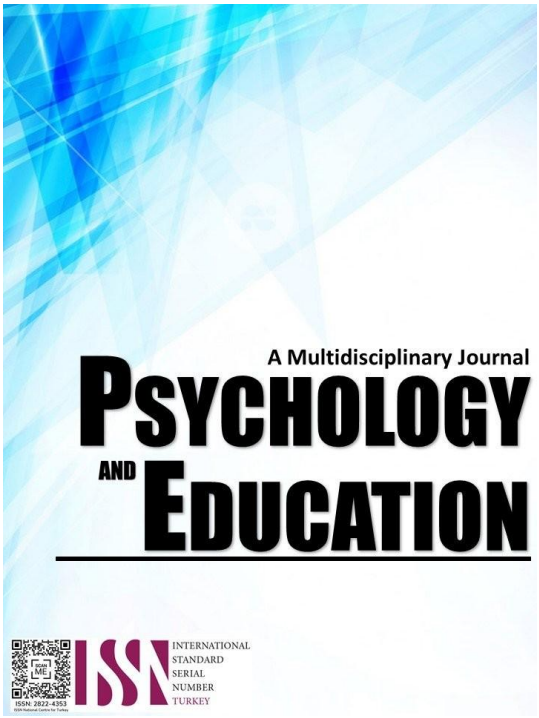
INNOVATIVE DIGITAL PEDAGOGICAL APPROACHES FOR GRADE 7 TLE: ENHANCED INSTRUCTION FOR MATATAG CURRICULUM



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Research Article

Innovative Digital Pedagogical Approaches for Grade 7 TLE: Enhanced Instruction for MATATAG Curriculum

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Abstract

This study aimed to develop and assess a digital pedagogical tool designed to enhance instructional strategies for Grade 7 Technology and Livelihood Education (TLE) under the MATATAG curriculum. Focusing on Lapu-Lapu City Division for the first semester of school year 2024 -2025, the research evaluated the acceptability of the tool by examining its alignment with curriculum standards, technological capabilities, and impact on teaching effectiveness. The research design was quantitative which considered descriptive statistics as method of analysis of the survey results. The study involved 140 respondents, including 120 Grade 7 TLE students and 20 TLE teachers. Key areas of investigation included the demographic profile of the respondents, the technological conditions of current teaching methods, and the technical requirements for developing the tool. The findings revealed that the tool was deemed "very highly acceptable" (VHA) in terms of content relevance, technical support, and usability. However, challenges such as infrastructure limitations, the need for ongoing professional development, and the importance of ensuring that the tool stays current and functional were identified. The research concluded that the digital tool had the potential to significantly improve instructional strategies in TLE but emphasized the need for continuous teacher training, improved infrastructure, and regular updates. Recommendations include enhancing connectivity, providing regular technical support, and ensuring the tool's alignment with evolving curriculum standards. The study's findings underscore the importance of integrating technology in TLE to foster better learning outcomes and enhance the educational experience for both teachers and students.

Keywords: *technology management, MATATAG Curriculum, digital pedagogical tool in technology and livelihood education, quantitative-descriptive design, Lapu-Lapu City, Cebu Philippines*

Introduction

Employing the right kind of approach and strategy for effectively teaching Technology and Livelihood Education (TLE) to Grade 7 learners under the MATATAG curriculum seems to be challenging. In MATATAG curriculum, learners are expected to explore and demonstrate knowledge and skills on the basic and common competencies in the TLE 7 particularly in the components of Information and Communication Technology, Agriculture and Fishery Arts, Family and Consumer Science, and Industrial Arts Intensified Integration of Entrepreneurship. Under the MATATAG curriculum, the Department of Education reiterates its commitment to ensure that the nation's basic education is aligned at par with global education standards. The continual commitment aims to meet international benchmarks and quality standards and to contribute significantly to achieving the United Nations' Sustainable Development Goal 4, which emphatically ensured inclusive, equitable quality education and promotes lifelong learning opportunities for all (Department of Education, 2024).

To successfully achieve learning outcomes in TLE 7, teachers must thoughtfully select and employ appropriate pedagogical approaches, methods, and strategies that consider various factors, including learning objectives, individual learning preferences, subject matter complexity, availability of resources, student diversity, classroom dynamics, and contextual factors. It is also critical to understand that these approaches and strategies are not limited to conventional educational environments. To address changing instructional demands across diverse contexts and learning environments, they must be flexible enough to support a range of learning delivery modalities, including blended learning, in-person learning, and other remote learning modalities (Department of Education 2024).

In the international scale, the Sustainable Development Goal for Quality Education, aims to raise the number of adolescents with technical and vocational skills for decent work and self-employment by 2030, has served as the banner goal for the Philippine educational system to achieve. It also serves as the foundation for the country's basic education guidelines for providing our schoolchildren with the skills they need to find respectable work and establish their own enterprises, thereby contributing to the nation's economic growth and with a particular emphasis on developing labor-market-relevant technical and vocational education and training (TVET) programs. This involves instruction approaches in science, technology, engineering, and mathematics (STEM), as well as practical skills including agriculture, construction, and healthcare. Achieving this target would assist in minimizing young unemployment and poverty while also encouraging economic growth and development (Kitamura & Brehm, 2020).

Instructional approaches are characterized to differentiate education. Specific approaches and tactics that create an atmosphere conducive to achieving learning objectives are significant factors influencing learning experiences. A teaching strategy is a comprehensive lesson plan that includes structure, learning objectives, and a description of the intended techniques to carry out the approaches. Teaching techniques involve instructor actions during lectures, such as designing teaching tactics, providing enough stimulation for timely answers, practicing learned responses, and refining responses through extracurricular activities. Moreover, the

availability of resources and the evolving nature of classroom environments further complicate the teaching process, making it essential for educators to be equipped with tools and methods that optimize learning outcomes in a flexible and efficient manner (Rana, 2022).

In the local setting, it has been observed by the researcher that the teachers who were made to handle TLE 7 had experienced challenges on time allotment and on the competencies introduced for the subject since the curriculum is exploratory to the different skills offered for Grade 7. As such, teachers assigned to handle TLE 7 subject for the current school year were apprehensive on the learning outcomes of the learners under their influence when the school year ends. Definitely, TLE teachers must be equipped with tools in engaging learners during classroom discussions. According to Curan (2023), as he claimed that learners are more engaged in learning about TLE abilities, despite their judgments of difficulty. They are more likely to be interested if they think they are competent at the subject, have the necessary knowledge, and can succeed despite the practical aspects of the TLE subject. They are more likely to be engaged in gaining its competences if they like activities, value their practicum, are internally driven, and favor TLE over other courses. Students are more engaged in learning abilities when teachers have sufficient materials and the required skills to teach the subject.

Hence, this research was conceived to develop a digital pedagogical tool which aids the teachers to effectively deliver the TLE 7 instruction to the learners. Subsequently, the study also looked into the effects of the developed digital pedagogical tool in teaching Technology and Livelihood Education (TLE) 7 during the first year of implementation of the MATATAG curriculum in Grade 7 after being piloted for a school year. Through the utilization of the developed digital pedagogical tool, it is expected that teaching ang learning in TLE 7 will become meaningful and engaging to both the teacher and the learners.

Research Questions

This research aimed to develop digital pedagogical tool to enhance TLE 7 instruction under the MATATAG curriculum and to determine the level of its acceptability through technology management in the Department of Education Lapu-Lapu City Division during School Year 2024-2025. Specifically, it sought answers to the following questions:

1. What is the demographic profile of the respondents as to:
    1.1. student;
        1.1.1. age and gender;
    1.2. teacher;
        1.2.1. age and gender;
        1.2.2. educational attainment;
        1.2.3. years of teaching experience;
        1.2.4. current teaching position;
        1.2.5. access to technology; and
        1.2.6. subject specialization?
2. What is the technological condition of the teaching methods used for the delivery of instruction in TLE 7 within the MATATAG Curriculum?
3. What are the technical requirements for developing a digital pedagogical tool that enhances TLE 7 instruction in relation to:
    3.1. curriculum alignment;
    3.2. digital resources and tools:
    3.3. infrastructure and connectivity; and
    3.4. teacher training and professional development?
4. As perceived by the respondents, what is the level of acceptability of the developed digital pedagogical tool to enhance TLE 7 instruction in terms of the following quality dimensions:
    4.1. performance;
    4.2. features;
    4.3. reliability;
    4.4. conformance;
    4.5. durability;
    4.6. serviceability;
    4.7. aesthetics; and
    4.8. perceived quality?
5. What are the challenges and concerns encountered by the respondent groups in the utilization of the developed digital pedagogical tool in relation to its ability to enhance instruction and improve student outcomes in TLE 7?
6. Based on the findings, what digital pedagogical tool can be crafted?

Methodology

Research Design

This research utilized quantitative-descriptive design employing Technological Pedagogical Content Knowledge (TPACK) model. A descriptive research design seeks to correctly and methodically characterize a population, circumstance, or phenomena. It can respond

to what, where, when, and how inquiries, but not why. A descriptive research design can employ a range of research approaches to study one or more variables (Sakharkar, 2023). As such, this design was used to answer the sub-problems considered in the study.

Respondents

Understanding the perspectives of both students and teachers is crucial for evaluating the effectiveness of educational programs, particularly in Technical Livelihood Education (TLE) 7, henceforth they were considered as respondents in the study. A stratified sampling method was used to ensure representation from different classes, allowing for diverse perspectives on the effectiveness of digital pedagogical tool. In a stratified sample, researchers split a population into homogenous sub-populations known as strata depending on certain features, with each member of the population investigated belonging to just one stratum. (Goldsmith-Pinkham et al., 2022). This balanced representation is vital for a nuanced understanding of the TLE program, as it allows for a comprehensive analysis of the experiences and challenges faced by both students and teachers. By capturing the viewpoints of both groups, the study can yield robust and statistically significant insights that inform targeted recommendations for enhancing the TLE 7 instruction.

Instrument

The instrument used in the study was anchored on the Technology Acceptance Model (TAM). The first part asked about the basic profile of the respondents while the second part collected the data on technological condition of the teaching methods used for the delivery of instruction in TLE 7 within the MATATAG Curriculum. The third part required responses on the technical requirements for developing a digital pedagogical tool that enhances TLE 7 instruction. The fourth part asked on the perceived level of acceptability of the developed digital pedagogical tool to enhance TLE 7 instruction while the last part asked about the challenges and concerns encountered by the respondent groups in the utilization of the developed digital pedagogical tool in relation to its ability to enhance instruction and improve student outcomes in TLE 7.

Procedure

This research commenced following approval of the title by the Dean of the Graduate School of Cebu Technological University, Main Campus. Subsequently, a letter request to conduct research on the given title is sought before the Office of the Schools Division Superintendent of Lapu-lapu City Division. The questionnaires were administered through google form to make the distribution of questionnaire more convenient for the respondents. Face to face modal was employed for those who were not comfortable answering the questionnaire in google form. Consent from the parents was sought for the participation of their children.

For the administration of the questionnaire, the researcher sent a letter to the School Heads requesting for permit to administer the same and the date for its retrieval. The details of the questionnaires were comprehensively discussed to the respondents through social media platform or in face-to-face modal before they were made to answer. The respondents were assured of the confidentiality of their responses and in adherence to Data Privacy Law in recording the collected data. The data gathered were consolidated, tallied, and analyzed with the aid of statistics.

Data Analysis

This research utilized frequency distribution and simple percentage to analyze answers on sub-problems numbers one, two, three, and five. While weighted mean was used for sub-problem four.

Frequency Distribution. It is a representation, either in a graphical or tabular format, that displays the number of observations within a given interval.

Simple Percentage Analysis. It refers to the kind of rates in making comparison between two or more series of data. Furthermore, a percentage is used to determine relationship between the series of data.

Weighted Mean. This is an average in which weights are assigned to individual values to determine the relative importance of each observation. It is the summation of the computed values of the product of the assigned weights and their respective number of responses.

Ethical Considerations

The researcher adhered strictly to the ethical guidelines and principles when conducting studies involving public school teachers. The risk-benefit ratio was properly weighed and assessed such that the procedures conducted are considered part of the routine activities of the school which will eventually benefit the entire Schools Division of Lapu-Lapu City. Hence, ethical issues were considered such as:

Informed Consent. It was made clear to the respondents that their participation in this research was purely voluntary and that they were not compelled to participate should they believe it was detrimental to their interest. Furthermore, the respondents were informed that the research conducted was solely for academic purposes and the data gathered from it were exclusively used for such purposes.

Confidentiality Pledge. The researcher ensured the confidentiality of the gathered data relative to the personal information of the respondents and in no case that it should be disclosed to the public. This were guaranteed by the following activities such as the names of the respondents were replaced by codes, the sheet containing the name of the respondents was removed and destroyed when no

longer needed for the research, the researcher shall have the sole access to the code's master list, files containing research data were password protected and encrypted to keep the data safe.

Authorization to Access Private Information. The interest of the respondents is protected by Republic Act 10173 also known as the Data Privacy Act of 2012, henceforth, any pertinent data or information of the respondents of this study shall not be accessed, transported, or copied without the approval and consent of the researcher.

Results and Discussion

This section presents the results and discussion of the research anchored on the identified subproblems. The study focused on systematically organizing, analyzing, and interpreting the findings derived from the survey results to assess the effectiveness and acceptability of the developed digital pedagogical tool for Grade 7 Technology and Livelihood Education (TLE) under the MATATAG curriculum.

The Demographic Profile of the Respondents

The demographic profile of the respondents is a crucial element in understanding the context and diversity of the participants in this study. In this section, presented and analyzed the demographic characteristics of the respondents, including age, gender, educational attainment, years of teaching experience, current teaching position, access to technology, and subject specialization. These factors are essential for understanding the background and perspectives of both the Grade 7 TLE students and their teachers. By analyzing the demographic data, the study can identify patterns or trends that may influence the acceptability of the developed digital pedagogical tool, as well as its potential impact on teaching and learning strategies (Gao & Zhang, 2020).

Age and Gender

The demographic profile of the respondents plays a crucial role in understanding the context and effectiveness of educational tools, especially when assessing their implementation and acceptability in the classroom. The following table outlines the age bracket distribution of the respondents in this study. Age, as one of the key factors, can significantly influence the way educators engage with and adapt to new technologies, as shown in Table 1.

Table 1. *Age and Gender*

Age Bracket	*Group of Respondents*			
	Grade 7 TLE Students (120)		*Grade 7 TLE Teachers (20)*	
	X	*%*	*X*	*%*
Above 50	0	0	0	0
46 to 50	0	0	0	0
41 to 45	0	0	3	15
36 to 40	0	0	7	35
31 to 35	0	0	5	25
26 to 30	0	0	5	25
Below 25	120	100%	0	0
Sub-total:	120	100%	20	100%
Gender	*Group of Respondents*			
	Grade 7 TLE Students		*Grade 7 TLE Teachers*	
	X	*%*	*X*	*%*
Male	50	41.66	8	40
Female	70	58.33	12	60
Non-Binary	0	0	0	0
Prefer not to say	0	0	0	0
Other	0	0	0	0
Sub-Total:	120	100%	20	100%

By examining the age distribution of both teachers and students involved in this study, we can gain insights into generational differences in technological proficiency, learning styles, and instructional preferences. This data can help tailor the digital pedagogical tool to better suit the needs of diverse age groups, ensuring that the tool is accessible, engaging, and effective across various user profiles (Koumpouros, 2024). The demographic data on age and gender reveals a clear distinction between the Grade 7 TLE students and their teachers.

For the student group, all 120 respondents were below the age of 25, indicating that the Grade 7 TLE students are predominantly younger and within a similar age range. This suggests that the students are likely to be familiar with technology and may be more receptive to using digital tools in their learning processes. On the other hand, the teachers' age distribution shows a broader range, with the majority (35%) falling within the 36 to 40 age brackets, and a significant portion (25%) between 26 and 30 years old, suggesting that the teachers are relatively young and may also be comfortable with technology but could still benefit from further training and support in integrating digital tools effectively.

In terms of gender, a larger proportion of Grade 7 TLE students are female (58.33%), while the teacher group is more balanced, with 60% female and 40% male. This gender distribution suggests that while both male and female students and teachers are involved in the study, the slight female majority among students may influence the design and accessibility of digital tools to ensure inclusivity (Mohan et al., 2020). These findings underline the importance of developing and implementing digital tools that cater to the needs of a youthful, technology-savvy student population, while also ensuring that teachers across different age groups are well-equipped to utilize the tool effectively (OECD, 2022).

Educational Attainment

Educational attainment is a key demographic factor that provides valuable insight into the qualifications and expertise of the respondents. By examining the educational levels of the respondents, it can be understood their preparedness to engage with the digital tool, as well as identify any gaps in knowledge or training that might impact its successful integration into the classroom (Rambrij, 2018). This section presents the distribution of educational attainment among the respondents, shedding light on the qualifications that may influence their use of technology in TLE instruction, as revealed in Table 2.

Table 2. *Educational Attainment*

Highest Educational Attainment	*Grade 7 TLE Teachers (20)*	
	X	*%*
Bachelor's Degree	18	80
Master's Degree	1	10
Doctorate Degree	1	10
Other Specify	0	0
Total:	20	100%

In this study, understanding the educational background of both Grade 7 TLE students and teachers helps assess the potential for effectively implementing a digital pedagogical tool and highlights areas where further support or professional development may be needed. The data on educational attainment for Grade 7 TLE teachers reveals that a majority (80%) hold a Bachelor's Degree, with 10% having earned a Master's Degree and another 10% possessing a Doctorate Degree. This indicates a well-educated teaching workforce with a significant proportion holding advanced degrees.

The high percentage of teachers with a Bachelor's Degree suggests a strong foundational knowledge, while the presence of teachers with Master's and Doctorate Degrees implies that there is expertise within the group to guide the implementation of more complex pedagogical strategies and technology integration. However, the lack of teachers with other educational qualifications suggests that there may be a gap in specialized training or certification in technology integration (Fraile et al., 2018). The diversity in educational attainment points to the potential for different levels of engagement with the digital tool, highlighting the need for targeted professional development to ensure that all teachers, regardless of their educational background, can effectively utilize the tool to enhance their teaching strategies (Asad et al., 2021).

Years of Teaching Experience

Table 3 presents the distribution of teaching experience among Grade 7 TLE teachers. The table highlights the number of years each teacher has spent in the profession, offering insights into the experience levels within the teaching group. The years of teaching experience for Grade 7 TLE teachers are distributed relatively evenly across four categories. This diversity in experience levels implies that the digital pedagogical tool must be versatile enough to cater to both novice and veteran teachers. New teachers may benefit from more structured support and guidance, while more experienced teachers might be interested in more advanced features and opportunities for customization (Wilson, 2019). The years of teaching experience of TLE 7 teachers are categorically shown in Table 3

Table 3. *Years of Teaching Experience*

Years of Teaching Experience	*Grade 7 TLE Teachers*	
	X	*%*
1-5 years	8	40
6-10 years	4	20
11-15 years	4	20
16+ years	4	20
Total:	20	100%

Forty percent of the teachers have 1-5 years of experience, suggesting a relatively young teaching workforce that may be more adaptable and open to new instructional technologies. Twenty percent each fall into the 6-10 years, 11-15 years, and 16+ years categories, indicating a balance between newer teachers and those with more extensive teaching experience. Tailored professional development programs are crucial to ensure all teachers, regardless of experience, can effectively use the tool to enhance their instructional strategies (Sarkar et al., 2023).

Current Teaching Position

This segment provides an overview of the current teaching positions held by Grade 7 TLE teachers in table form. The teaching position categories included teacher, master teacher, school head or principal, department head and others as specified in the table. This table categorizes the teachers by their official roles, shedding light on the distribution of leadership and instructional positions within the teaching staff. The distribution of the teaching positions is shown in Table 4.

Table 4. *Current Teaching Position*

Current Teaching Position	*Grade 7 TLE Teachers*	
	X	*%*
Teacher 1	15	75
Teacher 3	3	15
Master Teacher 1	1	5
Master Teacher 2	0	0
School Head/ Principal	1	5
Department Head	0	0
Other Specify	0	0
Total:	20	100%

The table shows that a significant majority (75%) of Grade 7 TLE teachers hold the position of "Teacher 1," which is the entry-level or most common role in the teaching hierarchy. Fifteen percent are in the "Teacher 3" position, while a smaller proportion (5%) hold leadership positions such as "Master Teacher 1" and "School Head/Principal." The presence of 5% in leadership roles suggests that only a few individuals hold higher administrative or mentoring responsibilities.

The implication of this distribution is that most teachers may require additional guidance, professional development, and training to effectively utilize the digital pedagogical tool, particularly in integrating technology into their teaching strategies. Furthermore, the relatively low number of higher-ranking educators may indicate a need for more leadership opportunities and a stronger role for department heads or master teachers in guiding the integration of technology within their departments. Given the positions held, the tool should also support teacher leadership by providing functionalities that could aid in mentorship or curriculum coordination (Dhlamini, 2022).

Access to Technology

Access to technology is a crucial factor in the effective integration of digital tools for teachers to engage learners during the teaching-learning process. This information is essential to understanding the readiness of teachers to adopt and maximize the potential of technology for enhancing instructional strategies, as depicted in Table 5.

Table 5. *Access to Technology*

Access to technology	*Group of Respondents*			
	Grade 7 TLE Students		*Grade 7 TLE Teachers*	
	Yes	*No*	*Yes*	*No*
Do you have regular access to a computer or laptop for learning / teaching?	50	70	15	5
Do you have reliable access to the internet for learning / instructional purposes?	70	50	5	15
Sub-total:	120	120	20	20
	Desktop computer	*Laptop*	*Tablet*	*Smartphone*
Which devices do you commonly used for learning / teaching? (Select all that apply)	50	70	10	10
Sub-total:	50	70	10	10
	Yes, completely	*Yes, but needs improvement*	*No, it doesn't meet my needs*	*Not sure*
Do you feel that the available technology meets your learning / teaching needs?	100	20	0	0
Sub-total:	100	20	0	0

Table 5 presents the data on the level of access to technology among Grade 7 TLE teachers, shedding light on how well-equipped educators are to implement and utilize digital pedagogical tools in the classroom. It highlights the significant disparity between Grade 7 TLE students and teachers in terms of access to technology, particularly for teaching and instructional purposes. The majority of students (70%) reported having regular access to a computer or laptop for learning, while a smaller percentage (30%) of teachers reported the same. Furthermore, while 70% of students have reliable internet access, only 25% of teachers enjoy the same level of connectivity. This suggests that students are more likely to benefit from the use of digital tools compared to teachers who might face technological barriers in delivering lessons (Rapanta et al., 2020).

Regarding the devices used, the data shows that most teachers (50%) rely on desktop computers for teaching, followed by laptops (20%), and a smaller number of use tablets or smartphones (10% each). This device distribution emphasizes that desktop computers are the most common tools for instructional delivery, but there is room for improvement in terms of mobility and access to more modern devices. Additionally, when asked whether the available technology meets their teaching needs, 100% of teachers felt that their current access was somewhat adequate, but 40% still felt it needed improvement. These findings underscore the need for better infrastructure, training, and support to enhance teachers' access to and use of technology, ultimately improving the integration of digital tools into teaching and learning strategies (Chan, 2023).

Subject Specialization

This section explores the distribution of subject specializations among the teachers involved in the study, shedding light on how their qualifications and expertise may influence the adoption and effectiveness of a digital pedagogical tool for enhancing TLE instruction under the MATATAG curriculum. Subject specialization refers to the academic field or area of expertise in which a teacher has been trained or focused on for their teaching, as read in Table 6.

Table 6. *Subject Specialization*

What is your primary subject specialization?	*Group of Respondents*			
	Grade 7 TLE Students		*Grade 7 TLE Teachers*	
	X	*%*	*X*	*%*
Technology and Livelihood Education (TLE)	120	100	12	60
Mathematics	0	0	1	5
Science	0	0	0	0
English	0	0	1	5
Filipino	0	0	0	0
Social Studies	0	0	1	5
Arts and PE	0	0	0	0
Other (please specify)	0	0	5	25
Sub-total:	120	100	20	100

For the Grade 7 TLE (Technology and Livelihood Education) teachers, understanding their subject specialization is crucial in determining their capacity to effectively integrate technology into their instructional strategies. The data from Table 6 reveals that a significant majority of Grade 7 TLE students (100%) are enrolled in the Technology and Livelihood Education (TLE) program, while 60% of Grade 7 TLE teachers specialize in TLE as their primary subject. This alignment between students and teachers in the TLE subject area underscores the relevance of the digital pedagogical tool in enhancing TLE instruction. However, there is a noticeable portion of teachers (40%) who specialize in other fields, such as Mathematics, Science, English, and Social Studies, which may suggest a potential gap in subject-specific expertise for implementing a tool designed specifically for TLE.

For teachers without TLE specialization, professional development in TLE content and technology integration may be necessary to ensure they can effectively use the digital tool. This finding highlights the need for targeted training programs to bridge the knowledge gap and ensure the tool's effective use across various teaching backgrounds. Recognizing a knowledge gap in the use of educational tools emphasizes the importance of specialized training programs that cater to instructors' different backgrounds. new programs should cover a wide range of technical skills and teaching styles, ensuring that all instructors can comfortably incorporate new technologies into their classrooms. By offering training, hands-on demos, and continuous assistance, we can increase instructors' awareness of technology and foster a more inclusive learning environment, which enhances student engagement and outcomes. Involving educators in the creation of these training programs ensures their relevance and practicality, addressing the unique difficulties they face in their teaching settings (McMichael, 2018).

Technological Condition of the Teaching Methods Used for Delivering Grade 7 TLE Within the MATATAG Curriculum

The technological condition of the teaching methods used for delivering Grade 7 Technology and Livelihood Education (TLE) within the MATATAG curriculum plays a critical role in shaping the effectiveness of instruction and student learning outcomes. As education continues to embrace digital tools and resources, the integration of technology into TLE teaching practices is essential for providing students with the skills and knowledge necessary to succeed in today's rapidly evolving technological landscape. Some salient points describe the status of the technological condition of the teaching methods used for delivering Grade 7 Technology and Livelihood Education (TLE) under the new curriculum, as read in Table 7.

This condition encompasses various factors such as the availability of technological resources, the level of teacher competency in utilizing these tools, the engagement of students through interactive and innovative methods, and the challenges faced in maintaining and scaling these technologies within schools. Understanding the current technological condition is vital for identifying gaps, addressing barriers, and improving the overall quality of TLE instruction under the MATATAG curriculum.

The technological condition of teaching methods reveals both strengths and challenges in the integration of digital tools within the Grade 7 TLE curriculum. While many schools show moderate success in using technology to enhance student engagement and support teaching strategies, there are significant barriers, such as inconsistent access to digital tools, poor internet connectivity, and gaps in

teacher training. The varying access to resources means that some schools struggle with basic tech maintenance, hindering the full potential of digital tools in TLE instruction. Additionally, despite the availability of some digital resources and assessment methods, many teachers still rely on traditional methods due to limited access to up-to-date devices and software (Oecd, 2020d). This highlights the need for a more consistent and sustainable infrastructure, along with targeted professional development programs that address the specific needs of TLE educators. (Ferri et al., 2020).

Table 7. *Technological Condition of the Teaching Methods*

Characteristic	*Description*	*Current Status / Condition*
Access to Technology	Availability of technology tools like computers, projectors, tablets, and internet connectivity.	Schools' access to digital tools and devices varies. Some schools have sufficient resources, while others face shortages in equipment and connectivity.
Integration with MATATAG Curriculum	Alignment of technology use with the TLE objectives under the MATATAG curriculum, such as agricultural simulations, CAD tools, and multimedia learning.	Technology is integrated with TLE curriculum in many schools, but full integration is still a work in progress.
Teacher Competency & Confidence	Teachers' ability and confidence in using technology to deliver TLE lessons effectively.	Many teachers show moderate to high confidence, but there are gaps in professional development and tech training.
Student Engagement	Use of technology to actively engage students through interactive lessons, multimedia, and digital simulations.	Technology enhances engagement, especially with interactive learning platforms and simulations, though student participation can vary.
Use of Digital Tools & Resources	Incorporation of software, apps, and online resources such as Google Classroom, multimedia tools, and educational websites into teaching.	Many teachers use multimedia and educational apps, but some still rely on traditional methods due to limited access to digital tools.
Assessment Methods	Use of digital assessments, quizzes, and online portfolios to evaluate student progress and performance.	Digital assessments (e.g., quizzes on LMS platforms) are used frequently, but some schools lack the infrastructure for more sophisticated tools.
Infrastructure & Support	Availability of technical support and infrastructure for maintaining technology, such as internet, hardware, and software.	Inconsistent; some schools have dedicated tech support, while others struggle with basic tech maintenance and internet issues.
Professional Development & Training	Ongoing training opportunities for teachers to improve their technological literacy and teaching strategies using digital tools.	Professional development opportunities are available, but they may not be frequent enough or tailored to the specific needs of TLE educators.
Barriers to Technology Integration	Challenges faced by teachers and students in integrating technology, including lack of resources, poor connectivity, and resistance to change.	Barriers include poor internet, lack of devices, inadequate training, and resistance to using unfamiliar tools or methods.
Adaptation to Diverse Learning Needs	How well technology caters to diverse learning styles, including differentiated instruction and inclusion of students with special needs.	Technology helps cater to different learning needs, but not all schools have access to specialized tools or the training to use them effectively.
Sustainability & Scalability	Ability to maintain and scale the use of technology in TLE teaching practices over time.	Challenges with sustainability due to limited budgets and inconsistent access to up-to-date devices and tools.
Feedback Mechanisms	Use of technology to gather feedback from students, parents, and peers to improve teaching methods and learning outcomes.	Some use of digital feedback tools (e.g., surveys, forms), though limited in some schools.
Collaboration & Communication	Use of digital tools to facilitate collaboration among students and communication between teachers, students, and parents.	Communication tools (e.g., messaging platforms, emails, Google Classroom) are widely used, though not consistently across all schools.

The state of technology integration in education today shows a mixed picture in a number of areas. Schools' access to technology varies greatly; some are well-equipped, while others face gadget and internet connectivity limitations. Full integration is still being worked out, despite the fact that many schools have included technology into the Teaching and Learning Environment (TLE) curriculum. Despite the fact that there are still gaps in professional development and training, teachers show moderate to high confidence when utilizing digital technologies for teaching. Furthermore, even while interactive classes made possible by technology have improved student engagement, participation rates might still differ greatly. Digital tools are often used for evaluations, however sustaining these technologies efficiently is made difficult by inconsistent infrastructure (Dwivedi et al., 2023c).

Technology integration is hampered by a number of factors, such as a lack of resources, insufficient connection, and unwillingness to change, despite the possible advantages. Even though technology can accommodate a variety of learning requirements, many schools still lack access to specialized resources and expertise. Budgetary restrictions and uneven access to modern technologies pose problems

for the sustainability and scalability of technology projects. Furthermore, not all schools implement digital feedback systems and collaborative tools consistently, even if some do so well. All things considered, continuous, specialized professional development and better infrastructure are desperately needed to foster a more uniform and successful strategy for integrating technology into the classroom (Group, 2017).

Technical Requirements for Developing Digital Pedagogical Tool That Enhances Instructional Strategies for Grade 7 Technology and Livelihood Education

The development of a digital pedagogical tool to enhance instructional strategies for Grade 7 Technology and Livelihood Education (TLE) is essential in fostering an interactive, engaging, and effective learning environment. As technology continues to play a central role in modern education, the integration of digital tools in TLE can provide students with practical skills and knowledge applicable to real-world scenarios. To ensure that such a tool meets the needs of both teachers and students, it must align with the curriculum, support diverse learning styles, and incorporate features that facilitate active learning, assessment, and collaboration.

Curriculum Alignment

The alignment of the digital pedagogical tool with the TLE Grade 7 curriculum is crucial for ensuring that the tool effectively supports the teaching and learning process. The domains considered in the tool with their technical description and requirements are introduced in Table 8.

Table 8. *Curriculum Alignment*

Key Aspect	*Description*	*Technical Requirements*
Curriculum-Based Content Integration	Ensuring the digital tool is designed to deliver content aligned with the TLE Grade 7 curriculum objectives.	The tool must include modules, lessons, and activities that align with TLE topics like agriculture, home economics, and industrial arts.
User-Friendly Interface	The design and navigation of the tool should be intuitive and accessible to both teachers and students.	A simple, clean user interface with clear navigation, touch-friendly features, and easily accessible resources and instructions.
Interactive Learning Modules	The digital tool must support hands-on, interactive learning experiences that engage students in active learning.	Features like simulations, virtual labs, quizzes, drag-and-drop exercises, and interactive video tutorials.
Multimedia Integration	The tool should support various forms of media (audio, video, text, and images) to cater to diverse learning styles.	Integration of multimedia resources such as instructional videos, animations, images, audio clips, and infographics.
Assessment and Feedback Mechanisms	The tool should include digital assessment features to evaluate student learning and provide instant feedback.	Integration of quizzes, automated assessments, rubrics for projects, and real-time feedback for students' performance.
Collaborative Features	The tool should encourage collaboration among students and between students and teachers.	Features such as discussion forums, collaborative project tools, group workspaces, and peer review systems.
Mobile and Multi-Platform Compatibility	The tool should be accessible on multiple devices, including tablets, computers, and smartphones.	Responsive design that works across devices (laptops, tablets, smartphones) and operating systems (Windows, macOS, Android, iOS).
Offline Functionality	The tool should allow for offline access to content and activities, especially in areas with unreliable internet.	Downloadable content, offline quizzes, and activity modules that can be accessed without an internet connection.
Customization and Personalization	The tool should allow for customization to suit the specific needs of teachers and students.	Options for teachers to adjust lesson plans, pace, and difficulty levels based on students' learning abilities and progress.
Scalability and Maintenance	The tool should be scalable to accommodate different class sizes and easy to maintain for long-term use.	Cloud-based infrastructure for scalability, with regular updates and maintenance schedules to ensure tool reliability and security.
Data Security and Privacy	The tool must adhere to educational data security and privacy standards.	Compliance with data protection regulations (e.g., FERPA, GDPR) to ensure student information is secure and confidential.
Teacher Support and Training	The tool should provide resources and support for teachers to effectively use the tool in the classroom.	Integrated guides, tutorial videos, help desks, and webinars for teachers to enhance their technological proficiency.
Integration with Other Educational Tools	The tool should integrate with other educational platforms and software used by the school.	Integration capabilities with Learning Management Systems (LMS) like Google Classroom, Microsoft Teams, or Moodle.
Alignment with TLE Skills Development	The tool must focus on developing the practical skills required in the TLE curriculum (e.g., problem-solving, critical thinking).	Incorporating real-world scenarios, skills development exercises (e.g., virtual carpentry, cooking simulations), and problem-based learning modules.

The technical requirements for developing this tool include user-friendly design, multimedia integration, accessibility across multiple platforms, and compatibility with existing educational infrastructures. By addressing these technical requirements, the tool can effectively enhance TLE instruction, improve learning outcomes, and prepare students with the skills needed to thrive in an increasingly

digital and technological world.

As indicated in the table, key aspects like curriculum-based content integration, interactive learning modules, and multimedia integration are essential for creating a tool that caters to the diverse needs of TLE instruction. This means the tool must cover a wide range of TLE topics, such as agriculture, home economics, and industrial arts, while also being flexible enough to allow for a personalized learning experience for both students and teachers. To accommodate a range of student interests and educational requirements, the digital tool should fully cover fundamental TLE subjects including industrial arts, home economics, and agriculture while also matching the goals of the Grade 7 curriculum. Additionally, it must be adaptable enough to offer individualized learning experiences that accommodate different learning preferences and skill levels, enabling educators to modify lesson plans and evaluations as necessary.

By creating an interesting and adaptable learning environment, technology empowers both teachers and students, improving academic performance. Through the creation of an adaptable and captivating environment that encourages cooperation, technology significantly improves the educational experience for both teachers and students. It enables teachers to adapt their methods to each student's unique needs, promoting individualized support. Since students may study at their own speed, interactive technologies promote creativity, critical thinking, and active engagement. Additionally, technology offers instant evaluation and feedback, allowing educators to monitor student development and modify their teaching methods. Since kids do best when they feel encouraged and involved, incorporating technology into the classroom not only energizes the learning environment but also improves academic performance (Calhoun, 2023).

The inclusion of features like assessments, feedback mechanisms, and collaborative tools ensures that the tool supports continuous learning, peer interaction, and real-time evaluation of progress. Additionally, the tool must be accessible on various devices and adaptable to different learning environments, particularly in areas with limited internet connectivity. By aligning the tool with these technical requirements, it ensures a seamless integration with the MATATAG curriculum, enhancing overall teaching efficacy and improving student engagement. However, the success of this tool depends on its scalability, ease of maintenance, and robust security features to protect students' data, which are critical for long-term adoption and use in schools (Pham et al., 2020).

The incorporation of digital technologies into the Grade 7 TLE curriculum involves careful evaluation of essential components that match with educational goals while also improving student learning experiences. Digital tools must provide curriculum-based material, including modules and exercises aligned with specific TLE areas like agriculture, home economics, and industrial arts. Both teachers and students want a user-friendly design with easy navigation and easily available content.

Multimedia integration, which includes text, graphics, video, and audio, supports a variety of learning methods, and the use of interactive learning modules, such simulations and quizzes, encourages active involvement. With integrated quizzes and rubrics, real-time assessments of students' progress are made possible by efficient assessment and feedback systems, which are equally crucial. To guarantee that all students can engage, regardless of their device or internet dependability, features that encourage collaboration, mobile adaptability, and offline functioning are also crucial (Giesler, 2024).

Digital Resources and Tools

Digital Resources and Tools refer to the various types of electronic materials, platforms, and software that support and enhance teaching and learning. In the context of Grade 7 Technology and Livelihood Education (TLE), these resources can significantly improve instructional strategies, student engagement, and overall educational outcomes. Integrating digital tools in the classroom creates dynamic, interactive, and personalized learning experiences that enhance engagement through multimedia resources catering to diverse learning styles.

Adaptive technologies evaluate individual progress and tailor material, whilst digital evaluation tools give immediate feedback, allowing students to take control of their learning. As a result, this technology integration enhances knowledge and prepares pupils for a technologically oriented future (Zamiri & Esmaeili, 2024). Below is a list of key digital resources and tools that can be used to enhance TLE instruction as shown in Table 9.

Table 9. *Digital Resources and Tools*

Category	*Digital Resources & Tools*	*Description & Use*
Learning Management Systems (LMS)	Google Classroom, Moodle, Edmodo	Platforms for managing courses, distributing materials, submitting assignments, and tracking student progress.
Collaborative Tools	Google Docs, Padlet, Microsoft Teams, Slack	Tools that allow students to collaborate on projects, share ideas, and work together in real-time, promoting teamwork.
Simulations & Virtual Labs	PhET Interactive Simulations, Tinkercad, Labster	Virtual labs and simulations for fields like engineering, technology, and home economics that allow hands-on learning in a virtual environment.
Interactive Whiteboards	Jamboard, Miro, SMART Boards	Digital whiteboards that allow teachers and students to draw, annotate, and share ideas in real-time during lessons.
Educational Videos and Tutorials	YouTube, Khan Academy, TED-Ed, National Geographic Education	Platforms that provide educational videos and tutorials on a wide range of TLE topics, from basic skills to complex systems.

Category	*Digital Resources & Tools*	*Description & Use*
Assessment Tools	Quizizz, Kahoot!, Socrative, Google Forms	Interactive assessment tools that enable teachers to create quizzes, polls, and surveys to evaluate student knowledge.
Design and Creation Tools	Canva, Adobe Spark, SketchUp, AutoCAD	Design tools for creating graphics, diagrams, presentations, and 3D models, enhancing creativity in industrial arts and home economics.
Resource Databases and Repositories	Khan Academy, Coursera, EdX, Skillshare	Online platforms that offer video lessons, interactive courses, and tutorials across a range of TLE topics, such as entrepreneurship, technology, and trades.
Multimedia Creation Tools	Adobe Premiere Pro, iMovie, Audacity, GarageBand	Tools for creating multimedia projects, such as videos, podcasts, and audio recordings, which help students express knowledge in creative ways.
Virtual Classrooms	Zoom, Google Meet, Microsoft Teams	Tools for conducting live, synchronous online classes, providing a platform for virtual learning and remote collaboration.
3D Printing and Modeling	Tinkercad, Fusion 360, SketchUp, Blender	Software that allows students to create and design 3D models for projects, promoting skills in technology and design.
Coding & Programming Platforms	Scratch, Code.org, Codecademy, Replit	Platforms for teaching basic coding and programming skills, which are essential for understanding technology in TLE.
Digital Textbooks & E-Books	Google Books, Project Gutenberg, CK-12 Foundation	Digital textbooks and resources that can supplement traditional materials, providing easy access to TLE-related reading.
Project Management Tools	Trello, Asana, Basecamp	Tools that help students organize, manage, and track the progress of their projects, simulating real-world work environments.

The integration of various digital resources and tools outlined in Table 9 is pivotal for enhancing the effectiveness of teaching and learning in Grade 7 TLE under the MATATAG curriculum. The resources span a broad spectrum of categories, from Learning Management Systems (LMS) such as Google Classroom and Moodle, which facilitate seamless course management and communication, to collaborative tools like Google Docs and Microsoft Teams, which foster teamwork and shared learning experiences. The inclusion of simulations and virtual labs, such as Tinkercad and Labster, enables students to engage in hands-on learning without the limitations of physical equipment, particularly for technical fields like engineering and home economics. Interactive whiteboards, educational videos, and assessment tools like Kahoot! provide dynamic, interactive, and formative assessment opportunities to actively engage students (Fisher et al., 2016).

Additionally, digital creation tools like Canva, Adobe Spark, and AutoCAD encourage creativity and technical skills, essential for TLE areas such as industrial arts and design. Platforms like Khan Academy, Coursera, and Skillshare offer rich, supplemental content, expanding the learning environment beyond the classroom. These digital resources also support project-based learning, allowing students to create and manage projects using tools like Trello and Asana, which align with real-world practices in technology and business (Khan et al., 2023). The adoption of these resources in TLE classrooms has the potential to significantly enhance student engagement, foster collaborative learning, and promote the development of critical 21st-century skills such as problem-solving, creativity, and digital literacy. However, successful implementation depends on adequate teacher training, reliable infrastructure, and access to necessary technology, particularly in underserved schools where access to digital tools may be limited.

Incorporating digital resources into Technology and Livelihood Education (TLE) classrooms transforms the learning experience by fostering critical 21st-century skills such as problem-solving, creativity, and digital literacy. These skills are essential for students' academic growth and future success in a rapidly changing workforce. By utilizing tools that enhance engagement and support collaborative learning, educators can promote critical thinking and teamwork, ultimately preparing students to tackle real-world challenges effectively (Dwivedi et al., 2023d).

The successful implementation of digital resources in Technology and Livelihood Education (TLE) classrooms hinges on several critical factors. Adequate teacher training is essential to equip educators to effectively integrate technology into their teaching, creating an environment conducive to student success (Adarkwah, 2020). Additionally, a strong infrastructure and ongoing access to necessary technologies are vital, particularly in underserved schools with limited resources. If these challenges are not addressed, the advantages of technology in TLE classrooms may be reduced, leaving some students at a disadvantage in acquiring essential skills for the modern workforce.

Infrastructure and Connectivity

Infrastructure and Connectivity are critical components for the successful integration of digital tools and resources in education particularly in Grade 7 Technology and Livelihood Education (TLE) under the MATATAG curriculum, as read in Table 10.

The data in Table 10 underscores the vital role of infrastructure and connectivity in successfully implementing TLE instruction under the MATATAG curriculum. Key elements like hardware availability (computers, tablets, projectors) and internet connectivity are essential for enabling the use of digital tools such as simulations, multimedia resources, and cloud-based platforms. Without reliable access to these resources, the full potential of technology in the classroom cannot be realized, limiting both teacher effectiveness and student engagement. These technologies play an important role in improving the learning experience by creating dynamic and engaging classroom settings that actively involve students. However, without constant and reliable access to these resources, the full potential of technological integration cannot be realized. This weakness can impede instructors' capacity to provide engaging lessons and reduce

student engagement and motivation, jeopardizing the overall learning results that the MATATAG program seeks to attain. As a result, ensuring that proper infrastructure and connection are in place is critical for realizing the pedagogical potential of technology in TLE training.

Table 10. *Infrastructure and Connectivity*

Aspect	*Description*	*Importance for TLE Instruction*
Hardware Availability	The provision of necessary devices (e.g., computers, tablets, interactive whiteboards, projectors) for both teachers and students.	Ensures that students and teachers can use digital tools for learning, such as simulations, design software, and multimedia resources.
Internet Connectivity	Access to reliable and fast internet connections, both for in-person classrooms and for remote or blended learning environments.	Enables the use of online resources, virtual simulations, cloud-based tools, and real-time collaboration tools, which are crucial for modern TLE instruction.
Technical Support	Availability of IT support to maintain, troubleshoot, and upgrade hardware and software used in the classroom.	Ensures that digital tools and devices are functional and up-to-date, minimizing disruptions in the learning process.
Cloud Infrastructure	The use of cloud-based platforms and storage solutions (e.g., Google Drive, Microsoft OneDrive) for accessing and sharing learning materials.	Facilitates easy sharing of educational resources, collaborative projects, and data storage, supporting the flexible and accessible nature of TLE instruction.
Electricity Supply	Access to stable and consistent power sources for operating digital devices and other technology in classrooms.	Without reliable electricity, devices like computers, projectors, and interactive boards cannot function, disrupting the teaching and learning process.
Learning Management Systems (LMS)	Platforms like Google Classroom, Moodle, or Microsoft Teams that provide a structured way to organize lessons, assignments, and student progress.	Streamlines the delivery of lessons, enables easy distribution of digital resources, and tracks students' work in TLE courses.
Interactive Learning Tools	Tools such as interactive whiteboards, student response systems, and smartboards that allow teachers to engage students through interactive content.	Enhances engagement by allowing real-time participation, problem-solving activities, and creative learning experiences in TLE subjects.
Digital Libraries and Repositories	Access to online databases, e-books, virtual libraries, and resource repositories that offer digital textbooks, journals, and multimedia content.	Provides students with immediate access to supplemental materials and resources, broadening their knowledge base and supporting independent learning in TLE.
Wireless Network (Wi-Fi)	Reliable wireless internet access across classrooms and other learning spaces, allowing students and teachers to connect devices to online resources.	Promotes flexibility by enabling the use of digital tools and resources in all learning environments—classrooms, labs, and even outdoor projects.
Security and Data Protection	Ensuring proper measures for the safety and privacy of student data, including encryption, firewalls, and compliance with data protection laws.	Protects students' personal information, especially when using digital platforms, and ensures compliance with legal standards (e.g., GDPR, FERPA).
Backup Systems	Backup solutions such as cloud storage or external hard drives to protect digital resources, lessons, and student data.	Prevents loss of important educational content, assignments, and student work in case of system failures or technical issues.

The availability of adequate infrastructure—such as devices, internet connectivity, and technical support—ensures that both teachers and students can fully access and benefit from digital pedagogical tools. In the context of TLE, where practical skills and hands-on learning are central, reliable infrastructure and connectivity are essential for delivering interactive, engaging, and real-world relevant educational experiences (Crossley & McNamara, 2016). Additionally, the presence of technical support, stable electricity, and cloud infrastructure ensures that the digital tools remain functional and accessible. Interactive learning tools, wireless network access, and digital libraries further enhance the learning experience by facilitating real-time collaboration, flexible access to resources, and active participation (Amici et al., 2022). Security measures and backup systems safeguard student data and prevent disruptions, ensuring a secure and reliable learning environment. To maximize the effectiveness of technology in TLE instruction, schools must invest in these critical infrastructure components, while addressing existing gaps in access and support to provide an equitable learning experience for all students.

This investment is essential for both detecting and resolving current access inequities among students, especially in underserved or rural locations, as well as for obtaining the newest technical tools. Schools may provide a fair learning environment that enables every student to succeed by putting in place extensive support systems that include continuing maintenance, technical help, and professional development for teachers. Furthermore, developing alliances with local groups and IT companies can improve resource accessibility and open doors for long-term assistance. Schools can fulfill their educational objectives and advance inclusion by addressing these crucial gaps and guaranteeing that every student has the chance to interact with technology in a meaningful way, acquire essential skills, and thrive in an increasingly digital society (Safe and learning in the midst of fragility, conflict, and violence, 2022).

Teachers' Training and Professional Development

Teacher Training and Professional Development are essential components in the successful integration of technology into education, particularly in subjects like Grade 7 Technology and Livelihood Education (TLE) under the MATATAG curriculum. The variables are read in Table 11.

Table 11. *Teacher Training and Professional Development*

Aspect	*Description*	*Importance for TLE Instruction*
Technology Integration Training	Providing teachers with specific training on how to effectively integrate digital tools and resources into TLE instruction.	Enables teachers to use technology to enhance their teaching methods, engage students, and support practical, hands-on learning in TLE.
Pedagogical Development	Training in modern teaching strategies such as project-based learning (PBL), inquiry-based learning (IBL), and blended learning.	Ensures that teachers can employ effective and student-centered teaching methods that encourage active learning and skill development.
Subject-Specific Professional Development	Offering professional development workshops or courses focused on the content areas of TLE (e.g., industrial arts, home economics).	Helps teachers deepen their subject knowledge and understand how to align instructional strategies with curriculum goals.
Digital Literacy Training	Providing training on the use of various digital tools, educational software, and online platforms.	Ensures teachers are proficient in using digital tools for instruction, assessment, and collaboration with students.
Collaboration and Networking	Encouraging teachers to participate in online communities, peer collaboration, and regional or national educational networks.	Promotes the exchange of ideas, resources, and best practices, fostering a community of educators focused on continuous improvement.
Ongoing Support and Mentorship	Offering continuous coaching, mentoring, and access to technical support as teachers integrate digital tools into their classrooms.	Provides teachers with the guidance and resources needed to troubleshoot challenges, refine their skills, and enhance instruction.
Assessment and Feedback	Providing teachers with the opportunity to assess and reflect on their own practices and receive feedback from peers and mentors.	Helps teachers improve their teaching strategies, better understand student needs, and refine the use of technology in TLE instruction.
Inclusion and Diversity Training	Offering training on how to adapt teaching strategies to meet the needs of diverse learners, including students with disabilities or those from different socio-economic backgrounds.	Ensures that all students have equal access to learning opportunities, particularly when using digital tools and resources.
Time Management and Organization	Teaching effective time management and organization strategies for handling digital resources, assignments, and project-based learning.	Helps teachers balance the use of digital tools with traditional teaching methods and manage classroom time efficiently.
Evaluation and Reflection on Technology Use	Encouraging teachers to evaluate the effectiveness of digital tools and platforms and reflect on how well they support student learning.	Ensures that teachers are constantly improving their use of technology to meet educational goals and enhance student engagement.

Table 11 highlights the critical aspects of teacher training and professional development necessary for the effective integration of technology in TLE instruction. As technology evolves fast, it is critical that instructors have the skills, knowledge, and pedagogical practices to successfully employ digital tools and resources. Teacher training and continued professional development guarantee that educators keep current with best practices in digital pedagogy, technology integration, and subject-specific teaching approaches, hence improving instructional quality and student learning results (Escueta et al., 2020).

Providing Technology Integration Training ensures that instructors are prepared to use digital technologies into their lectures, hence improving teaching techniques and encouraging hands-on learning. Pedagogical Development emphasizes current tactics such as project-based and inquiry-based learning, allowing instructors to embrace student-centered ways that promote active involvement and skill development (Kumar et al., 2021). Subject-Specific Professional Development training assists instructors in aligning their expertise with the curriculum, assuring proper delivery of TLE content, whereas Digital Literacy Training assures teachers' proficiency in the use of educational tools and digital platforms. Furthermore, encouraging collaboration and networking allows instructors to exchange ideas, building a community of continual professional development.

Ongoing support and mentorship are vital for teachers integrating technology into their classrooms, providing essential guidance to navigate challenges and enhance their teaching practices. Incorporating assessment and feedback mechanisms enables educators to reflect on their methods, leading to refined instructional techniques and more effective use of digital resources. Inclusion and diversity training ensures that technology is accessible to all students, including those with disabilities and from varied backgrounds, promoting equitable learning opportunities (Asy'ari & Sharov, 2024). Additionally, time management and organization training helps teachers balance digital tools with traditional methods and efficiently manage classroom activities. Finally, fostering a culture of evaluation and reflection on technology use encourages continuous improvement, allowing teachers to assess and enhance their technology integration to boost student learning outcomes. Overall, investing in these areas empowers educators to fully leverage technology and enrich the quality of Technology and Livelihood Education (TLE) instruction.

Teacher training and professional development are critical in providing educators with the skills and knowledge needed to effectively use technology in the classroom. As educational technologies and digital tools advance at a rapid rate, instructors must get ongoing training to keep current on industry best practices in digital pedagogy and technology integration. Such professional development opportunities enable educators to experiment with novel teaching approaches specific to their subject areas, allowing them to construct engaging and dynamic lesson plans that cater to a variety of learning styles (Mohamed et al., 2022).

Furthermore, continual professional development promotes a culture of cooperation and information sharing among educators, enabling them to share ideas and solutions for addressing technology-related difficulties. This collective growth not only improves instructional quality but also leads to better student learning outcomes, as well-prepared teachers are better able to facilitate meaningful learning experiences that foster critical thinking, creativity, and problem-solving skills in their students (Schleicher, 2021). Indeed, investing in teacher training and professional development is a critical step in achieving the MATATAG curriculum's broad objectives and advancing educational fairness.

Level of Acceptability of the Developed Digital Pedagogical Tool for Grade 7 TLE in Relation to Enhancing Teaching and Improving Instructional Strategies

The level of acceptability of the developed digital pedagogical tool for Grade 7 TLE plays a crucial role in determining its effectiveness in enhancing teaching and improving instructional strategies. This section of the study explores how the tool is perceived by both teachers and students in terms of its usability, functionality, and impact on learning outcomes. By evaluating the extent to which the tool aligns with the needs of educators and learners, as well as its capacity to integrate with the existing curriculum, this analysis provides valuable insights into the tool's potential for fostering an interactive and engaging learning environment. The feedback gathered from users will help assess whether the digital tool meets its intended goals and whether it can be effectively implemented across various classrooms to support the delivery of TLE lessons under the MATATAG curriculum.

Performance

Performance refers to how effectively and efficiently a Digital Pedagogical Tool operates in enhancing teaching and learning experiences. For a Grade 7 Technology and Livelihood Education (TLE) tool under the MATATAG curriculum, strong performance is critical to ensure that the tool meets educational goals without causing disruptions. The results of the survey are shown in Table 12.

Table 12. *Performance*

Developed Digital Pedagogical Tool for Grade 7 in terms of Performance	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Speed and Responsiveness	4.29	VHA	4.27	VHA	4.28	0.01	VHA
System Stability	4.27	VHA	4.25	VHA	4.26	0.01	VHA
Scalability	4.27	VHA	4.28	VHA	4.27	0.005	VHA
Multimedia Handling	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Data Synchronization and Cloud Integration	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Average	4.27	VHA	4.25	VHA	4.26	0.006	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

The data presented in Table 12 highlights the performance of the developed digital pedagogical tool for Grade 7 Technology and Livelihood Education (TLE), based on feedback from both students and teachers. The overall weighted means (WM) for each criterion, including Speed and Responsiveness, System Stability, Scalability, Multimedia Handling, and Data Synchronization and Cloud Integration, all fall within the Very Highly Acceptable (VHA) range, indicating strong approval from both groups of respondents. The low standard deviations (ranging from 0.00 to 0.01) suggest minimal variation in responses, reflecting consistent satisfaction with the tool's performance. These results imply that the digital tool is perceived as effective in its core functions, supporting smooth, stable, and scalable delivery of instructional content. The high level of acceptability across both students and teachers indicates that the tool is well-suited to enhancing the Grade 7 TLE curriculum and is likely to contribute positively to teaching and learning outcomes. The digital tool demonstrates strong effectiveness in delivering instructional content seamlessly and reliably, with scalability that allows it to adapt to different class sizes and educational settings (Park & Kim, 2022). Both students and teachers express high levels of approval, suggesting a shared confidence in the tool's ability to enhance the Grade 7 TLE curriculum through increased engagement and interactive learning. This mutual endorsement highlights the tool's potential to significantly improve teaching practices and student outcomes, contributing to a more effective educational environment.

The positive feedback from both students and teachers on the effectiveness of the digital tool highlights its vital role in education. This shared approval enhances the likelihood of its integration into everyday classroom use, promoting a collaborative environment where technology is effectively utilized. The tool's consistent performance across various criteria positions it as a dependable resource that accommodates diverse learning styles. Moreover, the findings emphasize the need for ongoing evaluation and the careful selection of quality digital tools in education. The uniformity in respondents' perceptions indicates a reduced learning curve for new technologies, allowing educators to optimize instructional time and focus more on personalized teaching. The favorable evaluations also suggest the

potential for valuable insights into future training, ensuring teachers can effectively use such tools (Selim, 2024).

Definitely, investing in high-quality digital solutions can improve the Grade 7 TLE curriculum and enhance teaching practices and student outcomes.

Features

The features in this research refer to the specific functionalities and tools that a Digital Pedagogical Tool offers to enhance the teaching and learning experience. They are defined in Table 13.

Table 13. *Features*

Developed Digital Pedagogical Tool for Grade 7 in terms of Features	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Interactive Learning Modules	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Multimedia Content Integration	4.25	VHA	4.24	VHA	4.24	0.003	VHA
Assessment and Feedback Tools	4.29	VHA	4.27	VHA	4.28	0.014	VHA
Progress Tracking and Analytics	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Collaborative Tools	4.25	VHA	4.24	VHA	4.24	0.003	VHA
Gamification Elements	4.29	VHA	4.27	VHA	4.28	0.014	VHA
Adaptive Learning Pathways	4.27	VHA	4.25	VHA	4.26	0.014	VHA
Access to Resources and Materials	4.27	VHA	4.28	VHA	4.27	0.004	VHA
Offline Functionality	4.23	VHA	4.23	VHA	4.24	0.003	VHA
Integration with Learning Management Systems (LMS)	4.25	VHA	4.24	VHA	4.23	0.00	VHA
Personalized Learning Support	4.29	VHA	4.27	VHA	4.28	0.014	VHA
Language and Accessibility Options	4.27	VHA	4.25	VHA	4.26	0.014	VHA
Virtual and Augmented Reality (VR/AR)	4.27	VHA	4.28	VHA	4.27	0.004	VHA
Average	4.26	VHA	4.25	VHA	4.26	0.007	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

For a Grade 7 Technology and Livelihood Education (TLE) tool under the MATATAG curriculum, the features should be designed to meet both the instructional needs of the teachers and the learning needs of the students. These features must not only align with the curriculum but also support the development of essential skills in students, such as critical thinking, problem-solving, collaboration, and digital literacy.

The data in Table 13 reflects the evaluation of the developed digital pedagogical tool for Grade 7 TLE in terms of its features, as rated by both students and teachers. All features, including Interactive Learning Modules, Multimedia Content Integration, Assessment and Feedback Tools, Gamification Elements, and Personalized Learning Support, are rated within the Very Highly Acceptable (VHA) range, indicating strong approval from both groups of respondents. The weighted means (WM) are consistently high, ranging from 4.23 to 4.29, and the standard deviations (SD) are very low (ranging from 0.00 to 0.014), suggesting that the responses were highly consistent across participants.

These results imply that the tool's features, such as interactivity, multimedia integration, assessment tools, and adaptive learning pathways, are well-received and perceived as highly effective in supporting Grade 7 TLE instruction. The high acceptability of these features indicates that the digital tool has the potential to significantly enhance the learning experience and improve pedagogical strategies for both teachers and students. The high acceptability of the digital tool's features suggests that it holds considerable promise for transforming the educational landscape. In addition to being user-friendly, this digital solution suggests that it successfully fits the requirements and preferences of both teachers and students. Teachers may use cutting-edge features to improve their pedagogical approaches and create a more dynamic and engaging learning environment by incorporating such a tool into the classroom. Improved accessibility and individualized learning experiences that accommodate different learning styles are also anticipated to benefit learners. The effective use of this digital tool may result in better academic performance, more student motivation, and more engaging teaching methods, all of which would significantly enhance the educational process (Rana et al., 2019).

Reliability

Reliability is defined as the consistency and dependability of the tool's performance and outcomes in aiding teaching and learning activities. Reliability in digital pedagogical tools means consistent performance with less error functioning, which allows educators and learners to effectively engage in teaching and learning. This includes the accurate delivery of content, stable operation, and a smooth user experience for various users. Reliable tools improve the teaching process, enhance student engagement, and lead to better educational outcomes by providing a trustworthy learning environment. This includes the tool's capacity to produce correct material, run effectively without major technological glitches, and sustain user engagement over time. A dependable digital educational tool should deliver comparable outcomes in varied circumstances and among different users, guaranteeing that instructors can successfully

apply their teaching methodologies and students can rely on it to help them learn. Factors such as simplicity of use, stability, and consistent user experience add to the tool's overall reliability, making it a critical component in developing effective educational settings. High dependability boosts educators' confidence in utilizing the tool and promotes favorable learning results for pupils (Yu et al., 2020). The indicators for this variable are shown in Table 14.

Table 14. *Reliability*

Developed Digital Pedagogical Tool for Grade 7 in terms of Reliability	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Alignment with Curriculum Standards	4.25	VHA	4.24	4.25	4.24	0.005	VHA
Compliance with Educational Policies and Regulations	4.29	VHA	4.27	4.29	4.28	0.01	VHA
Compatibility with Educational Frameworks	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Conformance with Technological Standards	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Adherence to Quality Assurance Standards	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Compliance with Accessibility Requirements	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Support for Local Context and Cultural Relevance	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Alignment with Data Privacy and Security Standards	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Average	4.27	VHA	4.253	VHA	4.26	0.006	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

The data presented in Table 14 shows that the Developed Digital Pedagogical Tool for Grade 7 TLE is perceived as Very Highly Acceptable (VHA) by both Grade 7 students and teachers across several reliability factors. The mean scores for the different criteria range from 4.23 to 4.29, consistently reflecting strong positive evaluations. The standard deviations are generally low, ranging from 0.00 to 0.01, indicating minimal variability and a high level of agreement between the respondents. This suggests that both students and teachers find the tool to be highly reliable in terms of alignment with curriculum standards, compliance with educational policies, adherence to quality assurance, and data privacy standards, among others. The reliability of a digital pedagogical tool is demonstrated by its alignment with curriculum standards, ensuring it meets educational objectives. Compliance with educational policies verifies adherence to legal and ethical guidelines, creating a secure learning environment. Regular evaluations and updates for quality assurance uphold the tool's effectiveness and relevance, while data privacy standards safeguard sensitive information. These elements make the tool a dependable resource that enhances teaching and learning experiences.

The lowest standard deviation (0.00) is found in Conformance with Technological Standards and Support for Local Context, which implies unanimous agreement on these aspects. The presence of a standard deviation of 0.00 in Conformance with Technological Standards and Support for Local Context indicates unanimous agreement among participants, highlighting that all respondents view the tool as fully compliant with necessary technological standards (Van Rooij & Sokol, 2021). This consensus assures its functionality across diverse educational settings. Additionally, the strong endorsement of its support for local context points to the tool's adaptability and effectiveness in meeting specific local needs. This widespread agreement not only bolsters the tool's credibility but also enhances its likelihood of widespread adoption, affirming its alignment with essential technological and contextual educational requirements. The tool is seen as effective in supporting educational goals and technological standards, ensuring a reliable learning environment. However, while these results suggest a strong alignment with key educational requirements, further refinement could address even the smallest discrepancies to enhance its use across diverse learning contexts.

Conformance

Conformance refers to how well a Digital Pedagogical Tool meets the established standards, guidelines, and specifications relevant to its intended use. The survey pointed out the views of the respondents on the conformance indicators, as reflected in Table 15.

Table 15 illustrates that the Developed Digital Pedagogical Tool for Grade 7 TLE meets the expectations for conformance to educational and technological standards, as reflected in the Very Highly Acceptable (VHA) ratings from both Grade 7 students and teachers. The mean scores across all criteria range from 4.23 to 4.29, signaling strong positive evaluations. Notably, the standard deviations are very low (mostly ranging from 0.00 to 0.03), indicating minimal variation in responses, which suggests a high level of consensus on the tool's conformance with key standards.

For a Grade 7 Technology and Livelihood Education (TLE) tool within the MATATAG curriculum, conformance involves aligning the digital tool with national educational policies, curriculum requirements, pedagogical standards, and technical specifications.

Ensuring that the tool conforms to these criteria ensures its effectiveness, acceptability, and usability in the educational environment.

Table 15. *Conformance*

Developed Digital Pedagogical Tool for Grade 7 in terms of Conformance	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Alignment with Curriculum Standards	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Compliance with Educational Policies and Regulations	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Compatibility with Educational Frameworks	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Conformance with Technological Standards	4.23	VHA	4.29	VHA	4.26	0.03	VHA
Adherence to Quality Assurance Standards	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Compliance with Accessibility Requirements	4.29	VHA	4.29	VHA	4.29	0.00	VHA
Support for Local Context and Cultural Relevance	4.23	VHA	4.23	VHA	4.23	0.00	VHA
Alignment with Data Privacy and Security Standards	4.27	VHA	4.23	VHA	4.25	0.009	VHA
Average	4.26	VHA	4.25	VHA	4.25	0.007	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

Areas such as alignment with curriculum standards, compliance with accessibility requirements, and support for local context received perfect agreement (standard deviation of 0.00), indicating uniform approval. However, the slightly higher deviation in conformance with technological standards (0.03) and alignment with data privacy standards (0.009) suggests some room for improvement. Despite these minor differences, the overall results imply that the tool is robust in adhering to relevant standards and regulations, supporting its effectiveness in promoting quality education. The tool demonstrates strong resilience in adhering to relevant educational standards and regulations, despite some minor differences in results. This compliance is crucial for its effectiveness and reliability, assuring educators and policymakers of its quality. Its alignment with established guidelines not only validates its functionality but also enhances its ability to support diverse educational needs while preserving integrity.

As a result, the tool is positioned as a valuable resource for promoting effective learning environments, ultimately leading to better educational outcomes for students. This implies that the tool can be reliably integrated into classrooms while ensuring compliance with educational frameworks and standards (Force, 2020).

Durability

When developing a Digital Pedagogical Tool for Grade 7 Technology and Livelihood Education (TLE), durability is a key characteristic to ensure that the tool is built to last, withstand frequent use, and maintain its performance over time. The durability of the tool is defined by the indicators in Table 16.

Table 16. *Durability*

Developed Digital Pedagogical Tool for Grade 7 in terms of Durability	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Robust Technical Infrastructure	4.25	VHA	4.24	VHA	4.26	0.005	VHA
Long-Term Software Compatibility	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Resilience to Technological Obsolescence	4.23	VHA	4.29	VHA	4.26	0.03	VHA
Data Backup and Recovery Systems	4.25	VHA	4.24	VHA	4.24	0.005	VHA
High-Quality User Experience (UX) Design	4.29	VHA	4.29	VHA	4.29	0.00	VHA
Average	4.26	VHA	4.27	VHA	4.27	0.010	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

Durability in the context of a digital tool refers to its ability to function reliably over extended periods, despite regular use, updates, and technological advancements. Table 16 shows that the Developed Digital Pedagogical Tool for Grade 7 TLE is highly durable according to the assessments of both Grade 7 students and teachers, with an Overall Weighted Mean (WM) of Very Highly Acceptable (VHA) across all criteria. The mean scores range from 4.23 to 4.29, indicating a strong consensus on the tool's durability. Notably, the tool's robust technical infrastructure, long-term software compatibility, and high-quality UX design all received high ratings, with perfect agreement (0.00 standard deviation) in the design's user experience. Although the resilience to technological obsolescence

received a slightly lower mean score of 4.23, it still remains within the acceptable range, and the higher standard deviation (0.03) suggests that there is some variability in how it is perceived. The standard deviations across most items are very low (mostly ranging from 0.00 to 0.03), indicating high reliability and agreement among respondents.

This implies that the tool is perceived to be both technically sound and designed to remain effective over time, with some minor concerns about its long-term adaptability to future technologies. The tool is acknowledged for its technical reliability and thoughtful design, which together provide lasting educational value. Built on strong principles, it serves as a dependable resource for educators and students. However, there are concerns about its ability to adapt to new technologies and changing educational practices. Given the rapid evolution in the field of education, the tool's capability to incorporate new features may be challenged. To maintain its relevance and effectiveness, it is crucial to implement strategies that promote flexibility and ongoing improvement, ensuring it can respond to future educational demands (S. McKenney & Reeves, 2018).

Serviceability

When developing a Digital Pedagogical Tool for Grade 7 Technology and Livelihood Education (TLE), serviceability is a crucial aspect to ensure that the tool is both reliable and easy to maintain. Serviceability refers to the ease with which the tool can be updated, troubleshot, and adapted to meet the evolving needs of students, teachers, and technological advancements. The position of the respondent on this variable is explained by its indicators in Table 18.

Table 17. *Serviceability*

Developed Digital Pedagogical Tool for Grade 7 in terms of Serviceability	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
User-Friendly Maintenance Interface	4.24	VHA	4.24	VHA	4.24	0.00	VHA
Regular Software Updates and Support	4.27	VHA	4.27	VHA	4.27	0.00	VHA
Error Detection and Troubleshooting	4.23	VHA	4.27	VHA	4.25	0.02	VHA
Scalability for Future Enhancements	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Cross-Platform Compatibility	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Average	4.26	VHA	4.26	VHA	4.26	0.007	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

Table 17 highlights the serviceability of the Developed Digital Pedagogical Tool for Grade 7 TLE, with all aspects rated as Very Highly Acceptable (VHA) by both Grade 7 TLE students and teachers. The Overall Weighted Mean (WM) across all criteria remains high, ranging from 4.23 to 4.29, indicating strong agreement on the tool's serviceability. The ratings suggest that the tool is seen as user-friendly, with features like a maintenance interface and regular software updates receiving perfect scores (4.24 and 4.27, respectively) and zero variability (standard deviation of 0.00), implying that all respondents agree on its ease of service. The error detection and troubleshooting capability had a slightly lower mean (4.23 for students, 4.27 for teachers), with a standard deviation of 0.02, suggesting some minor differences in perception. The scalability for future enhancements and cross-platform compatibility were also highly rated, further emphasizing the tool's adaptability and long-term usability.

These results suggest that the tool is not only easy to maintain but also robust in handling future updates and expanding its capabilities, ensuring sustained serviceability and effectiveness for TLE instruction. The tool is thoughtfully designed for user-friendliness, making it easily maintainable by educators and administrators without requiring deep technical skills. This simplicity is paramount in diverse educational environments, as it promotes consistent usage and minimizes downtime, allowing teachers to concentrate on enhancing their instructional methods rather than fixing technical problems. Its seamless maintenance leads to a positive user experience, encouraging greater adoption and integration into the curriculum (Education & Unesco, 2021).

Moreover, the tool's robust capacity for future updates and enhancements ensures it remains effective in the fast-evolving realm of educational technology. Its adaptability allows it to incorporate new methods and tools, preserving its relevance in delivering Quality Technology and Livelihood Education (TLE) instruction. This forward-thinking approach not only reinforces its current utility but also guarantees its long-term functionality, equipping educators to prepare students for a complex future with engaging content. The tool's combination of ease of maintenance and flexibility makes it a significant resource in the educational field, benefiting both teachers and students (Barrett et al., 2019).

Aesthetics

When developing a Digital Pedagogical Tool for Grade 7 Technology and Livelihood Education (TLE), aesthetics plays a key role in ensuring that the tool is engaging, user-friendly, and conducive to effective learning. The survey results on this variable are read in Table 18.

Table 18 reveals the aesthetic qualities of the Developed Digital Pedagogical Tool for Grade 7 TLE, with very highly acceptable (VHA) ratings across all aspects by both students and teachers. The overall weighted mean (WM) ranges from 4.23 to 4.27, reflecting strong approval of the tool's visual appeal and user-friendly design. The intuitive layout and navigation received a perfect score of 4.27 from

both groups, indicating that the tool is easy to use and navigate. Other factors like visually engaging design and interactive visuals were similarly well-received, with minor variations in ratings, as indicated by the standard deviations (0.005 to 0.02).

Table 18. *Aesthetics*

Developed Digital Pedagogical Tool for Grade 7 in terms of Aesthetics	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Visually Engaging Design	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Intuitive Layout and Navigation	4.27	VHA	4.27	VHA	4.27	0.000	VHA
Interactive Visuals and Multimedia	4.23	VHA	4.27	VHA	4.25	0.020	VHA
Consistency in Design	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Age-appropriate and Culturally Relevant Design	4.26	VHA	4.28	VHA	4.27	0.010	VHA
Average	4.25	VHA	4.26	VHA	4.254	0.008	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

Additionally, the tool's age-appropriate and culturally relevant design scored high, reflecting its alignment with the needs of the learners. The tool features an age-appropriate and culturally relevant design that demonstrates an understanding of learners' diverse backgrounds. By integrating culturally resonant elements, it enhances relatability and fosters a sense of belonging among students. This thoughtful design makes the content accessible and engaging for learners at different developmental stages, increasing motivation and participation. Additionally, by reflecting students' realities and values, the tool promotes an inclusive learning environment where all students feel valued and represented, enriching their educational experience (Oueriagli et al., 2023).

The positive responses suggest that the tool is aesthetically designed to attract and engage students, fostering a more interactive and enjoyable learning experience. This is crucial for maintaining student interest and ensuring the effective delivery of educational content in TLE. The tool's visually appealing design is crucial for capturing students' attention and enhancing their engagement in the learning process. By utilizing vibrant colors, intuitive layouts, and interactive elements, it creates an inviting environment that motivates students to actively participate and explore the subject matter. This engaging design not only makes learning enjoyable but also helps maintain students' focus, leading to improved comprehension and retention of material within Technology and Livelihood Education (TLE). The interactive features of the tool promote collaboration and active participation, enabling students to engage with content through simulations, hands-on activities, and gamified experiences. This hands-on approach aligns with the practical focus of TLE, fostering a deeper understanding of concepts while cultivating enthusiasm and ownership in learning. An engaging and interactive design is essential for maximizing student interest and delivering effective educational content, paving the way for successful skill acquisition and application (Hutson & Plate, 2023).

Perceived Quality

Perceived Quality refers to the overall impression and evaluation of the tool based on how users (students, teachers, and administrators) assess its effectiveness, reliability, and value in meeting their needs, as discussed in Table 19. It is subjective and is influenced by various factors, including the tool's functionality, ease of use, design, and its ability to enhance the teaching and learning experience. In the context of Grade 7 Technology and Livelihood Education (TLE), the perceived quality of the digital tool directly affects user satisfaction, engagement, and ultimately, the tool's success in improving learning outcomes. Table 19 reflects the perceived quality of the Developed Digital Pedagogical Tool for Grade 7 TLE, with very highly acceptable (VHA) ratings from both students and teachers across all aspects.

Table 19. *Perceived Quality*

Developed Digital Pedagogical Tool for Grade 7 in terms of Perceived Quality	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Usability and User Experience (UX)	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Content Relevance and Accuracy	4.29	VHA	4.27	VHA	4.28	0.01	VHA
Reliability and Performance	4.23	VHA	4.29	VHA	4.26	0.03	VHA
Functionality and Features	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Technical Support and Help Resources	4.29	VHA	4.29	VHA	4.29	0.00	VHA
Adaptability to Different Learning Styles	4.23	VHA	4.29	VHA	4.26	0.03	VHA
Engagement and Motivation	4.25	VHA	4.24	VHA	4.24	0.005	VHA
Cost-Effectiveness and Accessibility	4.23	VHA	4.29	VHA	4.26	0.03	VHA
Average	4.25	VHA	4.27	VHA	4.26	0.014	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

The overall weighted mean (WM) ranges from 4.23 to 4.29, indicating that both groups are highly satisfied with the tool's quality. Content relevance and accuracy received the highest score of 4.29, demonstrating strong alignment with the educational objectives and

expectations.

Other factors such as usability and user experience (UX), technical support, and engagement and motivation also scored very highly, with standard deviations ranging from 0.005 to 0.03, suggesting consistency in the responses. Additionally, the tool's reliability and performance, as well as its adaptability to different learning styles, received positive feedback, although there was slightly more variation in the latter (standard deviation of 0.03). The high scores in areas like cost-effectiveness and accessibility highlight the tool's practical value and its ability to meet diverse learning needs.

The findings reveal that the tool is effective and efficient for Grade 7 Technology and Livelihood Education (TLE), aligning well with educational objectives and student needs. Its effectiveness is likely due to its engaging nature, which actively involves students and provides practical skills essential for their development. The tool incorporates interactive, hands-on experiences that enhance understanding of TLE concepts, while its efficiency allows both educators and students to maximize learning outcomes effectively.

Moreover, the tool offers significant educational value, enriching the TLE curriculum with culturally relevant and age-appropriate content that connects with students' real-life experiences. This relevance fosters a more meaningful learning environment, potentially increasing student engagement and knowledge retention by demonstrating practical applications of their learning. The tool not only addresses immediate educational goals but also aids in the long-term development of crucial skills and competencies, highlighting the importance of high-quality instructional resources in education (Sato et al., 2023).

Summary of Results

This segment summarizes the results of the survey on the eight variables which defined the level of acceptability of the digital pedagogical tool in Technology and Livelihood Education (TLE) 7 which includes performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. These variables were measured based on the perceptions of the Technology and Livelihood Education teachers and Grade 7 learners. The summary of responded variables is presented in Table 20.

Table 20. *Summary of Results*

Developed Digital Pedagogical Tool for Grade 7 in terms of Quality	*Group of Respondents*				*M*	*Std Dev*	*Verbal Description*
	Grade 7 TLE Students		*Grade 7 TLE Teachers*				
	WM	*VD*	*WM*	*VD*			
Performance	4.26	VHA	4.25	VHA	4.26	0.006	VHA
Features	4.26	VHA	4.25	VHA	4.26	0.007	VHA
Conformance	4.26	VHA	4.25	VHA	4.25	0.007	VHA
Durability	4.26	VHA	4.27	VHA	4.27	0.010	VHA
Serviceability	4.26	VHA	4.26	VHA	4.26	0.007	VHA
Aesthetics	4.25	VHA	4.26	VHA	4.254	0.008	VHA
Perceived Quality	4.25	VHA	4.27	VHA	4.26	0.014	VHA
Average	4.257	VHA	4.259	VHA	4.259	0.008	VHA

n=140. Legend: 4.21- 5.00 Very Highly Acceptable (VHA), 3.00- 4.20 Highly Acceptable (HA), 2.41-3.20 Moderately Acceptable (MA),1.81- 2.40 Acceptable (A), 1.00- 1.80 Not Acceptable

The table presents the quantitative assessment of a developed Digital Pedagogical Tool aimed at Grade 7 students, based on the quality dimensions rated by both Grade 7 Technology and Livelihood Education (TLE) students and teachers. The results indicate that the overall average weighted mean (WM) scores for both groups are very close to each other, reflecting a high level of agreement regarding the tool's effectiveness in enhancing educational delivery.

In terms of performance, both students and teachers rated the tool with a WM of 4.26 and 4.25, categorizing it as "Very Highly Appreciated" (VHA). This suggests that the tool is perceived to meet performance expectations, likely contributing positively to the learning experience of Grade 7 TLE students. The standard deviation values for performance are notably low (0.006 for students and 0.007 for teachers), indicating consensus among respondents on the perceived effectiveness of the tool.

The features of the digital tool also received high ratings, with both students and teachers giving a WM of 4.26 and 4.25, respectively. This consistency implies that the respondents find the tool's attributes robust and supportive of the educational needs in a Grade 7 classroom context. Similarly, the dimensions of conformance and durability received uniform ratings of 4.26 from students and 4.25 from teachers, highlighting that both groups believe the digital tool adheres to quality standards and is expected to withstand the rigors of classroom use over time.

The dimensions of serviceability and aesthetics were assessed with an overall positive perception, achieving ratings around 4.25 and 4.26. The positive perception of aesthetics may enhance user engagement, thereby contributing to a richer learning experience. The average scores of 4.257 for students and 4.259 for teachers further reaffirm the overall high regard for the tool's quality and effectiveness.

The data indicates a strong consensus on the value of the Digital Pedagogical Tool among both students and teachers in the educational setting. Henceforth, with the overall results of the survey, it is remarked that the Digital Pedagogical Tool is deemed effective as instructional tool for an engaging and meaningful teaching-learning process.

The Challenges and Concerns Regarding the Developed Digital Pedagogical Tool, Particularly in Relation to its Ability to Enhance Pedagogical Approaches and Improve Student Outcomes for Grade 7 TLE

The integration of digital tools into the educational landscape, particularly in Grade 7 Technology and Livelihood Education (TLE) under the MATATAG curriculum, presents a promising opportunity to enhance pedagogical approaches and improve student outcomes. However, the development and implementation of a digital pedagogical tool come with a set of challenges and concerns that must be addressed to fully harness its potential. These challenges include issues related to access to technology, teacher preparedness, alignment with curriculum standards, and the tool's ability to effectively engage students in meaningful learning. Additionally, concerns such as system reliability, student digital literacy, and the tool's ability to provide personalized feedback are critical factors that could influence its success in the classroom.

Understanding and addressing these challenges is essential for ensuring that the tool can contribute positively to the teaching and learning process, ultimately improving student performance in TLE. The successful integration of a Digital Pedagogical Tool for Grade 7 TLE under the MATATAG curriculum faces several challenges that need to be addressed for it to truly enhance pedagogical approaches and improve student outcomes. Ensuring equitable access, providing teacher training, addressing technical issues, and aligning the tool with the curriculum are key steps to overcoming these concerns. By proactively addressing these challenges, the tool's potential to support and enrich student learning can be fully realized.

Table 21. *Challenges and Concerns Regarding the Developed Digital Pedagogical Tool*

Challenge/Concern	*Description*	*Impact on Pedagogical Approaches and Student Outcomes*
1. Lack of Access to Technology	Some students may have limited access to digital devices or reliable internet connectivity, hindering their ability to use the tool effectively.	Students may miss out on key lessons or fail to complete assignments, limiting their learning opportunities and negatively impacting outcomes.
2. Teacher Training and Familiarity with the Tool	Teachers may not be sufficiently trained or familiar with the digital tool, leading to improper use or underutilization of its features.	Inadequate use of the tool may result in ineffective integration into lessons, reducing its potential to enhance pedagogical approaches and improve outcomes.
3. Content Relevance and Alignment	The content and learning materials provided by the digital tool may not always be fully aligned with the TLE curriculum or the needs of Grade 7 students.	Misalignment can result in gaps in students' learning, making it harder for them to grasp core concepts, thus hindering their overall academic progress.
4. Over-reliance on Technology	Heavy reliance on technology might lead to reduced face-to-face interactions and practical, hands-on learning experiences, which are key in TLE subjects.	Students may miss out on essential skills like manual dexterity or interpersonal communication, which are critical for success in TLE fields.
5. Technical Issues and Reliability	Technical problems, such as system crashes, slow load times, or connectivity issues, can disrupt lessons and hinder student engagement.	Such disruptions can cause frustration, loss of learning time, and disengagement, leading to poor student performance and limited learning outcomes.
6. Student Digital Literacy Levels	Varying levels of digital literacy among students can affect their ability to navigate and effectively use the tool.	Students with lower digital literacy may struggle to interact with the tool, leading to unequal learning opportunities and widening achievement gaps.
7. Assessment and Feedback Limitations	The tool's automated assessments or feedback systems might not capture the full range of student abilities or provide personalized insights.	Limited feedback can prevent students from receiving targeted support, thereby hindering their growth and understanding of TLE concepts.
8. Motivation and Engagement Challenges	Some students may find the digital tool less engaging or motivating, particularly if it lacks interactive elements or fails to cater to diverse learning styles.	Low student engagement could result in decreased effort, leading to poorer academic performance and less mastery of TLE content.
9. Data Privacy and Security Concerns	There may be concerns regarding the protection of student data, particularly in relation to online assessments, performance tracking, and personal information.	Concerns about data privacy could undermine trust in the tool and limit its use, which could impede its effectiveness in enhancing learning outcomes.
10. Equity in Access Across Diverse Student Populations	Socio-economic disparities can result in unequal access to the tool, with some students facing greater barriers to digital learning due to financial or resource limitations.	Inequitable access to the tool can create disparities in student performance, with some students unable to fully benefit from the learning resources.

The table outlines ten significant challenges and concerns associated with the integration of a Digital Pedagogical Tool for Grade 7 TLE students. Each challenge underscores a hurdle that educators and students may face, highlighting potential negative impacts on pedagogical approaches and student outcomes. Understanding these concerns is crucial for addressing barriers to effective technology use in education. This awareness can guide improvements and strategies for enhancing student learning experiences and learning success. One major concern is the lack of access to technology faced by some students. Limited availability of digital devices or reliable internet connections can severely hinder their ability to engage with the digital tool effectively. Students who cannot access these resources may miss critical lessons and fall behind in their academic progress. This disadvantage can lead to unequal learning opportunities and hinder overall educational outcomes for affected students (Gottschalk & Weise, 2023).

Another challenge lies in teacher training and familiarity with the digital tool. Educators must be adequately trained to utilize the tool fully and understand its features. Insufficient training can lead to improper use or underutilization, diminishing the tool's potential to positively influence pedagogical approaches. As a result, students may not benefit from enhanced instructional strategies that could improve their learning outcomes, ultimately limiting the tool's effectiveness. Content relevance and alignment present an additional concern, as the materials offered by the digital tool may not always match the Grade 7 TLE curriculum. When the provided content is misaligned with curricular goals, students may encounter gaps in their learning, impeding their comprehension of essential concepts. This lack of cohesion in learning materials can hinder students' academic growth and create obstacles in their academic journey (DeJaeghere & Murphy-Graham, 2021).

Over-reliance on technology is a significant concern, especially in TLE subjects that emphasize hands-on learning experiences. While digital tools can enhance learning, excessive dependence may reduce face-to-face interactions and practical skill development. Students may miss crucial opportunities to practice interpersonal communication or manual dexterity, both of which are vital in TLE fields. This shift away from experiential learning could limit students' preparation for real-world applications of their skills. Technical issues and reliability pose yet another challenge to effective learning. Problems such as system crashes, slow loading times, or poor connectivity can disrupt lessons, which may frustrate both teachers and students. When technical difficulties arise, they can lead to a loss of learning time and student engagement. Hence, students may experience diminished academic performance and overall poor learning outcomes when lessons are consistently interrupted (Smith & Conti, 2019).

The issues related to data privacy and digital literacy levels further complicate the use of the digital tool. Concerns over the protection of student data can instill fear and mistrust, ultimately diminishing the tool’s effectiveness. Likewise, varying levels of digital literacy among students can exacerbate challenges, as those with lower skills may struggle to navigate the tool. Together, these factors can widen achievement gaps and impede students' overall success in the TLE curriculum.

Conclusions

The research concluded that the digital pedagogical tool developed for Grade 7 TLE under the MATATAG curriculum has the potential to significantly enhance instructional strategies. Both teachers and students found the tool to be highly acceptable and effective in improving teaching and learning experiences. The tool’s positive reception in terms of performance, features, and usability showed its value in enhancing the overall educational experience. However, the study also highlighted several areas of concern that need to be addressed for optimal effectiveness. These include the need for continuous professional development for teachers, the enhancement of technological infrastructure, and ensuring that the tool remains up-to-date and functional through ongoing support and updates. The study also emphasized the importance of aligning the tool with the evolving curriculum and pedagogical best practices. By addressing these challenges and continuously improving the digital tool, its potential to enhance TLE instruction can be fully realized, resulting in better learning outcomes for students.

To ensure the success of the digital pedagogical tool, the study offers several recommendations. First, teacher training and professional development should be prioritized. Continuous training programs will ensure that educators are equipped with the necessary skills to use the digital tool effectively, while also helping them integrate it into their pedagogical strategies. Secondly, infrastructure and connectivity should be improved to ensure equitable access to the digital tool for all students. This includes enhancing internet connectivity, providing devices, and ensuring that schools have the resources needed to support digital learning.

A system for regular updates and technical support should also be implemented to keep the tool functional and relevant. Teachers and students should have access to help resources and troubleshooting assistance when needed. The tool should also be continuously aligned with evolving curriculum standards and pedagogical best practices, ensuring that it remains effective in enhancing TLE instruction. Furthermore, a monitoring and evaluation system should be established to gather feedback from teachers and students, enabling necessary adjustments to the tool. Lastly, the digital tool should be designed to cater to diverse learning styles, ensuring inclusivity and fostering deeper engagement. By implementing these recommendations, the Department of Education can maximize the tool's potential and significantly improve TLE delivery under the MATATAG curriculum, leading to improved student outcomes.

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