Level of Technology Integration during Pandemic: Perception from College Teachers and Students

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Abstract: This quantitative study aimed to explore the college teachers' level of technology integration from the perception of 43 teachers and 134 students at Gov. Alfonso D. Tan College, Maloro, Tangub City, Misamis Occidental, Philippines. This study was anchored on the Triple E Framework of Liz Kolb in 2011. The quantitative data gathered using an adapted survey questionnaire revealed that the teachers' overall level of technology integration was Excellent as perceived by the teachers and Good as perceived by the students and there was a significant difference based on their perceptions in terms of Engagement in Learning Goals, p-value = 0.004, Enhancement of the Learning Goals, p-value = 0.005, and Extending the Learning Goals, p-value = 0.020. This further implies that the teachers' perception of technology integration is significantly different from the perception of their students. In conclusion, technology integration is critical in today's classroom. Teachers should consider both technology tools and the learning experience while in teaching. As a result, students are not only focused on the equipment but also on the learning objectives via the technology. Traditional teaching may be replaced with new, innovative pedagogical strategies that engage and excite students to improve their understanding.

Keywords—COVID-19, Pandemic, Philippines, Technology Integration, Quantitative Study

1. INTRODUCTION

Teacher competency in educational media and technology refers to a teacher's knowledge, understanding, skills, and abilities in using educational media and technology in teaching and learning (Machingauta et al., 2021). Turner (2005) enumerated technology skills or competencies that every teacher, regardless of age, must possess. These skills include, but are not limited to word processing, use of spreadsheets to compile grades and chart data, database program to create tables, store and retrieve data, electronic presentation, web navigation, website design, e-mail management, use of digital cameras, computer network knowledge applicable to the school system, file management and windows exploration, installation of computer software, WebCT or blackboard teaching skills, videoconferencing, knowledge on computer-related storage devices, scanner, and computer security knowledge. Turner (2005) further elaborated that teachers must continue to strive hard to maintain and improve their technical skills to attain excellence in their work. As computers and related technologies progress, it is no longer acceptable for teachers to be technologically illiterate.

Also, Johnson (2013) emphasized that a good online education can be delivered if the instructor first employs effective teaching strategies such as cooperative learning, visual and practical learning, and inquiry-based training, before examining how technological tools and applications can best support the instructor in achieving the desired learning goals. He listed four teaching factors that any teacher should consider: 1) planning and preparation; 2) learning environment; 3) instructional competency; and 4) teacher's ability to use an online grading and reporting system.

The following research findings showed the teachers' competence in technology integration in the teaching-learning process. In their study on Teachers' Competence in Information and Communications Technology (ICT) as an Educational Tool in Teaching, Dela Fuente and Biñas (2020) found that the teachers were at the intermediate or average level in ICT basics, word processing, spreadsheets, presentation, and information and communication skill set. On the other hand, Briones (2018) in her study on the Teachers' Competency on the Use of ICT in Teaching Physics in the Junior High School of Camarines Sur Division reported that the teachers were proficient in ICT, assessment and evaluation, teacher professional development, and social, ethical, legal, and human issues domains. However, they were at the basic level in pedagogy, organization, and administration domains.

Being one of the teachers in GADTC, the researcher finds it relevant to explore the teachers' competence and experiences with technology integration in today's learning environment. The researcher believes that finding out the teachers' skills in incorporating technology into the new modality of learning, would greatly help in improving the institution's teaching and learning processes and outcomes. Although there were already studies conducted on technology integration both locally and internationally, there was only a scarce amount of research on higher education teachers' experiences on this topic. Thus, the results and implications of this investigation may contribute to the body of knowledge in this field.

2. RELATED WORKS

2.1 Advantages of Technology Integration in Teaching

Educators nowadays are dealing with technologically advanced and engaged 21st-century students. These students

can easily access information through their cell phones, laptops, and other devices. As a result, their teacher is no longer the primary source of knowledge; learners are learning from the palms of their hands.

Application of technology necessitates a thorough mastery of basic computer tools and programs, as well as a thorough awareness of the content and pedagogical principles. Teachers must determine whether the technologies used to motivate students to actively engage with the learning materials, provide meaningful opportunities for students to attain learning outcomes, and allow students to apply what they have learned in real-world situations (Okojie et al., 2006). According to Davies (2011), technology in the classroom makes teachers' duties easier. For both students and teachers, the utilization of Seesaw, Google Classroom, YouTube, and Venngage, among other tools and applications, opens a new world of possibilities, making learning more fascinating and engaging.

Furthermore, Kimmons et al. (2020) stated that teachers' ideas on learning and how learning presents itself, as well as their institution's learning and teaching ideals, all play a role in successful technological integration. Teachers must consequently have a thorough understanding of the school's pedagogical framework and standards to guarantee that their teaching practices, including technology integration, are in sync. By introducing technology into their curriculum, teachers may engage students in a relevant and engaging learning environment. Students' learning can be extended outside of the classroom when appropriate mobile devices, technical tools, and applications are integrated into instruction; students with these devices can acquire information anywhere and everywhere.

Meanwhile, it is impossible to gather, absorb, and use all accessible knowledge in this information age. Technology helps people obtain access to and manage information, as well as make learning more interesting and pleasurable. Integrating ICT-related instructional tools in the classroom, such as presentation and simulation software, gamification, e-learning platforms, and smartphone apps, increases student enthusiasm for studying and focuses their attention on the topic (Duhaney & Zemel, 2000).

Bowers (2000) also said that teachers and students must use ICT to manage complexity, solve problems, think critically and reflectively, and work creatively and systematically to be literate in the twenty-first century. Students and teachers must be able to access, organize, integrate, assess, produce, and share information in a comprehensible manner. They must make use of technology to improve their productivity and personal growth. According to Donahoo and Whitney (2006), no educational institution can effectively expand into different programs without adequate technological integration by teachers who give instruction.

To this end, UNESCO also emphasizes that the demand for information and communication technologies in and for education is quickly expanding in various countries and is now viewed as both an opportunity and a necessity all over the world. The Dakar Framework for Action (April 2000) also recognizes the use of new information and communication technologies as a key strategy for attaining the EFA (Education for All) objectives (UNESCO, 2005a).

2.2 Challenges in Technology Integration

Teachers' ability to use technology to advocate for education may be limited if they lack the skills to do so, including the knowledge and capacity to manage technology integration using sound pedagogical principles (Okojie et al., 2006). According to Hew and Brush (2007), there are six factors that can hamper technology use in an online course. The first is a scarcity of resources to aid technological adoption. When classrooms lack the technology and suitable tools, students are robbed of the opportunity to extract vital concepts from materials. The second factor is a lack of specific knowledge and competencies. Teachers that lack essential technical expertise and abilities struggle to integrate it, allowing students to miss out on important learning opportunities. Third, while instructional structures are necessary, some are not favorable to learning. Administrative procedures, a lack of role models to help teachers understand how to use technology, and a failure to develop planning phases are all important issues that obstruct instructional frameworks from supporting effective instruction.

Attitudes and beliefs are the fourth crucial factor. A teacher's impressions of new technological breakthroughs influence whether technology should be used in the classroom. Fifth is high-stakes testing, which looks to leave teachers with little time to perform examinations and collect data before focusing on technological integration. The sixth factor is subject culture, in which teachers are reluctant to integrate technology into their subject areas since it does not suit the traditional instructional design of the subject matter.

Research findings abroad also revealed challenges that teachers faced in incorporating technology into the classroom. Tarman and Lafer (2019) investigated the views of Turkish social studies teachers and found out that a lack of technological infrastructure, restricted internet access, and a lack of administrative and technical support were among the most highly identified barriers to technology use in the classroom. Likewise, Ramorola (2013) disclosed that the biggest issues impacting the efficient integration of technology at the school level among South African teachers included a lack of technology policy, insufficient technology equipment, a shortage of teachers qualified in technology integration, and maintenance and technical problems.

Moreover, Dotong et al. (2016) reported that inadequate financial support, infrastructure, human capital, management support, as well as behavioral and environmental aspects were some of the problems of educational technology integration among the ASEAN member states. Dela Rosa and Obillos (2016) discovered that novice teachers viewed the use of ICT as time-consuming and called for a more knowledgeable

manipulation of technological devices in his study on Experiences, Perceptions, and Attitudes on ICT Integration: A Case Study among Novice and Experienced Language Teachers in the Philippines. On the other hand, experienced teachers viewed the insufficiency of resources and services like limited internet access as detrimental to effective ICT integration.

The literature review showed that technology integration in the new modality of teaching has both advantages and disadvantages. Enhancement of the teachers' competence in incorporating technology is needed to continue providing quality teaching and learning experiences to the students despite the present critical situation. The researcher views technology in teaching and learning as an important topic to study and a timely research endeavor in the context of his workplace. Hence, this study will focus on evaluating teachers' ability to integrate technology into the teaching and learning process as well as describing their perspectives, successes, and challenges in this modern educational setting.

3. THEORITICAL FRAMEWORK

The study is anchored on the Triple E Framework of Liz Kolb in 2011. This is a framework for educators to measure how well technology tools integrated into the lessons are helping students to engage, enhance, and extend learning goals. The framework is based on three components.

Triple E is a practical framework that measures the degree to which the technology in a lesson is helping students meet the learning goals. In contrast to other technology frameworks, Triple E focuses on learning goals rather than specific technology tools. It allows the teachers to put the needs of the learners first and then select the technology tools that leverage authentic engagement in the instructional goals. In this model, the three Es play significant roles in the teaching-learning process.

The first E stands for engagement. This emphasizes how technology focuses students' attention on the task at hand with less distraction, how it motivates students to start the learning process, and how it activates students' involvement through the learning activity.

The second E means enhancement, which focuses on how the technology helps the students develop or demonstrate a more sophisticated understanding of the content, how it creates scaffolds for students to easily understand concepts and ideas, and how it allows them to create paths to demonstrate their understanding of the learning goals.

The third E indicates extension. This emphasizes how technology creates opportunities for students to learn outside of their typical school day, how it bridges school learning and everyday life experiences, and how it builds students' skills that they can use in their everyday lives.

4. STATEMENT OF THE PROBLEM

The study aimed at investigating the following central questions:

4.1. What is the level of teachers' competence in technology integration as perceived by the teachers and students in terms of:

    4.1.1   engagement in learning goals;

    4.1.2   enhancement of the learning goals; and

    4.1.3   extending the learning goals?

4.2 Is there a significant difference between the level of teachers' competence in technology integration as perceived by the teachers and students?

5. METHODOLOGY

5.1 Design

The study utilized quantitative research with descriptive-inferential method to gather, analyze, and interpret the data. Quantitative research can be used to identify trends and averages, formulate hypotheses, examine causality, and extrapolate findings to larger populations. Moreover, descriptive-inferential statistics was employed to give a summary of the data and include measures of averages, variability, and make predictions or generalizations based on the data.

5.2 Respondents

The participants were the 43 teachers and 134 students from Gov. Alfonso D. Tan College. They were chosen as respondents after passing the inclusion criteria set out in this study.

For teachers:
1. They are higher education teachers at Gov. Alfonso D. Tan College for the academic year 2021–2022.
2. They have not completed a teacher education program or a certificate or diploma program in teacher education.
3. They have experienced the online learning modality of teaching; and
4. They have served the school for at least one year.

The inclusion criteria were based on the objectives and purpose of the study. The participants should not be graduates of any teacher education-related programs so that their understanding, experiences, and knowledge of technological and pedagogical utilization of technology tools are based on their teaching or professional experiences only.

For students:
1. They are officially enrolled in Gov. Alfonso D. Tan College in the academic year 2021-2022;
2. They are students of the teachers who are also participants in the study; and
3. They have experienced the online learning modality of teaching.

5.3 Sampling Procedure

Purposive sampling was utilized in determining the teacher participants in the study. Purposive sampling is a non-probability sampling procedure in which the elements are selected from the target population based on their fit with the purposes of the study and specific inclusion and exclusion criteria. Of the 47 total population, 43 of them passed the inclusion criteria to participate in the quantitative data gathering. For the students, out of the 159 total population, 134 were chosen to participate after passing the inclusion criteria. The sample size was calculated through the raosoft.com sample size calculator with a 5% margin of error, 95% confidence level, and a response distribution rate of 50%.

5.4 Instruments

The Evaluation Tool to Measure Technology Integration, adapted from Liz Kolb (2013), was utilized to measure the teachers' level of technology utilization as perceived by the students and teachers. The evaluation tool comprised 21 statements concerning technology integration. It focused on how technology is being used in terms of engagement in learning goals, enhancing the learning goals, and extending the learning goals. It is set on the four-point Likert Scale (1 - Strongly Disagree, 2 – Disagree, 3 – Agree, 4 - Strongly Agree).

The hypothetical mean ranges used to interpret the data are as follows: 3.26 – 4.00 as Excellent, 2.51 – 3.25 as Good, 1.76 – 2.50 as Fair, and 1.00 – 1.75 as Poor.

5.5 Data Analysis

The weighted mean was used to determine the teachers' level of competence in technology integration as perceived by the teachers and students. Moreover, the researcher used independent sample t-test to determine the significant difference between the level of teachers' competence in technology integration as perceived by the teachers and the students.

5.6 Data Gathering Procedure

Before the questionnaire was administered to the respondents, the researcher asked for consent or permission from the College President, VP for Academic Affairs, and the Institute Dean to conduct the study. Upon approval, the researcher then briefed and provided the respondents with a copy of the informed consent to ensure that they were correctly directed in answering the questions in the questionnaire. After which, the researcher used Microsoft Forms to distribute the Evaluation Tool to Measure Technology Integration to the respondents via the Gov. Alfonso D. Tan College's official learning management system, Microsoft Teams.

6. RESULTS

6.1 Level of Technology Integration as Perceived by the Teachers and Students

Table 1 summarizes the overall levels of teacher competence in technology integration as perceived by teachers and students.

Table 1. Level of Technology Integration

Indicators	Teachers		Students	
	Weighted Mean	Interpretation	Weighted Mean	Interpretation
Engagement in Learning Goals	3.25	Good	3.02	Good
Enhancement of the Learning Goals	3.30	Excellent	3.06	Good
Extending the Learning Goals	3.25	Good	3.04	Good
Average Weighted Mean	**3.27**	**Excellent**	**3.04**	**Good**

As indicated in Table 1, both teachers and students rated the enhancement of learning goals the highest. This means both teachers and students put importance on the understanding of the most essential concepts pertaining to the lesson. As perceived by the teachers, they did a great job of planning, designing, and implementing activities to help students grasp the lessons better. Technology assisted students in developing an understanding of learning goals that otherwise were difficult to achieve.

Teachers and students, on the other hand, gave the lowest average response to engagement in learning goals. Slow data/internet connections, as previously discussed, have a significant impact on students' engagement in learning goals. This issue makes it difficult for teachers to conduct online classes free of dead air. During the interview, most of the participants raised this as their primary issue regarding distance learning.

Contrary to their instructors' self-rating, students assessed their teachers as good in all indicators of engagement, enhancement, and extension in the results. The findings suggest that students expect more from their teachers. They want to see more progress in how teachers use technology to encourage students to participate in learning activities, increase their grasp of subjects, and apply what they have learned in the classroom to their everyday lives.

5.2 Test of Significant Difference Between the Level of Teachers' Competence in Technology Integration as Perceived by the Teachers and Students

In determining the significant difference between the level of teachers' competence in technology integration as perceived by the teachers and students, independent sample t-test was used. Table 2 showed the results on the test of the significant difference between the factors and levels of technology integration.

Table 2. Test of Significant Difference

Indicators	p-value	t-value	Mean diff.	Interpretation
Engagement in Learning Goals	0.004	2.910	0.23	Significant
Enhancement of the Learning Goals	0.005	2.850	0.24	Significant
Extending the Learning Goals	0.020	2.361	0.21	Significant

*at 0.05 level of significance

The data reveal a significant difference in all three indicators of technology integration (engagement in learning goals, enhancement of the learning goals, and extending the learning goals) as perceived by both the teachers and the students. The p-value of 0.004 for engagement in learning goals, 0.005 for enhancement of the learning goals, and 0.020 for extending the learning goals implies that the teachers' perception of technology integration is significantly different from the perception of their students.

A higher mean response of 0.23 in engagement, 0.24 in enhancement, and 0.21 in extension rated by the teachers means that teachers are more confident in their competence. This finding is supported by the mixed-methods study of Hartman et al. (2019). Forty-two teachers participated in the study and expressed their perceptions of technology integration. The descriptive statistics revealed that the teachers had a high level of perception in integrating technology and a strong sense of the value it brought to their classroom. However, it is also noted that different conclusions were obtained based on the different perspectives on technology-aided student learning. There are still some unanswered questions about how technology engages students in higher-order thinking and how much technology enriches the educator's job. Educators ' attitudes, beliefs, and confidence influence the adoption of new technologies and pedagogies in teaching and learning (Hartman et al., 2019).

As supported by Somera (2018), to effectively meet the learning styles of Generation Z students, educators need to be able to adapt quickly to changing technology, be comfortable with students who multitask, and be open to technology-rich teaching and learning environments. However, most educators do not have the adequate knowledge, skills, and confidence to effectively or efficiently use the available technologies to support technology integration into the learning environment. This is also true for most college courses, even those that use a learning management system (LMS). They tend to be teacher-centered and lecture-based (Vercellotti, 2018). Higher education tends to be slow at adopting innovations because of the risk and time commitment involved in exploring new tools and ideas (Serdyukov, 2017).

In conclusion, technology integration is critical in today's classroom. Teachers should consider both technology tools and the learning experience while in teaching. According to Kolb (2019), employing technology to engage, enhance, and extend the learning goals does not always require concentration on the device. It does, however, indicate a high degree of attentiveness and comprehension. As a result, students are not only focused on the equipment but also on the learning objectives via the technology. Traditional teaching may be replaced with new, innovative pedagogical strategies that engage and excite students to improve their understanding.

7. DISCUSSION

One component of technology integration is engagement, which considers how technological tools help students focus their attention on the tasks at hand to achieve the learning goals (Kolb, 2013). It also pertains to how the tools stimulate students' interest in the learning process and contribute to the changes in students' behavior from passive to active learners. Students perform better when they know what exactly is expected of them; thus, setting and communicating clear learning goals in a language that they can relate to is one of the learner engagement strategies for capturing students' attention right from the start. Even though the teachers had higher perceptions of their technological competence in terms of engagement, the students just perceived them as good. The good rating signifies that the technological tools applied by the teachers in their classes somehow ignited students' interest and enthusiasm to learn. Despite the sudden shift and less preparation on the part of the teachers to venture into online learning, they believed that technology increased engagement in the learning process.

Enhancing learning with technology integration occurs when technological tools support, assist, or scaffold learning in a way that is not achievable with traditional methods. The specialized tools integrated into the lesson can allow students to move beyond engagement in content and further enhance their understanding of the lessons (Kolb, 2013). Overall, the teachers' level of competence in integrating technology to enhance the learning goals is perceived as excellent by the teachers. Based on the results, the teachers had a 0.24 greater mean response than the students, which signifies a higher

perception from teachers regarding utilizing technological tools to enhance learning goals. The results further show that teachers need to hone their technical skills to choose the most appropriate tools and applications for their lessons since this indicator was only perceived as good by the students. In so doing, students would have an in-depth understanding of the course content.

Lastly, technology extends learning beyond the classroom and into students' daily lives, allowing them to continue developing when they leave school. According to Wartella (2015), technological tools are needed to encourage meaningful learning, where the technology both extends the understanding of students' pre-existing knowledge and helps them create new knowledge. Based on the results, the teachers' level of competence in integrating to extend the learning goals is perceived by the teachers and students as good. The results indicate that teachers' technology integration has been very successful in helping students apply their learning in their daily lives since none of the indicators were rated fair or poor.

8. CONCLUSION

Based on the findings of the study, it can be concluded that technology integration becomes pivotal in the continuation of education during this time of the pandemic. It helped in the transition and delivery of the new teaching and learning modalities to engage the students, enhance the discussion, and extend the learning. Thus, it is noteworthy that the teachers and students viewed these with good to high perceptions in terms of the teachers' level of technology integration as this is viewed as important factor in the delivery and utilization of blended, modular, and online learning.

Although there are rooms for improvement, their constant exposure, professional development trainings, and collaboration with others could greatly help the teachers and students adjust and continue the teaching and learning in this new normal.

9. RECOMMENDATIONS

School administrators should continue to conduct in-service trainings and workshops to help the teachers adopt to the new teaching-learning setting. Also, with the help of the government, they may find alternative solutions to strengthen the internet connectivity of the city as it is identified as the primary concern of online education.

Future researchers may conduct a related study exploring the impact of teachers' technological competence on students' academic performance.

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