Asian Research Journal of Arts & Social Sciences
1(2): 1-8, 2016, Article no.ARJASS.27543

SCIENCEDOMAIN *international*
www.sciencedomain.org

Compulsion in Studying Mathematics and Career Influence by Mathematics on Student Interest in Mathematics

Samuel Asiedu-Addo[1], Charles Assuah[1] and Yarhands Dissou Arthur[2*]

[1]Department of Mathematics Education, Faculty of Science Education, University of Education, Winneba-Kumasi Campus, Ghana.
[2]Department of Interdisciplinary Studies, College of Technology Education, University of Education, Winneba-Kumasi Campus, P.O.Box 1277, Kumasi, Ghana.

Authors' contributions

The work was jointly produced through team work by the authors. Author SAA is the lead author who supervised the work and gave the need guidance as well as leading the discussion. Author CA led the design of the questionnaire and supervised the analysis. Author YDA proposed the topic, collected the data and analyzed the data under the supervision of authors SAA and CA. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARJASS/2016/27543
Editor(s):
(1) Shiro Horiuchi, Associate Professor, COC Promotion Office, Yamagata University, Japan.
Reviewers:
(1) Adem Duru, University of Usak, Turkey.
(2) Christine Krisnandari Ekowati, Nusa Cendana University, Indonesia.
(3) Elif Esra Arikan, Istanbul Sabahattin Zaim University, Turkey.
Complete Peer review History: http://www.sciencedomain.org/review-history/15737

Original Research Article

Received 7th June 2016
Accepted 28th July 2016
Published 10th August 2016

ABSTRACT

Aims: This paper examined the effect of compulsion in studying mathematics and future career influence of mathematics on student interest in mathematics.
Study Design: This paper used mixed mode design to investigate the effect of compulsion and future career influence on the student interest in mathematics.
Place and Duration of Study: Faculty of Technical education as well as faculty of vocational education of the University of Education, Winneba. College of Technology education, Kumasi-Ghana, from January, 2016 to April, 2016.
Methodology: The study targeted all post-secondary students in the faculty of vocational education and the faculty of technical education of the University of Education Winneba-Kumasi

**Corresponding author: Email: day1981boy@yahoo.com;*

Campus. The researchers' randomly selected one hundred (100) participants were administered with questionnaires. The study used chi-square test of independence as well as logistic regression analysis to evaluate the effect of compulsion and career influence on student interest in mathematics. The result from this study was generated using SPSS version 16.

Results: The paper established no connection between student interest in mathematics and the compulsion in studying mathematics ($p>0.05$) but established connection for career influence. The study found Career influence to significantly influence student interest $P<0.05$. However, the both compulsion and future career influence can explain 11% of student interest in mathematics. The study further reveals that both compulsion and future career influence by mathematics does not significantly predict student interest in mathematics.

Conclusion: The study concludes that, students' interest in mathematics is independent on the compulsion nature of the subject to student but rather depends on the future career influence of mathematics. These findings led to new emerging theory among students-Theory of future anticipation. Students will be serious with mathematics if it will influence their career. The theory requires school leadership maximization by organizing career guidance and counseling for the student to know the importance of mathematics on their future career.

Keywords: Compulsion; future career influence; student interest; mathematics in Ghana.

1. INTRODUCTION

In Ghana, mathematics is compulsory for all basic and senior high schools. However the effect of compulsion on students' interest has not been explored. The interaction between compulsion, future career influence and students' interest lacks the exploration and explanation. Can there be any reason to blame low interest in mathematics on compulsion in studying mathematics and future career influence? In many countries around the globe (New South Wales, Victoria and Western Australia) education curriculums present student with the opportunity to make choices in the subjects they want to participate in during their high school education. On the other hand other countries make education curriculum compulsory where Ghana is not an exception. (South Australia, and to a small extent in Queensland and the Northern Territory). Studies have shown that nations without mathematics requirement for science study in senior high schools is likely to impact upon national attainment in mathematical and scientific literacy [1]. Although such restrictions or allowance exist for different countries for diverse reasons but problems of student interest in mathematics still persist.

1.1 Compulsion, Career and Achievements

There has been number of concerns around the world that many young people who have gone through senior secondary school education are poorly prepared for science, Technology, engineering and mathematics career [2] Science technology, engineering and Mathematic plays a very important role in the development of every economy and the more student get interest in the all integral subject mathematics the more indicative the country's preparedness to greater economic height [3]. It is fundamentally clear that mathematics is a pivot around which all science technology engineering and mathematics (STEM) discipline revolves.

Mathematics as a subject has not been treated as special in any case in that where mathematics is compulsory, there exist at least one other subject that is also compulsory [4]. The study further point out that in many country both the national language(s) and mathematics are treated as core subjects. Mathematics has been found to be compulsory in countries like Hong Kong and USA for their upper secondary schools [5], and Germany is compulsory in almost all general and vocational pathways [6]. It is interesting however to observe that these countries do not have the highest levels of participation in advanced mathematics. The appearance of compulsion in studying mathematics in Hong Kong seems to be accounting for a slight reduction in students' involvement in advanced mathematics [6]. Studies has further shown that countries with highest levels of participation in advanced mathematics including New Zealand and Singapore have done so without compulsion for all students However, in New Zealand, students are required to study mathematics until they have achieved a basic level of competence. Singapore's extended basic mathematics course gives some students an extra year to master the content and develop fluency [6]. Compulsion in studying mathematics in most part of the world

has been cited for two major reasons: Social needs as referred to as utility justification by [7] and the demand for science technology engineering and mathematics. The report by [8] however recommended that student should be compelled in the continuation in the study of mathematics until the end of their compulsory education. However, the study by [5] further suggest that the level of compulsion does not appear to have raised standards of attainment in mathematics across the board, implying that compulsion is not a sufficient strategy to in building student interest in mathematics.

1.2 Interest and Career Choices

The student interest in a subject has been found to have no significant influence on attainment during lower secondary education but significantly affect course selection that will possibly lead to students' career choice [9]. The student perception about their own competencies has been viewed as important factor that influence students interest. The [10] model of interest assumes that people interest is developed when activities furtherance an existing project of interest. It is however not clear if perception that only bright student can perform in mathematics or perhaps pursue further studies in mathematics may also be linked to student's own perception about their competences [11]. The study by [12] presented a stand that in working with students and parents means thinking differently about instrumentalism. The study further expands that working with student in terms of subject choices, career choices, and life choices mean that working with teachers, so that teachers can help their students to think more broadly about the benefits to be gained from their learning in different subject areas. In the study by [13] findings were made that the perception of student about the usefulness of mathematics for their future career influences their further interest in the pursuit of higher level mathematics. This has possibly been the case because the study by [14,4] indicates that mathematics as a subject has not received any special treatment since there are many other subjects that are taken compulsory as mathematics.

1.3 Purpose and Significance of the Study

Based on context explained in the previous section, this study aims at finding out the following.

1. Extent to which student interest is affected by the compulsory nature of mathematics in senior high schools in Ghana.
2. The effect of future career influence by mathematics on student interest in mathematics.
3. Extent to which student perception that only bright student can perform in mathematics affect their interest in mathematics.

The study is significant for the Ghanaian context for the reason the research will help in the explanation of low interest of mathematics in Ghanaian Senior High Schools. When this is done it will to explore and explain what contribution has compulsion in studying mathematics in Ghanaian curriculum as well as future career influence by mathematics perceived by student on their interest in mathematics.

1.4 Research Questions

Does compulsion in studying mathematics by senior high student affect their interest in mathematics?

Does the perception of student that mathematics may influence their future career affect their interest in mathematics?

Can only bright student perform in mathematics and what impart can this perception influence student interest in mathematics.

1.5 Research Hypothesis

H1: Student interest in mathematics is independent on the compulsion nature of mathematics in Ghanaian senior high schools.
H2: Student interest in mathematics is independent on the fact that mathematics may influence student future carrier.
H3: Student interest in mathematics is affected by student perception that bright student alone can perform in mathematics.

2. METHODOLOGY

2.1 Research Design

This paper used mixed mode design to investigate the effect of compulsion and future career influence on the student interest in mathematics. The authors therefore investigated the impact of compulsion and future career

influence (independent variables) on Ghanaian senior high school student interest in mathematics (Dependent variables). This study used purely quantitative method to explore and explain the effective of compulsion and career influence on students' interest in mathematics as justified by [15,16].

2.2 Population, Sampling Procedure and Sample

The study targeted all level hundred students in the college of technology education of the University of Winneba. The researchers randomly selected one hundred (100) post senior high school students from the University of Education Winneba-Kumasi campus. The researchers randomly selected the three (3) schools one from each category from the ten (10) regions in Ghana. The ages of male and female students selected ranged from 14 – 25 years.

2.3 Data Collection Procedure

The one hundred (100) participants who went through the selection process were administered with the questionnaires. The mathematics teachers in the selected schools helped in the process of questionnaire administration. The participant were instructed on how to respond to the questionnaires and instruction read out to the participants to ensure proper filling and high response rate. Ethical clearance was given by both the participating schools and student and issues of confidentiality was assured for both school and students the data collection. The answered questions were retrieved soon after the participants have finished with their response for analysis.

2.4 Data Analysis

The paper used chi-square test of independence as statistical technique to establish the extent of dependence or independence between the dependent and the independent variables. The study further used logistic regression analysis to establish the predictive strength of the independent variables. The statistical analyses were all generated using SPSS version 16.

3. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Respondents

The study randomly selected 65(68%) male and 30(31.6%) female respondent who attended Grade A (33.7%), B (41.1%) and C (25.3%) schools in Ghanaian senior high schools. The respondent were between the ages of fourteen and twenty three years who were in their second and final years in senior high school in the selected senior high schools The respondent graduated from basic public (83.2%) and private junior high schools .The respondents were selected randomly from all the subject area ranging from general art (11.6%), visual arts (14.7%) science (33.7%). Business (22.1%) and Home economics (17.9%).

3.2 Results on Students Interest

The student who took part in the study was asked various questions that pertain to their interest in mathematics. The result of the study shows that 85% of the students who were interviewed showed interest in working mathematics while 12.2% of the students did not enjoy working mathematics. The question of students being scared by their previous mathematics teachers was investigated and found that (37.2%) of the respondent were scared by their basic school mathematics teachers while (62.8%) of the respondents were not scared by their basic school mathematics teachers. The students' were asked to indicate the highest level of education of any of their parent and it was found that with 15.8% of the respondent their parent are uneducated, 22.1% of the respondent have their parents being level and A' level graduates with 16.8% of the respondent their parents are graduate from tertiary institution but majority of the respondent are had their parents belonging to the others categories which may below the levels indicated. The study investigated if students know their parents' interest in mathematics. This result reveals that 34% of the respondent indicated their parents are interested in mathematics, 13.8% of the respondent indicated their parents are not interested in mathematics while 52.1% of the respondent did not know if their parents are interested in mathematics.

The issue of discouragement by mathematics teachers was investigated and was found that 46% of the respondents were not motivated by their mathematics teachers while 54% were motivated by their mathematics teachers. The paper went deeper into the subject of who motivates students most in their study of mathematics as a subject. The study reveals that 12.8% of the respondent praised their parent for motivating them most in their study of

mathematics, 58.5% of the respondent praised teachers for being the most motivator of their study of mathematics while the 28.7% of the respondent were motivated by friend in their study of mathematics as a subject. The study waded further to investigate the parents' motivation of the student in mathematics while at home. The result reveals that 50.5% of the respondent accepted that, their parents motivates them to study mathematics at home and 49.5% of the respondents say they are not motivated by their parent to study mathematics at home.

3.3 Interest, Compulsion and Career Influence

The student compulsion in studying mathematics was investigated to establish their choice to study mathematics if the subject is not made compulsory for all students. The study reveals that most (68.4%) students would still pursue mathematics as subject while others (31.6%) will opt out of the study of mathematics. The views of respondents on whether they hold the views that mathematics as a subject will influence their future career was investigated and found that 87.4% of the respondents believes that mathematics will influence their future career and the remaining 12.6% hold the opinion that mathematics may not influence their future career. The respondents were asked whether they are interested in mathematics and were further asked to rate their level of interest in mathematics .The results reveals that 86.3% of the valid respondents liked mathematics while 13.7% of them did not like mathemetics.Moreover, over 71% of the respondents expressed above average on interest in mathematics while the remaining below 30% had low interest in mathematics.

3.4 Compulsion in Studying Mathematics and Students Interest

The perception on the issues of compulsion in the study of mathematics and student interest in mathematics was investigated. Over 70% of the respondent who are interested in mathematics were of the opinion that they would study mathematics even if it is made compulsory while remaining respondent who are interested in mathematics were of the view that they wouldn't have taking mathematics as a course if it was not compulsory. The study also makes known the facts that, though some students are not interested in mathematics as subject but would have still pursue it as a course even if it is not made compulsory. It is interesting to find that student interest in mathematics is independent on the fact that mathematics education in the senior high schools is made compulsory for students but might dependent on other factor rather than it compulsion in nature. This result may further imply that compulsion in studying mathematics in senior high schools in Ghana does not influence students' interest in mathematics though there is some level of relationship between student interest in mathematics and compulsion in studying mathematics. The Table 1 presents the results of the survey analysis conducted.

3.5 Effect of Mathematics on Future Career and Student Interest in Mathematics

The study looks at the effect of future influence of mathematics on future career of the student and their interest in mathematics. The result of the study reveals that close to 85% of the respondent who are interested in mathematics are of the views that mathematics can influence their future career but the remaining respondent opined that although they are interested in mathematics but mathematics will not influence their future career prospect. The study found that though greater proposition of respondents were found to have interest in mathematics base on the influence of mathematics on future career prospect but there is some fraction of students who are not interested in mathematics and also believes that mathematics will have influence on their future career. The total effect of mathematics on future career of student was investigated to see if its affects student interest in mathematics. The study found that the student interest in mathematics is influenced by the student perception that, mathematics will have influence on their future career. Thus the more students hold the views that mathematics is likely to influence their future career the more likely the students are interested in mathematics. This confirms [10] theory of interest that assumes that people will develop new interest in activity or subject if the subject or the activity will further their existing interest. The finding further extends the theory of selective attention by [13,4] that if students are attentive in lesson because of future anticipation that the subjects have effect on their future career. The attention given to the subject during lesions will keep the students focus and further impart on the recall rate hence the interest in the subject. Table 2 present the detailed results for the test of independence.

3.6 Logistic Regression Analysis

Logistic regression analysis was carried out using the compulsion in studying mathematics and the perception that mathematics can influence future career as predictor variables and whether or not student are interested in mathematics as dependent variable. A test of the full model using all predictors was not found to be statistically reliable, Chi-square (2,95) =5.942, p=0.051, indicating that the predictor variables did not reliably predict whether or not student are interested in mathematics. Nagelkerke's R square is .11. The model correctly predicted 81.71% of student interested in Mathematics and 25% of student who are not interested in mathematics as shown in Table 3. The regression coefficients, Wald statistics, odds ratios and the 95% confidence intervals for the odds ratios are shown in Table 6.

Using the Wald statistics as an indication of the unique significance of the predictor variables, all the predictor variables were not statistically significant with odds ratios as shown in Table 3-Table 6. The results indicate that the student interests in mathematics are highly unlikely to be influenced by the fact that the course is taking as a compulsory course. The finding extends further that the fact that student holds the perception that mathematics may or not affect their future carriers does not necessary predict the interest of the student.

Table 1. Effect of compulsion on student interest

Compulsion in studying mathematics and students interest					
		Compulsion in studying mathematics		Fishers test	P-value
Mathematics interest	**Responses**	**Yes**	**No**	3.456	0.105
	Yes	59	23		
	No	6	7		
	Total	65	30	95	

Table 2. Effect of career influence on student interest in mathematics

Career influence and interest					
		Influence of mathematics on future carrier		Chi-square test	P-value
Mathematics interest		**Yes**	**No**		
	Yes	74	8	4.49	0.034
	No	9	4		
	Total	83	12	95	

Table 3. Odd ratios result of logistics regression analysis

Classification table				
Observed		**Predicted**		
		Do you like mathematics as a subject		Percentage correct
		Yes	**No**	
Do you like mathematics as a subject	Yes	67	15	81.71%
	No	9	3	25.0%
Overall percentage				86.3%

Table 4. Test of model coefficients

Omnibus tests of model coefficients			
	Chi-square	**Df**	**P-value**
Step	5.942	2	0.051
Block	5.942	2	0.051
Model	5.942	2	0.051

Table 5. Logistic regression model summary

Model summary		
-2 Log likelihood	**Cox & Snell R square**	**Nagelkerke R square**
69.904a	0.061	0.11

Table 6. Results of a logistic regression analysis into whether or not student interest in mathematics is predicted with compulsion and future career influence

	B	S.E.	Wald	Df	Sig.	Exp (B)	95.0% C.I. for Exp (B)	
							Lower	Upper
DIPB14(1)	-0.963	0.625	2.376	1	0.123	0.382	0.112	1.299
DIPB15(1)	-1.25	0.727	2.961	1	0.085	0.286	0.069	1.19
Constant	-0.251	0.68	0.136	1	0.712	0.778		

4. DISCUSSION OF RESULTS

The result emanated from the first research question and the first research hypothesis reveals that students interest in mathematics is independent on the compulsion nature of mathematics to the student and that the compulsion in studying mathematics does not affect the interest of the students in liking or disliking the subject as consistent by the study in [14] that, mathematics as a subject has not been treated as special in any case in that where mathematics is compulsory, there exist other subjects that are compulsory. The findings may conform to the findings by [5,6] those in countries where mathematics is made compulsory the level of participation is low which actually confirm the result of the present study that compulsion does not ensure student interest in mathematics.

The investigation into the perception of students that mathematics may influence their future career affect their interest in mathematics as well as the hypothesis that Students interest in mathematics is independent on the fact that mathematics may influence students' future career. The study finding rejected the hypothesis that students' interest in mathematics is independent on future influence of mathematics on their career. This result confirms the study by [7] explaining that perception of students about the usefulness of mathematics for their future career and their further interest in the pursuit of higher level mathematics. The result further consonants with the work of [9] that student interest in a subject has no significant influence on attainment during lower secondary education but significantly affect course selection that will possibly lead to our career choice. Can only bright student perform in mathematics and what impart can this perception influence students interest in mathematics. The finding of this study has given rise to a theory that interest is a function of career influence. This theoretical result confirms [10] of interest which also assumes that student will develop interest in activity when it furtherance their existing interest hence extending the theory of selective attention by [13,4].

5. CONCLUSION

The study concludes that having sufficient proficiency in using Mathematics may be connected to future national productivity and it is therefore crucial in for progressive monitoring of teaching and learning of mathematics in Ghana. Since students' who perform well in mathematics may create a study and employment opportunities for themselves. The study concludes further that, students' interest in mathematics depends on the career influence by mathematics which conforms to the study of [7,9]. The study moreover concludes that, since students interest is independent on the compulsory nature of mathematics. The finding is consistent with the study by [5,6,14]. The study finally concludes that, all Ghanaian students continue to take mathematics as compulsory senior high school course to ensure equitable access to those opportunities mathematics may offer in future.

6. RECOMMENDATION FOR POLICY MAKERS

The study recommended to educators in the field of mathematics education to take notices of the theory of future anticipation. This theory suggest that students will show interest in mathematics when they anticipate future career influence by mathematics. It is further recommended that school leadership should regularly engage

students in career guidance and counseling. The study finally recommended for further implementation by the ministry of education to intensify public awareness on importance of mathematics and science in school.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Wilson R, Mack J. Declines in high school mathematics and science participation: Evidence of students' and future teachers' disengagement with maths. International Journal of Innovation in Science and Mathematics Education. 2014;22(7):35-48.
2. Harris J. Rational numbers: Investigating compulsion for mathematics study to 18. London: The Pearson Think Tank; 2012.
3. Noyes A, Wake G, Drake P. Widening and increasing post-16 mathematics participation: Pathways, pedagogies and politics. International Journal of Science and Mathematics Education. 2011; 9(2):483–501.
4. Hodgen J, Pepper D, Sturman L, Ruddock G. Is the UK an outlier? An international comparison of upper secondary mathematics education. London: Nuffield Foundation; 2010.
5. Kloosterman P. Mathematics skills of 17-year-olds in the United States: 1978 to 2004. Journal for Research in Mathematics Education. 2010;41(1):20–51.
6. Norris E. Solving the maths problem: International perspectives on mathematics education. England: RSA; 2012.
7. Huckstep P. Elevate or relegate? The relative importance of mathematics. Cambridge Journal of Education. 2007; 37(3):427–439.
8. Wolf A. Review of vocational education – the Wolf report. England: Department for Education; 2011.
9. Köller O, Baumert J, Schnabel K. Does interest matter? The relationship between academic interest and achievement in mathematics. Journal for Research in Mathematics Education. 2001;32(5):448–470.
10. Dewey J. Interest and effort in education. Boston: Riverside; 1913.
11. Mujtaba T, Reiss M. Girls in the UK have similar reasons to boys for intending to study mathematics post-16; 2012.
12. Anderson RC. Allocation of attention during reading. New York: North Holland Publishing Company; 1982.
13. Hipkins R, Vaughan K. Well I know I need English and Maths. Paper presented at the Pushing the Boundaries: An International Conference for the Careers Industry, Wellington; 2002.
14. Hodgen J, Brown M, Küchemann D, Coe R. Why have educational standards changed so little over time: The case of school mathematics in England. Paper presented at the British Educational Research Association (BERA) Annual Conference, Institute of Education, University of London; 2011.
15. Patton MQ. Qualitative evaluation and research methods (2nd ed.). Newbury Park, CA: Sage; 1990.
16. Creswell JW. Research design: Qualitative, quantitative and mixed methods approaches (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc; 2003.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/15737