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## DEVELOPING ESLTPACKHUB FOR TPACK DEVELOPMENT OF ESL PRE-SERVICE TEACHERS: PRELIMINARY USABILITY EVALUATION INSIGHTS

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### Abstract:

This article presents a usability evaluation of a portal on a Canva platform, known as ESL TPACK HUB which was developed to support the Technological Pedagogical Content Knowledge (TPACK) development of ESL pre-service teachers. The evaluation involved getting insights from two groups of subjects: three content and instructional design experts, and five ESL pre-service teachers in Sabah. Semi-structured interviews and feedback forms were adopted as the qualitative data sources to answer the research question. Four main usability criteria were focused on: the portal's visual design, functionality, content, and overall usefulness. The results indicate that the subjects perceive the portal as user-friendly, as they were able to access all five main components: video tutorials on ESL websites, digital applications and innovations for language lessons, lesson plans and a curated list of ESL websites. Additionally, participants found the demonstration videos for apps and websites particularly helpful, including the videos integrating multiple ICT tools in a language lesson. The content of the portal was deemed engaging, comprehensible, and highly pertinent to the TPACK development of pre-service teachers. The participants also agreed that the portal's functions effectively meet users' needs. However, minor technical issues were identified, notably in the loading speed of the videos, which require attention. These findings are critical in informing the iterative design and development phases of the instructional design model for this portal. Addressing the identified issues is essential to ensure the successful implementation of TPACK-supporting applications in teacher education programs.

### Keywords:

Usability Testing, ESL Pre-Service Teachers, TPACK, Instructional Design

## Introduction

The professional growth of ESL pre-service and in-service teachers is central to the development of effective teaching strategies in the digital age (Leong & Yunus, 2024). The rising demand for platforms that support educators' professional growth is evident in the abundance of digital resources now available. As of April 30, 2024, 80 million ESL-related resources and more than 45,000 academic results on Google Scholar were obtained, underscoring the growing interest in digital tools that improve ESL teaching and learning. These resources include educational portals, online writing labs, interactive dictionaries, discussion boards, and forums, all of which have been elevated by emerging technologies. They also offer more than just access to information—they enable interaction, collaboration, and sharing, transforming the Internet into a pivotal tool for the professional development of ESL educators and learners alike.

Leveraging on the TPACK model proposed by Mishra and Koehler (2006), an ESL teacher education program at one of the public universities in Malaysia embarked on an initiative to harness digital objects as a direct result of digital competency training through two academic courses: ICT in English Language Teaching and TESL Methodology. The move was deeply rooted in the instructors' beliefs that experimenting with ICT tools is an essential part of building the ESL pre-service teachers' Technological Pedagogical Content Knowledge (TPACK). Embedded in the course assessments, hundreds of digital multimodal objects such as videos and digital lesson plans were produced. This experimentation was seen as not only enhancing the ESL pre-service teachers' technological fluency but also preparing them for the dynamic needs of modern classrooms. In this study, a web-based portal was developed to showcase the digital objects obtained over 4 academic semesters, known as ESL TPACK Hub (see Figure 1).

ESL TPACK Hub (Figure 1) is a dynamic, evolving platform designed to meet the needs of both internal users—such as students and instructors—and external educational stakeholders. Plans include measuring the effectiveness of the hub by formally implementing it into academic courses and training programs for in-service teachers in the near future. Table 1 summarises how the constructs of TPACK are supported in this research.

**Table 1: Alignment between TPACK and ESL TPACK Hub**

TPACK Construct	Description	How ESL TPACK Hub Supports Each Construct
Content Knowledge (CK)	Teachers' understanding of the subject matter they are teaching (e.g., ESL language skills and components).	The hub provides a wide range of digital resources covering ESL teaching, including videos, lesson plans to enhance the content knowledge of both pre-and in-service teachers.
Pedagogical Knowledge (PK)	Knowledge of teaching methods, strategies, and classroom management.	The hub offers access to pedagogical strategies, lesson plans, and examples of best practices, enabling teachers to experiment and refine their teaching approaches.
Technological Knowledge (TK)	Teachers' ability to use technological tools and platforms effectively.	Teachers are introduced to digital tools (e.g., apps, and websites), allowing them

		to experiment and develop technological fluency.
Pedagogical Content Knowledge (PCK)	Understanding of how to teach specific content using the most effective pedagogical methods.	The hub showcases lesson plans and strategies demonstrating the intersection of pedagogy and content, such as using digital storytelling for listening skills or gamification for vocabulary.
Technological Pedagogical Knowledge (TPK)	How technology can enhance and transform teaching practices.	The hub provides resources and tools that show how technology can be integrated into lesson delivery, such as collaborative tools (e.g., Google Docs) and interactive teaching methods.
Technological Content Knowledge (TCK)	How technology can specifically enhance the teaching of content.	Teachers learn how to use digital tools, like apps or online platforms, to make content delivery (e.g., grammar, vocabulary) more engaging and interactive.
Technological Pedagogical Content Knowledge (TPACK)	The integration of content, pedagogy, and technology in teaching.	The hub fosters a collaborative learning environment that allows teachers to experiment with and reflect on the full integration of technology, pedagogy, and content in their practice.



**Figure 1: ESL TPACK Hub Main Page**

Guided by the ADDIE instructional model, the hub was first initiated by an analysis of students' TPACK levels and course objectives. In our previous research, our findings indicated that in overall our students' TPACK levels were at moderate level (Said, 2023). The design phase generated a structured task inventory to guide the platform's creation, while the development phase focused on key social constructivist elements like collaboration, and active learning, which underpin the platform's design. Furthermore, the ESL TPACK Hub leverages the concept of the More Knowledgeable Other (MKO), facilitating collaboration between students, instructors, and external users to enhance learning outcomes. This collaborative

environment nurtures the professional development of both pre-service and in-service teachers, promoting innovation in pedagogy and the effective use of technology in ESL education. We chose to feature the digital learning artefacts obtained over 4 semesters such as students' evaluation of digital apps and ESL websites, video demonstrations using digital apps and ESL websites, and digital lesson plans. Preliminary findings were published in Said, et. al. (2023) on the evaluation of digital applications.

To ensure usability at an early stage of the development process, we conducted a preliminary usability evaluation with three experts and five students. The evaluation described here is the first step of the series of the portal evaluation. The main focus is experts' and students' opinions regarding the portal. The evaluation gives us hints for the further development of the portal and actual portal testing with ESL students. The question of the research is the following: 1. What are the perspectives of ESL instructors and ESL pre-service teachers in their evaluation of ESL TPACK Hub in terms of their visual design, content, functionality and usefulness?

### Literature Review

According to Branch (2009), there are three phases of usability testing in formative evaluation such as a one-to-one trial, a small group trial and a field trial. The one-to-one trial is conducted with individuals of varying ability levels to remove obvious errors, which is consistent with Kous et. al's principles (2020) in including different types of users. During the process, the developer sits with the individual and obtains feedback mostly qualitative data, obtained to revise the learning resources. In a small group trial, between 8 and 20 individuals are recruited to used to determine the effectiveness of the revised instruction and to obtain feedback on the learning resources in their final form. Both quantitative and qualitative information is obtained from users' feedback. Finally, the field trial is the final stage of formative evaluation to determine whether the instruction can be utilized in the intended context.

Several recent studies highlighted the importance of usability testing as a formative evaluation. Aprilia, Ardiansyah and Riyanti (2023) evaluated the feasibility of their learning management system (LMS BeSmart) for 2 groups of users: students and experts. They gleaned experts' scoring based on predetermined criteria of the LMS. As for the students, Likert scale items were administered to 3 categories: one-to-one, small group and field trial groups consisting 31 users in total. The most promising findings came from the field trial as modifications were already based on output obtained from one-to-one and small-group trials. Hamid, Lee, Taha, Rahim and Sharif (2021) recruited 2 groups of users to formatively assess a Chemistry MOOC. 3 experts and 130 student users participated in the quantitative study. In another study by Mertasari and Candiasa (2022), qualitative data was obtained via think-aloud protocols in one-to-one and small-group phases to assess the digital learning outputs in their e-learning system. Expert reviews were also implemented to gain professional feedback on the content and design of e-learning. These studies underscore the need to conduct appropriate usability testing for any digital tools to gain valuable input for the continuous improvement of the developed systems.

Various evaluation criteria have been used across studies for usability testing. Aziz et al. (2020) examined twenty-four usability criteria divided into five categories: content, organization, and readability; navigation and linkages; user interface design; performance and effectiveness; and educational purpose. Their quantitative survey was deployed to 208 respondents from various groups to evaluate a COVID-19 website using a WEBUSE method. Findings showed that the

usability and overall user satisfaction were good and acceptable for a diverse audience. However, some users found the website's design unappealing.

In Aguayo and Ramírez (2020), three key elements for usability testing: content, form which accounts for design and appearance, and functionality were used to assess the technical quality of the free online English self-study resource, ESOL Courses, selected within the context of the LinguApp project at the University of Córdoba (Spain). A checklist was developed to guide the users to complete assigned tasks. Results indicated

Soleimani and Haqimi (2024) employed Son's (2005) evaluation criteria for their students to evaluate 2 language learning websites: Purdue Online Writing Lab & Pro Writing Aid. In another study, Alhabdan (2021) used functionality and usability evaluation criteria to assess existing language learning websites to create a better ESL website design. Several key principles emerge from these investigations, including ease of navigation, user pleasure, efficiency, and interactivity which serve as important indicators of their functionality and usability.

Based on the studies reviewed, a number of evaluation criteria was determined. For this study, a one-on-one trial was conducted with 5 students and 4 experts on the following criteria:

- **Visual Design:** The website's visual design encompasses several elements such as the background and font colors, as well as the use of graphics and styles. The presentation and attractiveness elements may also have an impact on the visual design.
- **Functionality:** Testing for mistakes or technical issues, loading speed, and whether all of these functions operate as they should.
- **Content:** Evaluating how well the information on the website relates to the goals it serves or the tasks that users are given to complete.
- **Usability:** Describing how beneficial the user thinks using this portal will be for their TPACK.

## Methodology

This cross-sectional study gleaned qualitative data by recruiting 3 ESL instructors as content and instructional design experts and 5 ESL pre-service teachers to participate in this usability test. Due to time constraints, only 2 phases which are one-to-one and small-group usability phases were conducted with the experts and students. The field trial involving 20 users was not conducted due to a lack of voluntary participation at the time the study was conducted. Only five students consented to be involved in this study. The field trial would be conducted later when preliminary findings from this study would be used to improve the design and correct any technical flaws discovered.

The student group were between the ages of 21 and 25, and was very comfortable using technology. The experts' group age ranges between 40 and 50, with an average of 15 years of teaching experience. The users had neither prior knowledge nor exposure to the site: ESL TPACK Hub. ESL TPACK Hub comprises of single-column layout, using a Canva template to avoid clutter and enable simple design. The hub contains the following features:

- i. Video tutorials based on 3 categories: ESL Websites, Digital Apps and Digital Innovation (Figure 2)
- ii. Video tutorials of beneficial ESL websites (Figure 3)



- iii. Video tutorials on ESL digital applications (Figure 4)
- iv. Video tutorials on integrating multiple technologies in a language lesson (Figure 5)
- v. Lesson plans featuring the use of ESL online resources (Figure 6)
- vi. A list of appraised ESL web resources (Figure 7)
- vii. Question boxes for each feature to allow interaction

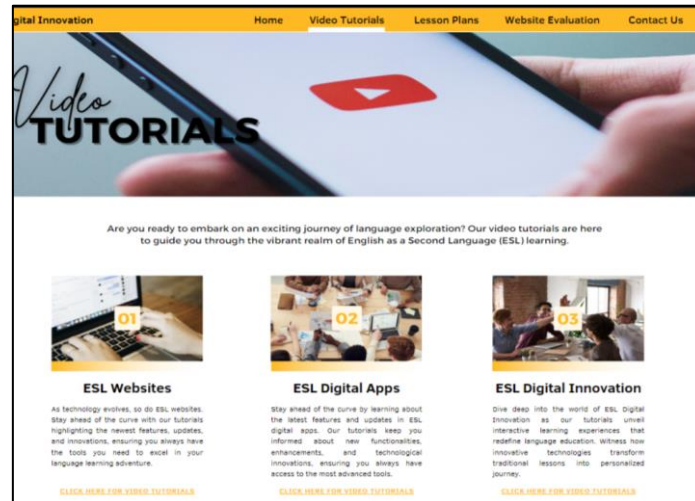


Figure 2: Three Categories of Video Tutorials

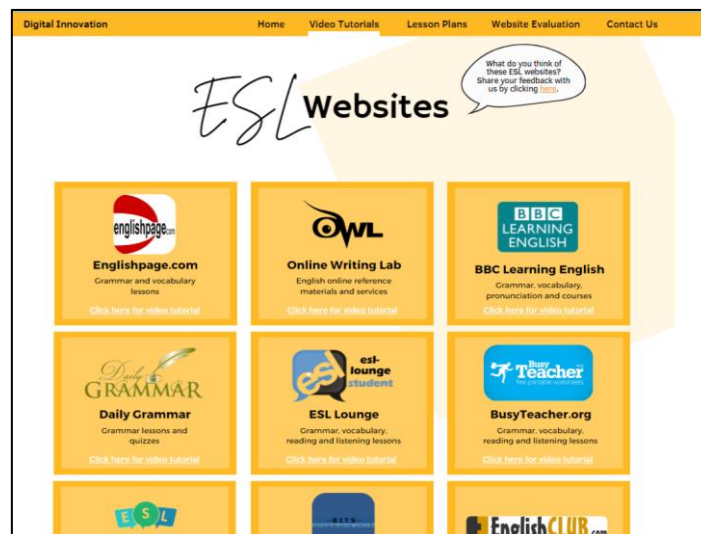


Figure 3: Video Tutorials on ESL Websites

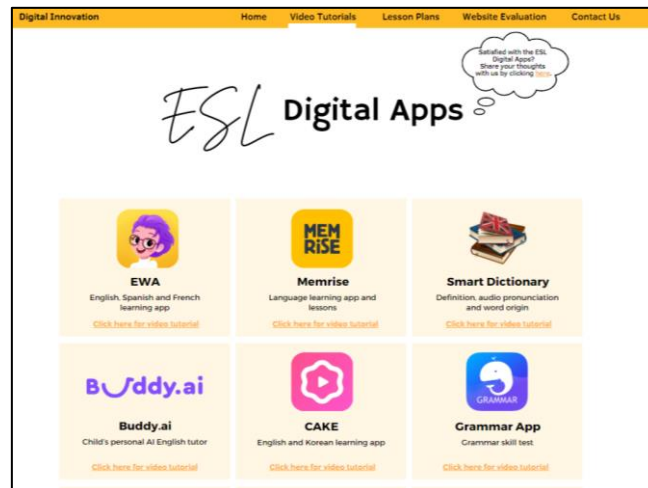


Figure 4: Video Tutorials on ESL Digital Resources

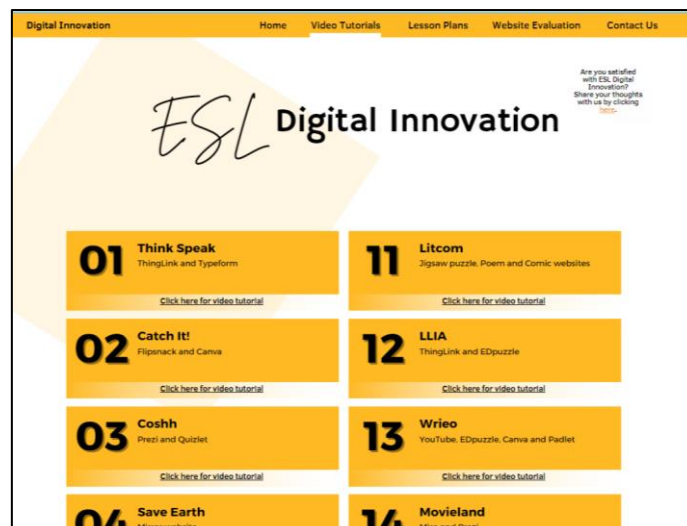


Figure 5: Video Tutorials on Innovative Language Lesson

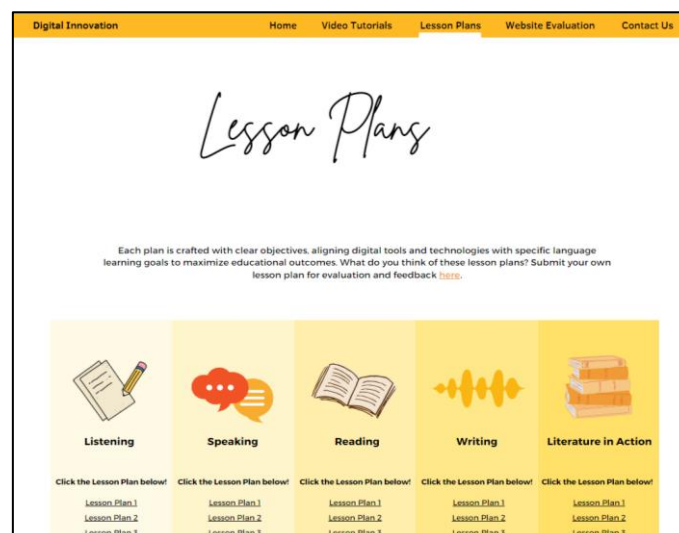
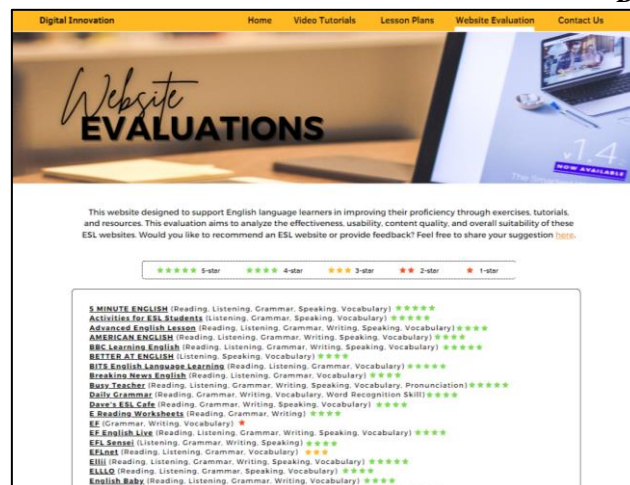


Figure 6: Digital Lesson Plans Based on Skills and Levels



**Figure 7: List of Appraised ESL Websites**

ESL TPACK Hub is developed using Canva, an intuitive graphic design platform as an integral supplementary platform to engender the development of TPACK. In addition to showcasing useful tutorial videos on using free ESL web resources and mobile apps, and integrating them into various language learning skills, ESL TPACK Hub also curates hundreds of ESL web resources (Figure 7) appraised based on Son's (2005) 15 evaluation criteria: Purpose, Accuracy, Currency, Authority, Loading speed, Usefulness, Organization, Navigation, Reliability, Authenticity, Interactivity, Feedback, Multimedia, Communication and Integration. More than 300 evaluations were completed by pre-service teachers over 4 academic semesters (2 years). Each website is rated from 1 to 5 stars, with 5 stars indicating the highest recommendation.

The qualitative data were gleaned from a feedback form and semi-structured interview focusing on the usability aspects such as the visual design, functionality, content, and usefulness of the portal. The feedback form contains items on 4 main constructs of evaluation (visual design, functionality, content and usability) and subjective questions on the issues/challenges faced, their general impression of the hub, suggestions and overall remarks. For visual design, subjects were asked to evaluate the design, layout, style, font size, graphics, background, and colours of the ESL TPACK Hub. All functions were listed in the feedback form (video tutorials, digital lesson plans and evaluated links) for subjects to test the functionality and usability. The idea was to have all functions/tools work correctly without any errors. The interview questions included four questions on their overall experience with the site based on the same themes for triangulation.

The usability test for the student group was conducted in a classroom at the faculty with individual access to the laptop or handphone. 2 students chose to use a handphone for the purpose. The researchers approved the decision as the compatibility of the site on different devices could also be assessed. Before the test started, each user was provided with an overall summary of the study and background of the portal. They were individually 'walked through' the portal by the researchers to familiarise them with it. Individual testing, or one-to-one trial was conducted with each of the users. Each session took between 30 and 45 minutes, and the users were free to leave or end the session at any point during the test. The users were given the feedback form to record any problems or errors they encountered during the exploration



and took important notes for the focus group interview later. The students were then asked to perform various tasks on the portal while being observed by one of the researchers.

As for the experts, they were given the link to the hub and 1 week to explore the hub and return their feedback form. According to Mahmud, Sadia, Rahman, Ahmed and Islam (2020), the duration of time has no impact on usability testing and can be implemented shorter time frame without imposing an additional cognitive load on subjects. After all the subjects finished the session, semi-structured interviews were done to discuss their experience during the activity and opinions about the portal. 2 separate interviews were done with students and experts. 6 features of the portal such as video tutorials on three categories, lesson plans, and a list of appraised ESL websites were tested. Users were also asked about each function they tested in terms of usefulness, and visual design. Thematic content analysis was used to capture the emergent themes from the semi-structured interviews and the qualitative feedback form.

## Results & Discussion

The following information is presented to answer the research question: *What are the perspectives of ESL instructors and ESL pre-service teachers in their evaluation of ESL TPACK Hub in terms of their visual design, content, functionality and usefulness?*

### ESL TPACK Hub Visual Design

Findings showed that both experts and student groups felt that the visual design overall was very interesting and attractive. The design is very sleek with a single column and no clutter, and the use of the strong colours of orange and black against the white background gives a good contrast. For instance, the home page features five functions altogether (refer Figure 1) but each function can still be accessed separately by clicking on the respective menu button. Some users wrote ESL TPACK Hub as ‘user-friendly’ in the visual design construct such as in the following excerpts:

*“I like the clean and well-organized design as it made it easy to read the information. The content also was informative as there's also a clear description for each..” (S1)*

*“The website maintains a consistent layout across all pages, creating a seamless and familiar experience. The simple navigation and straightforward design make it easy to find what I'm looking for. Additionally, the information presented is well-prepared and thoughtfully organized, which further enhances the overall design. (S4)*

*“I love the design of the website itself. So easy to access each of the links and watch the video tutorials one by one. I also like how every page has a detailed explanation especially the page of the video tutorials, where each of them are easily explained and I automatically know what video I will be watching. Good job on that! Lastly, I can learn many English lessons provide by each of the ESL website, and actually it will be a great help to those who are new to English and want to learn more and deeply (S3).*

Apart from the positive remarks, student group also reported a few flaws in the design as demonstrated here:

*Due to the website's simplicity and straightforward design, it is noticeable that this minimalistic approach has led to some missing features. For example, the navigation options*

*could be more comprehensive for example adding a breadcrumbs, and the absence of a back button can make it challenging to retrace steps. These missing elements can affect the overall user experience and might leave users feeling a bit frustrated (S2)*

*The Website fill all the Tutorial Video in one place and that make it very hard to differentiate each video (S1).*

These insights align with Branch's (2009) emphasis on the importance of iterative design in the ADDIE framework to address user needs while balancing simplicity and functionality. Additionally, Mahmud et al. (2020) stress that missing navigational elements like back buttons and breadcrumbs can negatively impact usability, as echoed in the feedback from S2. Aziz et al. (2020) highlight the value of consistent and simple design for positive user experiences, a key strength of ESL TPACK Hub. The feedback is also supported by Kous et al. (2020), who advocate for clear organization and intuitive navigation as central to usability in web design.

### **ESL TPACK Hub Functionality**

All functions of ESL TPACK Hub were successfully tested. The findings are presented in Table 2.

**Table 2: Subjects' Comments on Functionality**

<i>No</i>	<i>Items</i>	<i>Comments</i>
1	Video Tutorials on ESL Web Resources	All 20 videos played. Fully functioning. Loading speed: normal <i>E1: video playback too slow- probably due to internet connection</i> <i>E3: All videos were set to autoplay, though muted. Can consider changing to default: play upon request.</i>
2	Video Tutorials on ESL Digital Apps	All 20 videos played. Fully functioning. Loading speed: normal <i>E1 video playback too slow- probably due to internet connection.</i> <i>E3: All videos were set to autoplay, though muted. Can consider changing to default: play upon request.</i>
3	Videos on Innovative Language Lessons	All 20 videos played. Fully functioning. Loading speed: normal <i>E1 video playback too slow- probably due to internet connection.</i> <i>E3: All videos were set to autoplay, though muted. Can consider changing to default: play upon request.</i>
4	Digital Lesson Plans	20 respective lesson plans were correctly displayed upon clicking
5	Curated ESL Web Resources	2 links were inactive/broken: Link 75, Link 88
6	Question Dialogue Boxes	9 questions were successfully posted and captured

Table 2 shows that there were no major technical errors encountered by the student group. However, 2 experts highlighted that the videos they played were a bit slow, and all the videos were set to autoplay. Suggestions from the interview transcripts include embedding the videos into the website itself rather than being redirected to a cloud-sharing platform, and making it compatible with the different platforms. Subjects did not suggest additional features to be included in the ESL TPACK Hub. This feedback was very encouraging as researchers could now anticipate fewer problems with the actual users who have never interacted with this portal.

*Each of the ESL website links and lesson links also worked great! I can easily scroll the website without having any lagging problems too. (S3)*

*I tried to open this website link via Google and Samsung browser, but it just stuck with blank page. I was in a good internet coverage area when I opened the link. So, I try to find another alternative by installing UC browser, and suprisingly I can opened it and viewed the website smoothly. Maybe both of Google and Samsung browser can't support the website link? I am using my phone btw to open this website. (S5)*

These findings align with Aguayo-Arrabal and Ramírez-Delgado's (2020) emphasis on the importance of accessibility and platform compatibility for ESL/EFL websites to ensure smooth autonomous learning experiences. Similarly, Alhabdan (2021) highlights the necessity of technical assessments to identify and address browser-specific limitations, ensuring functionality across diverse devices and platforms.

### ***ESL TPACK Hub Content***

All subjects stated that the content featured in the hub is relevant, especially the themes featured in all the resources which are ESL resources. They stated that all ESL websites, digital applications, and lesson plans are pertinent to ESL professional development- catering to both in-service and pre-service teachers. Experts 2 and 4 especially approved the videos demonstrating how to use specific ESL websites and digital apps as they help to overcome the apprehension or anxiety teachers or users often face when dealing with new technology. In addition, the step-by-step instructions starting from signing up until the successful creation of output, and contextualizing it into a specific language learning skill given by demonstrators were also appreciated by all the subjects. A total of 60 videos were perceived as relevant. A list of 100 appraised ESL website links was also seen as helpful to teachers. Subjects agreed that the rating provided for each link is appropriate. The 20 digital lesson plans (see Figure 6) organized according to level (form) and language skills (listening, speaking, reading, writing, literature) are perceived as resourceful for pre-service teachers to help them with lesson planning. The following comments reinforce the positive outlook of the users.

*ESL website, and actually it will be a great help to those who are new to English and want to learn more and deeply. (S1)*

*The wide range of apps available on the website was fantastic. There was something for everyone, regardless of their learning style or preferences. (S4)*

These findings align with Aguayo-Arrabal and Ramírez-Delgado's (2020) criteria for assessing ESL/EFL websites, emphasizing relevance and support for autonomous learning. Alhabdan (2021) highlights the role of technical assessments in ensuring usability, while Aprilia et al.

(2023) underscore the benefits of interactive multimedia and gamified quizzes in enhancing engagement and learning outcomes.

### ***ESL TPACK Hub Usefulness***

The usefulness of ESL TPACK Hub is determined not only by the portal in overall but also by each category that is featured in the portal. In overall, the subjects felt that ESL TPACK Hub is very useful for them to support their TPACK and professional development. They quoted the usefulness of the external resources in the following phrases: “the resources will help me save time in locating ESL resources for my lesson plan assignments (S2)”, and “...wish I had the opportunity of using this portal long time ago, would definitely help me experiment with more digital tools (S5). The subjects also endorsed the useful links available ESL TPACK Hub which allows them to access other ESL websites easily.

The usefulness of ESL TPACK Hub was also enhanced by the uniqueness of the information in the portal as admitted by the subjects in their feedback. Such positive feedback for all functions suggests that users view ESL TPACK Hub with high regards in relation to fulfilling their TPACK and professional development needs. This aligns with Mertasari and Candiasa's (2022) findings, which highlight the role of digital learning materials in supporting educators' professional development through time-saving, high-quality resources. Similarly, Aziz et al. (2020) emphasize that intuitive navigation and integrated links enhance user satisfaction, reinforcing the effectiveness of ESL TPACK Hub in meeting users' professional needs.

### **Conclusion**

This study assessed a TPACK support tool known as ESL TPACK Hub based on the four evaluation criteria: visual design, functionality, content and usefulness from the perspectives of experts and students. The main findings of our preliminary usability evaluation of ESL TPACK Hub were that (1) interesting the visual design (2) sound functionality of the portal with all videos and links successfully played and retrieved with few loading issues were detected; (3) the content of the portal in the form of videos, lesson plans and appraised links were perceived as relevant and (4) usefulness of the portal is confirmed by the users. Further, the portal was seen beneficial to users and their needs were satisfied, which is a very important implication for technology application use in education. We found that although early evaluation is important to ensure the functionality of the portal in order to meet users' needs, there are challenges in the evaluation process which should be taken into consideration. The next step of the project is to go back to the design and development phases, and fix the problems encountered to ensure successful implementation with the target users.

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