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ATTITUDES AND COMPUTATIONAL SKILLS VALIDATION THROUGH CALCULATOR UTILIZATION

Emerson D. Peteros[1], Fritzie B. Estrera[2], Domenic T. Sanchez[3], Larry B. Peconcillo Jr.[4], Reylan G. Capuno[5], Ramil P. Manguilimotan[6]

[1]Dr., Faculty, College of Education, Cebu Technological University-Main Campus, Cebu Philippines, emerson.peteros@ctu.edu.ph

[2]Faculty, Don Vicente Rama Memorial National High School, Cebu Philippines, fritzieestrera01@gmail.com

[3]Dr., Faculty, College of Education, Cebu Technological University, NEC, City of Naga, Cebu, Philippines, domenic.sanchez@ctu.edu.ph

[4]Dr., Faculty, College of Education, Cebu Technological University, NEC, City of Naga, Cebu, Philippines, larry.peconcillojr@ctu.edu.ph

[5]Dr., Dean, College of Education, Cebu Technological University-Main Campus, Cebu Philippines, reylan.capuno@ctu.edu.ph

[6]Dr., Associate Dean, Graduate Program, Cebu Technological University-Main Campus, Cebu Philippines, ramil.manguilimotan@ctu.edu.ph

ABSTRACT

Learning mathematics entails performing computations to validate answers to specific math problems. Scientific calculators have been extremely useful in assisting students in solving these problems and validating their responses. This study examined the relationship between calculator attitudes and computational math skills of 156 Grade 10 students at Don Vicente Rama Memorial National High School in Cebu City, Philippines, during the school year 2018–2019. To identify respondents, simple random sampling was used. A survey questionnaire based on Kaino and Salani's (2004) "Attitudes on Calculator Use Survey" was used to determine the respondents' attitudes toward calculator use, while a researcher-made test was used to assess the respondents' computational skills. A pilot test was carried out to assess the dependability of the instrument, which a statistician also validated. The findings revealed that respondents performed very well on computational skills and had positive attitudes toward the usefulness and enjoyment of calculator use. They were unconcerned about the anxiety associated with using calculators. Furthermore, there was no significant relationship between computational skills, usefulness, and enjoyment. Anxiety, on the other hand, was found to be negatively related to their computational skills.

Keywords: attitudes, anxiety, enjoyment, usefulness, calculator use, computational skills

I. INTRODUCTION

Education has significantly benefited from the functions and applications of various forms of technology as they have emerged. It has aided students' learning in a variety of fields of study in a variety of ways. Mathematics is one of the beneficiaries of its educational benefits. Math is regarded as a complex subject by most secondary school students, which is why many efforts have been made to make it appealing to students (Clark, 2011). The subject's complexity contributes to students' negative attitudes toward it because it involves computations and problem solving, which necessitates students' proficiency with numbers and situational analysis. In recent years, it has always been advocated to incorporate technology into classroom instruction to motivate and encourage student participation, particularly in subjects where students are disinterested. Calculator use is a very common integration in Mathematics to lessen the burden of students in computations and algebraic manipulations, where calculators become powerful tools that reduce students' execution on paper-and-pencil calculations and algebraic manipulations. In the lives of students, this technology has been the most preferred mode of computation. As a result, incorporating calculators into mathematics instruction allows students to learn more quickly and efficiently while staying on track. It allows them to spend less time on computational algorithms and more time on improving

their problem-solving skills, mental arithmetic, estimation skills, and more explorations on its applications. As a result, students who are discouraged by tedious computations are inspired to explore the subject's magnificence (Mbugua, Muthomi& Okere, 2011).

The National Council of Teachers of Mathematics (NCTM) has long supported calculators in mathematics teaching and learning due to the benefits it provides to students (Dion et al., 2001). Many educators, however, oppose the use of calculators in the classroom because they see the dangers of students' basic mathematical and procedural skills in computation being weakened as a result of constant use of the device. Suppose this is used at a young age. In that case, it may impede the development of number concepts, lead to reliance on it, inability to distinguish between correct and incorrect answers provided by the calculator, and lead to laziness in thinking about how to manipulate numbers (Suydam, as cited in Mbugua, Muthomi& Okere, 2011). Furthermore, students unfamiliar with the functions of this device may develop a negative attitude toward its use in the classroom. It would be difficult for students unfamiliar with calculators' functions in mathematical computations, particularly scientific and graphing calculators, which have numerous features.

Because they can solve advanced mathematical computations, scientific calculators are commonly used in high schools. Students must thoroughly study the functions of these calculators before they can use them effectively, so rather than enjoying the calculators' applications, they will be anxious when computations require calculators and they have not mastered the skills. Calculator-related activities would be a burden for these students, affecting their performance. On the other hand, students are interested in the subject once they have mastered calculators. They will be more engaged in class interactions and activities if teachers can design activities that increase confidence and awareness of calculator functionality, use calculators as investigative tools, and answer exams and activities that require calculator use. As a result, students' learning may be enhanced when this device is used following its intended purpose.

As a result, the researchers designed this study to determine the significance of students' attitudes toward calculators in terms of usefulness, enjoyment, and anxiety with their computational math skills. The findings of this study will provide important information for the development of a more specific approach to addressing concerns about improving students' computational skills in math. This could aid in addressing issues concerning students' mathematical performance.

II. LITERATURE REVIEW

The Constructivism Theory supports this study by John Dewey, which states that "the learners construct and built the information inside their mind based on their experiences and prior knowledge" (Aldoobie, 2015, p.114). Students' exposure to calculator use through the activities provided by the teacher will help them build their knowledge on how to compute mathematical operations and solve problems with the aid of the calculators. The skills on the use of calculators are developed by the students themselves by constantly manipulating this gadget. These skills will help them solve problems in math that require them to use calculators. Performing basic mathematical and algebraic operations in calculators instead of manually performing these skills will reduce time in solving these problems.

On the other hand, this study is based on Vygotsky's Zone of Proximal Development Model, which states that "what the students can do, build, understand, and learn when they get help describe the actual potential development level in themselves" (Aldoobie, 2015,p. 115). The model illustrates learning, which includes stages of modification of the skills and interaction so that new knowledge will be developed through interaction with the more knowledgeable individual. Teachers stimulate the students to learn by themselves by providing them with activities that enhance their skills and use them to develop new ones. Teachers serve as facilitators of students' learning.

When teachers assess their students' skills, they can identify areas that need improvement and development. This will be achieved when students perform the activities given by the teachers. The experiences of the students on activities using calculators may develop positive and negative attitudes towards calculator use. Students proficient in calculator use are more inclined to like these activities, while students who are not well-exposed to these skills might develop a negative attitude towards calculator use. Calculators will also harm the students' achievement in math because using this gadget does not require students to think in performing mathematical operations and solving problems (Torstein and Neville, as cited in Mbugua, Muthomi, & Okere, 2011). However, calculators are only helpful for computations and make computations faster, and not all problems can be solved by calculators

only, and mental calculations are sometimes better than using these gadgets. Corollary to this, students believe calculators cannot be used to solve all problems. Calculators make their work faster, and mathematics is easier with the use of calculators. Further, this gadget does not confuse but instead encourages them to think and motivates them to learn (Mbugua et al., 2011).

The tendency for students to be dependent on calculator use was explored by Rohrabaugh and Cooper (2016) which they found that students have easy access to calculators either on their cell phone or on one that they purchase for their classes. Students immediately refer to their cell phones even on the fundamental number operations on one-digit numbers. When they are asked to perform multiplication without a calculator, most can provide wrong answers because of their dependency on their calculator. Eighty percent of students' time worldwide is spent on the learning and practicing mathematical procedures (Caroll, 2015). Hence, this time could be used more productively if technology integration is implemented in the classroom. In so many ways, the calculator has provided teachers with great potential to teach complicated topics that require complex computations. Besides, scientific calculators are believed to give students the necessary chances of participating actively in different math activities.

Moreover, Odhiambo and Wasike (2016) investigated whether there is a significant difference in the students' achievement between using the conventional mathematical tables in trigonometry and using scientific calculators to solve trigonometry problems. The respondents were selected from public secondary schools in Mumias Sub County, Kenya. Results revealed that using the conventional method is inferior towards motivating the students to learn over the use of calculators in the class, wherein calculators were successful in enhancing students understanding and improving their attitudes towards mathematics. Hence, calculator use is a good source of motivation and engagement for the students because they enjoy the usefulness of the technology in solving problems related to trigonometry. Studies have reduced some fears that calculators could diminish the students' computational skills, which they acquire from paper-pencil activities (Kaino & Salani, 2004). Educators also consider that using technology is the only alternative to teaching as a substitute for the traditional way of teaching and learning (Broekman et al., 2002).

Close et al. (2012) empirically tested the difference in the performance of the 1,469 Grade 9 Irish students using three calculator tests conducted in two phases wherein the first phase of the test study mathematics without calculators. After three years, the same test was administered, but this time with the use of calculators. Results revealed that the test using calculators provides better performance for the students than the test without calculators. Interestingly, students' attitudes towards calculators have improved over time. Calculators can benefit the students and the teacher because learners can be actively involved in the learning process while the teacher needs less supervision and directions to accomplish a particular task.

Further, calculator use has some benefits such as concepts in math will be more understood, and increased mastery on the students' computational skills, accurate answers have arrived, a source confirmation for doubtful answers, motivate students to do more tasks and are convenient to use for those who are proficient in using the calculator. Hence, constant use of these will lead to better performance (Odera and Ochanda, 2011). Majority of the teachers believed that technology makes calculations easier, aid students' understanding on math concepts, empowers the students to solve real-life applications and enable the students to in a different perspective (Goos & Bennison, 2008). Interestingly, Masibo (2007) study showed the attitude change and improvement of mathematics achievement were related when students use scientific calculators in learning mathematics. Thus, it was recommended to encourage the use of calculators in classrooms when appropriate to facilitate better grasps of the learners on the mathematical concepts. The attitudes that the students will develop in the use of calculators might affect their performance. Thus, the relationship that these variables may develop needs to be looked into as this could be the basis for a comprehensive view towards enhancing the students' math performance. Literature that provides information about the previous studies conducted serves as the framework for this study's development.

III. RESEARCH DESIGN

This study utilized the quantitative approach, which used the survey questionnaire to gather data to test the respondents' attitudes on calculator use and their computational skills. Quantitative research collects and analyzes numerical data, which can be used to determine relationships between two or more variables (Bhandari,2021). A simple random technique was used to determine the 156 Grade 10 respondents. Slovin's formula was used to determine the sample size sufficient to arrive at valid and reliable results. Slovin's formula helps the researchers determine the sample from a population to arrive at results with a high degree of accuracy (Ellen, 2020). The

study was conducted at Don Vicente Rama Memorial National High School in Cebu City, Philippines. This school is one of the recipients of the research project conducted by Basic Education – Math Teachers' Society (BE – MTS), entitled "Class – up With ClassWiz." A ClassWiz technology was used inside the classroom for the teaching-learning process. The school is one of the chosen public schools in Cebu City. In connection with this, the school received scientific calculators that the students used every time they have mathematical computations, and they also have time to practice how to handle the technology in the teaching-learning process in preparation and if there will be Calcu-lympics competitions. The selected schools were allowed to express official partnership with BE-MTS, Inc. As a school partner, the math teachers received free math training focuses on various technologies which can be integrated with the teaching-learning process. The researchers used a survey questionnaire adapted from the **Attitudes on Calculator Use Survey** by Kaino and Salani (2004). Each variable has five indicators in which the respondents were asked to rate as to the degree of their agreement to these statements as to how they think and feel with regards to calculator use using five-point Likert Scale, namely: 5 –Strongly Agree, 4 – Agree, 3 – Undecided, 2 – Disagree and 1 – Strongly Disagree. The computational skills of the respondents were measured using a researcher-made 25-item multiple-choice test which undergone pilot testing before it was administered to the respondents. An item analysis was conducted to ensure that each item passed the standards in constructing a multiple-choice test. Revisions were made until all the items had passed the requirements.

IV. RESULTS AND DISCUSSION

This section presents the level of computational skills of the respondents when using the scientific calculator, as illustrated in Table 1.

Table 1. Computational Skills of the Respondents

Level	Range of Scores	*f*	%
Outstanding	21 – 25	38	24.36
Very Satisfactory	16 – 20	55	35.26
Satisfactory	11 – 15	42	26.92
Fair	6 – 10	21	13.46
Poor	0 – 5	--	--
Total		*156*	*100.00*
Average		*16.65*	

As observed in Table 1, 55 out of the 156 respondents were able to score 16 to 20 points in the 25 – item computational skills assessment, which means that 35.26 percent of the respondents had a very satisfactory performance in the computational skills. However, 42 or 26.92 percent of them had a satisfactory performance, which means they had scored from 11 to 15 points in the test while 21 or 13.46 of the respondents had scored 6 to 10 points, which indicates that they had fair performance in the said test. Interestingly, 38 or 24.36 percent of them had an outstanding performance in the test, which means they scored from 21 to 25 points.

Even though there were students who had very good performance in the assessment, it cannot be disregarded that some of the respondents' performance still needs to be improved. The fact that the test utilized calculators in solving mathematical computations implies that those who had low scores do not know how to use the calculator's functions or do not know when to apply these functions. It is important that when using calculators, students should have mastered how to use the features of the calculators and be familiar with when to use these functions, or else the use of calculators in computational activities will not be beneficial to the students.

One of the variables that measure the respondents' attitudes towards calculator use is its usefulness in math-related activities presented in Table 2.

Table 2. Attitudes of the Respondents on Calculator Use in terms of its usefulness

Indicators		$\bar{x}$	sd
1	I have to use the calculator on a day-to-day basis.	3.49	1.019
2	I think a calculator will be helpful to me in my future job.	4.10	0.938
3	Anything that a calculator can be used for, I can do it also.	3.54	0.993
4	A calculator can help me learn some new skills.	3.88	1.018
5	A calculator helps me in answering math activities.	4.58	0.728
Overall Weighted Mean		*3.92*	
Overall Standard Deviation			*0.939*

As seen in the table, five statements describe the respondents' attitudes on calculator use in terms of its usefulness. The statement "*Calculator helps me in answering math activities.*" Had a weighted mean of 4.58 and a standard deviation of 0.728, the respondents had a very positive attitude towards calculator use in math activities. Moreover, the statements *"I have to use the calculator on a day to day basis.", "I think a calculator will be useful to me in my future job.", "Anything that a calculator can be used for, I can do it also.",* and *"Calculator can help me learn some new skills."* had weighted means ranging from 3.49 to 4.10 and standard deviations from 0.938 to 1.019, which signifies that the respondents had positive attitudes towards the use of calculators in math. Lastly, calculators had an overall weighted mean of 3.92 and an overall standard deviation of 0.939, which means that the respondents had a positive attitude towards the use of calculators. When students appreciate the use of calculators in their math activities, they tend to develop a positive attitude towards its use in math activities, especially in problems that need calculators when solving. Students have been exposed to using calculators at home and in school that made them knowledgeable on using this technology to find ways to utilize this gadget to help them in their mathematical tasks (Forman, 2006).

Another variable that measures the respondents' attitudes on calculator use is the enjoyment it brings to them when utilized during math-related activities.

Table 3. Attitudes of the Respondents on Calculator Use in terms of its enjoyment

Indicators		$\bar{x}$	sd
1	I enjoy using a calculator in mathematics activities.	4.03	0.926
2	A calculator is interesting to use in math classes.	4.19	0.828
3	I find the calculator fascinating and easy to use.	3.94	0.863
4	I enjoy investigating mathematics problems using a calculator.	3.76	1.062
5	A calculator is very interesting and challenging to use.	3.89	0.927
Overall Weighted Mean		*3.96*	
Overall Standard Deviation			*0.921*

Table 3 illustrates the respondents' level of attitudes on calculator use in terms of the enjoyment it brings to the respondents. Five statements are describing the enjoyment that calculators will bring when utilized during math activities. All the statements such as "*I enjoy using a calculator in mathematics activities.", "A calculator is interesting to use in math classes.", "I find calculator fascinating and easy to use.", "I enjoy investigating mathematics problems using a calculator."* and *"A calculator is very interesting and challenging to use."* had weighted means from 3.76 to 4.19 with standard deviations ranging from 0.828 to 1.062, which are interpreted as the respondents had positive attitudes towards the enjoyment that the calculator brings when utilized during math activities.

To sum up, the overall weighted mean of 3.96 and a standard deviation of 0.921 signify that the respondents had a positive attitude towards calculators regarding the enjoyment it brings to them when utilized during math activities. When used by the students effectively, the calculating power of the calculator will amaze them, especially on the complicated computations in math. There are many features in calculators that can quickly solve some of the very long processes of calculations when done manually. That is why it will bring enjoyment to students when they discover that math problems that they solve rigorously can be solved by calculators immediately. Most of the students enjoyed working with calculators. Furthermore, boys enjoyed more while working with calculators than girls (Kaino & Salani, 2004).

When students use calculators, this could bring anxiety to those who are not familiar with its functions. Thus, this is another important variable that can be the basis to measure the respondents' attitudes towards calculator use.

Table 4. Attitudes of the respondents on calculator use in terms of anxiety in using it

Indicators		$\bar{x}$	sd
1	I feel comfortable when I learn mathematics using a calculator.	2.69	1.058
2	The thought of using a calculator in mathematics activities does not frighten me.	2.71	1.035
3	I am not worried about using a calculator because I know what to do if something goes wrong.	2.85	1.102
4	The use of a calculator does not confuse me.	2.83	1.079
5	I feel I can manage to use a calculator effectively.	2.83	1.125
Overall Weighted Mean		*2.78*	
Overall Standard Deviation			*1.080*

As indicated in Table 4, five statements describe how they feel when they use calculators. Lower values on these statements imply that they feel the anxiety of using the calculators. Otherwise, they feel comfortable using calculators. It can be observed that all the comments "*I feel comfortable when I learn mathematics using a calculator.", "The thought of using a calculator in mathematics activities does not frighten me.", "I am not worried about using a calculator because I know what to do if something goes wrong.", "The use of a calculator does not confuse me."* and *"I feel I can manage to use a calculator effectively."* had weighted means from 2.69 to 2.85 with standard deviations from 1.058 to 1.125, which indicates that the respondents had neutral attitudes on the anxiety that calculator will bring to them.

The neutral attitudes of the respondents towards the use of the calculators imply that using calculators does not necessarily bring stress to them because they are already exposed to it. Though they have not mastered using it, they can find ways to manipulate the gadget effectively when necessary. They are already used to utilizing calculators when solving math problems and computations at their grade level, so they are not concerned anymore about using it. Regarding its use, students are already aware that it has limited use when it comes to problem-solving, wherein it needs more analysis before one can find the solution to the problem. Calculators are only limited to helping the students compute faster but not to analyze how to solve the problem. Students believe calculators cannot solve all problems, their performance is better, and they solve more problems when using calculators. Mathematics is faster and easier with calculators (Mbugua, Muthomi, & Okere, 2011). Lastly, the overall weighted mean of 2.78 with a standard deviation of 1.080 means that the respondents had neutral attitudes towards the calculator's anxiety. Students feel anxious when they use calculators, but they do not have the mastery of using the functions of the calculators. Hence, having a calculator does not guarantee that they can perform well in the subject. They still need to master the gadgets' features to ensure a better performance using the calculator. Students who do not enjoy solving math problems using calculators greatly impact their anxiety towards learning (Kaino & Salani, 2004). For the respondents, lesser anxiety had been observed because they believe that calculators are used to helping them in math computations, giving them the advantage of not using the gadget.

Generally, calculator use is a good source of motivation and engagement of the students because they enjoy the usefulness of the technology in solving problems related to trigonometry (Odhiambo & Wasike, 2016). Students

find mathematics very exciting and entertaining when they use calculators in their activities. Students who use calculators can finish their work faster and makes mathematics easy for them. The calculator does not confuse them. Instead, it encourages them to think (Mbugua, Muthomi, & Okere, 2011).

This section presents the test on the significant relationship between the computational skills of the respondents through calculator utilization and their attitudes towards the use of calculators in terms of its usefulness, enjoyment and the anxiety it brings to the users.

Table 5. Relationship between Attitudes on Calculator Use and Computation Skills of the Respondents

Variables	n	*r*	p - value	Decision	Remarks
Usefulness and Computational Skills	156	0.024	0.762	Do not Reject Ho	Not Significant
Enjoyment and Computational Skills	156	0.118	0.144	Do not Reject Ho	Not Significant
Anxiety and Computational Skills	156	-0.194*	0.015	Reject Ho	Significant
**significant at p < 0.05(two – tailed)*					

As observed in Table 5, the test on the usefulness of calculators and the computational skills of the respondents showed the computed Pearson r of 0.024, which means that there is a negligible positive correlation between the calculators' usefulness and the computational skills of the respondents. However, the test on the significance of its relationship showed that the p-value of 0.762 is greater than the significance level of 0.05 (0.762 > 0.05). Hence the null hypothesis is not rejected. The result suggests that the respondents' perception of the usefulness of calculators is not related to the computational skills of the respondents.

Moreover, the result on the test on the significant relationship between the respondents' perception of the enjoyment it brings to the respondents and their computational skills showed that the computed value of Pearson r is 0.118, which means that there is a negligible positive correlation between the enjoyment of calculator use and the computational skills of the respondents. The relationship was tested with a computed p-value of 0.144, which is greater than the level of significance of 0.05 (0.144 > 0.05). Thus the null hypothesis is not rejected. The findings suggested that the enjoyment that calculators bring to the respondents does not contribute to their computational skills.

Lastly, the test on the relationship between the anxiety that the usage of calculators brings to the respondents and their computational skills had a computed Pearson r of – 0.194 which means that there is a negligible negative correlation between the anxiety that the calculators bring and the computational skills of the respondents. Their relationship was further tested at a 0.05 level of significance with a p-value of 0.015 (0.015 < 0.05), which is lesser than the significance level. The results revealed that the anxiety that the calculators bring to the respondents is significantly related to the performance in their computational skills. This suggests that the lesser anxiety that the respondents have, the better their computational skills. Thus, when students are comfortable using calculators during math activities, their performance will more likely improve (Masibo, 2007). Students find mathematics very exciting and entertaining when they use calculators in their activities. Here, students manifested no anxiety in using calculators. Instead, they find enjoyment in it. The use of calculators improves students' attitudes in mathematics and develops their self–concept in mathematics, enhancing and motivating them to learn the subject (Mbugua et al., 2011). However, a calculator should not serve as an alternative for doing mental operations but should be used to explore, and later the teacher should reinforce with the explanation on the rule in math applied in the concept of the computation process (Noraini, 2002).

V. CONCLUSION

It can be inferred that, while students find calculators useful during their math activities and enjoy using them, it does not have to bear on their performance in computational skills. Furthermore, students' enjoyment of using the device does not guarantee that they will improve their computational skills; instead, it is dependent on their motivation to learn more about its application to math computations. Finally, the less anxiety that calculators cause students will result in better computational skills with the aid of calculators.

REFERENCES

1. Aldoobie, N. (2015). Technology Integration and Learning Theory. American International Journal of Contemporary Research, 5(6), 114 – 118
2. Asad, R. M., Iqbal, N. &Tasneem, S. (2015). The influence of parents educational level on secondary school students academic achievements in District Rajanpur. Journal of Education and Practice, 6(16), 76 – 80.
3. Bhandari, P. (2021). An Introduction to quantitative research. Retrieved from https://www.scribbr.com/methodology/quantitative-research/
4. Broekman, I., et al (2002). Distributive justice and information communication technology in higher education in South Africa. Journal of South African Higher Education, 16(1),29-35
5. Caroll, J. (2015). Weapons of maths destruction: are calculators killing our ability to work it out in our head? Retrieved July 19, 2018 from http://www.abc.net.au/news/2015-08-10/are-calculators-affecting-maths-skills/6684542
6. Clark, J. (2011). Mathematical Connections: A Study of Effective Calculator Use in Secondary Mathematics Classrooms. Retrieved July 28, 2018 from https://files.eric.ed.gov/fulltext/ED519032.pdf
7. Close, S. et. al. (2012). Effects of Calculators on Mathematics Achievement and Attitudes of Ninth-Grade Students. The Journal of Educational Research, 105:377–390, DOI:10.1080/00220671.2011.629857
8. Dion, G., Harvey, A., Jackson, C., Klag, P., Liu, J., & Wright, C. (2001). A survey of calculator usage in high schools. School Science and Mathematics, 101(8), 427-438
9. Ellen, S. (2020). Slovin's Formula Sampling Techniques. Retrieved from https://sciencing.com/slovins-formula-sampling-techniques-5475547.html
10. Forman, J. (2006). Calculator Use in the Middle School Classroom. Mathematical and Computing Sciences Masters. Paper 115.
11. Goos, M. &Bennison, A. (2008). Surveying the Technology Landscape: Teachers' Use of Technology in Secondary Mathematics Classrooms. Mathematics Education Research Journal 20(3), 102-28.
12. Jabor, M. K. (2011). The Influence of Age and Gender on the Students' Achievement in Mathematics. International Conference on Social Science and Humanity. IPEDR vol.5, IACSIT Press, Singapore.
13. Kaino, L. M. &Salani, E. B. (2004). Students' gender attitudes towards the use of calculators in mathematics instruction. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, Vol 3, pp 113–120
14. Machebe, C. H., Ezegbe, B. N. &Onuoha, J. (2017). The impact of parental level of income on students' academic performance in high school in Japan. Universal Journal of Educational Research, 5(9), 1614-1620. DOI: 10.13189/ujer.2017.050919
15. Masibo, E. N. (2007). Effects of the use of scientific calculators on students' attitude and achievement in mathematics: a case of secondary school students in Bungoma District, Kenya. Retrieved July 21, 2018 from http://www.researchkenya.or.ke/thesis/22587/effects-of-the-use-of- scientific-calculators-on-students-attitude-and-achievement-in- mathematics-:-a-case-of- secondary-school-students-in-bungoma- district, kenya
16. Mbugua, Z. K., Muthomi, M. W. &Okere, M. O. (2011). Attitude of Secondary School Students on use of Scientific Calculators in Learning Mathematics in Embu District in Kenya. International Journal of Humanities and Social Science, 1(13), 131 – 136.
17. Noraini, I. (2002). Developing Self-confidence Among Malay Students: Usage of Graphing Calculators. Proceedings of Second East Asia Regional Conference on Mathematics Education in Singapore. Retrieved September 14, 2018from http://www.ejmste.com/032006/d5.pdf
18. Odera, F. Y. & Ochanda, J. (2011). Challenges in the use of Scientific Calculators in the Teaching and Learning Mathematics in Secondary School Education. International Journal of Information and Communication Technology Research, 1(5), 230 – 238
19. Odhiambo, M. N. &Wasike, D. W. (2016). Effectiveness of Scientific Calculators on Secondary School Students' Attitude Development in Mathematics. Journal of Education Research and Behavioral Sciences Vol. 5(7), pp. 111-115
20. Vasquez, S. & McCabe, T. W. (2002). The Effect of Calculator Usage in the Learning of Basic Skills. Research and Teaching in Developmental Education, 19(1), 33-40. Retrieved July 24, 2018 from http://www.jstor.org/stable/42802150 Accessed: 10-12-2015 06:29