RELATIONSHIP BETWEEN PERFORMANCE IN SECONDARY SCHOOL MATHEMATICS AND DIPLOMA'S STRUCTURED PROGRAMMING UNIT IN TECHNICAL INSTITUTES WITHIN MERU COUNTY, KENYA

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ABSTRACT

The poor performance in structured programming unit in Kenya national examinations council (KNEC) examination for diploma in Information Communication Technology (DICT) programme by students in module one has caused a great outcry in most of the Technical Institutes in Kenya. The purpose of this study was to determine the relationship between the students' performance in secondary school mathematics and diploma's structured programming unit in technical institutes within Meru County, Kenya. The target population composed of all the 118 students that had sat for the KNEC examination in structured programming unit from the year 2012 to 2015 in Meru, Kiirua and Nkabune technical institutes, and the six lecturers that had taught them in the structured programming unit. The study established that there is no significant relationship between the students' performance in secondary school mathematics and diploma's structured programming unit in technical institutes within Meru County, Kenya ($r = 0.098$, $p = 0.291$, $\alpha = 0.05$, $R^2 = 0.010$, adjusted $R^2 = 0.001$, $f = 1.124$).

Key Words: DICT, structured programming, KCSE, mathematics, performance

1.1 Background of the Study

Diploma in Information Communication Technology (DICT) is one of the most recent computer programmes that were introduced by Kenya National Examinations Council (KNEC) in the year 2010. It is classified as a TVET programme that was designed to equip the trainees with knowledge, skills and attitudes to perform system operations, system analysis, software design and development, besides, performing network systems and support duties. It is divided into three modules and takes a period of three years for one to graduate. The first module is composed of seven key units which are structured programming, introduction to ICT and ethics, computer application 1, communication skills, computational mathematics, operating systems and entrepreneurship education (KIE, 2008).

Therefore, according to KNEC (2015) regulations for this programme, a student must pass in all the seven units for module one before being allowed to graduate to the next module, which is module two. However, according to the report presented to the examiners by Gichara, the poor performance in structured programming (SP) unit had led to various impacts in DICT programme since the year 2011. According to KIE (2008), structured programming is the only computer programming unit in the DICT syllabus for module one. It requires the students to be able to apply various analytical and logical thinking skills, so that they can be able to develop a set of computer instructions that can be used to guide the computer on what to do and tell it how to do it. The Structured Programming lecturers associate the analytical and logical thinking skills required by students to pursue structured programming unit to those expected to be acquired by students in secondary mathematics. They argue that if a student had problems in solving mathematical problems from secondary school, there is no way such a student can be able to apply the same mathematical principles to solve mathematical problems found in structured programming unit, and more so, because

this is the first computer programming unit that such a student encounters in the DICT course immediately he or she joins the college.

This kind of a scenario was also witnessed in various universities and tertiary institutions in America in 1990s. White and Sivitanides (2000), carried out a study of several tertiary institutions and universities in America concerning the relationship between success in mathematics and certain computer programming units by the first year students. From the findings, it was evident that the students who performed well in freshman level mathematics units possessed the cognitive characteristics required to perform equally well in sophomore level computer programming classes. As a result, many tertiary institutions in America made mathematics a prerequisite for most of the computer courses (White & Sivitanides, 2000).

However, in Kenya, the admission criteria in terms of specific subject scores in KCSE varies for various technical, business, engineering or science courses depending on the type of institution one wants to join, the number of vacancies available, and the overall students' performance in KCSE. As a result of this, many of the computer courses offered in TTIs such as DICT do not have mathematics included by KNEC or KICD as a pre-requisite for admission, yet mathematics grade is considered for those students who want to pursue ICT (computer) programmes at the University level (KUCCPS, 2015). It is for this reason therefore, that the structured programming lecturers in TTIs have persistently maintained that, not unless KCSE mathematics is included as a pre-requisite to those students being enrolled in DICT, success of students in structured programming examinations will never be guaranteed. However, this persistence by the lecturers has been seriously opposed by the TTIs managements who have continuously maintained that, if performance in KCSE mathematics dictates students' performance in structured programming unit, then, KICD should have included mathematics in the entry requirements for DICT course, which is not the case today.

1.2 Problem Statement

Whenever poor results are reported in structured programming unit in the KNEC examination for DICT module one, the lecturers justify this performance based on the student's performance in KCSE Mathematics. They explain that, there is a relationship between the students' performance in KCSE Mathematics and their respective performance in structured programming unit. Therefore, according to the lecturers, if a student had scored any grade below D+ in KCSE Mathematics, he or she is also expected to fail in Structured Programming unit in the KNEC examination by scoring a Referral (7R or 8R) grade.

1.3 Objective of the Study

To establish the relationship between the students' performance in KCSE mathematics and their respective performance in Structured Programming unit in DICT module one KNEC examination

1.4 Research Hypothesis

There is no significant relationship between the students' performance in KCSE Mathematics and their respective performance in Structured Programming unit in DICT module one KNEC examination

2.1 Literature Review

2.1.1 Measurement of Performance

According to Cozby (2001), measurement is the process by which the attributes or dimensions of something, such as, intelligence, are determined and quantified. It refers to the set of procedures and the principles used in educational assessments. Some of the basic principles of measurement in educational assessment include raw scores, percentile ranks, derived scores and standard scores. Therefore, measurement is concerned with quantification

whereby numbers are assigned according to observable operations and explicit procedures or rules to measure a construct.

According to Pascarella and Terenzini (1998), academic performance is affected by a host of factors. They note that there are several factors that have the potential to influence students' achievement in tertiary courses. These factors include: student ability, motivation, quality of secondary education obtained, age and gender, psychological characteristics, social and institutional factors, poor attendance to lectures, poor content delivery in tutorials and laboratories, financial constraints, inadequate internet facilities, pressure of work due to bulky courses, lack of latest reference materials, inadequate laboratory facilities and overcrowded lecture rooms. The same study has also clearly shown that there are some positive factors enhancing academic performance of mature-age students in science and technical education. These include: students' group discussions, participation in research, families and peer support, lecturers' and tutors' encouragement, positive feedback on work done and motivation from other students who have succeeded in the sciences and technology (Pascarella & Terenzini, 1998).

Therefore, the aim of theory and practice in educational measurement is typically to measure abilities and levels of attainment by students in areas such as reading, writing, mathematics, science and so forth. Traditionally, attention is focused on whether assessments are reliable and valid. In practice, educational measurement is largely concerned with the analysis of data from educational assessments or tests. Typically, this means using total scores on assessments, whether they are multiple choice or open-ended and marked using marking rubrics or guides (Lester, Inman & Bishop, 2014). Most of the tertiary institutions of learning and examination bodies make use of criterion-referenced measurement system, whereby a student's performance is assigned a grade based on the preset guidelines on performance. A student is thus said to have passed or failed depending on the extent of his/her score's

deviation from the pass-mark or criterion (Lester, Inman & Bishop, 2014).Academic success is most commonly measured using grades and Grade Point Average.

2.1.2 Selection of Students for Tertiary Institutions

There are various types of tertiary institutions in Kenya also referred to as post-secondary learning institutions. These include: public and private universities and their constituent colleges, teacher training colleges, technical training institutes, vocational schools and colleges, trade schools, polytechnics, research institutes, institutes of science and technology, and proprietary schools (Eshiwani, 1993).

According to CUE (2017), there are currently 72 accredited universities in Kenya. These are composed of 31 public chartered universities, 5 public university constituent colleges, 18 private chartered universities, 5 private university constituent colleges, and 13 Institutions with letter of interim authority. In addition, there are 3 categories of private universities: chartered universities – fully accredited universities, by the Commission for University Education (CUE); universities which had been offering degrees long before the establishment of the Commission for University Education; and universities authorized to operate with Letters of Interim Authority.

In addition, there are currently 591 public and private colleges registered by TVETA to offer TVET programmes. These colleges or institutions are spread across the 47 counties and they offer TVET curriculum. For any of these institutions to offer TVET programmes, it must have been registered by TVETA (TVETA, 2017). Therefore, all other tertiary institutions except universities are two- or three-year post-secondary school institutions. They award artisan and craft certificates, diplomas and higher national diplomas after successful completion of relevant courses.

KUCCPS, formally known as Joint Admission Board (JAB) is tasked to determine those students who are expected to join various Kenyan public universities and colleges under the government sponsorship scheme. This exercise is usually challenging because of the large number of qualified students compared to the very limited number of slots at various institutions and the shortage of funding from the government. Further, this is made complex by the fact that the selections are done against a predefined cluster subjects vis-à-vis the student's preferred and applied for academic programmes. Minimum requirements exist for each programme and only students having the prescribed grades in specific subjects are eligible to join that programme. Those students who do not qualify to join public universities and colleges through KUCCPS can enroll in the private universities and colleges, which mostly require students to finance their studies without much financial assistance from the government (KUCCPS, 2015).

During the admission process, priority is given to an applicant's first choice. The applicant's second to fourth choices are considered where vacancies still exist. KUCCPS makes the choice for a student in cases where vacancies which exist do not match with the student's choice. However, due to limited capacities in popular programmes, some qualifying students with the required cut–off points end up in courses that might not have been their preferred choices (Chacha, 2004). Those students, who fail to be admitted to the public university through KUCCPS, are allowed to pursue parallel degree programmes in the public universities. Such students are required to apply for their preferred degrees in universities of their own choices. On the side of admission to TTIs through KUCCPS, a student must have attained a minimum grade of C (plain) in KCSE for Diploma in technical courses. However, in most cases, most trainees in most of the tertiary institutions such as TTIs do not get admitted through KUCCPS. According to KNEC (2015), a student wishing to pursue artisan certificate course should have attained KCPE regardless of the score attained, or D – (Minus)

in KCSE or equivalent qualification approved by KNEC. Those who prefer to be enrolled for craft certificate courses should have attained a minimum grade of D (Plain) in KCSE or a pass in an artisan certificate in the relevant area.

Then those who prefer to be enrolled for Diploma should have attained a minimum of C- (Minus) in KCSE or a pass in craft certificate in the relevant area, while those who prefer to pursue higher diploma courses are required to possess a minimum of pass in Diploma in the area of specialization. In order to ensure that institutions do not admit unqualified students in pursuing various technical and business TVET programmes, KICD stipulates very clearly in the respective syllabuses, the minimum entry requirements in terms of the overall KCSE performance, that every student must in order to qualify for the training. KNEC also specifies the minimum entry requirements in terms of grades that every candidate must possess so as to be registered for the respective TVET KNEC examinations. However, KNEC and KICD do not clarify the specific subject grades that a student should possess so as to be admitted into the DICT course.

According to KIE (2008) and KNEC (2015), a trainee entering this course should have any of the following minimum requirements: either: Passed KCSE with a mean grade of C- (Minus), or Passed Craft in Certificate in Computer Studies, or any equivalent qualification as approved by KNEC. Therefore, when it comes to pursuing ICT courses in Kenya, there is a lot of market liberalization today, such that, we do not have any streamlined admission requirements that require students to have attained certain minimum entry requirements in mathematics. In addition, the decision on whether to include a certain minimum entry grade in mathematics or not, varies from one examining body to another and from one type of institution to another.

For example, mathematics is not included as a minimum entry requirement for those students joining TTIs to do DICT that is examined by KNEC. In fact, KNEC does not even consider or include mathematics amongst her criteria of admission into DICT course (KNEC, 2015).

2.1.3 Diploma in ICT

This section explains the academic progress of trainees in terms of performance in DICT Module One programme in relation to their performance in mathematics. This review is discussed under the following headings: students' performance in DICT, mathematics performance in ICT subjects, and effects of KCSE mathematics performance on DICT performance.

2.1.4 Students performance in DICT

According to the report presented to the examiners by KNEC (2010), it emerged that, unless a tremendous action is taken immediately to salvage the DICT course in TTIs in Kenya, this course was bound to become extinct due to the low performance experienced by students courtesy of their poor performance in just a single unit called Structured Programming, yet its first KNEC examination was administered in July 2010.

According to the statistics presented by the KNEC examiner, the continuous trend of poor performance in Structured Programming unit had resulted to some of the following scenarios: students prematurely terminating their studies in DICT course and dropping out of the Institutes. Other students changed the programmes of study, while others either repeated SP unit or repeated all the seven units in module one course as per the KNEC regulations for technical and business examinations.

In addition, according to the reports given by the Structured Programming lecturers from Meru, Nkabune and Kiirua TTIs from Meru County during one of their consultative meetings held in Meru National Polytechnic in March 2016 to discuss the KNEC results of DICT

November 2015 examinations series, a similar scenario as that explained in Gichara's report on poor performance in SP was reflected.

This problem of poor performance in structured programming unit had elicited a lot of accusations and counter-accusations between the DICT lecturers, and the management of the TTIs concerning the cause of this poor performance in just 1 out of the 7 units that module one DICT students sit for in the KNEC examinations. This was because, this problem had not only led to a lot of challenges in decision making at the top level management of the TTIs, but it had also led to a lot of discouragements not only to students but also to the lecturers. The SP lecturers had persistently insisted that for students to pass in this unit, they must have passed very well in secondary school mathematics because most of the concepts in the SP syllabus and the test items in the KNEC examinations required a lot of prior mathematical knowledge and logic, while the management had continuously maintained that performance in KCSE mathematics could not be considered during students admission because it is was listed by KICD or KNEC as one of the entry requirements for DICT module one programme (KIE, 2008).

However, according to Kofi, Kingsley and Amoako (2013), several research works that were initiated by UNESCO in various tertiary institutions in Africa and America between the year 2010 and 2011 to look at the major causes of poor performance by students in ICT courses at tertiary level, came up with a number of reasons behind the poor performance. Some of those reasons included inappropriate entry behaviour, wrong teaching methods and strategies, inadequate laboratory practical exercises and inadequate teaching and learning resources.

According to World Bank (2002), the greatest cause of poor performance in most of the Technical courses offered in tertiary institutions in Africa such as computer programming is admitting students into Diploma and Degree levels while they do not possess the correct entry

behaviour. This is as a result of the management in those institutions assuming that, because the students are to be trained technical skills, they do not need to have passed in some subjects like mathematics. As a result, many of those students end up performing very poorly in theory examinations that require prior mathematical logic, and that is why it is vital to ensure that all students being admitted to pursue any course in a tertiary institution possess the appropriate entry behaviour in every programme.

2.2 Mathematics performance in ICT subjects

Even though mathematics is a core subject in school curriculum for both primary and secondary schools in Kenya, and thus a compulsory subject in KCSE, this is a subject that has students post poor results by majority of student's in secondary schools. As a result, this has greatly influenced students in making decisions as to the courses to pursue, such that, if a student gets to know that a certain course in tertiary institutions has mathematics, such a student tends to avoid such a course and especially if he or she did not perform well in KCSE. It is as a result of the poor performance in secondary school mathematics that many institutions do not request for mathematics performance in KCSE in certain courses, yet, there are a number of units that require mathematical knowledge (Sifuna, 1992).

Further, according to Oluoch (2000), a good grade in mathematics is very critical when it comes to selection of the course to pursue after the KCSE or in higher education levels. It is a prerequisite for most Diploma and degree programmes and selection for further training in Kenya. While the importance of mathematics cannot be over emphasized, many educators, parents and practitioners in Kenya have decried the poor achievement levels in the subject at both primary and secondary levels.

2.2.1 Effects of KCSE Mathematics Performance On DICT Performance

Mathematics as an academic subject which focuses on abstract, deductive reasoning and problem solving, is a discipline that is required in the scientific, technological and

engineering world where the ability to 'think logically and systematically, reason, judge, calculate, compare, reflect and summarize' is of paramount importance. Renk (1986) as cited by Ojimba (2012) explained that good mathematics ability encourages good performance in computer programming units. He further states that without mathematics, there is no science and without science there is no modern technology, and without modern technology there is no modern society (Ojimba, 2012). This explanation by Ojimba (2012) explained that both mathematics and programming involves the ability to understand abstract concepts in solving problems. This is because, when solving a problem through programming, the students are required to develop the abstract representation of the problems and express them in a logical structure and detailed realization in a computer programming language, just as it is for mathematics. However, even though mathematics constitutes an integral part of most professional courses in universities and middle level colleges, and it is a major requirement in admissions to those institutions, the tertiary education management sometimes tend to ignore performance in mathematics for the sake of getting adequate students being enrolled into the science, technical and engineering courses regardless of the challenges those students are bound to encounter as they pursue the tertiary programmes (Eshiwani, 1993). In conclusion, even though much emphasis has been laid on the importance of good student's performance in KCSE mathematics, this performance may not necessarily translate into good results in tertiary or higher education programmes. This is because, there are very many other prevailing conditions in tertiary education that may influence the students' performance.

3.1 RESEARCH METHODOLOGY

3.1.1 Location of the Study

This study was carried out in the three Technical Training Institutes within Meru County that had their module one DICT students examined by KNEC from the year 2012 to 2015. This was because in Meru County, there were six technical training institutes, but it is only three

institutes that had examined their students in SP by the year 2015. The institutes that had their students examined by KNEC by the year 2015 were Meru, Nkabune and Kiirua.

3.1.2 Research Design

This study used correlational research design, because the data collected was quantitative illustrating the specific scores or grades attained by students in KCSE mathematics and Diploma's Structured Programming unit from the year 2012 to 2015. Further, the scores attained by the students in KCSE mathematics were compared with the scores attained by the same students in Diploma's Structured Programming unit so as to assess the degree of relationship that existed between the two subjects or units' performances.

3.1.3 Target Population

This study focused on all the students that sat for DICT module one KNEC examination in Structured Programming unit for the first time from the year 2012 to 2015, and the lecturers who prepared and presented them for the DICT Structured Programming examination in TTIs within Meru County. The target population composed of all the 118 students that sat for structured programming unit from the year 2012 to 2015 in module one KNEC examination in Meru, Kiirua and Nkabune TTIs. All the six lecturers that prepared the students for the module one KNEC examinations in structured programming unit also constituted part of the target population.

3.1.4 Research Instruments

The two main types of data collection instruments used in this study were a structured questionnaire and a document analysis schedule. The numbers of questionnaires administered to the six SP lecturers were six in total, whereby, each lecturer filled one questionnaire. The data analysis schedule was used to capture each student's performance in KCSE mathematics and his/her respective performance in Structured Programming unit, with

the total number of document analysis schedules prepared and used in the process of capturing students' details and performance were 12.

This was because the numbers of institutions studied were three and the students' results being captured were for a period of four years (2012 to 2015). A single schedule was used to capture students' performance per year per institution.

3.1.5 Data Collection Procedures

The researcher first got an introductory letter to NACOSTI from the Dean of Research Development and Postgraduate Studies in KeMU. The researcher then applied for and received a Research Clearance Permit from NACOSTI together with authorization letters from the Meru County Commissioner and Meru County Director of Education. The researcher presented the introductory letters to the Principals for authorization to approach the subjects and collect data from their institutions. The principals and the respondents, respectively were explained the purpose of the study. They were also informed that the data to be collected by the researcher would be treated with utmost confidentiality, and only used for the intended purpose.

3.1.6 Document analysis

The researcher studied the admission registers for the students result slips so as to find out the entry behaviour for each of the students in relation to mathematics score. This was followed by the process of filling the same details in the document analysis schedule. Once the student's details were transferred in this form, including the student's scores in mathematics at KCSE level, the researcher proceeded to the examinations office or department in charge of KNEC's Diploma examinations.

The researcher then liaised with the relevant examinations officers who he requested to provide him with KNEC's results sheets for module one examinations for the years 2012 to

2015. The researcher then studied those documents and recorded the performances of the students in Structured Programming unit in the same document analysis schedule that was used to capture data in the admissions or registrar's office.

3.1.7 Data Analysis

Then the researcher converted every grade attained in KCSE mathematics and Structured Programming unit into its respective equivalent points. He then summarized the points in form of tables using Microsoft Excel package, and further analysis was carried out using SPSS version 16.0 software, whereby, Pearson correlation coefficients, analysis of variance (ANOVA), coefficients of determination and scatter plots were computed. The results were then presented in form of tables, figures and explanations based on the study objective.

4.1 RESULTS AND DISCUSSION

4.1.1 Relationship Between KCSE Mathematics Performances and the Performances In SP Examinations From Year 2012 To 2015

In order for the researcher to derive clear conclusive evidence on whether there was a relationship between the students' performance in secondary mathematics and their respective performance in structured programming unit, all the results for the 118 students in both mathematics and structured programming from year 2012 to 2015 were combined and analyzed together. Table 4.1 illustrates the breakdown of the students' performance in SP examination based on their performance in KCSE mathematics

Table 4.1 Overall Students Performance in SP Based On Their Performance in KCSE Mathematics

Grade attained in KCSE mathematics	Total number of candidates that sat for SP	Number of candidates that passed in SP examination	Number of candidates that did not pass in SP examination.

	examination		
B-	1	0	1
C+	2	2	0
C	3	1	2
C-	12	7	5
D+	23	9	14
D	40	21	19
D-	32	12	20
E	5	1	4
Totals	***118***	***53***	***65***

Results displayed in Table 4.1 show clearly that, the arguments received from the lecturers through the questionnaire, that the students who had passed in Structured Programming unit examination were those that had passed in KCSE Mathematics with a D+ and above grade, was not necessarily true. This is because, out of the 41 students that had scored a D+ and above grade in KCSE mathematics, it is only 19 of them that managed to pass in SP examination. In fact, out of the 53 students that had passed in SP examination since year 2012, 34 of them had attained a KCSE mathematics grade of below D+. Therefore, from the look of the performances in secondary school mathematics and Structured Programming performance, there seems to be no significant correlation between the two performances.

According to the feedback generated from the questionnaire, 4 out 6 lecturers (66.67%) stated that more than 50% of the SP unit's syllabus requires the trainees to have acquired adequate prior knowledge in KCSE mathematics, and that more than 50% of the test items in the Structured Programming unit examination administered by KNEC in the year 2015 required students to apply previous mathematical knowledge and logic.

In addition, 5 out of 6 lecturers (83.33%) stated that Structured Programming unit requires adequate prior knowledge in mathematics, while 66.67% agreed that there is a relationship between performance in KCSE mathematics and performance in Structured Programming unit in DICT KNEC examination. Therefore, in order to either confirm or disapprove the

above arguments obtained from the lecturers through the questionnaire, further analysis on coefficient of correlation had to be carried out using SPSS software, so as to clearly determine whether there exists any real relationship between KCSE mathematics performance and the performance in Structured Programming. Table 4.18 illustrates the results of that analysis

Table 4.2

Correlation between Performance in Mathematics and SP From Year 2012 to 2015

		KCSE Mathematics Performance	Structured Programming Performance
KCSE Mathematics Performance	Pearson Correlation	1	0.098
	Sig. (2-tailed)		0.291
	N	118	118
Structured Programming Performance	Pearson Correlation	0.098	1
	Sig. (2-tailed)	0.291	
	N	118	118

According to the results of the analysis presented in Table 4.2, there seems to be a very weak positive correlation (r = 0.098) between the performance in secondary school mathematics and the performance in Structured Programming unit. In addition, this relationship was not statistically significant (p = 0.291).

In order to clearly identify the strength of this relationship in practical sense, further analysis was carried out using coefficient of determination (r^2). The results are indicated in Table 4.19.

Table 4.3 Model Summary for Performance in Mathematics and SP from Year 2012 to 2015

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	0.098[a]	0.010	0.001	2.45753

a. Predictors: (Constant), KCSE Mathematics Performance

According to the results from the analysis outlined in Table 4.3, the strength of the relationship in practical sense between the two performances is 1.0% with an effect size of 0.001, and with a variation of positive 0.1% (R^2 =0.010, adjusted R^2 = 0.001). This clearly indicates that there is no real relationship between the students' performance in secondary school mathematics and their respective performance in Structured Programming examination. Finally, in order to be able to see vividly the distribution of the results within the line of best fit, a scatter plot was developed as presented in Figure 4.1

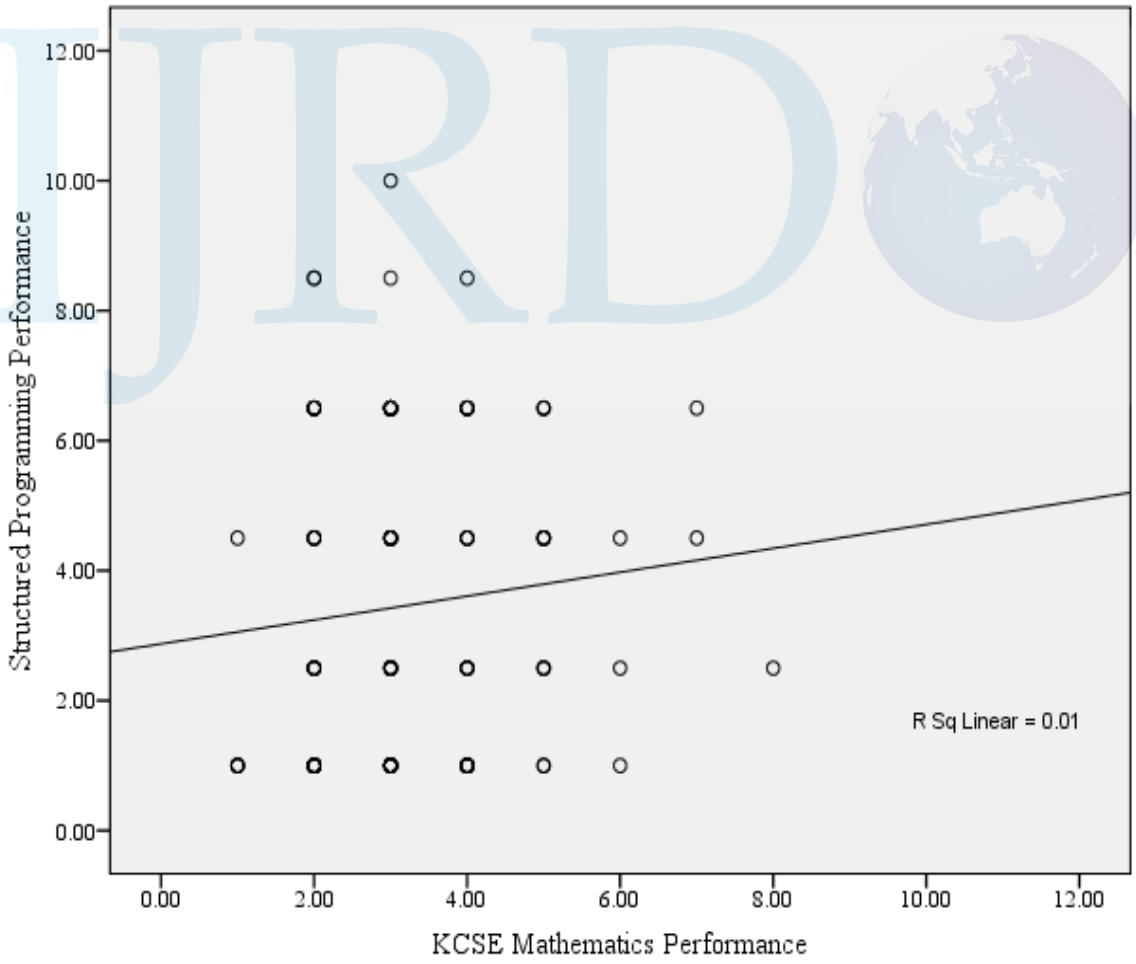

Figure 4.1 Relationship between Mathematics and SP Performance from years 2012 to 2015

Based on the scatter plot in Figure 4.1, it is very clear that there is no linear relationship between the students' performance in KCSE mathematics and their performance in SP examination. Therefore, even though there seemed to be a very weak positive correlation between the two performances (r = 0.098) as in Table 4.3, this relationship does not exist in practical sense. Therefore, it is not possible to predict the students' performance in SP based on their performance in KCSE mathematics.

These findings seem to concur with the studies under the literature review, which explained that, even though performance in secondary school mathematics may be a predictor in performance in tertiary education, it is not always the case (Wambugu & Emeke, 2014; Pascarella & Terenzini, 1998). This is because there seems to be other factors that contribute to the student's performance other than their performance in specific subjects in KCSE such as mathematics. Therefore, based on the analysis of the students' performance from the year 2012 to 2015, there is adequate evidence to suggest that there is no real effect or significant relationship between the students' performance in KCSE Mathematics and their respective performance in structured programming unit in Module one DICT KNEC examination ($r = 0.098$, $\alpha = 0.05$, $p = 0.291$, $R^2 = 0.010$, Adjusted $R^2 = 0.001$, $f = 1.124$).

These findings and the detailed analysis on the relationship between the performance in secondary school mathematics and Structured Programming unit, seems to negate the hypothesis by the structured programming lecturers that performance in secondary school mathematics determines the performance in Structured Programming unit. Therefore, the arguments by the structured programming lecturers that, the main reason as to why majority of students fail in structured programming examinations is because of their poor performance in secondary school mathematics does not hold. Even though performance in KCSE mathematics has been treated in the literature review as a predictor for performance in higher or tertiary education (White & Sivitanides, 2000; Campbell & Bruce, 2009; Oluoch, 2000),

this may not be the case when it comes to performance in Structured Programming unit in the DICT module one level.

These findings, therefore, justifies the decision by KICD and KNEC not to include mathematics as an entry criterion into DICT module one level, and supports the hypothesis that, there is no significant relationship between the students' performance in KCSE mathematics and their respective performance in structured programming unit at the diploma level.

5.1 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1.1 Overall relationship of the performance from year 2012 to 2015

The overall analysis for all the performances in KCSE mathematics and SP examinations for all the students from year 2012 to 2015 established that there was a very weak positive correlation between the performance in secondary school mathematics and the performance in Structured Programming unit. However, this relationship was not statistically significant and did not exist in practical sense ($r = 0.098$, $p = 0.291$, $\alpha = 0.05$, $R^2 = 0.010$, adjusted $R^2 = 0.001$, $f = 1.124$). The results from this analysis could not therefore, lead to a rejection of the null hypothesis.

Therefore, this study revealed that; even though 83.33% of the Structured Programming lecturers had argued that, in order for a student to pass in Structured Programming unit, he or she must have performed equally well in KCSE mathematics, that argument was not supported by the results in this study.

5.1.2 Conclusion

After undertaking a detailed analysis of the research findings, and after executing several tests on the research hypothesis based on the students' performance in KCSE mathematics

and their respective performance in Structured Programming unit from the year 2012 to 2015, there was adequate evidence to suggest that, there is no significant relationship between the students' performance in KCSE mathematics and their respective performance in Structured Programming unit in DICT module one KNEC examination ($r = 0.098$, $p = 0.291$, $\alpha = 0.05$, $R^2 = 0.010$, adjusted $R^2 = 0.001$, $f = 1.124$).

5.1.3 Recommendations

With the study having revealed that there is no significant relationship between performance in secondary school mathematics and diploma's structured programming unit in technical institutes within Meru County, Kenya, the researcher recommends that:

i) No student should be deterred from accessing education in DICT programme as a result of his or her performance in KCSE mathematics.

ii) The student's performance in KCSE mathematics should not be used as a tool to justify his or her performance in diploma's structured programming examinations.

iii) The Ministry of Education, in collaboration with various stakeholders in the technical institutions, should put in place effective strategies to curb the poor performance in structured programming unit.

5.1.4 Recommendations for Further Research

i. The researcher recommends that further studies be carried out on the relationship between performance in secondary school mathematics and diploma's Structured Programming unit across the 47 counties in Kenya so as to enhance the generalization of the findings from this study.

ii. Further studies can be carried out on the causes of the poor performance by students in Structured Programming unit, as well as, the causes of students' poor performance in DICT module one programme in technical institutes in Kenya

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