IOSR Journal of Research & Method in Education (IOSR-JRME)
e- ISSN: 2320–7388,p-ISSN: 2320–737X Volume 8, Issue 4 Ver. II (Jul. – Aug. 2018), PP 65-71
www.iosrjournals.org

Connecting Mathematics To Real Life Problems: A Teaching Quality That Improves Students' Mathematics Interest.

[1]Yarhands Dissou Arthur, [2]Emmanuel Kofi Owusu, [3]Samuel Asiedu-Addo And [4]Ato Kwamina Arhin

[1,4]*Department of Interdisciplinary Studies, College of Technology Education, University of Education, Winneba-Kumasi Campus..*
[2]*Department of Accounting Studies Education, College of Technology Education, University of Education, Winneba-Kumasi Campus,*
[3]*Department of Mathematics Education, Faculty of Science Education University of Education, Winneba.*
Corresponding Author: Yarhands Dissou Arthur

Abstracts: *The Mathematics teachers' ability to connect Mathematics to real life problems is principal to students' interest development in Mathematics. The current study seeks to identify factors that studentsprefer that their Mathematics teacherswould improve on to help build their interest in Mathematics. The study used random sampling technique to select ten (10) high schools and 1,263 students' from the various subject areas to respond to a structured questionnaire on variables that contributes to the students' Mathematics interest building process. The study used principal component analysis together with multiple linear regression analysis to analyze the effect of teachers' ability to connect Mathematics to real life problem on the student interest in Mathematics. The study found that teachers ability to connect Mathematics to real life problem can be put into two principal component and these components significantly ($p<0.001$) predicts 57.4% students interest in Mathematics. The relative importance index of the factors used for the Mathematics connection to real life problem was computed and assessed. The study found that, students' will be more interested in Mathematics when Mathematics teachers dedicate quality time for practicing class exercise .The study also found the teacher's ability to link Mathematics to other subject areas is key to students' interest development in Mathematics. The study concluded that teachers' ability to connect Mathematics to real life problems is very essential to their Mathematics interest development process.*

Date of Submission: 20-07-2018 Date of acceptance: 04-08-2018

I. Introduction

The teaching of Mathematics is made interesting to students when teacher are able to connect mathematical concepts to real life problems and experiences as well as establishing connection between the various forms of Mathematical knowledge.This way of teaching Mathematics is seen as integral to the teaching and learning of Mathematics at all levels ofeducation. The principles and standards for school Mathematics has stated that Mathematics instructions should enable students to 1) Recognize and use connection among Mathematics ideas.2)Understand how Mathematics ideas interconnect and builds on one another to produce a coherent whole and finally,(3) Recognize and apply Mathematics in contexts outside of Mathematics (Casey, Kersh, & Young, 2004; Fraivillig, Murphy, & Fuson, 1999).In the North America the connected Mathematics project is a prominent Mathematics curriculum based on principles and standards which emphases on significance of connecting Mathematics. This is done to make Mathematics to look meaningful to students among various Mathematics topics and between Mathematics and problems in other disciplines(Ginsburg & Amit, 2008; Winheller, Hattie, & Brown, 2013).The Australia for instance has it as requirements for effective Mathematics pedagogy to help students learn to connect Mathematics between various forms of academic disciplines to the Mathematics Mathematical knowledge learnt. They have come to agree that in order for a student to become competent, the student should be able to perceive connection between Mathematics and other forms of knowledge as well as between Mathematics and their life experiences.

In the countries where Mathematics connection to other subjects and real life problems has did not agree on how these connections should be done and the methodology to be adopted to achieve.Although in some countries, there has been reform oriented curricula which support the use of problem solving and discussion – oriented pedagogies but others disagrees on the use of such pedagogical approach(Ball, 1993; Intaros, Inprasitha, & Srisawadi, 2014).

There have been various strategies in whichMathematics teachers has adopted in the teaching of mathematics. This includes the teachers' ability to connect mathematics to real life problems and this strategy

has seen application in the teaching of mathematics at various fields. Connecting mathematics to different subject area may see different this may include the style of questioning by the Mathematics teacher which may improve on the students level of participation in Mathematics education to help gain Mathematical knowledge(Fredricks et al., 2016; Lubienski, 2002). The acquisition of mathematical knowledge has also been known to differ from one class of students to the other.While students' in the working class have difficulty in completing mathematical task their counterpart who are not working finds mathematics task easy.

Mathematics and Real-life Problem Connectedness

This section of the study review studies in literature that has contributed to the expansion of the body of knowledge in the area of teachers' ability to connect Mathematics to real life problems.

The study by (Palm, 2008) indicated some level of disconnection between the students' Mathematics learning and how it applied to real world problems. This disconnection may lead to struggle by student understanding Mathematics. The studies by many authors(Rakes, Valentine, McGatha, & Ronau, 2010)has made assertion for improving the teaching and learning of Mathematics and further establish correlation between the students Mathematical struggle and students inability to solve problems. The difficulty in connecting Mathematics to real life problems has been attributed to the traditional teaching methods adopted for instruction and this is seen to be contributing to the failing and bad performance of students (Rakes et al., 2010).

The studies of Mathematics for comprehension and understanding by students is important since understanding of previous Mathematics concepts enables students to learn and master new concepts. The study by(Ketterlin-Geller & Chard, 2011) accepts that, when students are given strong conceptual foundation through connectedness for effective learning of Mathematical concepts will improve interest and performance. It was further outlined by (Greer, 2008; Sciarra, 2010)that students who struggle to comprehend with Mathematical concepts which may be due to lack of connection of Mathematical topics and to real life problems. The study further informs that lack of comprehension by students may further impede and sends signs of frustration to students for higher studies in Mathematics and course that demands application of Mathematics since there exist relationship between previous and future Mathematical achievements(Greer, 2008; Sciarra, 2010).Ghana like other countries across the globe require that students pass in Mathematics and Mathematics specific subjects before making upward movement to the next level of education(Fry, Ketteridge, & Marshall, 2009; Ketterlin-Geller & Chard, 2011).

The study of Mathematics interest has reveals that, students interest in Mathematics increases when they understand the skills and how that skill is developed connected to needed Mathematics competencies for performance(Dweck, 1986; Mensah, Okyere, & Kuranchie, 2013; Rowland, Huckstep, & Thwaites, 2005).The study of needed skills for understanding for Mathematics performance will include teaching of students application of needed skills to their studies and how to study. The students need for learning strategies will involve the student ability to learn how to relate relevant mathematical concepts in connection to previous mathematical knowledge. The study by (Tobias, 1989) suggest that students who are able to adopt strategies of learning that is able to relates previously studied materials to what is to be studied has shown good results forest for student interest in Mathematics.For students to meet this requirement that they need to pass their high school Mathematics. The condition that cannot be eliminated as we such for solution to poor performance in Mathematics is the interest of students in Mathematics and how this interest construct can be influenced by the teachers ability to connect Mathematical concepts to real life problems. The problem of Mathematics connectedness to the real-life problems as well as other subject areas and how its influence students interest and understanding to enhance performance requires investigation and its implemented in Ghana.

Study Objectives

The current study seeks to identify practices that students' will prefer their Mathematics teachers engaged in to help build their interest in Mathematics

The study specifically seeks to establish the following from the students view point.

i. To determine the extent to which teachers' ability to connect Mathematics to real life problem affects the student Mathematics interest.
ii. Develop a multiple linear regression model to determine the effects of the extracted principal components on the students' interest in Mathematics.
iii. The most important factors in the Mathematics connection constructs in contributing to the students interest development in Mathematics.
iv. To perform principal component analysis(PCA)on Mathematics connection construct by assessing the inter item correlations and PCA validity.

Research Questions

i. To what extent does the measurements of mathematics connectivity contributes to the students' Mathematics interest development.

ii. To what extent does the measurement in mathematics connection construct correlates with each other?
iii. To what extent does mathematics teachers' connect mathematics to real life problem in the teaching and learning of mathematics?
iv. To what extent does the principal components extracted contributes to the students' interest development process.

Research Hypothesis

The study proposed the following hypothesis to be tested by the study.

i. There is a positive and significant relationship between students' interest and the extracted component of the Mathematics connectivity constructs.
ii. There is a significant correlation between the items measuring mathematics connectivity construct.
iii. The principal component extracted significantly predicts students' interest in Mathematics.

II. Research Methodology

This section of the study presents the methodology deplored by the researchers to arrive at the stated objectives, research questions and the hypothesis.

Study Design and Approach

The study adopted purely quantitative research paradigm investigates the problem under investigation. The study used survey method to collect data to help unearth the contribution of the mathematics connectivity constructs on the study of mathematics by student. The studies first explore the reliability of the instrument and further used it to explain the effect of the construct on student interest in Mathematics

Instrument

Due to the geographical and cultural barriers that exist in the training of high school students across the globe, the study constructed a new instrument that is specific to peculiar problems associated with teaching and learning of Mathematics. The study used structured questionnaire with closed ended questions. The mathematics connectivity construct consist of six (6) items constructed to measure how teacher connects or link mathematical concepts to real life problems. All items of the construct were measured using the five point Likert scale.

Population, Sample and Sampling Techniques

The population consists of all senior high school students in the Ashanti Region of Ghana. The study used multistage sampling to first select randomly the participating schools included in the study. The second stage of the sampling includes selection of participant from the selected schools to respond to the questionnaires for the study. The study randomly selected 1500 participants from 10 randomly selected schools however 1,263 participants properly filled their questionnaire item to pass test of being included in the final analysis representing 84.2% response rate.

III. Data Analysis, Results, Findings And Discussion

The study used both descriptive and inferential multivariate statistical analysis techniques such as exploratory factor analysis and multiple linear regression analysis. These techniques helped in arriving at the conclusion that properly responds to the objectives, research questions and the hypotheses stated for investigation. The study used SPSS version 16 to generate both the descriptive and multivariate inferential statistics results. Thedescriptive statistics for each item in the construct was discussed as indicated below.

The study investigatedthe creativity of Mathematics teachers in connecting Mathematical concept to real life problem and this wasmeasured using questionnaires. The construct included items such as:Teachers connect Mathematical concept to real life problems, Teachers link Mathematics to other subject areas, Teachers provide examples and case studies while delivering instruction in Mathematics, Teachers dedicate quality time for practicing class exercise. There is coordination between class work and assignments given by Mathematics teacher and finally Mathematics is abstractly taught.

The study was descriptively analyzed item by item to ascertain the participants' perceived influence on the construct and how this construct influence the prediction of students' interest in Mathematics. Out of the total participants, 30% of the respondents cumulatively disagrees that Mathematics teachers connect Mathematical concepts to real life problems, however, 48.8% of the study participants were of diverse opinion that Mathematics teachers' connect mathematical concepts to real life problems. The study further found that 21.2% of the total participant neither agreed nor disagreed to the statement that Mathematics teachers connect mathematics to other subject areas.The total rating of students' teacher ability to connects Mathematical concepts to real life problem result in a mean of 3.25 and a standard deviation of 1.35 however the overall rating in terms of relative importance index was found to be 0.65 as shown in Table 1

The study also investigated the measure of teacher ability to link Mathematics to other subject areas. Out of the total participants, 18.8% of the valid participants' cumulatively disagreed those teacher link Mathematical conceptsto other subject areas, nonetheless, the study on the contrary found 60.8% of the valid participants agreeing to the facts that Mathematics teachers linkage of Mathematics to other subject area may influence their interest in Mathematics. The study also reveals that 20.4% of the total participants were neutral of the claim that teachers' linkage of Mathematics to other subject area contribute to student interest development in Mathematics. The study analyzed the cumulative rating of teachers ability to link mathematics to other subject areas and found that, the participants rated very high with mean(3.69) and standard deviation of (1.31) moreover, the study also found the relative importance rating of teachers ability to link Mathematics to other subject area to be 0.74 as indicated in Table 1.This result is consistent with the studies in (Ginsburg & Amit, 2008; Winheller et al., 2013) which emphasis on the teachers ability to connect curriculum content to real life problems and its effects on the students' interest in mathematics.

The study further investigated the effects of teachers' provision of examples and case studies during mathematics lesions impact on student interest in Mathematics. The results from the survey reveals that, 23.2% of the total participant disagreed that teachers' provision of exercises and case studies during lesions will influence students interest in mathematics but contrary to this results is the 50.1% of the total participant who believe that, teachers' provision of enough exercises and case studies during Mathematics lesions will help build the interest of student in Mathematics. The study also reveals that, 25.6% of the valid participants strangely perceive that provision of enough examples and case studies will neutrally influence the student interest in Mathematics. The results further reveal that, the mean and standard deviation of the rating was 3.44 and 1.22 respectively with relative importance index of 0.69 as indicated in Table1.The result in some way ties with the studies in (Dweck, 1986; Mensah et al., 2013; Rowland et al., 2005) as students interest in mathematics increases as mathematics educators systematically develops contents of the curriculum to improve their performance.

The effect of teachers' commitment of quality time for practicing class exercises was also investigated by the study. The study results reveals that in total,17.1% of the total participants were disagreed that teachers dedicates quality time for practicing class exercise while 66.5% of the total participant agreed that teachers dedicates quality time for practicing class exercise although 16.5% of the total participants were indifferent. The study reveals that teachers' dedication of quality time for practicing class exercises was the most important factors with mean and standard deviation of 3.8 and 1.25 respectively and a high relative importance index of 0.76 as indicated in Table 1.

The study also found out if there is coordination between what is being taught in class and the assignment given to student by Mathematics teachers. The results from the survey indicated that, 22.8% of the total participants disagreed that, there is coordination between class work and assignment given by Mathematics teachers, but 57.8% of the valid participants agreed to the claim that, there is coordination between class work and assignment given by Mathematics teachers'. The study revealed that, teachers' ability to coordinate between the class work and assignment given by Mathematics teachers' was very important to student interest develop with mean of 3.49 and standard deviation of 1.27 while the relative importance index was 0.70 as indicated in Table 1.The result is partly consistent with the study by (Palm, 2008) which indicated the level of disconnection between the students' Mathematics learning and how it applied to real world problems. This disconnection may lead to students struggle to understand Mathematics.

The study finally investigated how student's perception that Mathematics is abstractly taught influence their interest in mathematics. The results indicate that 20% of the participants disagreed that mathematics is abstractly taught while 55.6% of the total participants agreed that Mathematics is abstractly taught. It is important to note that 25.4% of the total participants were neutral about whether Mathematics is abstractly taught or not. The overall ranking of the fact was high with relative importance index of 0.71 and the mean as well as standard deviation was 3.58 and 1.91 respectively as shown in Table 1.

To be able to determine how many components (factors) to be extracted, the study considered some information provided in the out from the EFA. Using the KMO and Bartlett's test of sampling adequacy showed significant hence passing the data test to running the principal component analysis using the data. To determine number of component in the six (6) item measuring mathematics teachers ability to connect mathematics to immediate environment from the students' point of view, Kaiser's criterion using component with Eigen values of 1 or more. The final rotated component matrix maintained two factors were extracted and these two components indicates that the six factor of mathematics connection can be further reduced to two .When the factors were rotated, the first factor accounted for 42.1% of the variance, the second factor accounted for 14.7%. Table 1 displays the items and factor loadings for the rotated factors with loading less than 0.4 omitted for clarity sake.

Table 1 *Descriptive Statistics of Mathematics connectivity constructs*

Factors	SD	D	N	A	SA	RII	M	SD
Teachers connect Mathematical concept to real life problems	14.9%	15.1%	21.2%	27.5%	21.3%	0.65	3.25	1.35
Teachers link Mathematics to other subject areas	9.5%	9.3%	20.4%	23.8%	37%	0.74	3.69	1.31
Teachers provide example and case studies	7.4%	15.8%	25.6%	27.3%	23.9%	0.69	3.44	1.22
Teachers dedicate quality time for practicing class exercise	7.2%	9.9%	16.5%	28.2%	38.3%	0.76	3.8	1.25
There is coordination between class work and assignment given by Mathematics teacher	10.4%	12.4%	19.4%	33.5%	24.3%	0.70	3.49	1.27
Mathematics is abstractly taught	8.9%	10.1%	25.4%	29%	26.6%	0.71	3.58	1.91

Table 2 *KMO and Bartlett's Test of Sampling Adequacy*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.785
Bartlett's Test of Sphericity	Approx. Chi-Square	1184
	Df	15
	Sig.	0.00

Table 3 *Total Variance Explained*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.527	42.123	42.123	2.527	42.123	42.123
2	0.884	14.738	56.862	0.884	14.738	56.862
3	0.825	13.746	70.607			
4	0.718	11.975	82.582			
5	0.61	10.164	92.746			
6	0.435	7.254	100			

Table 4 *The Two-Component Rotated Structure Matrix*

Rotated Component Matrix		
	Component	
	1	2
Teachers connect Mathematical concept to real life problems.	0.812	
Teachers link Mathematics to other subject area during mathematics lesions.		0.602
Teachers provides example and case studies during mathematics lesions.	0.501	
Teachers dedicate quality time for practicing class exercise.	0.695	
There is coordination between class work and assignment given by mathematics teacher.	0.515	
Mathematics is abstractly taught.		0.835

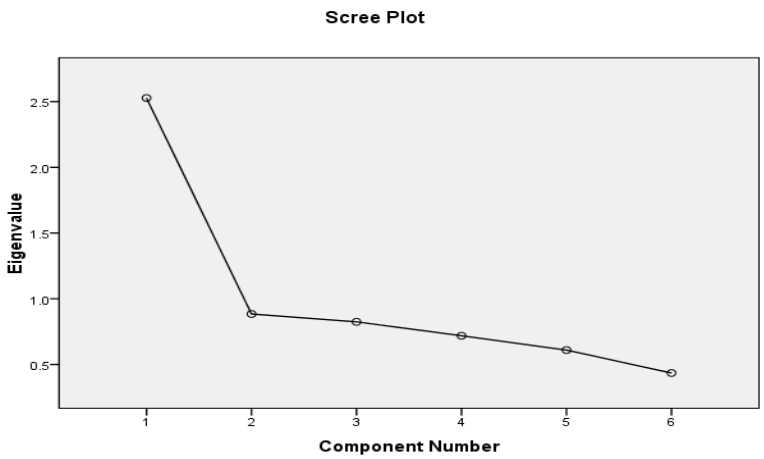

Fig 1 *Scree plot Rotated structure component*

Table 4 Correlation *Analysis of Students' Interest with Extracted Components*

Correlations				Descriptive statistics	
	Students Interest	Component 1	Component 2	Mean	Std. Deviation
Students Interest		0.731**	0.606**	3.6342	0.94471
Connectedness			0.448**	3.5032	0.88138
Abstraction				3.6382	1.31947

**** P-value< 0.001**

Table 6*Summary of Multiple Regression Analysis Results*

IV. Conclusions And Recommendations

Model Summary					
R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
				R Square Change	F Change
.795	0.632	0.631	0.57381	0.632	1080.364
ANOVA					
	Sum of Squares	Df	Mean Square	F	P-value
Regression	711.432	2	355.716	1080	0.000
Residual	414.862	1260	0.329		
Total	1126.294	1262			
Coefficients					
	Unstandardized Coefficients		Standardized Coefficients	t-Statistics	P-value
		Std. Error	Beta		
(Constant)	0.567	0.069		8.281	0.00
Connectedness	0.617	0.021	0.575	30.075	0.00
Abstraction	0.249	0.014	0.348	18.202	0.00

The study used exploratory factor analysis to determine the principal components of mathematics connectedness construct. The study further conducted regression analysis using the extracted principal components to determine their predictive strength of students' interest in mathematics. The study made the following conclusions and recommendations in the sections below.

V. Conclusions

The study after analysis concluded that

i. The Mathematics connectivity construct can be put into two principal components(connectedness and abstraction)and these components significantly predicts 63.1% of variability of student interest in Mathematics.
ii. The teachers' dedication of quality time for practicing class exercise during mathematics lessons is the most important factor in the Mathematics connectivity construct.The students' perceived it as the greatest contributor to students' interest development in Mathematics.
iii. The Mathematics teachers' ability to connect mathematics to real life problems in various subject areas is crucial to building students interest in Mathematics since its predicts 63.1% of the variance in the student interest in mathematics.
iv. The existence of coordination between what is been taught and the class exercise given will help develop the student interest in Mathematics.

Recommendations

The study made the following recommendations for mathematics educators and stakeholders after data analysis was rigorously performed on the data collected.

The study recommends for mathematics educators to establish connection between the contents taught in the classroom and the exercises given to students. When teachers are able to connect what is been taught with the exercises given to students it will improve students' interest in mathematics. Teachers are encouraged to connect mathematics to real life problems and their immediate environment as well as other subject areas. This will help students to connect what is being taught and its relevance to the society or the course pursued by the students. The study also recommends that teachers of mathematics should develop ways in which abstraction in teaching mathematics will be dealt with so that students with less interest in mathematics will see reasons for learning mathematics without struggle. The study suggests that further studies should research into the factors that predict and significantly influence mathematics teachers' ability to connect mathematics to real life problems as this will helpextend the frontiers of mathematics connectedness literature.

References

[1]. Ball, D. L. (1993). With an eye on the mathematics horizon: Dilemmas of teaching elementary school mathematics. *The Elementary School Journal*, *93*(4), 373–397.

[2]. Casey, B., Kersh, J. E., & Young, J. M. (2004). Storytelling sagas: An effective medium for teaching early childhood mathematics. *Early Childhood Research Quarterly*, *19*(1), 167–172. http://doi.org/10.1016/j.ecresq.2004.01.011

[3]. Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, *41*(10), 1040–1048. http://doi.org/10.1037/0003-066X.41.10.1040

[4]. Fraivillig, J. L., Murphy, L. A., & Fuson, K. C. (1999). Advancing Children's Mathematical Thinking in Everyday Mathematics Classrooms. *Source: Journal for Research in Mathematics Education Journal for Research in Mathematics Education*, *30*(2), 148–170. http://doi.org/10.2307/749608

[5]. Fredricks, J. A., Wang, M. Te, Schall Linn, J., Hofkens, T. L., Sung, H., Parr, A., & Allerton, J. (2016). Using qualitative methods to develop a survey measure of math and science engagement. *Learning and Instruction*, *43*. http://doi.org/10.1016/j.learninstruc.2016.01.009

[6]. Fry, H., Ketteridge, S., & Marshall, S. (2009). *A Handbook for Teaching and Learning in Higher Education*. *A Handbook for Teaching and Learning in Higher Education*. http://doi.org/10.1080/03075079312331382498

[7]. Ginsburg, H. P., & Amit, M. (2008). What is teaching mathematics to young children? A theoretical perspective and case study. *Journal of Applied Developmental Psychology*, *29*(4), 274–285. http://doi.org/10.1016/j.appdev.2008.04.008

[8]. Greer, B. (2008). Algebra for all? *Montana Mathematics Enthusiast*, *5*(2), 423–428.

[9]. Intaros, P., Inprasitha, M., & Srisawadi, N. (2014). Students' Problem Solving Strategies in Problem Solving-mathematics Classroom. *Procedia - Social and Behavioral Sciences*, *116*(0), 4119–4123. http://doi.org/http://dx.doi.org/10.1016/j.sbspro.2014.01.901

[10]. Ketterlin-Geller, L., & Chard, D. J. (2011). Algebra readiness for students with learning difficulties in grades 4-8: Support through the study of number. *Australian Journal of Learning Difficulties*, *16*(1), 65–78. http://doi.org/10.1080/19404158.2011.563478

[11]. Lubienski, S. T. (2002). A Closer Look at Black-White Mathematics Gaps: Intersections of Race and SES in NAEP Achievement and Instructional Practices Data. *Journal of Negro Education*, *71*(4), 269–287. http://doi.org/10.2307/3211180

[12]. Mensah, J. K., Okyere, M., & Kuranchie, A. (2013). Student attitude towards Mathematics and performance : Does the teacher attitude matter ? *Journal of Education and Practice*, *4*(3), 132–139.

[13]. Palm, T. (2008). Impact of authenticity on sense making in word problem solving. *Educational Studies in Mathematics*, *671*(1), 37–58. http://doi.org/doi: 10.1007/s10649-007- 9083-3

[14]. Rakes, C. R., Valentine, J. C., McGatha, M. B., & Ronau, R. N. (2010). Methods of instructional improvement in algebra: A systematic review and meta-analysis. *Review of Educational Research*, *80*(3), 372–400. http://doi.org/doi: 10.3102/0034654310374880

[15]. Rowland, T., Huckstep, P., & Thwaites, A. (2005). Elementary teachers' mathematics subject knowledge: The knowledge quartet and the case of Naomi. *Journal of Mathematics Teacher Education*, *8*(3), 255–281. http://doi.org/10.1007/s10857-005-0853-5

[16]. Sciarra, D. T. (2010). Predictive factors in intensive math course-taking in high school. *Professional School Counseling*, *13*(3), 196–207.

[17]. Tobias, S. (1989). *They're not dumb, they're different: Stalking the second tier*. Tucson, AZ: Research Corporation.

[18]. Winheller, S., Hattie, J. A., & Brown, G. T. L. (2013). Factors influencing early adolescents' mathematics achievement: High-quality teaching rather than relationships. *Learning Environments Research*, *16*(1), 49–69. http://doi.org/10.1007/s10984-012-9106-6

1Yarhands Dissou Arthur. "Connecting Mathematics To Real Life Problems: A Teaching Quality That Improves Students' Mathematics Interest.." IOSR Journal of Research & Method in Education (IOSR-JRME) , vol. 8, no. 4, 2018, pp. 65-71.