



**EXPERIENCES ON INTEGRATION OF DIGITAL TECHNOLOGY
IN TEACHING MATHEMATICS: BASES FOR
ENHANCEMENT PROGRAM**

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ABSTRACT

The descriptive-qualitative study aimed to determine the experiences of Grade 9 teachers in the integration of digital technology in teaching Mathematics. The research method utilized in the study was qualitative method using in-depth interview and the research design was phenomenology. It was found out that the digital technology used by the Grade 9 teachers were online learning platforms, graphing calculators, and collaborative tools. The experiences encountered by the Grade 9 teachers on the integration of digital technology were enhanced learner engagement, personalized learning, and visualization of abstract concepts. Teachers' hindering factors were lack of access to technology, inadequate training, and incompatibility with existing curriculum. Facilitating factors were teacher training and professional development, access to digital tools and resources, and curriculum alignment. Results of the study served as bases for enhancement program in the Schools District of Cabatuan I and Cabatuan II during the school year 2022-2023.

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Keywords: *Integration of Digital Technology, Teaching Mathematics, Policy Recommendation*

INTRODUCTION

Information and Communication Technology (ICT) plays a crucial role in the distance education system, particularly in the instruction of learners who are facing challenges in reading, writing, and arithmetic. The integration of new communication and educational technologies in distance education programs is vital for ensuring the quality of education. The shift from traditional face-to-face communication between teachers and learners toward the instructional methods that are facilitated by technology characterizes distance education.

Education stands as the foremost service provided by society to equip its future workforce. Objectives of education must align with the evolving needs of the world. The notion of learner-centered active learning garners widespread support in research literature as an empirically validated teaching practice that optimally fosters learning for contemporary students (Freeman et al., 2014).

Furthermore, Information and Communication Technology (ICT) is poised to usher in a revolution in teaching, particularly for learners who are facing challenges. As a result, positive changes are anticipated in the future (Rashid et al., 2012).

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However, digital technology is essential in teaching and learning Mathematics to understand the basic concepts and the way of problem-solving techniques (Skutnabbs-Kangas, 2000).

Research conducted by Safdar et al. (2011) examined the effectiveness of teaching Mathematics through technology, in comparison to traditional teaching methods, revealed that employing technology in Mathematics education resulted in improved academic achievements among learners.

It suggests that integrating technology as a teaching strategy in Mathematics contributes to more effective teaching, thereby, enhancing learners' academic performance.

Committed to address the challenges in digital learning and education technology, the Department of Education (DepEd), through the Information and Communications Technology Service (ICTS), reported the milestones of its Digital Rise Program during the 2022 World Book and Copyright Day Celebration. Through its second component which is ICT Assisted Teaching, Department of Education (DepEd) aims to provide teachers with equipment, software content, and skills for their daily classroom teaching. The program also envisions providing laptops, smart TVs, and lapel speakers to each teacher and classroom (Department of Education, 2017).

An enhancement program refers to a program or system that aims to improve or add new functionality to an existing program or process. It can be applied in various domains such as education, healthcare, and technology. In the field of technology, a system and method for

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enhancing a program or competition effect has been developed that allow users to improve their experiences while watching a program or game (George et al., 2021).

The researcher, based on personal observations and teaching experiences in Mathematics, noted that integrating digital technology served as a motivational factor for teachers, thus, it results in positive outcomes. The integration contributed to more effective teaching methods, ultimately leading to improved student performance. The use of technology in teaching Mathematics provided teachers with additional tools to enhance instructional delivery.

The researcher further believes that with the use of digital technology integrated in the teaching of Mathematics would improve the learners' performance.

MATERIALS AND METHODS

Research Methodology

This chapter presents the research design, research method, participants of the study, sampling design, data-gathering procedure, research instrument, validity of the research instrument and data analysis used in the study. The purpose of this study was to determine the experiences on the integration of digital technology in teaching mathematics as bases for enhancement program of the Schools District of Cabatuan I and II, Cabatuan, Iloilo during the school year 2022-2023.

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Research Method

The research method utilized in the study was qualitative research using in-depth interview.

The interviewer with the interviewee during the interview was allowed to sit together at a distance and to think about the series of questions about a certain issue. The aim was to get the main or the necessary views of the participants in a certain issue in a social context through the responses of the participants to the questions (Patton, 2015).

Research Design

The study adopted a qualitative research design using phenomenology. According to Smith (2013), phenomenology was the examination of the structures of consciousness as perceived from a first person perspective.

In the context, the pivotal aspect of an experience lay in its intentionality and signified its inherent directedness toward something. Phenomenology asserted that an experience was fundamentally characterized by its connection to or reflection upon some objects which constituted an experience of or about the particular object.

Indeed, an experience was inherently directed toward or about some objects. It involved a conscious orientation toward a specific entity and reflected an engagement with or contemplation of the object. The directionality was established through the content or meaning of the experience, which served as a representation of the object in consideration. The experience

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was thus directed toward an object based on its content or meaning, and the directionality was facilitated by the presence of appropriate enabling conditions.

Phenomenology was considered a philosophical approach that undertook qualitative research. Phenomenology was a research method typically employed by conducting interviews with subjects to understand and explore subjective impressions and experiences.

In qualitative analysis, series of steps were followed, beginning from the bottom up. The steps included transcribing data, segmenting information into categories using codes, generating themes or categories, describing themes, and ultimately interpreting the data (Creswell, 2009).

In a qualitative study, interviews played a significant role which provided interviewees the opportunity to express viewpoints, perceptions, and explanations without pre-determination by the researcher (Galanes, 2003).

The findings were supported by the existing literature regarding the practices, challenges, and opportunities of integrated schools in management and operations. Findings also led to implications for the discipline and future research.

Participants of the Study

The participants of the study were all Grade 9 teachers teaching Mathematics in both Mother School and Junior High Schools in the Schools District of Cabatuan I and Cabatuan II, Cabatuan, Iloilo during the school year 2022-2023.

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Total population was considered by the researcher since only few were teaching Mathematics 9.

Sampling Design

Purposive sampling design was used in the study. This was used to select participants from the population according to the purpose of the study.

According to Fraenkel and Wallen (2007), a purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study. Purposive sampling is also known as judgmental, selective, or subjective sampling.

Research Instrument

The research instrument utilized in the study was a researcher-made interview schedule. The interview schedule aims to gather relevant information about the involvement of the stakeholders in management and operations. An open-ended question was used for the interview. The researcher asked questions to the participants and then followed-up with relevant questions that arose from the responses of the participants.

Voice and video recorder were used for data gathering and documentation depending upon the permission of the participants.

A thematic analysis was used to summarize the results of the study.

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Validity of the Research Instrument

Before assessing the validity of the questionnaire- checklist created by the researcher, items underwent review and modification processes conducted by a panel of jurors. The jurors were selected based on their expertise in the fields of research, testing, assessment, and English. Their input and feedback were sought to enhance the quality, relevance, and appropriateness of the questionnaire-checklist, and ensured that it was effectively aligned with the goals of the research study and met the standards of validity in the chosen domains.

Each item was assessed by the jurors, revised, rejected, and retained. All comments and suggestions for the finalization of the research instruments were incorporated.

Validity is a comprehensive evaluative judgment that assesses the extent to which empirical evidence and theoretical rationales provide support for the adequacy and appropriateness of interpretations and actions derived from test scores or other modes of assessment.

The principle of validity extends beyond interpretive and action inferences derived from test scores in the conventional sense. It also applies to inferences drawn from any method of observing or documenting consistent behaviors or attributes (Braun, 2011).

Data Gathering Procedures

Upon approval of the Dean of the Graduate School and adviser to conduct the research, the researcher identified the participants and those specifically involved in the integration of digital technology in teaching Mathematics.

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A letter of request for the conduct of the study was sent to the principal of Mother School and Junior High Schools in the Schools District of Cabatuan I and II, Cabatuan, Iloilo through their Public Schools District Supervisor.

Upon approval, the researcher set for an individual appointment to the identified participants to conduct the face-to-face interview. The researcher personally conducted the interview using the interview guide. Face to face in-depth interview, voice and video recorder were provided to completely capture the interviewee's words.

The researcher obtained a permit from the Schools Division of Iloilo, securing official approval to conduct the study.

Subsequently, a courtesy call with the School Principal was arranged to ensure adherence to proper protocol. With strict observance of health guidelines, the researcher consistently maintained social distancing and wore face masks and face shields.

The next step involved the researcher personally by conducting, distributing, and retrieving the questionnaires. All information and responses gathered were meticulously recorded, compiled, and subjected to thorough analysis.

As a matter of ethical consideration, participants of the study were treated with the utmost confidentiality, and the gathered data were used solely for the purpose of the research study. It ensured the protection of participants' privacy and upheld ethical standards throughout the research process.

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Data Analyses

The research instrument was reproduced according to the number of participants of the study.

The information that was gathered in the study was properly analyzed using thematic approach.

Thematic analysis was a qualitative data analysis method commonly applied to sets of texts, such as interview transcripts.

In the approach, the researcher meticulously examined the data to identify recurring themes, topics, ideas, and patterns of meaning. By closely scrutinizing the content, thematic analysis aimed to uncover and understand the prevalent themes that emerged within the dataset (Caufield, 2019).

A theme, as defined by Braun and Clark (2006), is a pattern that encapsulates something meaningful or noteworthy about the data or research question. It emphasizes that there are no rigid criteria for determining what constitutes a theme.

In the present study, the researcher scrutinized the codes, and certain codes that were naturally converged to form distinct themes. Identification of themes involved recognizing recurring patterns or significant aspects within the data that contributed to deeper understanding of the underlying phenomena being investigated.

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RESULTS AND DISCUSSIONS

The qualitative research was conducted to determine the experiences on the integration of digital technology in teaching Mathematics as bases for enhancement program in the Schools District of Cabatuan I and II, Cabatuan, Iloilo during the school year 2022–2023.

The research method utilized in the study was qualitative method using in-depth interview and the research design was phenomenology. It was to gain deeper understanding of the experiences in integrating digital technology in teaching Mathematics through interviews with open-ended questions and observations described in words, also to get their views and experiences through their responses.

Participants of the study were the ten (10) Grade 9 Mathematics teachers as identified by the researcher.

The chosen research design was a phenomenological approach within the qualitative research paradigm. This design aimed to achieve a comprehensive and detailed understanding of a specific topic, delving into the intricacies of the phenomenon under investigation.

Given the qualitative nature of the study, a coding process was implemented for analysis, as the data could not be quantifiably analyzed using statistical techniques. The approach allowed for a nuanced exploration of the phenomenon, capturing the depth and richness of the participants' experiences and perspectives.

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The questionnaire underwent content-validation by the panel of experts. The criteria for the content validation by Fraenkel and Wallen (2007) were used to determine the validity of the questions in the interview schedule. The researcher considered all comments and suggestions relative to the validation of the tool. After the questionnaire has been found valid, permits were prepared to allow the researcher to start conducting the in-depth interview.

Permits from the adviser, dean of the Graduate School, Office of the Schools Division Superintendent, public schools district supervisor, school heads and participants were obtained to allow the researcher to conduct the study. The researcher personally went to the school or community or place convenient on the part of the participants to conduct the interview.

The researcher consolidated all the collected data after series of interviews. The information was gathered, analyzed, and interpreted using thematic approach.

Based on the information gathered during in-depth interview, the teachers used different digital technologies in teaching Mathematics wherein technologies were very applicable in teaching Mathematics 9 just like online learning platforms, graphing calculators, and collaborative tools.

Based on the information gathered during in-depth interview, experiences of teachers in the integration of digital technology were enhanced learners' engagement, personalized learning, and visualization of abstract concepts.

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Based on the information gathered during in-depth interview, the hindering factors of the teachers in the integration of digital technology were lack of access to technology, inadequate training, and incompatibility with existing curriculum.

Based on the information gathered during in-depth interview, the facilitating factors of the teachers in the integration of digital technology were teacher training, and professional development and teacher training, access to technology and curriculum alignment.

The enhancement program was proposed to address the experiences encountered by teachers in the integration of digital technology in teaching Mathematics as identified during the conduct of in-depth interview to participants of the study.

CONCLUSION

In the light of the findings and insights derived from the study, the following recommendations are forwarded:

Schools can enhance the use of the apps Geogebra, access to technology, support professional development, and improve curriculum alignment, ultimately creating a more effective and equitable learning environment for Grade 9 Mathematics education.

School heads may help improve and sustain the experiences of Grade 9 teachers in the integration of digital technology in teaching Mathematics.

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The Local Government Units and Department of Education should make a program on how to push this for teachers to be given more attention and quality education will be reached. They should work together in planning and implementing to have a better outcome. Collaboration among the school, parents, learners, and the government are highly needed in this challenging time.

The enhancement program should be considered for further improvement in consultation with Department of Education Regional, Provincial, Division and District Offices.

Similar study can be conducted in quantitative design supported by qualitative information to come up with conclusive and more valid results.

Seminars and training may be conducted within the school level to disseminate the information and the importance of teaching Mathematics using digital technology.

Teachers may continue guiding and coaching their fellow Math teachers especially during their vacant time.

A similar study is also encouraged to be conducted in the future and consider other variables not used nor mentioned in the study.

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