highly influence the learners' SE before, during and after the teaching/learning process.

4.3.2: T test on Hypothesis two (H_{02}): Mathematics teachers do not influence learner's self-efficacy in the topic of probability in Meru County Secondary schools.

Table 4.7: Test Statistic for Teachers' Influence on Self-efficacy in Probability

Teacher Aspect	Influences (1)	Doesn't Influence (2)
Mean	1173.89	4.29
Variance (s^2)	319.57	10.23
Standard deviation (s)	17.88	3.20

Source (Author, 2020)

A confidence level of 95% was used. Given this level, the alpha/significance value (α) = 1- 95= 5%. This is an equivalence of 0.05.

$$t = \frac{(\bar{x}1-\bar{x}2)-d}{\sqrt{\frac{s^2 1}{n1} + \frac{s^2 2}{n2}}}$$

t={1169.6/√(0.01+ 0.27)}=2206.79. The critical value of t was 1.943

Therefore, since the critical value of t is less than the absolute value of t then the null hypotheses (H_{02}) was rejected in this study thus the alternative hypothesis that Mathematics teachers influence Learners' SE in the topic of Probability in Meru County holds. Thus the Pearson's moment correlation coefficient (+0.77) and the t test statistic value of +2206.79 is an indicator that Mathematics teachers do influence their learners' SE in the topic of Probability as intimated by Busato *et al.,* (202020), Gipps (2015) and Drivet (2021) that a teacher's personality, behavior and exceptional knowledge on the subject matter are essential in creating confidence in learners which in turn influences their attitudes towards learning in school.

IV. Conclusions

Teachers influence learners SE in Probability through their style of teaching, language used, skills they possess.

Recommendations

Teachers should incorporate practical teaching approach in addition to theoretical teaching to improve comprehension of Probability concepts.

Recommendation for further study

Further study to be done on whether the national curriculum should be revised so that the topic of Probability is split in to two so that it is taught in phases (form two and three) in secondary schools.

References

[3]. Alexander, J., Nuchols, B., Bloom, J., & Lee, S. (2010). Organizational demography and turnover: An examination of multiform and nonlinear heterogeneity. *Human Relations*, *48*(12), 1455- 1480.doi: 10.1177/001872679504801204

[4]. Benson, A. D., & Whitworth, A. (2014). *Research on course management systems in higher education*. North Carolina: Information Age Publishing.

[5]. Bray, B., &McClaskey, K. (2015). *Make learning personal: The what, who, where, and why*. Indiana: Corwin.

[6]. Burt, A. (April 01, 2010). Perspective: Sex, Recombination, And The Efficacy Of Selection & Mdash;Was Weismann Right?. *Evolution, 54*, 2, 337-351.

[7]. Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (January 01, 2010). Intellectual ability, learning style, personality, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences*, *29*, 6, 1057-1068.

[8]. Casti, J. L., &Karlqvist, A. (2016).*Complexity, language, and life: Mathematical approaches*. Berlin: Springer-Verlag.

[9]. Coloma, R. S. (2015). *Postcolonial challenges in education*. New York: Peter Lang.

[10]. Dewey, J. (2009). *Democracy and education. A handbook on motivational learning in school*. United States: Prentice Hall.

[11]. Gibbs, C. (2015). *Teachers' cultural self-efficacy: Teaching and learning in multicultural settings.* Retrieved from https://www.researchgate.net/publication/290546048_Teachers' cultural self-efficacy Teaching and learning in multicultural settings

[12]. Gipps, C. V., Murphy, P. F., & ProQuest (Firm). (2014). *Equity in the Classroom: Towards Effective Pedagogy for Girls and Boys*. London: Falmer Press.

[13]. Gorroochurn, P. (2012). *Classic problems of probability .Hoboken*: New Jersey: Wiley and Sons.

[14]. Government of Kenya (2017).*Ministry of education report on the performance of secondary school learners in sciences and mathematics*. Nairobi: Government Printers.

[15]. Khurram, S., & Sajida, N. (2017).Impact of teacher self-efficacy on secondary school students' academic achievement. *Journal of Education and Educational Development*, *4*(1), 48-72. doi: 10.22555/joeed.v4i1.1050

[16]. Kihumba, K. (2011). *Crucial education reports*. Nairobi, Kenya: Teachers Image Education.

[17]. Kombo, D.K.,& Tromp, D.L.A. (2006).*Proposal and thesis writing. An introduction*. Nairobi: Pauline's Publication Africa.

[18]. Kothari C. R., (2004). *Research methodology: Methods and techniques* (2nd Ed.). New Delhi: New Age International limited.

[19]. Sharma, S. (2010).*Quantitative techniques*. Jaipur, India: ABD Publishers.