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Development of Interactive Teaching Resources (ITR) in technology and livelihood education

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Article Info

Abstract

The aim of this study is to contribute to the online learning resources freely available for TLE teachers. The researchers, through the contributors, developed ITR in TLE through the use of the *Wordwall* Application. The study developed interactive teaching resources (ITR) for the Technology and Livelihood Education (TLE) subject using the Wordwall application. The developed ITR were curated in a TLE Hub for easy access by the teachers and the students. The ITR and TLE Hub were evaluated by experts and TLE teachers to ensure acceptability and usability. The ITRs were evaluated based on technological acceptance in terms of perceived usefulness, perceived ease of use, attitude to use and intention to use. The TLE Hub was evaluated using system usability scale. The study revealed that the ITR and TLE Hub are acceptable by the experts and TLE teachers highlighting perceived usefulness and ease of use, which got the highest rating. With the limited resources of TLE available online, the development of the TLE Hub is a great contribution to the teachers. TLE teachers are recommended to be trained to create ITR using the *Wordwall* application and become contributors to the TLE Hub.

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Introduction

The COVID-19 pandemic made a drastic change in the educational landscape. Educational institutions were pushed to implement flexible learning to cater to the needs of the students. Though the sudden change to education brought a culture shock to each and every one, together with its challenges, it cannot be denied that flexible learning also becomes advantageous in this kind of situation. Students feel more empowered because of their freedom in flexible learning with the application of technology available to them. The Basic Education-Learning Continuity Plan (BE-LCP) Executive Summary of the Department of Education (2020) reveals in the summary of data collected from all the students in the country that 46 percent is okay with online learning conducted through discussion through radio and television.

The data should not be ignored, because they represent the divide of the kind of students the country has. As an educational institution, the department's main role is to cater to the differences of the students to bring out the best in each of them. Teachers admitted that they are also learning in terms of the use of technology for the teaching-learning process. It is an additional burden for teachers to prepare everything since their available online teaching resources before the pandemic were limited. Even in the Department of Education, most schools still implemented blended learning (Module and Online Distance Learning). The situation of teachers wherein they are preparing modules and at the same time learning technology is not an easy task. Developing instructional materials for online distance learning is really a challenge because of the different factors that need to be considered, such as technical skills and the availability of resources. The technological skills of the teachers are a challenge for digital immigrant teachers to cope with the use of technology easily. Though there could be thinking that digital natives are "tech-savvy," with the reality of the workloads of a public school teacher, most of the time, developing interactive teaching resources is considered an additional load for them.

The educational applications available online are widely available for teachers and students. Some of these applications are being tested for their effectiveness in improving the student's performance. A study in Indonesia on using the Google Meet and Quiziz applications to assist and strengthen online learning during the COVID-19 pandemic shows that online-based learning is successful and runs smoothly at Elementary School 1 (Nasution & Nandiyanto, 2021). Another study conducted by El-Sofany and El-Haggar (2020) on the effectiveness of using mobile learning techniques to improve learning outcomes in higher education exhibits some important results towards the integration of mobile technology into teaching, including student positive perception, facilitating student concentration, flexible access to m-services for learning materials, and increasing students' skills in using mobile technology for e-learning. Furthermore, Santos, Bantog et al. (2023) conducted a study on the development of a Game-Based Assessment Tool (GBAT) using an online education application (Quizizz) for the Technology and Livelihood Education (TLE) subject. The study revealed that experts and TLE teachers, who served as evaluators, found the GBAT highly acceptable. They rated perceived usefulness, perceived ease of use, attitude towards using it, and intention to use in the range of 'Strongly Agree'. This result demonstrates that the evaluators highly appreciate the development of the GBAT and the TLE Learning Hub.

Wordwall is an online application described as an easy way to create teaching resources and make custom activities for the classroom, such as quizzes, matchups, word games, and much more (wordwall.net). This application offers free but limited features and paid account with full features. The free account can be a trial for teachers who are still new to its features. Wordwall could be considered a powerful online application because of its ease of use and flexibility. Anything that the teacher can think of to make the discussion interactive can be done using Wordwall, including motivation, activities, and assessment. It is important to remember that teachers have to vary their strategies to bring something for the students. Several studies have been conducted on the effectiveness of using the Wordwall application. Research by Latifah and Saputri (2020) shows a substantial difference in students' test scores before and after using Wordwall, where the results of the post-test are higher than the results of the pre-test. Wordwall media can also be used in fifth grade in primary school, as well as first and second grades in junior high school. This demonstrates how the word wall can be used at all levels of education, especially in Junior High. Another study about Wordwall reveals the influence of Word Wall Game on students' writing ability. The average score of the student's writing ability with Word Wall Game taught was higher than that taught by direct instruction (Ardiyanto, 2018). Recent studies on the use of the Wordwall application are a witness to the willingness of the teachers to use and test different applications that will help improve the student's performance.

Technology and Livelihood Education is a special subject in the Philippine K-12 Curriculum, having specializations taken between Grades 9 to 12. At 40 hours per quarter, exploratory subjects are taken during Grades 7 to 8 (Department of Education, 2017). Specializations in this subject, such as Home Economics, Agri-fishery, Industrial Arts, Information and Communications Technology, and Entrepreneurship, are custom-based from the Philippine settings. The activities of the subjects are contextualized based on the need of the students, industry, and the school's capacity. This is the main reason why a finite number of resources are available online. Usually, resources available on the internet tackle general information from general subjects like English, Mathematics, and Science.

The aim of this study is to contribute to the online learning resources freely available for TLE teachers.

The researchers, through the contributors, developed ITR in TLE through the use of the Wordwall App. The study developed Interactive Teaching Resources (ITR) in Technology and Livelihood Education (TLE) through the use of the Wordwall application. The developed ITR was curated in a TLE Hub for easy access by the teachers and the students. The ITR and TLE Hub were evaluated to ensure acceptability and usability.

Literature Review

The concept of gamification, which involves incorporating game elements into non-game environments, has attracted considerable attention in educational research due to its potential to boost engagement, motivation, and learning outcomes. This literature review consolidates various studies on gamification in education, concentrating on its effects on student engagement, learning performance, and teaching methods.

Numerous studies have underscored gamification's positive impact on cognitive, motivational, and behavioral learning outcomes. For instance, game-based math tests have been effective in reducing test anxiety and increasing engagement, providing comparable results to traditional paper-based tests (Kiili & Ketamo, 2018). This suggests that gamification can foster a more inclusive and engaging learning atmosphere, catering to diverse learning styles and preferences. Implementing Game-Based Assessment (GBA) presents opportunities for innovative evaluation methods. Approaches like evidence-centered design, combined with Bayesian networks, have proven effective in assessing mathematical learning within game-based environments (Ke et al., 2019). However, future innovations should prioritize content-agnostic stealth assessment and personalized adaptive gameplay to address individual learner needs (Muhammad et al., 2021).

Several Philippine schools have conducted research on the effectiveness of the Wordwall application in classroom activities. Bueno et al. (2022) conducted a case study with Grade 11 STEM students, using Wordwall as an online instructional tool for Basic Calculus. They found it helped achieve learning objectives efficiently, and students had no trouble accessing it. Colendra and Carada (2023) experimented with Grade 7 students, discovering that Wordwall, Raptivity, and Classpoint are effective gamification tools for teaching Filipino. Their study showed improved literal, inferential, and critical reading comprehension skills. Dizon et al. (2022) explored Wordwall's use in buzz sessions with undergraduate students, finding it significantly increased virtual engagement levels before and after the intervention. These studies demonstrate Wordwall's positive impact across various grade levels in the Philippines.

The literature indicates a growing interest in gamification in educational settings, with a surge in scientific output over recent years and widespread interest across countries and disciplines (Jakub, 2021). Despite this growth, many studies lack robust theoretical foundations, highlighting the necessity for stronger theoretical frameworks to guide gamification research (Zainuddin et al., 2020). Nevertheless, gamification is recognized as a promising strategy for enhancing student engagement, motivation, academic achievement, and fostering social connectivity and collaboration (Bay Atlantic University, 2022). Proposed conceptual frameworks aim to integrate gamification principles into eLearning systems using instructional design models (Yamani, 2021). While acknowledging drawbacks such as the need for a systematic approach and unresolved factors contributing to successful gamification, these frameworks emphasize the positive aspects of gamification in inspiring learner performance and providing measurable feedback.

Despite the potential benefits of gamification, challenges persist in effectively implementing and integrating game elements into educational contexts. One major challenge is accommodating diverse learner preferences and styles while sustaining engagement and motivation (Poondej & Lerdpornkulrat, 2019). Additionally, ongoing research is necessary to explore gamification's impact on various aspects of learning, including retention, knowledge transfer, and critical thinking skills (Bouchrika et al., 2021; Swacha, 2021; Zainuddin et al., 2020).

In summary, gamification holds significant promise for enhancing engagement, motivation, and learning outcomes in educational settings. While ample evidence supports its effectiveness, further research is required to address existing gaps, refine theoretical frameworks, and explore innovative approaches to gamified instruction. By effectively leveraging gamification principles, educators can create more dynamic and engaging learning experiences tailored to the diverse needs of students.

Methodology

The study utilized a descriptive developmental approach to research. The students taking Technology for Teaching and Learning (2) were asked to be contributors of the study and developed Interactive Teaching

Resources (ITR) in TLE, which is their specialization. The students trained to use *Wordwall* and created ITR for a particular topic in TLE. Topics of the ITR were from the Department of Education (DepEd) Modules to ensure that all the topics were based from DepEd curriculum. The developed ITRs were evaluated by experts and teachers for acceptability and usability. Technology Acceptance Model (TAM) is a widely used tool to assess how people come to admit and use technologies (Kalayou et al., 2020). The System Usability Scale (SUS) gives an idea of how users feel about the usability of the computer program being tested (Sauro & Lewis, 2012).

Participants

Experts from the field such as teachers from the Department of Education (DepEd) who were teaching TLE for at least 5 years and taking Masters in TLE were requested as evaluators of the ITR. Revisions and updates were followed accordingly based on the result of the evaluation. After revisions were done, twenty (20) TLE teachers were invited to use the ITR-TLE Hub to evaluate the materials based on its acceptability and usability.

Data Collection

The Technology Acceptance Model (TAM) survey questionnaire was used by the experts to evaluate the acceptability of the interactive teaching resources (ITR). A detailed comment was given by the experts for the improvement of the ITR. The authors edited the ITR based on the comments and suggestions of the experts. The TLE teachers were asked to evaluate the ITR using the TAM survey questionnaire to determine its level of acceptability in teaching TLE. The same respondents also evaluated the interactive teaching resources (ITR) which are located in the Learning Hub.

Data Analysis

The level of acceptability was evaluated using the TAM survey questionnaire which consists of 16 questions using the 4 - point likert scale (4 - Strongly Agree; 3 - Agree; 2 - Disagree; 1 - Strongly Disagree). The level of usability consisting of 10 questions was evaluated using a 5 - point likert scale (5 - Strongly Agree; 4 - Agree; 3 - Neutral; 2 - Agree; 1 - Strongly Disagree). The mean of the level of acceptability and usability were computed, interpreted and analyzed. The SUS scores were analyzed using an acceptability scale, where ratings above 70 (exceeding our typical average of 68) were considered acceptable, while scores falling below 50 (akin to our threshold for an "F" grade, below 51.6) were deemed unacceptable. Within this scale, the range spanning 50–70 was labeled as "marginally acceptable" roughly aligning with grades between C and D on the curved grading scale.

Results

Development of the ITR and the TLE Learning Hub

Figure 1 shows the development of the ITR and the TLE learning hub. The researchers categorized the topics to cover in the development of ITR to prevent duplication.
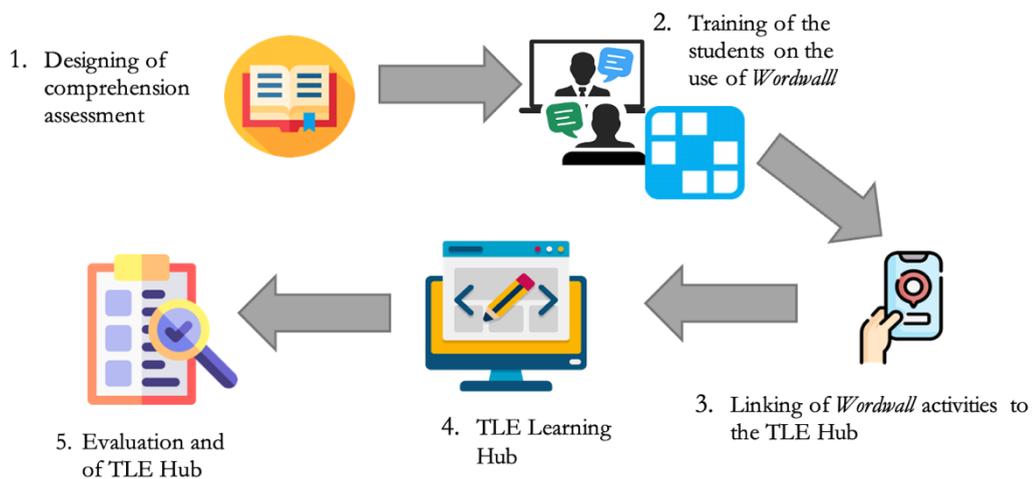

Figure 1 ITR and TLE Hub development process

The study's participants were third-year students enrolled in the Bachelor of Technical Livelihood Education/ Bachelor in Technical-Vocational Teacher Education (BTLEd/BTVTEd) program who were taking the Technology for Teaching and Learning 1 (TTL1) course during the first semester of the academic year 2021–2022, which is their area of specialization. The *Wordwall* App was introduced to the students as part of the curriculum. Students were required to design a comprehension assessment exercise using a *Wordwall* template. They were told to look for DepED learning resources to serve as the foundation for their activities. The study stated clearly that the contents of the ITRs were obtained from approved DepEd modules to guarantee their dependability and accuracy.

The students created ITR's *Wordwall* activities as contributors and incorporated them into the researchers' TLE Learning hub. The TLE Learning Hub includes *Wordwall* as an online tool for creating educational exercises; with it, teachers may enter the subject they want to cover in class into *Wordwall* and get a range of ready-made, completely customizable activities including tests, word games, maze hunts, and more. Users can even design entirely their own activities. Most *Wordwall* exercises can be utilized in interactive and printed forms.

The *Wordwall* activities completed by the contributors have all been gathered and added to the hub for the teacher's access. Several grade levels and specializations were the focus of the stated learning hub. It includes topics for Grades 7, 8, 9, and 10 for Junior High School level and TVL track for Senior High School, all of which were based on the Department of Education's curriculum (DepEd). The developers of the program made a deliberate effort to include most of the specialization with various topics under the TLE subject as part of the initial launch of the learning hub to ensure that all areas would be covered. The following areas of expertise are included: crop production, drafting technology, food technology, clothing fashion design, illustration, and TVL track.

The developed ITR for TLE subject were evaluated by 20 experts and 20 volunteer users. They evaluated the ITR based on its technological acceptance. The experts also give detailed comments to make sure that all ITR are acceptable, and the hub is usable. The level of acceptability of ITR were evaluated in terms of perceived usefulness, perceived ease of use, attitude toward using ITR, and intention to use, using a scale of 4 - Strongly Agree as the highest and 1-Stongly Disagree as the lowest.

The developed ITR and TLE Hub can be viewed in this link: https://itrtle41.github.io/tle/index.html (Santos, Abelgos et al., 2023).

Table 1 reveals the perceptions of both experts and teachers regarding the usefulness of the Wordwall App as an Interactive Technology Resource (ITR) and their level of agreement on the app's effectiveness in enhancing pedagogy, improving teaching performance, and addressing individual student needs.

Table 1 shows the perceived usefulness of ITR by the experts having the verbal interpretation of 'Strongly Agree' ($\bar{x}$ = 3.95; σ = 0.04) and the teachers ($\bar{x}$ = 3.59; σ = 0.14). The experts and the teachers find ITR useful in teaching TLE during online learning.

Table 2 shows the perceptions of experts and teachers on the ease of use of the Wordwall App as an Interactive Technology Resource (ITR) and their agreement on the app's user-friendliness, flexibility, and ease of integration into classroom teaching.

The perceived ease of use of ITR by the experts is illustrated in Table 2. The experts strongly agree in all the items ($\bar{x}$ = 3.89; σ = 0.08). The items which describe the use of the *Wordwall* app are easy and understandable, and the use of it is more flexible to teach than the traditional one. The TLE Teachers also have a verbal interpretation of strongly agree in general ($\bar{x}$ =3.55; σ = 0.06). The teachers find that it is easy to become skillful at using *Wordwall* App, and the use of the application is easy and understandable. The experts and the teachers find the approval of using ITR as part of conducting online learning.

Table 1 Perceived usefulness of ITR

Items	Experts	Verbal Interpretation	Teachers	Verbal Interpretation
1. Use of *Wordwall* App helps me to control the pedagogy.	3.95	Strongly Agree	3.40	Strongly Agree
2. Use of *Wordwall* App enhances the teaching performance.	3.95	Strongly Agree	3.60	Strongly Agree
3. I find the *Wordwall* App useful in my class.	4.00	Strongly Agree	3.60	Strongly Agree
4. Use of *Wordwall* App makes it easier to catch individual students' needs.	3.90	Strongly Agree	3.75	Strongly Agree
General Mean	3.95	Strongly Agree	3.59	Strongly Agree
SD	0.04		0.14	

Note: *SD* = Standard Deviation.

Table 2 Perceived ease of use of ITR

Items	Experts	Verbal Interpretation	Teachers	Verbal Interpretation
1. It is easy to become skillful at using *Wordwall* App.	3.80	Strongly Agree	3.60	Strongly Agree
2. I find it easy to apply *Wordwall* in my class	3.90	Strongly Agree	3.50	Strongly Agree
3. Use of *Wordwall* App is easy and understandable.	4.00	Strongly Agree	3.60	Strongly Agree
4. Use of *Wordwall* App is more flexible to teach than traditional one.	3.85	Strongly Agree	3.50	Strongly Agree
General Mean	3.89	Strongly Agree	3.55	Strongly Agree
SD	0.08		0.06	

Note: SD = Standard Deviation.

Table 3 illustrates the attitudes of experts and teachers toward the use of the Wordwall App as an Interactive Technology Resource (ITR) and their overall sentiment regarding the app's value, relevance, and positive influence in classroom settings.

The attitude toward using the *Wordwall* App by experts is described in Table 3. It is shown that the experts have a positive attitude in using the *Wordwall* App ($\bar{x}$ = 3.83; σ = 0.08). The experts strongly agree that the use of the Wordwall App in class is favorable, it is a positive influence for them to use the app in class, they think that it is valuable to use the app in class and they think it is a trend to use the app in class. The TLE Teachers also have positive attitude on the use of the application ($\bar{x}$ = 3.48; σ = 0.04).

Table 4 reflects the perceptions of experts and teachers regarding their intention to use the Wordwall App in the classroom and their willingness to integrate the app into teaching practices, highlighting its perceived impact on student engagement and instructional variety.

Table 4 shows the intention to use by the experts and TLE Teachers. They all have strong intentions to use the *Wordwall* application ($\bar{x}$ = 3.87; σ = 0.10). The experts evaluated the use of the *Wordwall* application in their class to enhance students' learning interest, and they use the application to provide multi-approaches on teaching. The *Wordwall* app's interface overall is an ideal combination in facilitating the learning process while making it enjoyable. It is highly helpful because it covers a variety of TLE specialties.

Table 5 displays the overall acceptability of the Wordwall App as an Interactive Technology Resource (ITR) based on the perceptions of experts and teachers and key dimensions such as perceived usefulness, ease of use, attitude, and intention to use, reflecting a consistently strong agreement on the app's effectiveness and applicability in educational settings.

Table 3 Attitude toward using the ITR

Items	Experts	Verbal Interpretation	Teachers	Verbal Interpretation
1. Use of *Wordwall* App in class is good.	3.85	Strongly Agree	3.55	Strongly Agree
2. Use of *Wordwall* App in class is favorable.	3.75	Strongly Agree	3.45	Strongly Agree
3. It is a positive influence for me to use *Wordwall* App in class.	3.95	Strongly Agree	3.45	Strongly Agree
4. I think it is valuable to use *Wordwall* App in class.	3.75	Strongly Agree	3.50	Strongly Agree
5. I think it is a trend to use *Wordwall* App in class.	3.85	Strongly Agree	3.45	Strongly Agree
General Mean	3.83	Strongly Agree	3.48	Strongly Agree
SD	0.08		0.04	

Note: SD = Standard Deviation.

Table 4 Intention to use

Items	Experts	Verbal Interpretation	Teachers	Verbal Interpretation
1. I tend to use *Wordwall* App in my class.	3.75	Strongly Agree	3.40	Strongly Agree
2. I increase the occurrences of using *Wordwall* App in class.	3.85	Strongly Agree	3.40	Strongly Agree
3. Use of *Wordwall* z App in my class enhances students' learning interest.	4.00	Strongly Agree	3.65	Strongly Agree
4. I'd love to use *Wordwall* App in my class.	3.80	Strongly Agree	3.55	Strongly Agree
5. I use *Wordwall* App to provide multi- approaches on teaching.	3.95	Strongly Agree	3.60	Strongly Agree
General Mean	3.87	Strongly Agree	3.52	Strongly Agree
SD	0.10		0.11	

Note: SD = Standard Deviation.

Table 5 Summary of the acceptability of ITR

Items	Experts	Verbal Interpretation	Teachers	Verbal Interpretation
1. Perceived Usefulness of ITR	3.95	Strongly Agree	3.59	Strongly Agree
2. Perceived Ease of Use of ITR	3.89	Strongly Agree	3.55	Strongly Agree
3. Attitude toward Using the ITR	3.83	Strongly Agree	3.48	Strongly Agree
4. Intention to Use	3.87	Strongly Agree	3.52	Strongly Agree
General Mean	3.89	Strongly Agree	3.54	Strongly Agree
SD	0.05		0.05	

Note: SD = Standard Deviation.

Table 5 summarizes the evaluation of experts and teachers in the technological acceptance of ITR. The experts highly rated the acceptability of ITR ($\bar{x}$ = 3.89, σ = .05) with a verbal interpretation of 'Strongly Agree. The teachers' average mean of the evaluation of technological acceptance of ITR is also high ($\bar{x}$ = 3.54, σ = .05), which shows the teachers strongly agree that ITR is highly acceptable.

The experts gave their detailed evaluation of the ITR. They commended the way ITR is organized and the availability of several topics in each specialization.

The visual clarity of the activities under the categories of Illustration and Drafting was commended. The experts offer their thoughts and suggestions on how to enhance the ITR, including assessing the length of the activities, certain misspelled words, and incorrect grammar structures. They also found that several questions in the other categories are duplicated. They said it is a highly original approach that will succeed best in class while retaining a sense of humor, using this without a doubt to increase class participation. The researchers took note of these observations, and they aided to guide the development of the ITR. Additionally, general feedback was provided by TLE teachers who volunteered to take the ITR. Most of the respondents think that employing an ITR enables students to participate and interact in the teaching-learning process more actively, and the pupils' interest will be quickly stimulated by this. In addition, respondents noted that because it is designed like a game, it will put students at ease when completing formative and summative exams. Some of them also think that ITR is helpful for teachers, particularly in blended learning environments. The ITR is highly helpful because it covers a variety of TLE specializations. Its user-friendly Interface makes it especially welcoming to students who may not be very unfamiliar with playing games online.

The level of acceptability of ITR were evaluated in terms of perceived usefulness, perceived ease of use, attitude toward using ITR, and intention to use. It was evaluated using a scale of 5-Strongly Agree as the highest and 1-Strongly Disagree as the lowest.

Table 6 shows the system usability evaluation of the ITR-TLE Learning Hub as perceived by experts and teachers. It highlights their experiences regarding the hub's simplicity,

Table 6 System usability of TLE hub

Items	Experts	Verbal Interpretation	Teachers	Verbal Interpretation
1. I think that I would like to use the ITR-TLE Learning Hub frequently.	4.95	Strongly Agree	4.33	Agree
2. I found the ITR-TLE Learning Hub to be simple.	4.70	Agree	4.44	Agree
3. I thought the ITR-TLE Learning Hub was easy to use.	4.75	Agree	4.44	Agree
4. I think that I could use the ITR-TLE Learning Hub without the support of a technical person.	4.70	Agree	4.39	Agree
5. I found the various functions in the ITR-TLE Learning Hub were well integrated	4.80	Strongly Agree	4.44	Agree
6. I thought there was a lot of consistency in the ITR-TLE Learning Hub.	4.50	Agree	4.22	Agree
7. I would imagine that most people would learn to use the ITR-TLE Learning Hub very quickly.	4.80	Strongly Agree	4.44	Agree
8. I found the ITR-TLE Learning Hub very intuitive.	4.80	Strongly Agree	4.56	Agree
9. I felt very confident using the ITR-TLE Learning Hub.	4.75	Agree	4.56	Agree
10. I could use the ITR-TLE Learning Hub without having to learn anything new.	4.45	Agree	4.33	Agree
General Mean	4.72	Agree	4.42	Agree
SUS	93	Acceptable	85.42	Acceptable

Note: SUS = System Usability Scale.

ease of use, integration, and overall user confidence. The responses are summarized using the System Usability Scale (SUS), indicating the platform's acceptability and usability in educational settings.

The data in Table 6 show the rating of the evaluators, experts and teachers, towards the System Usability of the development of interactive teaching resources (ITR) in Technology and Livelihood Education (TLE). Evidently, the experts found the developed TLE Hub useful based on the computed system usability score of 93, which is considered to be above average. Since the provided statements were all positive in nature, the computation applied is, (1) subtracting 1 from each user's response, then, and (2) adding up the converted responses for each user and multiplying that total by 2.5. This converts the range of possible values from 0 to 100 instead of from 0 to 40. The experts rating for the system usability is 93, which is 'Acceptable'. The Teachers evaluated the system usability of the hub having the score of 85.42, which is interpreted as 'Acceptable'.

The following items (1) the experts would like to use the TLE Hub frequently, (5) experts found the various functions in the TLE Learning Hub were well integrated, (7) they would imagine that most people would learn to use the TLE Hub very quickly, and (8) they found the TLE Learning Hub very intuitive got the highest score among the 10 items with a verbal interpretation of "Strongly Agree". Evaluators recommend to use the TLE learning hub frequently, and that they found out various functions of the said program that are well integrated. Also, data show that users of the hub will learn quickly, and it was found to be very intuitive. The remaining items got the verbal interpretation of "Agree". The calculated weighted mean for the evaluation of the TLE learning hub is 4.72, interpreted verbally as "Agree". Clearly, the experts agreed on the acceptability of the learning hub and its system usability.

Meanwhile, another set of evaluators were teachers who also tried using the developed ITR Learning Hub. Teachers expressed almost the same evaluation towards ITR's usability, a computed system usability score of 85.42, which also indicates that the usability of the ITR is said to be above average. Teachers consider the ITR to be intuitive and that they would be confident enough using the application. This is clearly represented by the mean score of 4.56, which is verbally interpreted as "Agree". Likewise, all remaining items garnered mean scores which are all interpreted as "Agree", resulting in a weighted mean of 4.42, so evidently teachers are agreeing with the acceptance and usability of the developed ITR.

Overall, if the system usability score of the experts in the field will be added to the system usability of the teachers, an average rating of 89.21 will be the result. This figure undoubtedly shows that the developed ITR's usability is above the average score, hence it is very much accepted as far as its intended purpose is concerned.

Discussion

The study started from the identification of topics to be part of the comprehension assessment, training of the students as contributors on the use of *Wordwall* application to develop Interactive Teaching Resources (ITR), linking the ITR to the Hub, up to evaluation and revision of the ITR. The evaluation of ITR in terms of acceptability got a positive rating from both the experts ($\bar{x} = 3.89$, $\sigma = 0.05$) and the teachers ($\bar{x} = 3.54$, $\sigma = .05$). Perceived usefulness of ITR is rated as the highest item by the experts ($\bar{x} = 3.95$). and the teachers ($\bar{x} = 3.59$). The study by Paksi et al. (2023) found that the majority of teachers agreed that the *Wordwall*.net application is very user-friendly and significantly facilitates their work in developing, implementing, and assessing learning. This finding validates the result of this study. Another study by Rahmi and Dilla (2021) confirms the usefulness of *Wordwall,* finding that because it can be done over the internet network, *Wordwall* makes it simpler for teachers to supply resources and to evaluate students' homework. Perceived ease of use of ITR was the second in rank of technological acceptability by the experts ($\mu = 3.89$) and teachers ($\mu = 3.55$). The study by Nenohai et al. (2022) finds Wordwall's visually appealing and game-based display helps users in learning the reaction rate material in an entertaining way. Cancino and Ibarra (2023) state that instructors remarked on how simple it was for new users to learn how to use *Wordwall* effectively. In general, several studies reveal that users of *Wordwall* find it helpful in the classroom and easy to use.

The study evaluated the system usability of an Interactive Teaching Resources (ITR) Learning Hub in Technology and Livelihood Education (TLE) by gathering ratings from both experts and teachers. Results show that experts rated the TLE Learning Hub with a score of 93, denoting 'Excellent', while teachers rated it slightly lower at 85.42, indicating an 'A'- grade. Key aspects such as frequency of use, integration of functions, ease of learning, and intuitiveness received high scores from both groups, indicating strong agreement on the usability and acceptance of the hub.

The overall weighted mean of the evaluations is 4.72 for experts and 4.56 for teachers, both interpreted as 'Agree'. Combining the ratings from experts and teachers yields an average rating of 89.21, confirming the ITR Learning Hub's above-average usability and widespread acceptance.

Conclusion and Recommendation

With the limited resources of TLE available online, the development of the TLE Hub is a great contribution to the teachers. The developed materials can be an extension of the physical classroom using online platform. The materials ITR can also be used in the classroom for discussion, checking of understanding, and assessment. The development of the ITR and Learning Hub was rated highly acceptable and usable by the experts and teachers. The evaluators and teachers strongly agree that the materials are useful and user-friendly. TLE teachers are recommended to be trained to create ITR using the Wordwall application and become contributors to the TLE Hub.

Conflict of Interest

The authors declare that there is no conflict of interest.

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References

Ardiyanto, Y. (2020). *The use of Word Wall game to teach writing skill at the first semester of the eighth grade of SMPN 2 way Tenong in the academic year of 2020/2021* [Master's thesis, Tarbiyah and Teacher Training Faculty, State Islamic University of Raden Intan Lampung]. https://repository.radenintan.ac.id/13576/

Bay Atlantic University. (2022, June 3). How does technology impact student learning? Bay Atlantic University - Washington, D.C. https://bau.edu/blog/technology-impact-on-learning/

Bueno, M., Perez, F., Valerio, R., & Areola, E. M. Q. (2022). A usability study on google site and Wordwall.Net: Online instructional tools for learning basic integration amid pandemic. *Journal of Global Business and Social Entrepreneurship (GBSE)*, *7*(23), 61–71. http://www.gbse.my/V8%20NO.23%20(JANUARY%202022)/Paper-288-.pdf

Bouchrika, I., Harrati, N., Wanick, V., & Wills, G. (2021). Exploring the impact of gamification on student engagement and involvement with e-learning systems. *Interactive Learning Environments*, *29*(8), 1244–1257. https://doi.org/10.1080/10494820.2019.1623267

Cancino, M., & Ibarra, P. (2023). EFL secondary education teachers' perceptions toward using online student response systems. *Profile: Issues in Teachers' Professional Development*, *25*(1), 97–111. https://doi.org/10.15446/profile.v25n1.101107

Colendra, R. C., & Carada, I. G. (2023). Gamification tools sa pagtuturo ng asignaturang Filipino at komprehensyon sa pagbasa [Gamification tools in teaching Filipino subject and reading comprehension]. *EPRA International Journal of Multidisciplinary Research (IJMR)*, *9*(8), 72–80. https://eprajournals.com/IJMR/article/11138/abstract [in Filipino]

Department of Education. (2017). *Technology and Livelihood Education (TLE) and Technical-Vocational-Livelihood (TVL) Track.* https://www.deped.gov.ph/k-to-12/about/k-to-12-basic-education-curriculum/technology-and-livelihood-education-tle-and-technical-vocational-livelihood-tvl-track/

Department of Education (2020). *The Basic Education-Learning Continuity Plan (BE-LCP) in the time of COVID-19.* https://www.deped.gov.ph/wp-content/uploads/2020/07/DepEd_LCP_July3.pdf

Dizon, S., Fernandez P. M. Q., Dalangin, H. R. S., Mungcal, K.S., Tolentino, J. C., & Valenzuela, L. R. (2022). Sustaining pre-service teachers' virtual engagement in a health education course through interactive buzz sessions. *International Journal of Multidisciplinary: Applied Business and Education Research*, *3*(8), 1526–1547. https://doi.org/10.11594/ijmaber.03.08.15

El-Sofany, H. F., & El-Haggar, N. (2020). The effectiveness of using mobile learning techniques to improve learning outcomes in higher education. *International Journal of Interactive Mobile Technologies (iJIM)*, *14*(08), 4–18. https://doi.org/10.3991/ijim.v14i08.13125

Jakub, S. (2021). State of research on gamification in education: A bibliometric survey. *Education Sciences*, *11*(2), 69. https://doi.org/10.3390/educsci11020069

Kalayou, M. H., Endehabtu, B. F., & Tilahun, B. (2020). The Applicability of the Modified Technology Acceptance Model (TAM) on the sustainable adoption of eHealth systems in resource-limited settings. *Journal of Multidisciplinary Healthcare*, *13*, 1827–1837. https://doi.org/10.2147/jmdh.s284973

Ke, F., Parajuli, B., & Smith, D. (2019). Assessing game-based mathematics learning in action. In D. Ifenthaler, & Y.J. Kim (Eds), *Game-Based Assessment Revisited* (pp.213–227). Springer. https://doi.org/10.1007/978-3-030-15569-8_11

Kiili, K., & Ketamo, H. (2018). Evaluating cognitive and affective outcomes of a digital game-based math test. *IEEE Transactions on Learning Technologies*, *11*(2), 255–263. https://doi.org/10.1109/tlt.2017.2687458

Latifah W., & Saputri, T. (2020). Using word wall to improve english vocabulary mastery: Systematic review. *Konstruktivisme: Jurnal Pendidikan Dan Pembelajaran*, *12*(2), 120–131. https://doi.org/10.35457/konstruk.v12i2.1041

Muhammad, A. H., Ume, H., Fiaz, M., & Shoaib, M. (2021). Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments*, *29*(4), 545–565. https://doi.org/10.1080/10494820.2019.1588745

Nasution, A., & Nandiyanto, D. (2021). Utilization of the Google Meet and Quiziz applications in the assistance and strengthening process of online learning during the covid-19 pandemic. *Indonesian Journal of Educational Research and Technology*, *1*(1), 31–34. https://ejournal.upi.edu/index.php/IJERT/article/view/33367

Nenohai, J. A., Rokhim, D. A., Agustina, N. I., & Munzil, M. (2022). Development of gamification-based wordwall game platform on reaction rate materials. *Orbital: The Electronic Journal of Chemistry*, *14*(2), 116–122. https://doi.org/10.17807/orbital.v14i2.16206

Paksi, G. R., Sari, R. K., & Somawati, S. (2023). Teacher perceptions on the use of the wordwall.net application as an english vocabulary learning media. *Edunesia: Jurnal Ilmiah Pendidikan*, *4*(1), 120–132. https://doi.org/10.51276/edu.v4i1.307

Poondej, C., & Lerdpornkulrat, T. (2020), Gamification in e-learning: A moodle implementation and its effect on student engagement and performance, *Interactive Technology and Smart Education*, *17*(1), 56–66. https://doi.org/10.1108/ITSE-06-2019-0030

Rahmi, L., & Dilla, A. (2021). Training on utilization of wordwall media os online-based learning assessment for elementary school teachers 08 supayang. *Sumatra Journal of Disaster, Geography and Geography Education*, *5*(2), 144–149. https://garuda.kemdikbud.go.id/documents/detail/2403894

Santos, J., Abelgos, A., & Lomerio, N. (2023). *Interactive Teaching Resources for Technology and Livelihood Education*. Retrieved June 12, 2025, from https://itrtle41.github.io/tle/index.html

Santos, J. M., Bantog, DJ. D. & Del Rosario, V. R. (2023). Development of Game-Based Assessment Tools (GBAT) using Quizizz application for Technology and Livelihood Education (TLE) subject. *Kasetsart Journal of Social Sciences*, *44*(3), 867–876. https://so04.tci-thaijo.org/index.php/kjss/article/view/267918

Sauro, J., & Lewis, J. (2012). Standardized usability questionnaires. In *Quantifying the User Experience Practical Statistics for User Research* (pp. 185–240). Morgan Kaufmann. https://doi.org/10.1016/b978-0-12-384968-7.00008-4

Swacha, J. (2021). State of research on gamification in education: A bibliometric survey. *Education Sciences*, *11*(2), 69. https://doi.org/10.3390/educsci11020069

Yamani, H. A. (2021). A conceptual framework for integrating gamification in eLearning systems based on instructional design model. *International Journal of Emerging Technologies in Learning (iJET)*, *16*(4), 14–33. https://doi.org/10.3991/ijet.v16i04.15693

Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, *30*, 100326. https://doi.org/10.1016/j.edurev.2020.100326