Global Scientific JOURNALS

GSJ: Volume 11, Issue 5, May 2023, Online: ISSN 2320-9186
www.globalscientificjournal.com

APPLICATION OF LOTI FRAMEWORK FOR DIGITAL-AGE TEACHING IN THE UB SCIENCE HIGH SCHOOL

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KeyWords
Digital-age teaching, Digital Integration, Digital Resources, Levels of Teaching Innovation (LoTi), School's Digital Climate

ABSTRACT

Learning has moved beyond the classroom, and schools must improve classroom innovation and better prepare students for the challenges they face in a highly competitive, digital-age society. The study aimed to identify gaps in promoting digital-age teaching and help identify professional development goals that could assist students to succeed in an ever-changing technological context. The study applied descriptive-quantitative analysis to the responses of 34 teachers in the LoTi digital-age survey and framework. Results showed that the sudden shift from face-to-face learning to blended learning using the hyflex model due to the Covid-19 pandemic made the teachers consider time to learn, practice, and plan as the greatest obstacle to advancing the use of digital resources in teaching. Implementing the online learning mode subsequently allowed the teachers' frequent integration of digital resources to promote engaged and effective student learning environments. This opportunity led the teachers to score very highly on all the professional development priorities identified by the LoTi digital-age survey. Results of the study also showed that the frequency of implementation of digital integration does not depend on the length of teaching experience and the highest educational attainment of teachers since the teachers were given equal chances in the application of digital resources and capacity-building in the integration of digital technology. The evaluations made on the learning modules written by the teachers showed that the teachers' highest level of technology innovation is on Expansion (LoTi 5). However, most teachers are on Integration (LoTi 4a, LoTi 4b) level. It is important for school administrators to continuously provide teachers with trainings on using current digital resources since this is directly related to their effective instructional technology integration.

I. Introduction

The integration of technology in the curriculum has challenged many schools. Learning is no longer limited to the confines of a classroom. Anybody can take advantage of the fact that he can continue his education through blended approach of learning. On the other hand, students gain a deeper sense of purpose from education that helps them identify and cultivate their strengths and needs through the integration of digital technology.

The Sustainable Development Goals (SDGs) of the United Nations (UN) laid out a broad, global vision for addressing the world's big issues. Ensuring comprehensive and equitable quality education and supporting lifelong learning opportunities for all students globally is one of the major values featured in the Unpacking SDG 4-Education 2030 (2017). SDG 4 establishes high expectations for countries in terms of educational opportunities. On the other hand, the International Society for Technology Education (ISTE) Standards (n.d.) are utilized as policy and implementation guides around the world in support of the SDGs. The ISTE Standards aim to improve educators' digital literacies and pedagogical approaches to using technology in the classroom. The ISTE Standards help to ensure that every student has access to a high-quality education. The International Task Force on Teachers for Education 2030

(TTF) of the Southeast Asian Ministers of Education Organization (SEAMEO) and the UNESCO Institute for Information Technologies in Education (IITE) showed strong support to the SDG – 4 of UN when they join hands in developing an Action Agenda on teacher competencies in the digital revolution during a high-level forum conducted last July 30, 2021 (Su-angavatin, 2021). With the aim of preparing the teachers and learners amidst uncertainties and challenges, the event calls for cooperation among the TTF Member Countries, SEAMEO Member Countries, and partner organizations in the different key areas which includes investing in teacher's capacity building and professional development in areas of distance learning and digital technologies in education and providing access to hybrid and distance learning programs to enhance teacher competencies in the digital era.

In line with this, Leonor Briones, the secretary of the Department of Education (DepEd) of the Philippines, said during the 2020 innovation forum that teaching innovation should begin at the basic education level (Hernando-Malipot, 2020). Briones cited the "Sulong EduKalidad" program as an example of how the Department of Education (DepEd) responds to the rapidly shifting educational landscape in the Philippines by implementing new teaching and learning methods. "Sulong EduKalidad" is a four-pronged reform effort in basic education that includes reviewing and updating the K-12 curricula; improving the learning environment; upskilling and reskilling teachers; and engaging stakeholders for support and collaboration. Also, Briones emphasized the importance of the ongoing DepEd innovation in addressing the challenge of changing how learners are taught, producing new breeds of learners, upgrading teachers' capacity, and enhancing facilities and equipment.

During the Covid-19 pandemic, most schools shifted from face to face to online mode of teaching – learning not only to keep students from the hazards of Covid – 19 but to maximize learning through digital resources. Technology enables quarantine and education to coexist (ChildHope, 2021). A look back from the second quarter of 2020 shows how the educational system handled online classes. In many Local Government Units (LGUs), students were given smartphones, teachers were given digital learning strategies, and educational shows were added to the television lineups. By January 2021, the DepEd TV team hoped to produce 220 episodes per week, spanning all subject matter areas. Also, various learning management systems (LMS) have grown worldwide as a primary tool for virtual classes. Everyone in this day and age relies on digital technology in some capacity.

Even if there is a shift from face-to-face to online mode of teaching-learning, it is still expected that teachers deliver quality education and engage students in the teaching-learning process. The online platform can be advantageous for both students and teachers since digital resources can be easily accessed to enhance the quality and relevance of learning and strengthen inclusion. Digital innovation has powers to complement, enrich and transform education, and has the potential to speed up progress towards Sustainable Development Goal 4 (SDG 4) for education and transform modes of provision of universal access to learning (UNESCO, n.d.).

Selvaraj et al. (2021), who looked at the benefits and drawbacks of online education compared to traditional schools, pointed out that online education has the potential to dominate the educational field if a proper initiative is taken from the government and authorities of educational institutions and there is a need for more investment in technology and basic infrastructure which will ensure uninhibited access to online classes for students and teachers belonging to all strata of society. Even if a certain amount of digital technology is required in school, the findings of Sailer et al. (2021) revealed that teachers' basic digital skills and technology-related teaching skills are more important than digital technology tools. He also suggested that the focus of schools be shifted from classroom equipment to teachers' ability to properly use technology.

Respondents in the study of Mishra et al. (2020) are cooperative in the implementation of online teaching-learning and unanimously agreed that there is no alternative of online education during the Covid-19 pandemic. In the same study, universities realized the need of technical preparedness with necessary online educational resources and training programs for teachers for them to successfully integrate digital technology in the teaching-learning process. In fact, capacity-building interventions enable academic staff to successfully support online learning (Gil-Flores et al., 2017). MacNeil (1998) added that when administrators act as technology leaders, the teachers integrate and use technology more successfully.

The findings of Garzón-Artacho et al. (2021) revealed that age, teacher training, and school type impact digital competence development. Singh and Chan (2015), on the other hand, showed that teachers' attitudes toward the use of ICT vary with the years of experience and knowledge of ICT. However, the study by Tweed (2013) showed that years of experience did not significantly influence classroom technology use.

The focus of this study was on the utilization of the Levels of Teaching Innovation, also known as the LoTi framework which is first introduced by Dr. Chris Moersch in 1994. This framework addresses classroom teachers' implementation of digital tools to promote higher-order thinking, engaged student learning, and authentic assessment which were measured by the US National Education Technology Standards for Teachers (NETS-T) (Moersch, 2010). This framework emphasizes on the importance of a delicate balance between instruction and assessment and the effective use of digital resources.

Education increasingly recognizes the inadequacy of simply dumping digital technologies into classrooms and expecting meaningful changes in teaching; however, the promise for technology to close equity gaps, engage kids as unique individuals, and prepare them for an uncertain future has yet to be completely realized. Furthermore, an institution's internal processes for ensuring quality teaching delivery are critical. Through the use of the LoTi framework in this study, the researchers support the "Sulong EduKalidad" program of DepEd. This study is a first step toward enhancing instruction at UBSHS for the digital age. After this investigation is completed, the educational institution could make more informed decisions about staff development and future technology acquisitions. Teachers, students, and administrators can benefit from using the LoTi framework as tool for assessing the current digital land-

scape and the perceptions of teachers about the school's climate and use of resources. This study could also help teachers determine if they meet their professional development goals in helping today's students succeed in an ever-changing technological context and be encouraged to equip themselves with higher levels of teaching innovation which will benefit the digital-age learners.

Research Questions

This study aims to identify gaps in promoting digital-age teaching in the University of Baguio Science High School (UBSHS). Specifically, it seeks to answer the following questions:

1. What is the digital landscape in UBSHS as perceived by the teachers?
2. What are the teachers' perceptions about the use of digital resources in the classroom?
3. What are the teachers' perceptions about the digital climate in their school?
4. What are the instructional practices in the UBSHS learning environment as perceived by the teachers?
5. Are there significant differences in the perceptions of teachers on instructional practices considering their years of teaching experience and their highest educational attainment?
6. What is the level of teaching innovation (LoTi) of the UBSHS teachers?

II. Methodology

This section describes the research design, population of the study, research instrument, data gathering procedures, treatment of data, and ethical considerations.

Research Design

Descriptive-quantitative analysis was applied in the self-report survey answered by the University of Baguio Science High School (UBSHS) teachers using the LoTi Digital Age Survey created by Moersch (2020). To validate the level of teaching innovation of the teachers, respondents were asked to evaluate their modules for SY 2021 – 2022 using a module evaluation form aligned with LoTi Framework developed by Moersch (2020).

Population of the Study

UBSHS is one of the few schools in Baguio City, Philippines which adapted online mode of learning during the COVID-19 pandemic since upon enrolment, students and parents agreed to procure reliable devices like laptop/desktop/tablet and stable internet connection which are necessary in the conduct of online learning. Modules were prepared to help the students become independent on their learning specially that additional instructions and formative activities were provided there. With the idea that the online mode of learning will give way to more frequent integration of digital resources of teachers in the teaching-learning process and implementation of higher levels of teaching innovation, the teachers of the University of Baguio Science High School (UBSHS) for the academic year 2021 – 2022 were chosen as participants of this study and that they were also able to prepare modules to the subjects they were handling. Since this study needs to evaluate the levels of teaching innovation of the teachers, the modules prepared by these teachers during the online learning were used to validate their responses. There were 34 out of 35 teachers who responded in the study.

Research Instrument

The LoTi Digital Age survey (Moersch, 2020) which consists of a series of questions and statements concerning the classrooms and the school's/instructional use of technology was used in this study. This survey has undergone extensive research for more than 20 years and has emerged as a statistically-valid tool achieving (1) content, (2) construct, and (3) criterion validity (Stoltzfus, 2009). In addition, Meta and Hull (2012) investigated the structural construct validity of the LoTi Digital-Age Survey's Professional Development Profile by conducting exploratory and confirmatory factor analyses on teachers' instructional practices with technology in the classroom.

Aside from the survey, a module evaluation form aligned with the LoTi framework was prepared and reproduced.

Data Gathering Procedures

Upon receiving permission from the Research and Development Center (R & DC), a letter addressed to the school principal was sent via email asking permission to conduct research and distribute the survey to the UBSHS teachers. An informed consent form for teachers who initially agreed to participate was displayed at the top of the form. The survey link and the forms were shared with the research anchorperson with the approval of the school head. The online survey forms remained open for one month for those who missed the initial posting on Facebook Messenger, Google Classroom, or in their emails.

To assess the teachers' teaching innovation level, they were asked to complete a module evaluation form for each module they wrote.

Treatment of Data

Frequency and percentage were used in determining the digital landscape of the University of Baguio Science High School, the instructional practices in the learning environment and the level of teaching innovation of the teachers. Mean and standard deviation were applied in determining the teachers' perceptions about the use of digital resources and the school's digital climate. The 37 statements on the instructional practices/professional development priorities were categorized into five. The descriptive equivalent was divided into three categories based on professional development priorities: low priority (0% to 33%), mid priority (34% to 66%), and high priority (67% to 100%). Kruskal Wallis test was used to analyze if there are significant differences in teachers' perception of instructional practices/professional development priorities considering their years of teaching experience and their highest educational attainment.

Ethical Considerations

Participation in the study was entirely voluntary but highly encouraged. All of the teachers' responses were treated with confidentiality. A preliminary request in the Google form was made to gather information essential for the study to acquire voluntary informed consent. The data was stored on a password-protected computer that only the researchers have access to. The digital files were wiped out and the paper records were shredded after the study. The findings of this study may be included in reports, presentations, or publications but the names of the respondents were not mentioned.

Participating in the study has only minor risks and inconveniences, such as discomfort due to exposure to their computer screens when answering the online survey and time spent taken from classes or schoolwork. To minimize these risks and inconveniences, the questions were clarified when participants wanted more information while doing the survey, the researchers' contact information were provided in the survey and in the consent form, and participants were allowed to respond to the survey via Google Forms beyond their work schedule.

III. Results and Discussion

This section discusses gathered survey results, analyses, interpretations, and generalizations. Descriptive and inferential statistics are utilized in the presentation, organization, and data analysis. In addition, the study's findings are supported by implications.

The Digital Landscape in UBSHS, as Perceived by the Teachers

The UBSHS digital landscape as perceived by the teachers is presented in table 1.

Table 1

Digital landscape in the University of Baguio Science High School

Digital Landscape	Descriptors	f	%
Approach to blended or hybrid learning in the classroom	Blended Learning using a Flex Model	34	100.00
Classroom's digital infrastructure	BYOD (Bring Your Own Device)	34	100.00
Frequent Source of guidance, information, inspiration, and/or direction relating to classroom use of digital resources	Students	7	20.58
	Building Administrators	13	38.23
	School/District Specialists (e.g., Media/Technology Specialist, Instructional Specialist)	5	14.71
	Classroom Teachers (e.g., Other Colleagues, Mentors, Peer Coaches)	25	73.53
	Specific websites (e.g., Teaching Channel, YouTube, Kahn Academy, Online Subscriptions)	26	76.47
	Other (e.g., College Professor, Conference Presenter, Business/Community Member, Vendor, Seminars)	11	32.35
The greatest obstacle to advancing the use of digital resources in an instructional setting	None	1	2.94
	Lack of Access to Digital Resources	12	35.29
	Time to Learn, Practice, and Plan	23	67.65
	Required Instructional Priorities (e.g., Statewide Testing, New Textbook Adoptions)	6	17.65
	Lack of Staff Development Opportunities	2	5.88
	Others: Net connection; Some good digital sources require a premium account to fully access it	3	8.82

The approach to blended or hybrid learning adapted by the University of Baguio Science High School is blended learning using a Flex Model for SY 2020 – 2021 and SY 2021 – 2022, as indicated by the 100 percent of the respondents choosing the flex model.

Teachers upload modules, instructional materials, and assessments online. Students submit their requirements online. Teachers do the instructions during scheduled synchronous classes, and students worked at their own pace during asynchronous. Teachers provide one-on-one or small group help when needed. Group chats and emails were also utilized for easier communication, guidance, and student support. All of these lead to the characteristics of the flex model.

The 100 percent of respondents claiming that they bring their own device can be explained by the online mode of learning which has been implemented for two consecutive school years.

Regarding the frequent source of guidance, information, inspiration, and/or direction relating to classroom use of digital resources, 77% of the respondents pointed to specific websites, and 74% identified classroom teachers. Since teachers are all working from home, their most convenient source of guidance with regards to the use of digital resources would be specific websites such as Teaching Channel, YouTube, Kahn Academy, and Online Subscriptions.

Results show that the number one barrier to advancing digital resources in an instructional setting is time to learn, practice and plan. More than two-thirds (68%) of the respondents blamed it. Writing modules for online classes are already time-consuming. Intermittent internet connections even made checking students' outputs longer than usual, leaving the teachers little time to prepare their instructional materials. Cleaver (2014) explained that when teachers adopt new classroom technology, they work through additional layer of preparation since they must first learn the technology well enough to utilize it in a classroom setting before deciding how to integrate it with classroom objectives and curriculum. Teachers faced problems regarding the limited amount of time needed to learn technologies and determine how to teach with them and the tension between focusing on teaching and other job responsibilities (Polly et al., 2021). In addition, lesson preparation using ICT is time-consuming because, as a rule of thumb, one hour of ICT- enhanced lessons would require about 3 to 4 hours of preparation (Mai, 2020). Thus, time constraints hinder teachers' readiness and decision to implement or integrate a digital curriculum as reflected in some studies (Al-Awidi and Aldhafeeri, 2017; Raman and Yamat, 2014). On the other hand, only few (6%) respondents identified lack of staff development opportunities as the greatest obstacle to advancing the use of digital resources in an instructional setting. This is contrary to the study finding of Garzón-Artacho et al. (2021) that one of the obstacles that teaching professionals must face to incorporate ICT skills into their professional practice is training in digital competence. Even though this pandemic opened many opportunities for professional development through online platforms, the availability of time for the teachers remained a big deal. The time allocated to incorporate new technologies is a major challenge for teachers (Hyndman, 2018). The sudden shift from face-to-face to online classes coupled with the writing of modules and preparation of suitable instructional materials for the new modality required teachers plenty of the time resulting to limited time in attending these training.

Over one-third (35%) of the respondents pointed out lack of access to digital resources as the second greatest obstacle to advancing digital resources in an instructional setting. Teachers are facing the challenge of a slow internet connection. Not all teachers can afford to pay for good digital sources requiring a premium account to fully access them. This is consistent with the study of Al-awidi and Aldhafeeri (2017) which showed that infrastructure and technical support rank the second obstacle in advancing the use of digital resources.

Teachers' Perceptions about the Use of Digital Resources in the Classroom

Table 2 provides the mean and standard deviation of teachers' perceptions about the use of digital resources and their interpretation.

Table 2

Teachers' perceptions about the use of digital resources

Descriptors	Mean	SD	Interpretation
I believe the use of digital resources in my classroom can positively impact student learning and achievement.	3.74	0.45	Strongly Agree
I have the necessary capabilities and skills to integrate digital resources successfully into my classroom instruction	3.09	0.51	Agree
I know where (e.g., Teaching Channel, YouTube, Kahn Academy) or who (e.g., campus technology specialist, academic coach, grade-level teacher, curriculum coordinator) to go to when I need support for using digital resources in my classroom.	3.50	0.56	Strongly Agree
I receive useful feedback on the integration of digital resources into my instruction from my administrator(s).	3.29	0.68	Strongly Agree
I am able to maximize student learning best when I complement my whole group approach with learning stations/centers, cooperative grouping, and/or individualized instruction.	3.47	0.56	Strongly Agree
Average Weighted Mean	**3.37**	**0.55**	**Strongly Agree**

Four out of the five indicators on the teachers' perceptions about the use of digital resources are interpreted to be strongly agree. The average weighted mean of 3.37 is interpreted as strongly agree. Here, teachers are stating that they have the necessary capabilities and skills to integrate digital resources successfully in their classrooms, can maximize student learning, know where or who to ask for help regarding the use of digital resources and receive useful feedback in the integration of digital resources from their administrators. This shows the high confidence and preparedness of the teachers in integrating digital resources in the classroom.

Results show that teachers strongly agree that using digital resources in the classroom can positively impact student learning and achievement and that the use of digital resources can maximize learning. The teachers value integrating digital resources into the classroom (Alberola-Mulet et al., 2021) since lessons become more attractive and comprehensive when discussed through the integration of digital resources (Shatri et al., 2021). In addition, certain teaching materials would be more interesting, easier to understand, more practical, less expensive and more diverse if given in digital form than in regular textbooks (Sariyatun et al., 2021).

Teachers were subjected to capacity building on the use of digital resources before the start of the school year which resulted to teachers agreeing that they have the necessary capabilities and skills to integrate digital resources successfully into their classroom. This is in agreement with the study of Brown (2014) which revealed that teachers feel confident that they have the skills necessary to use technology for instruction and can successfully teach relevant subject content with the appropriate use of technology.

The teachers strongly agree that they know where or who to ask for help regarding using digital resources in their classroom. When asked about the frequent source of guidance, information, inspiration, and direction relating to classroom use of digital resources, 77% of the teachers considered other colleagues, mentors, or peer coaches, and 74% of the teachers considered specific websites.

Teachers strongly agree that they receive useful feedback from their administrators regarding integrating digital resources in their instruction. Sadaf and Johnson (2017) supported this when they mentioned in their study that one of the reasons for teachers' integration of digital literacy is meeting the expectations of administrators. MacNeil and Delafield (1998) added that when administrators act as technology leaders, the teachers and students integrate and use technology more successfully.

Teachers' Perceptions about the School's Digital Climate

The mean values and interpretations of the teachers' perceptions about the school's digital climate are presented in table 3.

Table 3

Teachers' perceptions of school's digital climate

Descriptors	Mean	SD	Interpretation
I am treated as a respected educational professional on my campus.	3.50	0.56	Strongly Agree
I engage in a two-way cycle of communication and feedback with my school administrators.	3.62	0.49	Strongly Agree
I feel that I am listened to, represented, and feel I have a voice on campus.	3.44	0.61	Strongly Agree
I understand and support the shared vision for our school's use of digital resources along with other key stakeholders.	3.68	0.47	Strongly Agree
Average Weighted Mean	**3.56**	**0.54**	**Strongly Agree**

As can be seen in table 3, the computed means of all school digital climate descriptors are interpreted to be strongly agree. The over-all mean of 3.56 is interpreted as strongly agree. Teachers claimed that they are treated with respect, can communicate well with their school administrators, and understand and support the shared vision for their school's use of digital resources. This finding shows the existence of an open school climate and a harmonious relationship between the administrators and the teachers. Raygan and Moradkhani (2020) confirmed that school climate predicts technology integration. An open school climate where employers' behavior is supportive, genuine, and engaged is important since this will directly affect the teacher's self-efficacy (Almessabi, 2021; Lacks, 2018; Zakariya, 2020). If teachers know that they can get administrative backing and peer cooperation whenever they need guidance or recommendations about how to use a specific or new technology in their classrooms, their perception of self-confidence and self-efficacy will get better and thus they will become more comfortable for taking risks in learning and using new technologies (Gürfidan and Koc, 2016).

Teachers' Perceptions of Instructional Practices in the Learning Environment

The 37 statements on instructional practices in the survey tool were classified into five main categories as indicated in table 4.

Table 4
Teachers' perception of instructional practices in the learning environment

Instructional Practices Category/ Professional Development Priorities	Low-Level Priority		Mid-Level Priority		High-Level Priority	
	f	%	f	%	f	%
Digital-Age Work and Learning	1	2.94	9	26.47	24	70.59
Digital-Age Learning and Assessments	1	2.94	7	20.59	26	76.47
Student Learning and Creativity	1	2.94	6	17.65	27	79.41
Professional Growth and Leadership	1	2.94	6	17.65	27	79.41
Digital Citizenship and Responsibility	1	2.94	7	20.59	26	76.47

More than 70% of the respondents have high-level priority to all professional development priorities. Only 3% of the respondents claimed low-level priority to all categories of instructional practices. The pandemic, which pushed the University of Baguio Science High School to shift to blended learning using the hyflex model, gave teachers and students more access to digital teaching and learning. The demands of the blended learning using the hyflex model gave the teachers more opportunities of integrating digital technology in their classes as shown by their high-level priority on all the professional development areas identified by the LoTi digital-age survey.

Under digital-age work and learning, this implies that teachers give higher value to the use of digital tools to support learning. Since instructions are done online, teachers explored creative applications of digital tools that will improve student learning and used current and emerging digital tools to make synchronous classes more interactive. Teachers used emails and group chats to expand communications with students and parents. To be able to equip their students with new skills for them to learn throughout life, think critically, achieve goals, communicate cross-culturally and be competitive in the labour market, teachers need to consider improving their own digital competence as a priority in their areas or fields (Blyznyuk, 2018).

Under digital-age learning and assessment, the teachers focus on designing, developing, and evaluating authentic learning experiences and assessments by incorporating digital tools and resources to maximize content learning. Formative and summative assessments were given through Kahoot, Mentimeter, Google forms, Socrative, Quizizz, etc. The high-level priority given by teachers to digital-age learning and assessments is supported by the study of Saubern et al. (2020), which showed that teachers with higher degrees of Technological Pedagogical Content Knowledge (TPACK) competency are more confident in using technology to support and enable deeper thinking and learning in and across curriculum areas than teachers with lower levels of proficiency.

The teachers value employing technology for complex thinking projects as part of student learning and creativity because it allows them to use their subject matter knowledge, teaching and learning, and technology to support experiences that promote student learning, creativity, and innovation. Students were encouraged to present their outputs using different applications or programs like GeoGebra, Prezi, and sketchpad. Kitchel et al. (2010) pointed out that priority areas for in-service training needs associated with teaching and learning include teaching students to think critically/creatively and designing/developing digital-age learning assessments that address digital-age learning experiences and assessments support this finding.

Under professional growth and leadership, teachers value continuous improvement in their professional practice by promoting and demonstrating the effective use of digital tools and resources. Teachers locate resources such as online tutorials, videos, multimedia, and online simulations to increase existing classroom technology use. The high-level priority given by teachers to professional growth and development is supported by the study of Almas and Krumsvik (2008), which highlights that digital literacy must be given high priority and needs to be explored more deeply in the upper secondary schools.

The use of digital tools has become a necessity during the COVID-19 pandemic. Students and teachers use digital tools extensively. This has required teachers to advocate, model, and teach safe, legal, and ethical use of digital information and technology, resulting in high-level priority in this domain of professional development of the LoTi Digital Age survey. In connection to this, the findings of Cristol and Gimbert (2018) suggest that teacher educators and researchers need to better understand how to engage teachers as responsible, informed, and engaged digital citizens in a globalized and networked society by accounting for teachers' backgrounds, internet use, and self-efficacy towards completing internet-based activities.

Differences in the Teachers' Perceptions of Instructional Practices Considering their Years of Teaching Experience

Table 5 shows the Kruskal Wallis tests in the perceptions of teachers on instructional practices considering their years of teaching experience.

Table 5
Kruskal Wallis tests on the teachers' perceptions of instructional practices considering their years of teaching experience

Instructional Practices	Years of Experience	Median (%)	Descriptive Equivalent	*P*-value	Interpretation
Digital-Age Work and Learning	Less than 5	80	High–Level Priority	0.76	Not Significant
	5 to 9	69	High–Level Priority		

	10 to 20	71	High–Level Priority		
	More than 20	73	High–Level Priority		
Digital-Age Learning and Assessments	Less than 5	83	High–Level Priority	0.38	Not Significant
	5 to 9	71	High–Level Priority		
	10 to 20	73	High–Level Priority		
	More than 20	63	Mid–Level Priority		
Student Learning and Creativity	Less than 5	79	High–Level Priority	0.75	Not Significant
	5 to 9	73	High–Level Priority		
	10 to 20	71	High–Level Priority		
	More than 20	73	High–Level Priority		
Professional Growth and Leadership	Less than 5	81	High–Level Priority	0.45	Not Significant
	5 to 9	71	High–Level Priority		
	10 to 20	72	High–Level Priority		
	More than 20	76	High–Level Priority		
Digital Citizenship and Responsibility	Less than 5	80	High–Level Priority	0.72	Not Significant
	5 to 9	74	High–Level Priority		
	10 to 20	74	High–Level Priority		
	More than 20	74	High–Level Priority		
df = 3					

Except for teachers with more than 20 years of teaching experience under digital-age learning and assessments with a median that is interpreted as a mid-level priority, the computed median for the rest is all interpreted as high–level priority.

Even though teachers with more than 20 years of experience showed mid-level priority under digital-age learning and assessment, the computed p-values in all the five professional development priorities are higher than the alpha value, which is 0.05. With this, the hypothesis is affirmed that there is no significant difference in the teachers' perceptions of instructional practices as applied in the learning environment according to years of experience. This means that novice or experienced teachers have equal levels of priority towards proficiency with the use of technology; ability to develop, design, and evaluate authentic learning experience and assessment by incorporating digital tools and resources; ability to use technology to facilitate experiences that advance student learning, creativity, and innovation; inclination to continuous improvement of professional practice by promoting and demonstrating effective use of digital tools and resources; and understanding local and global societal issues and responsibilities in an evolving digital culture and the ability to exhibit legal and ethical behavior in their professional practice. Tweed's (2013) study also showed that years of experience did not significantly influence classroom technology use. Singh (2014) came up with an opposite finding that showed the attitudes of teachers on the use of ICT vary with their years of experience and level of knowledge of ICT.

The rapid growth in Information Communication and Technologies (ICT) has brought remarkable changes in the twenty-first century and affected our educational system. There is a growing demand for ICT to teach the skills and knowledge students need for the 21st century. It was even highlighted due to the pandemic where schools must shift to the online learning mode. Although teachers may have different levels of digital competence, which their educational backgrounds can attribute, the demand of the times pushed them to embrace digital teaching and learning. The educational institutions also supported them by sponsoring capacity-building programs regarding digital teaching and learning. This contributed to the high-level priority given to all the domains of digital professional development.

Jorge-Vasquez et al. (2021) identified a different factor that may influence teachers' digital professional development priority level and digital competence: the generation of digital divide among teachers. The study revealed that younger teachers of the millennial generation have a more advanced profile in digital skills and older teachers of Baby Boomers have a lower level of digital skills. In addition, the youngest age group had familiarized themselves with digital technologies for teaching as part of their formal education and the oldest age group recognized a need for professional development in digital competence (Hamalainen et al., 2021). Basantes-Andrade et al. (2020) supported this by pointing out that there is a dependence between the digital skills of teachers and the generation to which they belong. Gudmundsdottir (2017) concluded that younger teachers are more willing to incorporate technology into the teaching-learning process.

Differences in Teachers' Perceptions on Instructional Practices Considering their Highest Educational Attainment.

The instructional practices as perceived by the teachers considering their highest educational attainment are presented in table 6.

Table 6
Kruskal Wallis tests on the teachers' perceptions of instructional practices considering their highest educational attainment.

Instructional Practices	Educational Attainment	Median (%)	Descriptive Equivalent	*P* – value	Interpretation
Digital-Age Work and Learning	Bachelor's Degree	71	High–Level Priority	0.33	Not Significant
	Master's Degree	80	High–Level Priority		
	Doctorate Degree	65	Mid–Level Priority		
Digital-Age Learning and Assessments	Bachelor's Degree	71	High–Level Priority	0.53	Not Significant
	Master's Degree	80	High–Level Priority		
	Doctorate Degree	71	High–Level Priority		
Student Learning and Creativity	Bachelor's Degree	73	High–Level Priority	0.34	Not Significant
	Master's Degree	77	High–Level Priority		
	Doctorate Degree	70	High–Level Priority		
Professional Growth and Leadership	Bachelor's Degree	71	High–Level Priority	0.06	Not Significant
	Master's Degree	80	High–Level Priority		
	Doctorate Degree	65	Mid–Level Priority		
Digital Citizenship and Responsibility	Bachelor's Degree	74	High–Level Priority	0.27	Not Significant
	Master's Degree	81	High–Level Priority		
	Doctorate Degree	67	High–Level Priority		

df = 2

Except for teachers with doctorate degree under digital-age work and learning and professional growth and leadership, which have medians interpreted as a mid-level priority, the computed medians for the rest are all interpreted as high–level priority. Even though teachers with doctorate degrees showed mid-level priority under digital-age work and learning and professional growth and leadership, the computed p-value in all the professional development priorities is higher than the alpha value, which is 0.05. With this, the hypothesis is affirmed that there is no significant difference in the teachers' perceptions of instructional practices as applied in the learning environment according to educational attainment. This means that teachers with bachelor's degrees, master's degrees, or doctorate degrees have equal levels of priority towards proficiency with the use of technology; ability to develop, design, and evaluate authentic learning experience and assessment by incorporating digital tools and resources; ability to use technology to facilitate experiences that advance student learning, creativity, and innovation; inclination to continuous improvement of professional practice by promoting and showing effective use of digital tools and resources; and understanding global and local issues in the society and responsibilities in an evolving digital culture and the ability to exhibit legal and ethical behavior in their professional practice.

The sudden shift of face–to–face mode of learning to the online mode of learning brought by the pandemic pushed the teachers to equip themselves with the necessary skills needed for online learning. Institutions supported this need by providing their teachers with training that most are done on online platforms. All teachers had equal opportunities for digital professional development.

Mallinson (2013) reported that the struggles of academic institutions in providing sufficient support to online learners are due to inadequate staff capacity in terms of familiarity with and use of online communication tools and virtual learning environments. Her study shows that capacity-building interventions enable academic staff to successfully support online learning.

Gil-Flores et al. (2017) showed that teacher ICT training and collaboration among teachers influence classroom ICT use. They added that another factor that may influence digital professional development is the availability of educational software. This supported the fact that 35% of the respondents of this study claimed that lack of access to digital resources is one of the greatest obstacles to advancing the use of digital resources in an instructional setting.

Level of Teaching Innovation of Teachers Evident in the Learning Modules

The Level of Technology Innovation (LoTi) focuses on using technology as an interactive learning medium as it has the greatest and lasting impact on classroom pedagogy. It does not refer to the mere use of technology to achieve isolated tasks but rather to integrating technology in an exemplary manner that supports purposeful problem-solving, performance-based assessment practices, and experiential learning. It focuses on the quality of technology implementation other than how often it is implemented. Details of the application of the level of teaching innovation framework are indicated in the module evaluations made by the subject teachers and affirmed by the researchers. Table 7 shows the teachers' level of teaching innovation (LoTi).

Table 7
Level of the teaching innovation (LoTi) of the teachers

Level of the teaching innovation (LoTi)	f	%
Level 0: Non-use	0	0
Level 1: Awareness	0	0
Level 2: Exploration	1	2.94
Level 3: Infusion	9	26.47
Level 4a: Integration – Mechanical	6	17.65
Level 4b: Integration – Routine	15	44.12
Level 5: Expansion	3	8.82
Level 6: Refinement	0	0

More than one-fourth (27 %) of the respondents are at the Infusion level (Level 3) of the LoTi scale which is the beginning of using technology for higher-order uses. This implies that teachers on this level use technology to support tasks that require higher-order thinking but they still use technology to support teacher-centered instruction.

Majority (71%) of the respondents reached the Integration level (Level 4) and Expansion (Level 5) on the LoTi scale which means that teachers on these levels use technology to support learner-centered instruction. This is already good as compared to the findings of McConnell (2011) where only 14% of the respondents and Jefferson (2015) where only 28% of the respondents reached the Integration level (Level 4) which is the target goal for teachers to be comfortable in using technology for higher-order tasks in a learner-centered environment.

Only 3% of the respondents are below the Infusion level of the LoTi scale which means that teachers on this level emphasize content understanding and support mastery learning. It does not imply that teachers below the Infusion level lack the skills to integrate digital technology, instead they teach performance or activity type classes that would not use technology as much with the students. This is supported by the study of Jefferson (2015) which showed that the LoTi level of teachers is affected by the nature of the subject they are handling. His study further revealed that Math, Science and Technology teachers have higher LoTi scores compared to teachers handling other subjects. The study of McConnell (2011) revealed similar result when none of the language teachers in his study reached the Integration level (Level 4).

Factors that could affect the teachers' level of technology innovation are their proficiency with using technology in the classroom, supportive culture and self-efficacy. McConnell, (2011) revealed that teachers with high proficiency with using technology in the classroom lean towards student-centered instructional practice, thus practicing higher levels of technology innovation. Kent and Giles (2017) and Wijnen et. al. (2021) mentioned in their study that positive self-efficacy is essential for effective instructional technology integration. Jung et. al. (2019) confirmed the significant influence of supportive culture, teachers' self-efficacy, and teachers' knowledge on use of digital resources to technology integration.

IV. Conclusions and Recommendations

The pandemic caused the UBSHS to shift from face-to-face learning to blended using the flex model. In this situation where teachers are away from each other, they find it most convenient to seek guidance, information, inspiration, and direction from specific websites such as teaching channels, YouTube, Khan Academy, and online subscriptions relating to classroom use of digital resources. Teachers consider time to learn, practice, and plan as the greatest obstacle to advancing the use of digital resources in the instructional setting. Integrating digital resources in class would require much time from the teachers considering they need to attend to their other responsibilities like module writing, time-consuming checking of students' outputs because of slow internet connection, communicating with parents, and the like.

Teachers expressed a positive attitude towards the use of digital resources in the classroom to maximize learning. Teachers revealed high confidence and preparedness in integrating digital resources in the classroom. Capacity building assisted teachers gain confidence to successfully teach subject content with the appropriate use of technology and keep up with the fast-paced changes in the digital world.

The teachers claim that they are treated with respect, can communicate well with their school administrators, and understand and support the shared vision for their school's use of digital resources only suggests the existence of an open school climate and harmonious relationship between the administrators and the teachers. School climate affects the teacher's self-efficacy.

Teachers gave high-level priority on all the professional development domains identified by the LoTi digital-age survey. This is attributed to the implementation of the online mode of learning which gave both teachers and students more access to digital learning and teaching and allowed the teachers to integrate digital resources more often in promoting engaged and effective student learning. The teachers were given equal chances in the application of digital resources because of the support given by the administration through its capacity-building activities prior to the commencement of the online classes. Teachers integrated digital resources in their classes as they deem necessary and this is not affected by their length of teaching experience and highest education-

al attainment.

The teachers' highest level of technology innovation as shown in the summary of evaluation of learning modules is expansion (LoTi 5) but majority of the teachers are on integration (Level 4). Teachers should be willing to go beyond traditional learning methodologies by designing activities requiring students' collaboration in using technology to develop authentic solutions to problems and resolutions to issues.

Based on the finding of the study, the following recommendations are deduced.

1. Teachers who are on Expansion Level (Level 5) of the LoTi scale should be encouraged to share and present their ideas about innovative instructional methods with other teachers and take the leadership role in the implementation of digital technology. Subject heads should also promote the sharing of best practices on the integration of digital technology during the conduct of their Professional Learning Communities (PLC).
2. The administration should continue offering teachers capacity-building activities for them to keep up with the fast-paced changes in the digital world and increase their level of technology innovation.
3. The open school climate where teachers are treated with respect and can engage in a two-way cycle of communication and feedback with school administrators especially on their needs regarding digital infrastructure and trainings on the use of digital resources should be kept to encourage everyone to continue working their best in integrating digital technology in their classes and support the shared vision for the school's use of digital resources.
4. Further studies on applying the LoTi framework for digital age teaching can be pursued by considering other factors like the generation gap, availability of digital resources and levels of technological innovation.
5. Subject teachers should revisit learning modules to include activities that reflect higher levels of technology innovation application. They should not stop at infusion (LoTi 3) but move towards integration, expansion, and refinement. Teachers are encouraged to have understanding of a wide range of online collaboration tools and related digital resources and a willingness to go beyond traditional learning methodologies.

Acknowledgment

The researchers want to thank everyone who helped make this study possible, especially Dr. Antonio D. Mangaliag, Dr. Thea P. Suaco, educators and personnel from UBSHS, UB R&DC, and UB Management, for their support and assistance.

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