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Utilization of Information and Communication Technology in Aiding Students' Mathematics Performance Tasks

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Abstract

Aim: The study assessed the utilization of information and communication technology in aiding students' mathematics performance tasks. It investigated the demographic profile of the respondents in terms of college and sex. It further determined the utilization of information and communication technology in aiding students' mathematics performing tasks as regards to attention, perception, comprehension, memory, and problem solving. Significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to profile were also taken into consideration. All of these were accounted to propose a classroom management plan to maximaize the utilization and benefits of information and communication technology in aiding student's mathematics performance tasks.

Methodology: The researcher used the descriptive design using quantitative technique. This design helped assessed the utilization of information and communication technology in aiding student's mathematics performance tasks. The researchers used Raosoft calculator to identify the sample size and stratified proportionate sampling to identify the 338 student respondents who took Mathematics in the Modern World during the 1st semester of SY-2022-2023. Survey questionnaire was used as the main data gathering instrument. This was subjected to reliability test using Cronbach Alpha which resulted to .955 reliability index. Frequency, Percentage, Weighted Mean, T-Test and Analysis of Variance were used to statistically treat the data.

Results: With 186 or 55.03 percent majority of the respondents were from the CABEIHM Department while 236 or 69.82 percent out of 338 respondents were female. ICT were often utilized in aiding students mathematics performance task as reflected from the composite mean value of attention (3.97), perception (3.83), comprehension (3.91), memory (4.08), problem solving (3.84). No significant difference were found on the utilization of ICT when grouped according to College as reflected on the p-values which are all greater than .05 level of significance. Same was found when they are grouped according sex. However significant difference was found in terms of comprehension as reflected on the p-value which is less than .05 level of significance..

Conclusion: It was found out that majority of the respondents belongs to CABEIHM Department and female. It was also revealed that the utilization of information and communication technology often aids the student's mathematics performance tasks as regards to attention, perception, comprehension, memory, and problem solving. Further, there is no significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to college and sex. However, significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to sex in terms of comprehension. In line with the findings, classroom management plan was proposed to maximize the utilization and benefits of information communication technology in aiding student's mathematics performance tasks.

Keywords: attention, comprehension, memory, perception, problem solving, and utilization of information and communication technology

INTRODUCTION

Benefits from having exposed to modern technologies gives numerous advantages. It additionally incorporates the advantages that can be gained by students on the use of information and communication

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technology as a medium of learning. Information and Communication Technology (ICT) includes computers, the Internet, and electronic delivery systems such as radios, televisions, and projectors among others, and is widely used in today's education field (Fu,2013). The worldwide integration of information and communication technology (ICT) into education has advanced significantly over the last two decades. People have always tried to use technology to meet their needs (Gelacio & Cominghud, 2020), and today new technologies appear almost daily. Using information and communication technology, tends to be advantageous for the individuals who want to take the chance. A large portion of the students embraced digital media as a place for those seeking information materials, as the fundamental source of recent issues as well as a platform for sharing information with partners through social networking sites. In this manner, the information and communication utilization make it simpler for students to get the desired information effectively and rapidly. The utilization of information and communication affect students' cognitive learning in terms of attention, perception, comprehension, memory, and problem solving. If the learners can better manage the utilization of information and communication technology, it will positively affect their academic performance (Shabibi and Rusli, 2017), they also impact the macroeconomic growth, which in turn affects society by enabling infrastructure and standard of living improvements (Roztocki, et. al., 2019). In view of these, several initiatives are being forwarded to adept everyone in the use of technology to link the gap in every facet of life. Schools for example are looking for new ways to integrate information and communication technology skills into their policies and curriculum to foster the teaching and learning process in the context of "twenty-first-century skills (Bryant, et. al., 2012). The use of technology and internet is expectedly increasing as it become more accessible especially to the students. Being known as a superhighways of computer information and network in a global system, internet has penetrated diversely in everyone's lifestyle. In the field of education, integration of information and communication technology in learning is inevitable. With these, the utilization of technology and internet gives contribution to student's active use in order to generate, obtain, manipulate, and display information which can either be personal or social and even in their performance of academic tasks. That being said, this study wants to explore how utilization of information and communication technology aids in students' mathematics performance tasks and what course of actions can be proposed to maximize the utilization and benefits of ICT.

However, many authors propose that although use of technology in the mathematics classroom is increasing, the outcomes of its utilization do not live up to their perceived potential to enhance the learning experience (Lameras and Moumoutzis, 2015; Oates, 2011; Selwyn, 2011; Geiger et al., 2010). Further, empirical evidence suggests that students' positive attitudes toward Information and Communication Technology are positively associated with their mathematics performance (Tourón et al., 2019; Petko et al., 2017). Furthermore, research has also suggested that Information and Communication Technology use in educational settings with academic purposes has been shown to be useful in improving students' performance in mathematics (Erdogdu & Erdogdu, 2015; Skryabin et al., 2015; Carrasco & Torrecilla, 2012).

Objectives

The study assessed the utilization of information and communication technology in aiding student's mathematics performance tasks. Specifically, it sought answer to the following objectives.

1.To determine demographic profile of the respondents in terms of

1.1college; and

1.2 sex.

2. To assess the utilization of information and communication technology in aiding student's mathematics performance tasks in terms of

2.1 attention;

2.2 perception;

2.3 comprehension;

2.4 memory; and

2.5 problem solving.

3. To determine the significant difference on the respondents' assessment on the utilization of information and communication technology in aiding student's mathematics performance tasks when the respondents are grouped according to profile variables.

4. To propose classroom management plan to maximize the utilization and benefits of information and communication technology in aiding student's mathematics performance tasks.

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Hypothesis

There is no significant difference significant difference on the assessment on the utilization of information and communication technology in aiding student's mathematics performance tasks when the respondents are grouped according to profile variables

METHODS

Research Design

The researcher used the descriptive design using quantitative technique. This design helped assessed the utilization of information and communication technology in aiding student's mathematics performance tasks.

Population and Sampling

The researchers used Raosoft calculator to identify the sample size and stratified proportionate sampling to identify the 338 student respondents out of 2758 who took Mathematics in the Modern World during the 1st semester of SY-2022-2023.

Instrument

The instrument used in this study consists of items used to assess the utilization of information and communication technology in aiding student's mathematics performance task as regards to attention, perception, comprehension, memory, and problem solving. This was subjected to reliability test using Cronbach Alpha which resulted to .955 reliability index

Data Collection

The data were gathered, read, and analyzed following the objectives of the study and in adherence to all protocols in the coduct of research.

Treatment of Data

Frequency, Percentage, Weighted Mean, T-Test and Analysis of Variance were used to statistically treat the data.

Ethical Considarations

The researcher ensured that all research protocols involving ethics in research were complied with for the protection of all people and institution involved in the conduct of the study.

RESULTS and DISCUSSION

4.1 Profile of the Respondents

The researcher described the profile of the respondents in terms of college and sex and shown in Table 1 and Table 2.

4.1.1 College

The respondents of the study are distributed to the students enrolled in one public university. They served as the respondents of the study which is shown in Table 1.

Table 1. Distribution of the Respondents in terms of College

College	Frequency	Percentage
CABEIHM	186	55.03
CTE	43	12.72
CAS	49	14.5
CONAHS	60	17.75

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Total	338	100

Table shows the distribution of respondents in terms College specifically those who took Mathematics in the Modern World during the first semester of SY 2022. As can be gleaned from the table there are 338 respondents. The researcher used the stratified proportionate random sampling to identify the number of respondents. Majority came from the CABEIHM Department which are 186 or 55.03 percent. The least number of participants are from the CTE which are 43 or 12.72 percent.

4.1.2 Sex

Table 2 shows the distribution of respondents in terms of sex.

Table 2. Distribution of the Respondents in terms of Type of Sex

Sex	Frequency	Percentage
Female	236	69.82
Male	102	30.18
Total	338	100

It can be gleaned from the table that majority of the respondents are female and there are 236 or 69.82%, while there are only 102 or 30.18 percent who are male.

4.2 Utilization of Information and Communication Technology in Aiding Students' Mathematics Performance Tasks

4.2.1 Attention

Table 3 presents the respondents' assessment on the utilization of information and communication technology in aiding students' performance tasks in mathematics in terms of attention.

Table 3. Utilization of Information and Communication Technology in Aiding Student's Mathematics Performance Tasks in terms of Attention

Items When using information and communication technology…	WM	Verbal Interpretation
1. I am excited to participate in school activities	3.90	O
2. I am able to perform the tasks more easily	4.00	O
3. it brings me the urge to perform the tasks	3.85	O
4. it took me short time to finish the task	3.78	O
5. I am able to maintain my concentration while performing the task	4.32	O
Composite Mean	3.97	O

Legend: O-Often

The composite mean value of 3.97 shows that the respondents agreed that they utilized the information and communication technology to aid them in the performance of their mathematics tasks in terms of attention. This could mean that the process of concentrating or focusing of limited cognitive resources to facilitate mental activity can be addressed using the ICT. Students becomes excited and they could be able to finish their task easily and in a short period time by way of utilizing ICT in doing their performance tasks in mathematics. These results were associated to that of Cowan, 2009; Diamond, 2013; Posner et al., 2014. To them, attention is also the gateway to higher-order cognition and determines how well individuals perform cognitively demanding tasks including reasoning, decision-making, and action-planning

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4.2.1 Perception

Table 4 shows the respondents' assessment on the utilization of information and communication technology in aiding student's mathematics performance tasks in terms of perception.

Table 4. Utilization of Information and Communication Technology in Aiding Student's Mathematics Performance Tasks in terms of Perception

Items When using information and communication technology it is easy …	WM	Verbal Interpretation
1. to understand the concepts through picture and demonstration	4.30	O
2. to perform tasks in the class	3.47	O
3 to collaborate in doing tasks	3.70	O
4. to acquire and develop new skills	3.83	O
5. for the senses to become active while doing academic tasks	3.87	O
Composite Mean	3.83	O

Legend: O-Often

The composite mean value of 3.83 shows that utilization of information and communication technology often aids the respondents on their mathematics performance tasks in terms of perception. Through the utilization of information and communication technology they were able to easily and excitedly perform their mathematics task. Their excitement can also lead to the utilization of their senses which in turn affect their performance which triggered their perception. Perception is a cognitive process that allows people to take information through their senses (sensation) and then utilize this information to respond and interact with the world Cherry (2020), This result is in connection to the findings of Nurhasanah et. al., (2020), who found out that students had a positive perception of using the internet as learning media. It means that the internet is a facility to improve his proficiency makes learning an easier process by being fun, interactive, and interesting through the use of internet.

4.2.3 Comprehension

Table 5 shows the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance in terms of comprehension.

Table 5. Respondents' Assessment on the Utilization of Information and Communication Technology in Aiding Student's Mathematics Performance Tasks in terms of Comprehension

Items When using information and communication technology it is easy to …	WM	Verbal Interpretation
1. understand the tasks	4.13	O
2. perform and explain tasks	4.11	O
3. understand and avoid repeated instructions on how to perform the task	3.84	O
4. achieve high scores in performing the tasks	3.72	O
5. give opinions and ideas in doing the task	3.77	O
Composite Mean	3.91	O

Legend: O-Often

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The composite mean value of 3.91 shows that the utilization of information and communication technology often aids the students in mathematics performance tasks in terms of comprehension. Result showed that the utilization of information and communication technology often helps the respondents to easily understand the mathematics performance tasks. Articles reviewed showed that there are several online factors affecting the comprehension of Mathematics learners using ICT (Alejandro, 2021) one of it is the students' willingness to learn which is a very important factor.

4.2.4 Memory

Table 6 shows the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks in terms of memory.

Table 6. Respondents' Assessment on the Utilization of Information Communication Technology in Aiding Student's Mathematics Performance Tasks in terms of Memory

Items When using information and communication technology it is easy to …	WM	Verbal Interpretation
1. recall what have been learned	3.92	O
2. memorize the concepts	3.91	O
3. respond to task performance	3.85	O
4. relate the previous information gathered to the newly acquired knowledge	3.90	O
5. get information on the required task	4.80	O
Composite Mean	4.08	O

Legend: O-Often

The composite mean value of 4.08 shows that the utilization of information and communication technology often aids the respondents in school performance tasks in terms of memory. It is a clear indication that the utilization of internet technology often helps the respondents easy to understand the tasks. According to Martzog and Suggate (2022), it appears that increased time spent engaged in internet activities and resources may improve understanding of school concepts, increase cognitive ability, and boost memory ability.

4.2.5 Problem Solving

Table 7 shows the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks in terms of problem solving.

Table 7. Utilization of Information and Communication Technology in Aiding Student's Mathematics Performance Tasks in terms of Problem Solving

Items When using information and communication technology it is easy to …	WM	Verbal Interpretation
1. simplify complex problems in the performance of tasks	3.80	O
2. analyze the data	3.77	O
3. create strategies to solve the problem	3.81	O
4. complete the task even without the assistance the teacher or classmate	3.78	O
5. collect the precise information to perform the task	4.05	O
Composite Mean	3.84	O

Legend: O-Often

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The composite mean value of 3.84 shows that the utilization of information and communication technology often aids the students in terms of problem solving. This could mean that the respondents often able to collect the precise information using the internet to perform their mathematics tasks. As Caccamise (2013) said, students are often looking for a site where they can go to the quickest and the most information with minimal effort. Further, it could mean that the respondents often properly analyze the data using the internet as they perform academic tasks such as in mathematics. McMahon's study (2009) showed that there were statistically significant correlations between studying with ICT and the acquisition of critical thinking skills.

4.3. Difference on the Assessment on the Utilization of Information and Communication Technology in Aiding Learners' Performing Tasks When Grouped According to Profile Variable

Difference on the respondents' assessment on the utilization of information and communication technology in aiding student's mathematics performance tasks when grouped according to college and sex, this can be found in Table 8 to Table 9.

4.3.1 College

Table 8 shows the difference on the respondents' assessment on the utilization of information and communication technology in aiding learners' performing tasks when grouped according to grade level.

Table 8. Difference on the Assessment as Regards to Utilization of Information and Communication Technology in Aiding Student's Performance Tasks When Grouped according to College

Items	F-value	p-value	Decision on H_0	V.I
attention	.504	.714	Failed to Reject H_0	Not Significant
perception	.548	.640	Failed to Reject H_0	Not Significant
comprehension	.210	.887	Failed to Reject H_0	Not Significant
memory	.253	.862	Failed to Reject H_0	Not Significant
problem solving	.250	.861	Failed to Reject H_0	Not Significant

Legend**:** criteria for rejection $p<.05$

Results revealed that there is no significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to college. This was validated from the F-value in terms of attention of .504 and p-value of .714 which is greater than .05 level of significance which failed to reject on H_0. Likewise, perception has a F-value of .548 and p-value of .640; comprehension has a F-value of .210 and p-value .887; memory has a F-value of .253 and p-value of .862; and problem solving has a F-value of .250 and p-value of .861 which are greater than .05 level of significance which lead to the acceptance of the null hypothesis. This means that utilization of information and communication technology has no significant difference as regards to the respective college. This is because regardless of college, every student as digital native can utilize internet technology considering that promise of technology in the classroom is great; enabling personalized, mastery-based learning; saving teacher time; and equipping students with the digital skills they will need for 21st-century careers (Bryant, et al., 2012).

4.3.2 Sex

Table 9 shows the difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to sex.

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Table 9. Difference on the Assessment as Regards to Utilization of Information and Communication Technology in Aiding Student's Mathematics Performance Tasks When Grouped according to Sex

Items	t-value	p-value	Decision on H_0	V.I
attention	-1.522	.123	Failed to Reject H_0	Not Significant
perception	-.836	.390	Failed to Reject H_0	Not Significant
comprehension	-2.347	*.022	Reject H_0	Significant
memory	-1.181	.240	Failed to Reject H_0	Not Significant
problem solving	-1.115	.266	Failed to Reject H_0	Not Significant

Legend**:** criteria for rejection p<.05

Results revealed that there is no significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to sex in terms of attention, perception, memory, and problem solving. This was validated from the t-value in terms of attention of -1.522 and has a p-value of .123 which is greater than .05 level of significance which failed to reject H_0. Likewise, perception has a t-value of -.836 and a p-value of .390; memory has a t-value of -1.181 and a p-value of .240; and problem solving has a t-value of -1.115 and a p-value of .266 which are greater than .05 level of significance which lead to the acceptance of the null hypothesis. This means that utilization of information and communication technology has no significant difference to their sex in terms of attention, perception, memory, and problem solving. It indicates that the male and female respondents have the same assessment as regards to the utilization of information and communication technology in terms of attention, perception, memory, and problem solving. As regards to comprehension significant difference were accounted as shown from the t-value of -2.347 and p-value of .022 which is less than .05 level of significance which leads to the rejection of null hypothesis. This means that there is significant difference on the respondents' assessment on the utilization of information and communication technology in aiding student's mathematics performance tasks as regards to comprehension when grouped according to sex. It could be that male students easily comprehend mathematics concepts compared to their female counterparts. This result contradicts results in reading comprehensions where female students outperformed their male counterparts. In other words, it can be stated that gender differences affect reading comprehension in as much as it affects mathematics comprehension (Ngongare et. al., 2021).

4.4 *Proposed classroom management plan on the utilization of information and communication technology in aiding student's mathematics performance tasks.*

Teachers must manage responsibilities beyond class activities and lesson preparation such as administrative tasks. A classroom management plan is an essential tool that will allow you to handle a class much more efficiently. Like any complex endeavor, having a plan ensures that your efforts are not wasted and that you can maximize any opportunity (Bouchrika,2023).

Result of the study shows that students often utilized the information and communication technology in performing their mathematics tasks. Since using ICT is inevitable nowadays, and the fact that both literatures and research findings validate its contribution in the teaching and learning process it is recommended that teachers may include in their classroom management plan the full utilization of ICT to aid the students in their task's performance in mathematics as regards to *attention, perception, comprehension, memory and problem solving.* According to Berrocoso et.al., (2022), there was evidence of improved performance in educational practices enriched with ICT where mathematics is one of the areas of greatest interest to researchers, and it was observed that the educational systems most oriented toward competitiveness and educational selectivity are the most productive in this field. Though, using the PISA 2018 data it was found out that there is an inverted U-shaped relationship between ICT use at school and students' performance in mathematics in 22 OECD countries. It was also found out that excessive use of technology is associated with a lower academic performance, although this penalty differs across countries which points to the importance of addressing country-specific analyses (Gorjón & Osés, 2022). These conflicting results prompted the researcher to proposed classroom management plan that can be suggested to maximize the utilization and benefits of ICT in aiding student's mathematics performance tasks. Teachers could reiterate to their students of the following;

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Students must be aware of their existing internet habits. In this case, students can create an internet activity log so that their attention will only be focused in doing mathematics performance task and train themselves to resist this eternally unsatisfying and unproductive loop. They must also be able to identify their problem areas so that much attention can be given to those areas. If the task students are researching begins to feel frustrating or boring, it seems harmless to take a 10-second break in order to see if something more exciting is going on in another window but this should not be the case.

Students must be prepared all the time. They have to organize their workstation. It's amazing how much space we free up in our brains just by having a workspace free of visual distractions. It is always a wise decision to make a list of what they need to do on the Internet before opening the browser and determine what time of day you are most productive. With this, students could to do more with less in addressing full utilization of the ICT as regards to *attention*, *perception, comprehension, memory and problem solving.*

Part of the plan is to guide students to implement change in their ICT habits. Some of which are as follows; They might consider minimizing their screen time, and avoid multitasking, considering what they can do offline can also be a possibility. Restrict the time spend on social networking sites to remain focused on the task at hand and look outside themselves for help with self-control.

Summary, Conclusions, and Recommendations

It was found out that majority of the respondents belongs to CABEIHM Department and female. It was also revealed that the utilization of information and communication technology often aids the student's mathematics performance tasks as regards to attention, perception, comprehension, memory, and problem solving. Further, there is no significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to college and sex. However, significant difference on the respondents' assessment on the utilization of information and communication technology in aiding students' mathematics performance tasks when grouped according to sex in terms of comprehension. In line with the findings, classroom management plan was proposed to maximize the utilization and benefits of information communication technology in aiding student's mathematics performance tasks. In this view it is further recommended that the proposed classroom management plan be reviewed and be considered for wider dissemination to concerned students.

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