Fundamental Operations In Mathematics With Or Without Aided Calculator: Implications To Students' Learning

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Abstract: The purpose of this study was to find out the performance of the selected fourth year high school day students in Carmen National High School Carmen, Cebu in fundamental operations with or without calculator. Calculators are great invention that in one way or another helped the children in doing some of their mathematical computations. But a desire to identify the current condition of the students in performing basic mathematical computations by comparing their computational ability without using calculators and of using calculators pushes these curious minds to pursue this study. This study was conducted during the School Year 2013-2014.In conducting the study, the description method was utilized with the help of a researcher-made questionnaire as the main tool in gathering data in order to come up with sufficient and justifiable results. There are 229 respondents out of 535 total populations of the day session fourth year high school students.The results showed that the students were performing well in doing calculations with the use of calculators compared to those who were not using calculators. It only confirmed their dependency on calculators in solving basic mathematical computations, which by any case, only traces its disadvantages to the teaching matters. Attitude like relying on inventions that gave direct, fast and accommodating features were observable in most students and always results to weakening ability to judge the correctness of an answer due to the fact that they do not think of the real concept enough to determine what type of answer to expect.

Keywords: Fundamental Operations, Mathematics, With or Without Aided Calculator, Students' Learning

1 Introduction

People in the 21st century live in a technology and the media-driven environment, marked by various characteristics, such as access to abundance of information changes in technology tools, and make individual contribution on an unprecedented scale (Narquita et al. 2013). Current research in technology and mathematics education has found electronic technologies—calculators and computers—are essential tools for teaching, learning, and doing mathematics (National Council of Teachers of Mathematics, 2000; 24-25).With the advent of smart phones, many of us now carry calculators in the pockets wherever they go. While some people think that children should be taught to use calculators from the time they enter school, others fear that learning to use calculators will rob children of the ability to do mental calculations. Much of the contentious atmosphere surrounding this issue arises from using calculator or not using calculator. Though important, using calculator is only one of the methods in computing. Even young children can use calculators to focus on the ideas behind computation rather than on the act of calculating. Young students can learn to compare the calculator's messages to the reasonable answers they have learned to expect from their evolving understanding of arithmetic. This statement was supported by Dick (1988,39) also states in his article that "Students using calculators possesses a better attitude toward mathematics than no calculator students." Some students may have fears of the computational part of the problem, by allowing these students to use calculators which make them more comfortable and therefore they spend more time on the thinking part of the problem instead of worrying about computation mistakes.

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This allows students to succeed and build mathematics confidence. Mental math, estimation, paper and pencil, calculators and computers compromise the range of tools to help students work through the computations and manipulations necessary for solving problems. In many problem situations, calculators free students from tedious calculations so that valuable classroom time can be spent on higher order thinking and reasoning. Opponents for the use of calculators in classrooms have strong arguments against the tool. The critics stressed that calculators produce students who cannot perform basic tasks independently. Moreover, calculators encourage students to randomly try a variety of mathematical computations without any real understanding of which is appropriate or why. Calculators indeed, prevent students from discovering and understanding the underlying mathematical concepts and give students a false sense of confidence about their math ability. Lastly, with the aid of this The students fail to make connections and generate ideas. The majority of experts on high school learning maintain that for students who lack basic number proficiency, calculators may provide only the illusion of progress (Golden, 2005).The debate about calculator usage in math class has been going on ever since the calculators were first invented. One opinion in the debate states that calculators are good because they allow problems to be completed faster and more accurately. The opposing viewpoint is that calculators become a crutch and students have weak arithmetic skills as a result of having the calculator do the mathematical "heavy lifting." Calculators and their usage is that many students overuse their calculator, which leads them to underuse their brain. You probably know someone who starts every math problem by reaching for their calculator. This behavior is a problem as the calculator becomes more and more of a crutch. Some students use calculators so much that their first reaction is to use it to simply try to add, subtract, multiply, or divide the numbers given in the problem to see if any of those results make sense as an answer. These students have lost their problem-solving instincts and have weakened their ability to judge the correctness of an answer because they do not think through the problem enough to determine what type of

answer to expect. Continuous debates and further discussions about the matter of either to let the students use their calculators or not in solving fundamental operated numbers heightened the interest of many researchers to find the real response to this one problem in country's educational system. Most schools already took some actions and made personal evaluation in their respective institution to address the issue. The use of calculator in a formally structured learning institution, as such Carmen National High School Carmen, Cebu, has not been studied before. This research serves the purpose of informing future development. The main purpose of this study is to bring answers to the range of questions concerning the comparison of performance of the fourth year high school day students in solving basic mathematical number problems for the school year 2013-2014. This is an effort to determine the feasibility of implementing and managing the proper use of calculators The other intention of this study is to contribute to the field of teaching and learning, especially on Mathematics, since this study will shed light about important issues related as to what level of fundamental mastery the students posses, what ability and skills they are developing and how should the observed performances be improved or increased. This study is also relevant to the students, because it will help them improve their logical reasoning and to train and discipline their minds. On the other hand, this study is also pertinent for the educational institution where this study has been conducted, because it will lead teachers of the Mathematics Department to reflect on the importance of weighing two teaching concepts and techniques before administering them to the students without risking the students learning opportunities. The objective of this study helps to understand the dual effects, the positive and the negative outcomes of using calculators and without the aid of calculators.

Theoretical Background of the Study

This study is anchored on the following theories: Mathematics reveals hidden patterns that help us understand the world around us. Now much more than arithmetic and geometry, mathematics today is a diverse discipline that deals with data, measurements, and observations from science; with inference, deduction, and proof; and with mathematical models of natural phenomena, of human behavior, and social systems. Mathematics, as a major intellectual tradition, is a subject appreciated as much for its beauty as for its power. The enduring qualities of such abstract concepts as symmetry, proof, and change have been developed through 3,000 years of intellectual effort. Like language, religion, and music, mathematics is a universal part of human culture The study of Mathematics can satisfy a wide range of interests and abilities. It develops the imagination. It trains in clear and logical thought. It is a challenge, with varieties of difficult ideas and unsolved problems, because it deals with the questions arising from complicated structures. Yet it also has a continuing drive to simplification, to finding the right concepts and methods to make difficult things easy, to explaining why a situation must be as it is. In so doing, it develops a range of language and insights, which may then be applied to make a crucial contribution to our understanding and appreciation of the world, and our ability to find and make our way in it. Mathematics and calculation have been associated from earliest times. In modern times, the need to perform rapid mathematical calculations in war time, particularly in ballistics, and in decoding, was a strong stimulus to the development of the electronic computer. The existence of high speed computers has now helped mathematicians to calculate and to make situations visual as never before. These capacities change, not the nature of mathematics, but the power of the mathematician, which increases perhaps a million fold the possibility to comprehend, to argue, to explore (Brown & Porter, 1996). The term number sense refers to a person's general understanding of numbers and operations along with the ability to use this understanding in flexible ways to manage numerical situations (McIntosh, Reys, &Reys, 1992). Although children develop number sense in informal ways in their early years, after the age of four or five, they start their school lives and learn numbers and operations in more formal ways (Varol&Farran, 2006). In the past, the primary mathematics computation in early school years was based on the pen-and-paper algorithm (Cooper, Heirdsfield, & Irons, 1996). Technology, media, and study habits are said to have a direct causal relationship to the performance of the students in the National Achievement Test. It means that the more a value of the independent variable increase, the more it is likely to cause favorable results (Bautista, 2012). The National Council of Teachers of Mathematics (NCTM) provides a vision for the teaching and learning of mathematics. NCTM's Technology Principle states: "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning. Technology should not be used as a replacement for basic understandings and intuitions; rather, it can and should be used to foster those understandings and intuitions. In Mathematics-instruction programs, technology should be used widely and responsibly, with the goal of enriching students' learning of mathematics" (Government of Newfoundland and Labrador - Department of Education Division of Program Development, 2004). When calculators were first invented in the 1960's, they were not considered for use in schools because of their size, appearance, and cost. Eventually, they became sleeker and less expensive and students began using them in and out of the classroom. The calculator is just a symbol for the real issue at hand. It was said that, "Mathematics is not about rote computations, memorization, endless drills, or tedious manipulations. Nor it is meant to consist the solely of learning and performing algorithms. At its heart, mathematics embodies logical and reasoning, problem solving and number sense and a search for order" (Parent Issues, 1999). Students using calculators had better attitude toward mathematics than their noncalculator counterparts. Further research is needed in the retention of mathematics skills after instruction and transfer of skills to other mathematics-related subjects (Olkin's, et al. 1985). Free calculator use helps rather than hinders the mathematical thinking strategies and number awareness of young children (Ruthven, 1998). According to the Education World Journal (1997), critics are likely to preach repetition and memorization and view mathematics as a discipline and claim that 'calculators prevent students from seeing the underlying structure and beauty in math. Common sense tells us that if calculators are approved and made available too early, many capable students will resist doing the arduous paper-and-pencil practice that is necessary to develop the mental skills of arithmetic. Then these students will be unable to do simple computation in their heads, and worst of all, they will not be able to estimate (Dick 1988,37). Anita Straker (1997)

commented that there are only minor differences concerning the use of calculators, reflecting little change in opinion regarding their uses. Firstly, they are no longer specified as a 'tool for exploring number structure'. Other details no longer explicitly stated are using calculators for computations with addition and subtraction of negative numbers, and when interpreting displays in the context of a problem. The detail of including rounding and remainders is no longer mentioned. (Straker, 1997) Despite the lack of evidence, the view of many parents and educators remains that children using calculators will become lazy and reliant on calculators to do their work for them. (McIntosh, 1990) Trauss (2009) supported the banning of calculators in mathematical test, especially in dealing with simple numbers and fundamental operations. She said, "The irony is that while math is all around us, it seems to have become acceptable to be "bad with numbers." The habit of simply reaching for the calculator to work things out only to serves to worsen that problem. All young children should be confident with methods of addition, subtraction, multiplication tables and division before they pick up the calculator to work out more complex sums. By banning calculators in math test, we will reduce the dependency on them in the classroom for the more basic sums." Blatch (1993) expressed her fear tha*t 'instead of learning how to add up, children are being taught how to use a calculator*.' With the Numeracy Strategy, children are not only learning how to add up, but are encouraged to utilize a full range of mental strategies. The appropriate use of calculators alongside, not in place of oral and mental work, should encourage greater numeracy still, the calculator being used as a tool for investigating number and not as a substitute for skills and strategies. Mental math does not receive the attention it deserves. Perhaps this is because the development of mental techniques is not always explicitly stated as an objective or state-level standard. Whatever the reason, the time has come to invest in helping students build the mental math skills in their tool kits as part of their comprehensive mathematical understanding. The payoff for this investment can be tremendous both in improving students' mathematical abilities and in giving a visible sign that we are committed to preparing students with the kind of mathematical proficiency that the public can readily appreciate (Seeley, 2006).

Statement of the Problem

This study attempts to examine and analyze the comparison of performance of the fourth year high school day students at Carmen National High School Carmen, Cebu in solving fundamental operations in Mathematics with the aid of calculator and without calculator for the school year 2013-2014. More specifically, the study seeks to investigate the following inquires:

1. What is the profile of the respondents as to:
1.1 age ; and
1.2 gender?

2. What is the respondents performance in performing fundamental operations in Mathematics:
2.1 by using calculators ;and
2.2 by non-aided calculators?

3. Is there any significant difference between the students' performance with calculators or without aided calculators?

4. Based on the findings, what is its implication to the students' learning or performance?

Significance of the Study

The result of this study unconditionally benefited from many sectors of the educational institutions by providing information on the results of the Performance of Fourth Year High School Day Students at Carmen National High School Carmen, Cebu on fundamental operations in Mathematics with calculator and without calculator for the school year 2013-2014. Among the persons who will be directly or indirectly benefited are the following:

Teacher Education Department

Through the findings of this study, Teacher Education instructors and students in the university will enable to know the students' performance in dealing basic computations and determine their strengths and weaknesses. Hence, guiding them in reconstructing their program of teaching to suit the students' needs.

Carmen National High Schools' Principal and Teachers

This study may give them insights which would encourage them to plan projects designed to improve the quality of mathematical teaching, thereby upgrading, enriching and broadening their understanding and knowledge in teaching Mathematics. This will also help the teachers pinpoint the weaknesses of the students.

Students

This will also help them enhancing their mathematical ability. The development of this ability will able them to make good decisions, and making them successful in doing their tasks. Thus, motivate them to understand basic concepts of computations and incorporate themselves at the innovative teaching-learning approaches of the society.

Parents

This will help them recognize that their actions and perceptions toward their children regarding Mathematics can greatly affect their children's interest and thinking skills as well as motivation in learning the subjects. Through this study the parents can provide situations and examples which will inspire and encourage their children to study hard on the said subject.

Future Researchers

This will serve as their avenue in conducting researchable areas relative to the findings of the study. Furthermore, this will enable them to be aware on the common difficulties encountered by the students in doing Math calculations.

Community or General Public

This will help them determine the factors that affect children's ability in basic computation observed in the community. Leads them in organizing programs or workshops that will help improve the quality of students their society could make for the future generations. Equipped with the information provided by this study, they will be able to understand, educate and give appropriate advice in order to breed respected and responsible members of the community.

2 MATERIAL AND METHODS OF

Research Design

The study was conducted to identify the performance of the fourth year high school student's day students in solving fundamental operations in Mathematics with or without aided calculator for the school year 2013-2014. The researchers construct a survey questionnaire dealing the basic mathematics only for gathering the data. The study is conducted from the month of November 2013 to March 2014.

Research Environment

This study was conducted at Carmen National High School located at Cogon West, Carmen, Cebu.

School History

Carmen National High School is located along the National Highway bound to the Northern part of Cebu about 45km away from Cebu City. It has a land area of 9,450 sq m donated by the Municipality of Carmen. The school has a population of 2,576 students, 87 teachers, 9 of which are locally funded, disbursing officer, 1 bookkeeper, 2 guards, 1 utility worker and 1 school maintenance funded by the Parents Teachers Community Association (PTCA) . It has 13 buildings with 30 classrooms and 1,664 armchairs, 1 science laboratory, 2 computer laboratories with 20 functional computer units, 2 TV sets, 1 sound system, 18 comfort rooms, 1 school canteen, offices for PTCA, Supreme Student Government and School Publication, Faculty rooms, 1 School Clinic, annexes buildings and Office of the Principal. With the demand of increasing school population, the school decided to conduct two sessions to solve the classroom shortage but in spite of the two shifting classes the day class still increased its population thereby the school is in dire need of additional classrooms to accommodate excess students.

Research Respondents

The major respondents of this study were the Fourth year high school day students in Carmen National High School during the School Year 2013-2014.

Table 1

Number Of Respondents

Sections	Population Per Section	Number of Sampled Respondents				Total	
		Female		Male			
		f	%	f	%	f	%
Cassiopeia	36	9	3.93	6	2.62	15	6.55
Persius	41	13	5.68	5	2.18	18	7.86
Sagittarius	45	12	5.24	7	3.06	19	8.30
Virgo	48	10	4.37	11	4.80	21	9.17
Libra	45	12	5.24	7	3.06	19	8.30
Aquarius	46	9	3.93	11	4.80	20	8.73
Gemini	45	10	4.37	9	3.93	19	8.30
Aries	46	15	6.55	5	2.18	20	8.73
Pisces	45	11	4.80	8	3.49	19	8.30
Taurus	43	11	4.80	7	3.06	18	7.86
Polaris	46	11	4.80	9	3.93	20	8.73
Andromeda	49	13	5.68	8	3.49	21	9.17
Total	535	136	59.39	93	40.61	229	100

The respondents of the study were the fourth year high school day students with the total population of 535 consisting of 12 sections. Using the Slovin's Formula with 5% margin of error, the researchers obtained 229 respondents out of the total population.

Statistical Tool

Slovin's Formula: $n = \frac{N}{1+Ne^2}$

Where:

n = sample size
N = population size
e = sampling error/ desired margin of error

Research Instrument

The instrument used to gather the data in this study is the survey questionnaires about the fundamental or basic operations in Mathematics that embodies the very foundation of students' learning before they proceed to a more complex level of dealing numbers. The questions were taken from different references namely: 21st Century Mathematics for Grade 7 Students, Mathematics for Everyday Life for First Years, Merced College Sample Diagnostic Test for Mathematics-Arithmetic Elementary Algebra College Level Math and Number Sense for Grade Seven.

Research Procedure

After the approval of the request letter by Mrs. Fedelina C. Entero Principal II, the researchers are assigned to 12 sections of the fourth year high school day students as the respondents of the study. Before administering the research instrument to the respondents, the researchers will discuss the purpose of the conducted study in front of the respondents, for them to understand. After the discussion, the researchers gave the first set of survey questionnaires (non-aided) to the selected students for them to answer. They will have to encircle the best answers to corresponds to the question given with a specified time which is six minutes. The time being used to the fourth year high school students is determined through the Pre-test Examination conducted to selected first year college students which happened to be ahead of the center or concern of the study. The next set of the questionnaire (aided with calculator) will be given to the same respondents that can be answered within six minutes also. There are ten questions in every six minutes. The

survey questionnaires have the same content of questions and varied only in the ways of solving it, through calculating with and without aided calculator.

Gathering of Data

Since the survey questionnaires are already prepared earlier before the survey schedule, extra copies are secured for the purpose of contingency. From the selected students or respondents, each of them will be given one copy of questionnaire for them to answer. The survey questionnaires are distributed and administered at Carmen National High School Carmen, Cebu. The survey questionnaires will be retrieved right after six minutes provided time for the respondents. Responses will be checked, tallied, summarized and then tabulated. Data will be analyzed and interpreted, presented in a tabular form through tables and analytical discussion or textual presentation. Tally sheets that are recorded must matched the accurate responses from the survey questionnaires being interpreted.

Treatment of Data

The study is highly descriptive. Utilization of frequency distribution and percentage are important in analyzing the data. Specifically, the formula as follows:

$$P = \frac{f}{N} \times 100$$

Where: **P** is the percentage
F is the frequency
N is the total number of cases

To determine if there is a significant difference between the performance of the students "With Calculator" and "Without Calculator", t-test formula is used:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\left(\frac{ss_1 + ss_2}{n_1 + n_2 - 2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)\right]}}$$

Where: t = the t-test
$\bar{X}_1$ = the mean of group 1
$\bar{X}_2$ = the mean of group 2
SS_1 = the sum of squares of group 1
SS_2 = the sum of squares of group 2
n_1 = the number of observations in group 1
n_2 = the number of observations in group 2

The above t-test formula is for independent samples and is used to determine the difference of two independent groups. The means are compared$_1$ against the$_2$

Scoring Procedure

This section presents how the responses of the respondents were scored.

Table 2
Parameter Of Limits

Rating Code	Descriptive Rating		Verbal Rating
	With Calculator	Without Calculator	
81-100	Extremely Dependent	Excellent	Respondents having 81% to 100% of correct answers.
61-80	Very Dependent	Very Good	Respondents having 61% to 80% of correct answers.
41-60	Slightly Dependent	Good	Respondents having 41% to 60% of correct answers.
21-40	Dependent	Fair	Respondents having 21% to 40% of correct answers.
0-20	Not Dependent	Poor	Respondents having 0% to 20% of correct answers.

The higher the score obtained from the calculated than the non-aided, the more the respondents become reliant to the calculators. However, the lower the score from the non-aided compared to the calculated, the excellent the performance they have in computing fundamental operations.

DEFINITION OF TERMS

For purposes of clarification for the terms which are difficult to understand, operational definitions are provided.

Calculator. Used for mathematical calculations, in particular a small electronic device with a keyboard and a visual display.

Non-aided. Calculating mathematical calculations without the usage of any devices.Can be mental or pencil-paper kind of solving.

Performance. As used in the study , this refers to the mathematical skills of the fourth year high school day students.

Significant difference. Refers to two separate mathematical quantities.

Fundamental Operations. The basic or the elementary mathematical calculation operated with the four fundamental operations such as addition, subtraction, multiplication and division.

Fourth Year Students. The selected respondents of the researchers' made questionnaires and are the center of the whole research study.

Statistical Tool. These are the tools or the treatment of gathered data to answer the questions involving the specific topic.

Carmen National High School. As used in the study, refers to the **location** where the research study is conducted.

3 RESULTS AND DISCUSSION

This chapter features the results and its corresponding discussion

Table 3
Age and Gender of the Respondent

Age	Male		Female		Total	
	f(frequency)	%(percentage)	f	%	f	%
14-15	8	25	24	75	32	100
16-17	61	37	102	63	163	100
17 up	25	74	9	26	34	100

Table 3 presented the gender and the age bracket of the respondents of the study. The male respondents who belong to age 14 to 15 were 8 and 24 for females. The age bracket 16 to 17 has 61 males and 102 females while ages 17 up has 25 male respondents and 9 females. Majority of the respondents are females.

COMPARISON OF THE PERFORMANCE OF THE RESPONDENTS

This part showed the performance of the respondents in dealing fundamental operations with calculator and without aided. This determines whether the respondents were very dependent on calculators or if they performed well in calculating computations without the use of calculators.

Table 4
Comparison of Performance

Question	Overall Percentage				Rank	
	Non-aided	Description	With calculator	Description	Non-aided	With calculator
1.5,031-1,286	84.28	Excellent	96.07	Extremely Dependent	2	1
2. $\frac{3}{8}+\frac{1}{4}$	51.09	Good	55.90	Slightly Dependent	6	9
3. $\frac{3}{4}$ of 36	56.33	Good	72.05	Very Dependent	3	4
4. $\frac{3}{11} \div \frac{2}{5}$	43.67	Good	71.62	Very Dependent	8	5
$5.27 \div 3 \times 9$	84.71	Excellent	94.76	Extremely Dependent	1	2
6.35.2-3.31	54.51	Good	89.06	Extremely Dependent	4	3
7. 3^2 -6+9 ÷3	11.79	Poor	58.08	Slightly Dependent	10	8
8. $\frac{-16-(-2)}{4}$	48.03	Good	63.76	Very Dependent	7	7
9.350 students distributed equally among 90 children. How many pencils does each child receive?	53.71	Good	67.25	Very Dependent	5	6
10.You scored 95% on a 60-item examination. How many questions did you miss?	33.19	Fair	41.48	Slightly Dependent	9	10

Table 4 presented the performance of fourth year high school day students on fundamental operations in Mathematics with or without aided calculator for school year 2013-2014. In non-aided, the respondents got the highest rank on question number 5 in which they performed excellently. However, the respondents got the lowest rank in question number 7 in which they performed poorly. In terms of the respondents' performance with calculator, they got the highest rank on question number 1 which implies that they are extremely dependent on calculator. However, the respondents got the lowest rank on question number 10 which implies that they are slightly dependent on calculators.

SIGNIFICANT DIFFERENCE BETWEEN THE STUDENTS' PERFRORMANCE

This portion discussed if there was an important variation between the performance of the respondents in calculator aided and the non-calculated in solving basic mathematical

computations. A t-test treatment was applied to come up with a decision if there was really a difference of the importance of two compared concerned quantities as shown in table 5.

Table 5
Significant Difference of the Respondents Performance

Sections	X_1 (without aided calculator)	X_2 (with calculator)	X_1^2	X_2^2
Cassiopeia	134	144	1210	1388
Persius	131	167	1007	1563
Sagittarius	90	132	468	944
Virgo	111	167	705	1413
Libra	84	122	480	848
Aquarius	92	132	480	930
Gemini	102	128	580	886
Aries	99	128	525	852
Pisces	76	133	386	977
Taurus	87	109	487	725
Polaris	73	117	319	793
Andromeda	123	137	779	951
Total	1202	1616	7426	12210

Result: t = -10.039

Since the t-absolute computed value of 10.039 is greater than the t-tabular value of 1.960 at .05 level of significance with 456 degrees of freedom. The null hypothesis is disconfirmed in the favor of the research hypothesis. This means that there is a significant difference between the Performance of the Fourth Year Students in Fundamental Operations in Mathematics with calculator and without calculator for the School Year 2013-2014 implying that the students performed better in Fundamental Operations in Mathematics with the aid of Calculator considering that the mean average was 7.057 was greater compared to the mean average of fourth year high school day students without the aid of calculators of only 5.25.

IMPLICATION TO STUDENTS' LEARNING

This part stated the proposition of the whole study to the students' learning. After finding out the results of tabulations and the outcome computations of their performance, suggestions and inferences were presented. As for children who became habitual users of calculators they need to develop their arithmetic skills which are commonly used in their daily lives.

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter provides the summary of findings, conclusions including the recommended advancement avenue on enhancing the basic mathematical computation of the Fourth Year High School Day students with and without the aid of calculators.

SUMMARY OF FINDINGS

The study was conducted at Carmen National High School Carmen, Cebu where the Fourth Year High School Day Students population totaled 535 during the School Year 2013-2014. Through random sampling, 229 students were selected to be the center of study and were provided with a set of survey questionnaires which mainly concerned on fundamental operated computations. The survey questionnaires were administered twice to the same students; first set was responded without the use of calculators and as for the second set was with calculator aided. Based on the gathered data from the questionnaires, the following findings were drawn:

1. Majority of the respondents' ages span from 16-17.
2. Female respondents were dominant compared to the male respondents.
3. In terms of their performance in doing fundamental operated computations in Mathematics with:
   3.1 calculators – the respondents performed well in doing computations with the aid of calculators. It was also observed that they finished solving earlier as well as they were more confident because the device already displayed the correct answer they needed. However, there were few of them that had only a little knowledge on how to use calculators though they strived to use the device in helping them.
   3.2 Without aided calculators- the respondents did not perform well in non-aided computations and did not finish early as expected. They had problems in trusting hand-made calculations. The students experienced complicating concepts of the four fundamental mathematical operations.
4. Determining the student's performance in solving fundamental operations in Mathematics with or without the aid of calculator, it was found out that there was a significant difference between the two. T-test was treated in order to come up with a computed value which happened to be greater than its t-tabular value, which in the sense rejected the formulated null hypothesis that there is no significant difference of the Fourth Year High School Day students performance in computing fundamental operations in Mathematics with the aid of calculators and those without aided calculators. Hence, alternative hypothesis is accepted.
5. Based on the overall data, it has been find out that the Fourth Year High School Day Students at Carmen National High School Carmen, Cebu is growing and becoming **VERY DEPENDENT** in calculators in terms of dealing basic mathematical computations. Knowing

that calculators will make things easier, they raised confidence in correcting answers through the device neglecting the fact that they were taught fundamental operation concepts during earlier years of schooling and therefore, they can do computations without the help of calculators. Now, calculators produce students who cannot perform basic tasks independently. Moreover, it is essential that mastery of basic facts, mental computation, and some attention to hand-techniques continue to be required for all students which in contrast the students of Carmen National High School did not practice.

4 CONCLUSION

From the overall data gathered, the researchers concluded that the Fourth Year High School Day students of Carmen National High School are very dependent on calculators than performing basic mathematical calculations mentally or through hand-technique. It is easy for them to operate the device rather than making their minds and hands do the work. On the aspect of mastering the calculators, majority of them had great backgrounds on the device since it was already taught to them for complex computations. Considering that it was only for complex calculations, they still used it for basic computations as such adding, subtracting, multiplying and dividing numbers. Due to this kind of performance, dependency in calculators, the reasoning ability and their nature of understanding concepts were at some risks. They are proceeding to a much higher degree of education and continue to learn yet they are not competent enough, how much more in connecting to more complex computations. This matter bounces back to the teaching issues, specifically on how they were being taught on basics.Teachers in the first place should know the balance the use of calculators in the classroom. Calculators can be a helpful and effective aid in justifying answers being computed through hand- work solutions. Students should be aware that calculators help and at the same time can destroy an ability of mental calculations. Having them solidly grounded on the basics, they can grow up to be comfortable with the Mathematics they will need in their adult lives.

Recommendations

Based on the findings and implications on this study, the following recommendations are hereby presented:

1. Require students to show the actual computations of their work. Encourage and teach them how to proper use the calculators as one of the tools provided by the advancement of technology.
2. Minimize the habit of using the calculator to work out mathematical operations.
3. Incorporate open-ended problems or projects with several possible solutions into classroom instruction.
4. It is essential to point out that by-hand techniques are not to be totally abandoned so that introductory explorations are often best done without the calculator. The teacher must play a role in setting the necessary explorations in the classroom.

ACKNOWLEDGMENT

The author wish to thank my students from CTU who helped me pursue this research. May the Force be with you all.

Bibliography

A. Unpublished Books

[1] Blote, A. W., Klein, A. S., &Beishuizen, M. (2000).Mental computation and conceptual understanding. Learning and Instruction, 10, 221–247.

[2] Carpenter, T. P., Coburn, T. G., Reys, R. E., & Wilson, J. W.(1976). Notes from National Assesssment: Estimation. ArithmeticTeacher, 23, 296–302.

[3] Cooper, T., Heirdsfield, A., & Irons, C. (1996). Children's mental strategies for addition and subtraction word problems. In J. Mulligan, & M. Mitchelmore (Eds.), Children's number learning (pp. 147–162). Adelaide: Australian Association of Mathematics Teachers, Inc.

[4] Dick, T. (1992). Super calculators: Implications for calculus curriculum, instruction, and assessment. In J. T. Fey (Ed.), Calculators in mathematics education, 1992 yearbook, (pp. 145-157). Reston, VA: National Council of Teachers of Mathematics.

[5] Narquita, et.al(2013). Perceptions of the Selected Organic and Parttime Teachers in Cebu Technological University Carmen Campus in the Classroom: It's Implication to Students' Learning. People in the 21st century,(Chapter 1 pp.1).

[6] McIntosh, A. Becoming Numerate: Developing Number Sense in Being Numerate: What Counts? Ed. Willis, S. (1990). The Australian Council for Educational Research: Australia

[7] McIntosh, A. J., Reys, B. J., &Reys, R. E. (1992).A proposed framework for examining number sense.For the Learning of Mathematics, 12(3), 2–8.

B. Journal

[8] Government of Newfound land and Labrador(2000)Supporting Learning: Report on the Ministerial Panel on Education Delivery in the Classroom, St John's, NL, Department of Education

[9] National Council of Teachers of Mathematics.(2000). Principles and standards for school mathematics.Reston, VA: Author.

[10] Ruthven, K. 1998. The use of mental, written and calculator strategies of numerical computation by upper-primary pupils within a 'calculator-aware' number curriculum, British Educational Research Journal 24 (1) 21 - 42.

[11] Varol, F., &Farran, D. (2006). Early Mathematical Growth: How to support young

children's mathematical development. Early Childhood Education Journal, 33(6), 381–387.

C. Electronic Sources

[12] Bautista, F.(2011):Factors affecting the National Achievement Test performance of selected Second Year High School Students in Santa Maria, Bulacan(http://www.up-diliman.academia.edu/FrancisBaconBautista/Papers, 11 December 2013)

[13] Brown,R.&Porter,T.(1996):Why study mathematics? (http://www.popmath.org.uk/centre/pagescpm/imahob95.html, 4 January 2014)

[14] Center for Mathematics and Science Education(2001):Calculator as a Learning Tool (http://www.sedl.org/scimath/quicktakes/qt9803.html, 1 March 2014)

[15] Duczeminski, M.(2000):Disadvantages of using Calculators of Students (http://www.everydaylife.globalpost.com/disadvantages-using-calculator-students-18063.html, 8 December 2013)

[16] Education World(1998):Educators Battle Over Calculator Use: Both Sides Claim Casualties(http://www.education-world.com, 7 March 2014)

[17] Government of Newfoundland and Labrador Department of Education (2004): Calculators in Mathematics Instruction and Assessment:A Position Statement for Mathematics K-12 in the Province of Newfoundland and Labrador (http://www.ed.gov.nl.ca/edu/k12/curriculum/documents/mathematics/CalculatorsinInstruction.PDF, 12 February 2014)

[18] Green,C.(2008):Calculating the Difference: A discussion of the Use of Calculators in the English Primary Classroom (http://www.123helpme.com/view.asp?id=41269, 3 February 2014)

[19] Home School Math(): Use of Calculator in Teaching Math (http://www.hpmeschoolmath.net/teaching/calculator-use-math-teaching.php, 25 February 2014)

[20] Math Resource(): Calculators: Good or Bad? (http://www.freemathresource.com/articles/50calculators- good-or-bad, 25 February 2014)

[21] National Council of Teachers of Mathematics.(2002). [On-line], June.2002. Available: http:///www.standards.nctm.org/document/eexamples/chap4/4.5/index.htm

[22] Saint Louis University: Why Study Mathematics? (http://www.mathcs.slu.edu/undergrad-math/why-study-mathematics, 16 December 2013)