Empowering Deaf Children Through Tabeer-e-Isharaat, A Digital Educational Platform

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Empowering Deaf Children Through Tabeer-e-Isharaat, a Digital Educational Platform

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ABSTRACT

This paper presents a case study on the design, development, and evaluation of Tabeer-e-Isharaat (TEI), a digital educational platform tailored to meet the needs of deaf children at the Deaf Reach School in Pakistan. Informed by classroom observations and interviews with educational experts, TEI incorporates visual and interactive learning activities aligned with the curriculum and preferences of deaf students. Feedback from both deaf and non-deaf participants regarding the TEI platform suggests overall positive perceptions of its usability. While both groups found the platform easy to understand and navigate, there were slight differences noted, such as deaf participants encountering challenges in error recovery compared to their non-deaf counterparts.

CCS CONCEPTS

• **Applied computing → Education**; • **Human-centered computing → Accessibility**.

KEYWORDS

 deaf, deaf children, kindergarten, e-learning, digital platform, design process, User-Centered Design, Human-Computer Interaction, Pakistan Sign Language (PSL), accessibility, interactive learning, assistive technology, visual learning, language development, educational games

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*Both authors contributed equally to this research.

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1 INTRODUCTION

The integration of technology into educational settings has revolutionized traditional teaching methods, offering innovative approaches [26]. Particularly, the emergence of e-learning platforms has captured attention for its potential to enhance accessibility and effectiveness in education [11]. Research suggests that online learning can improve learning outcomes of people with different disabilities by allowing customization and flexibility to meet individual needs [7].

One such group is deaf individuals, particularly deaf children, who generally lag behind their hearing peers in terms of academic achievement [17]. Roughly 1.2 per 1,000 children in Pakistan who undergo screening exhibit moderate to profound congenital bilateral hearing impairment, which means they experience hearing loss in both ears [15]. However, despite there being over a million deaf children of school age in Pakistan, only less than 5% attend school [8].

It has been found that deaf children find reading to be a tedious task, and have shown limited progress in obtaining the skill to read over the decades [16]. Studies like [18] demonstrate the efficacy of digital platforms in facilitating sign language learning among preschool students. However, in the context of Pakistan, limited to no solutions regarding e-learning platforms for deaf children have been developed. In 2013, Deaf Reach, a program by Family Educational Services Foundation (FESP) in Pakistan [12], introduced the 'Bridging the Gap' project [9], aiming to empower deaf children for active participation in education and society. This initiative offers diverse resources, including a website [1] featuring a 5,000-word Pakistan Sign Language (PSL) dictionary and learning tutorials for KG to Class 12 students and teachers/parents. Additionally, a mobile version of the website, a DVD with PSL lexicon and sign language videos, and a PSL book with essential signs in seven languages are provided. However, a notable limitation has been the absence of self-assessment or feedback mechanisms in the learning tutorials.

To address this, in 2023, the authors of this paper were approached by the aforementioned Deaf Reach School in Karachi, Pakistan to digitize their existing educational activities for kindergarteners. The remaining sections detail the design, development, and evaluation of a digital platform for students from Deaf Reach School, Karachi, named TEI (*Tabeer-E-Isharaat*), roughly translated as 'interpretation of signs or symbols.' Our main contribution through this work lies in providing design recommendations aimed

at enhancing the accessibility and user-friendliness of education for deaf children, drawing insights from our case study.

2 LITERATURE REVIEW

In this section, we review the existing literature concerning the development and evaluation of intervention measures for augmenting the education of deaf or hard-of-hearing children, with the primary focus of identifying key design elements in effective e-learning tools for deaf children to inform our design.

2.1 Design of e-learning platforms for deaf children

Several studies emphasize the significance of visual elements in enhancing accessibility and engagement for deaf individuals. Lynch et al. [15] emphasize on the importance of incorporating visual aids, colorful graphics, and sign language videos to facilitate distance learning for deaf children in Pakistan. Ahmed et al. [2] introduce the Distance Learning Platform for Deaf Students (DLPDS), enabling remote education through sign language videos and interactive features like educational graphics and visual quizzes. Similarly, Al-Osaimi et al. [3] propose guidelines for designing e-learning programs tailored to the needs of deaf children, emphasizing factors such as minimizing textual content, vibrant color schemes, and instant feedback mechanisms. Birinci et al. also demonstrates the effectiveness of visual materials in vocabulary instruction for deaf learners, emphasizing its impact on long-term retention [6]. The DK Defenders program [25] launched in Pakistan and South Africa, further illustrates the use of online animations and interactive games to educate deaf children about online safety. Finally, Shohieb [24] explores gamification techniques, integrating Player Centered Design steps, which include avatars, time-based activities, and immediate feedback mechanisms to enhance engagement and accessibility for Arab deaf students. Incorporating insights from these studies, we prioritize and adopt various visually engaging components (detailed in Section 3) to cater to the specific needs of deaf children, aiming to optimize their learning experience compared to conventional paper-based teaching methods.

Other studies focus on different components like Debevc et al. [10] propose an e-learning environment for deaf and hard-of-hearing individuals, focusing on optimized loading of sign language videos, efficient content navigation, and clear text presentation. Batanero-Och at el. [5] assess a learning platform designed for students with different capacities, including blind, deaf, and deaf-blind individuals, revealing concerns from blind students about excessive visual information and challenges faced by deaf students during the login process. Rowel et al. [22] propose a web-based e-learning platform for teaching deaf children letter and number writing in English and Sinhala, but neglect to discuss user interface design considerations for hearing-impaired children. Our research addresses this gap by focusing on key universal design principles tailored for deaf children.

2.2 Evaluation Methods for assessing digital platforms for deaf children

Various evaluation methods have been utilized to assess the effectiveness and usability of digital platforms designed for deaf children.

Aristizabal et al. [4] conducted a comprehensive study focusing on interactive systems for deaf and hard of hearing (DHH) children, utilizing methods such as drawing intervention, thinking aloud, and direct observation to gather data on user experience. The paper utilized the smileyometer to assess children's emotional responses to using apps like Speaking with TEO, Vivoso, and Memory Kids [19, 21, 23]. Additionally, Yeratziotis et al. [27] introduced HE4DWUX, a novel heuristic evaluation method, comprising 12 heuristics, aimed at assessing web accessibility and usability for deaf users. Similarly, Nielsen's ten usability heuristics [20] offer another robust method for evaluating interface design. Additionally, Zamakhsyari et al. [28] and Debevc et al. [10] focused on evaluating interfaces' usability and effectiveness using different methods like ISO-9241 standards, Software Usability Measurement Inventory (SUMI) evaluation, and AdaPI, emphasizing the importance of user-centered design. We integrate aspects of these approaches to comprehensively evaluate the accessibility and usability of our platform by employing a three-emotion avatar (happy, sad, thinking) for immediate feedback during activities (Section 3), complemented by a three-emotion (happy, sad, neutral) smileyometer during pilot testing (Section 3).

3 SYSTEM DESIGN AND DEVELOPMENT

The requirement-gathering phase was the first step in the design of TEI, where we had to understand and clarify the deaf students' needs and expectations of the system. This research has been reviewed and approved by Habib University's Institutional Review Board. Ethical considerations were duly addressed, with consent obtained from all participants involved in the study as volunteers.

Classroom Observations. Our observations during classroom visits for KG-1, underlined significant challenges in maintaining student engagement, with distractions hindering the learning process. The teacher utilized a small screen to display media content (PowerPoint presentations) while instructing, with the assistance of two moderators. Despite these efforts, student attention appeared scattered, suggesting a high level of distraction within the classic classroom environment. This distraction necessitated frequent interventions from the teacher to regain student focus, leading to significant time wastage and repetitive explanations of key concepts.

Interviews with Deaf Education Experts. We conducted interviews with deaf educational experts at Deaf Reach School to understand the specific needs and challenges faced by deaf students in their education journey. We discussed various aspects such as the current state of deaf education in Pakistan, teaching methods and materials used, the creation and management of educational activities, challenges faced, and the potential of a digital platform to address these challenges. The experts emphasized the importance of visual and interactive learning activities, highlighted the preference for game-based activities among students, and discussed limitations due to the lack of digital resources. Recommendations included features desired in a digital platform, such as engaging content, a free web-based platform, and a digital grade book system for tracking student performance.

Activity Design and Pilot Testing. We developed six activities, comprising three for English and three for Mathematics, presented as a PowerPoint presentation. These activities underwent a pilot test involving 14 students from the KG-1 class at Deaf Reach School. During the pilot test, the instructor displayed the presentation slides on their television screen. Following a brief explanation of each activity, students were prompted to select their responses. After each question, students were provided with a three-option smileyometer to indicate their reactions. Simultaneously, we closely observed the students' facial expressions for additional insights. Table 3 shows the results for each activity.

Activity	*Happy*	*Neutral*	*Undetermined*
Match number with sign	71.4%	0%	28.6%
Counting	85.7%	0%	14.3%
Click all 1s	71.4%	0%	21.4%
Match letter with sign	71.4%	7.1%	21.4%
Match letter with object	78.6%	0%	21.4%
Match letter with object #2	71.4%	0%	28.6%

Table 1: The pilot testing results indicate that 71.7% of expressions were happy, 1.2% were neutral, and 27.1% were undetermined across various activities.

3.1 Development Stack and Features of TEI

TEI is developed using the MERN stack (MongoDB, Express.js, React, Node.js) and incorporates Flaticon icons [13]. Catering for kindergarten-level deaf students at Deaf Reach School (DRS), following Pakistan Sign Language (PSL), TEI covers literacy and mathematics courses. Primary users include deaf students, instructors, and administrators at DRS in Karachi, Pakistan. Instructors can easily create activities by selecting a specific week, followed by a category, and then specific words associated with the chosen category and week (figure 1, C), Additionally, they can also view the published activities (figure 1, B). The questions are generated using pre-designed templates at the backend. Students can perform activities (figure 2, A) and view corresponding grades. Administrators have GUI tools to manage users and database content.

TEI also incorporates Player-Centered Design steps as discussed in Section 2 to enhance student's learning experience and engagement. Additionally, TEI offers multiple multimedia representations of content and incorporates features such as progress tracking and formative feedback, avatars, confetti, and time-based activities (figure 2 B, C, and D). The creation of all avatars also takes into account regional clothing preferences and aims to maintain gender inclusivity.

3.2 Heuristic Evaluation

To evaluate the platform's interfaces and pinpoint design issues, a heuristic evaluation was conducted with 14 participants from Deaf Reach School, including diverse roles such as educational consultant, content developer, intern, web developer, PSL assistant, and members of the Digital Learning Program (DLP). The evaluation utilized a variation of Nielsen's ten heuristics [20] as detailed in Table 2, catering to accommodate preferences of deaf individuals,

Figure 1: Progressions in TEI: A) Both instructors and students can access their respective courses after logging in. B) Activity creation based on course material through pre-designed templates, making it easier for the instructor to generate activity on a specific topic in very little time. C) Student can perform activities published by the instructor

with a simplified binary questionnaire format (Yes or No) and comment boxes for detailed feedback. Participants viewed platform interfaces on a large screen while completing evaluation forms, supported by verbal explanations by one of our team members, coupled with a sign language interpreter. Statistical measures like mean and standard deviation were employed to analyze collected data.

4 DISCUSSION

Table 3 presents perceptions of TEI among both deaf and non-deaf members of DRS. Descriptive comments from participants are listed in A. Each heuristic number in Table 3 corresponds to a specific heuristic and its corresponding question as listed in Table 2. Overall, participants found TEI easy to understand and navigate, with mean scores of 0.93 for deaf and 1 for non-deaf participants in heuristic 1. TEI effectively communicates with clear language and follows an intuitive design structure, as shown by mean scores of 1 for heuristics 2 and 6 across both groups. However, deaf participants

Table 2: Variation of Nielsen's Ten Heuristics

| Heuristic	Question
Heuristic 1: Visibility of System Status	(1) While navigating through the platform, users are clearly able to figure out which page/screen they are currently on. (2) While navigating through the platform, users are able to quickly go to different screens/views after performing an action.
Heuristic 2: Match Between System and the Real World	(1) The language used on the platform is easily understood by the users and does not contain unfamiliar terminology. (2) The design of the platform follows natural and logical order which can be easily understood by the user.
Heuristic 3: User Control and Freedom	While navigating through the platform, users are able to recover quickly after performing an action by mistake.
Heuristic 4: Consistency and Standards	The platform follows a consistent theme in terms of design and structure.
Heuristic 5: Error Prevention	(1) The platform minimizes errors by making unwanted actions invisible/unavailable on the screen. (2) The design shows good error messages and warns user before performing a risky action.
Heuristic 6: Recognition Rather Than Recall	While navigating through the platform, users do not need to remember information from previous page to work on the current page.
Heuristic 7: Flexibility and Efficiency of Use	(1) The design is easy to use by both inexperienced (i.e. children) and experienced users (i.e. instructors). (2) The design speeds up interaction with the platform by providing keyboard shortcuts for expert users.
Heuristic 8: Aesthetic and Minimalist Design	The interfaces do not have distracting or irrelevant information that diminish their visibility.
Heuristic 9: Help Users Recognize, Diagnose, and Recover from Errors	(1) The design uses traditional error message visuals, like bold, red text. (2) The design shows error messages in plain language and make suggestions which can be easily understood.
Heuristic 10: Help and Documentation	The design is simple and easy to use and does not require any additional explanation.

encountered challenges in error recovery, scoring 0.43 in heuristic 3, highlighting the need to improve backtracking mechanisms. Consistency in theme and structure was positively received by both groups, with mean scores of 1 and 0.88 for heuristics 4 and 10, respectively. TEI actively reduces the possibility of errors by hiding or disabling irrelevant options, as indicated by mean scores of 1 and 0.94 for heuristic 5 among deaf and non-deaf participants, respectively. While participants found TEI user-friendly for diverse users (heuristic 7), there's room for improvement in providing conventional error message visuals, as seen in mean scores of 0.5 for deaf and 0.69 for non-deaf participants in heuristic 9. Overall, participants appreciated TEI's minimalist design, with mean scores of 0.86 and 0.88 for deaf and non-deaf participants, respectively.

4.1 Design Considerations in TEI

Based on the insights from the literature review, classroom observations, interviews, and pilot testing, and heuristic evaluation, we recommend the following principles to facilitate deaf students' learning process, classroom engagement, and help enhance their linguistic skills.

(1) Aligning content with the deaf students' curriculum and following expert-designed concept sequences.
(2) Reducing text significantly.
(3) Displaying one question on screen at a time to minimize distraction.
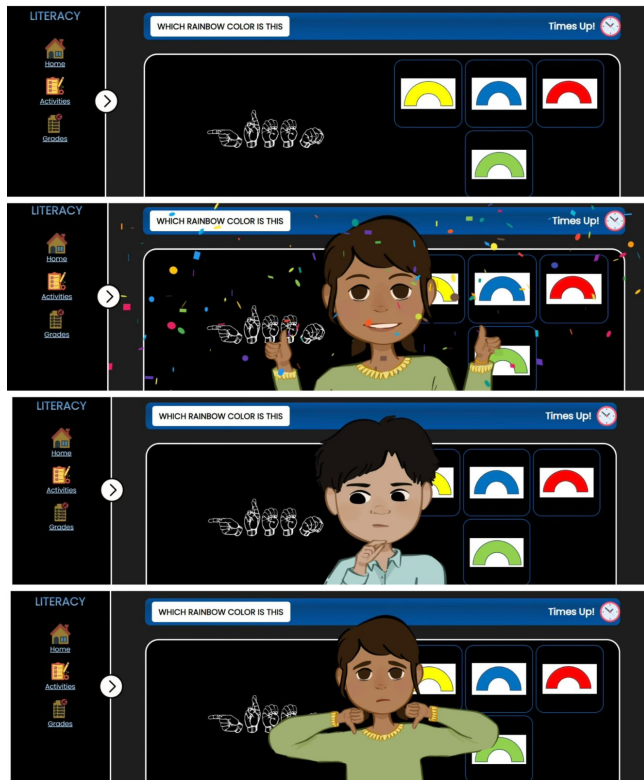
Figure 2: Progressions within TEI student activities: A) Student is presented with a time-based question with multiple options. B) Avatar showing a happy girl avatar with confetti for correctly answered questions. C) and D) Sad and retrospective avatars for incorrectly answered questions to give visual feedback to students. The creation of all avatars takes into account regional clothing preferences and aims to maintain gender inclusivity.

Table 3: Heuristic Evaluation Results

Heuristic No.	Deaf Participants				Non-Deaf Participants			
	Yes	No	Mean	SD	Yes	No	Mean	SD
1	13	1	0.93	0.18	16	0	1	0
2	14	0	1	0	16	0	1	0
3	3	4	0.43	0.5	7	1	0.88	0.33
4	7	0	1	0	7	1	0.88	0.33
5	14	0	1	0	15	1	0.94	0.17
6	7	0	1	0	8	0	1	0
7	10	4	0.72	0.25	15	1	0.94	0.17
8	6	1	0.86	0.35	7	1	0.88	0.33
9	7	7	0.5	0	11	5	0.69	0.16
10	7	0	1	0	7	1	0.88	0.33
Overall Mean		0.84				0.91		

(4) Using culturally appropriate avatars and facial expressions for visual feedback.
(5) Maintaining proximity of text, images, and videos.

5   CONCLUSION AND FUTURE WORK

In this paper, we detail the key considerations for designing e-learning platforms for deaf children through our case study of designing, developing, and testing TEI at Deaf Reach School, Pakistan. Feedback from both deaf and non-deaf participants regarding the TEI platform suggests overall positive perceptions of its usability. While both groups found the platform easy to understand and navigate, there were slight differences noted, such as deaf participants encountering challenges in error recovery compared to their non-deaf counterparts. The consensus among participants highlighted the platform's consistency, simplicity, and effective reduction of error possibilities, indicating its potential for a diverse user base. As part of future work, we aim to broaden our scope by incorporating diverse educational categories tailored specifically for preschool deaf children. Additionally, in the next iteration of our project, we intend to conduct load testing to assess the platform's performance under varying levels of usage and demand. These enhancements will further advance our efforts to create an inclusive and robust educational tool for the deaf community.

REFERENCES

[1] [n. d.]. Pakistan Sign Language (PSL). https://www.psl.org.pk/.
[2] Mohamed Elsayed Ahmed and Shinobu Hasegawa. 2022. Development of New Distance Learning Platform to Create and Deliver Learning Content for Deaf Students. *Education Sciences* 12, 11 (2022). https://doi.org/10.3390/educsci12110826
[3] Asma Al-Osaimi, Hadlaa AlFedaghi, and Asmaa Alsumait. 2009. User interface requirements for e-learning program designed for deaf children. In *Proceedings of the First Kuwait Conference on E-Services and e-Systems* (Kuwait) (*eConf '09*). Association for Computing Machinery, New York, NY, USA, Article 7, 5 pages. https://doi.org/10.1145/1836029.1836036
[4] Leandro Flórez Aristizábal, Sandra Cano, César A. Collazos, Fernando Moreira, Daniyal M. Alghazzawi, and Habib Fardoun. 2017. Tools and Methods Applied in Interactive Systems to Evaluate the User Experience With Deaf/Hard of Hearing Children. In *Proceedings of the 5th International Conference on Technological Ecosystems for Enhancing Multiculturality* (Cádiz, Spain) (*TEEM 2017*). Association for Computing Machinery, New York, NY, USA, Article 18, 8 pages. https://doi.org/10.1145/3144826.3145365
[5] Concepción Batanero-Ochaíta, Luis De-Marcos, Luis Felipe Rivera, Jaana Holvikivi, José Ramón Hilera, and Salvador Otón Tortosa. 2021. Improving Accessibility in Online Education: Comparative Analysis of Attitudes of Blind and Deaf Students Toward an Adapted Learning Platform. *IEEE Access* 9 (2021), 99968–99982. https://doi.org/10.1109/ACCESS.2021.3095041
[6] Fatma Gulengul Birinci and Arif Saricoban. 2021. The effectiveness of visual materials in teaching vocabulary to deaf students of EFL. *Journal of Language and Linguistic Studies* 17, 1 (2021), 628–645.
[7] Ibrahim Dahlstrom-Hakki, Zachary Alstad, and Manju Banerjee. 2020. Comparing synchronous and asynchronous online discussions for students with disabilities: The impact of social presence. *Computers & Education* 150 (2020), 103842. https://doi.org/10.1016/j.compedu.2020.103842
[8] Deaf Reach. [n. d.]. *Deaf Reach Schools, Training Centers and Colleges in Pakistan.* https://deafreach.com/
[9] Deaf Reach Schools. 2015. *Technology Based Resources for Deaf Learners: Pakistan Sign Language digital lexicon developed by Deaf Reach Schools.* Technical Report. Deaf Reach Schools.

[10] Matjaž Debevc, Zoran Stjepanovič, and Andreas Holzinger. 2012. Development and evaluation of an e-learning course for deaf and hard of hearing based on the advanced Adapted Pedagogical Index method. *Interactive Learning Environments - INTERACT LEARN ENVIRON* 22 (01 2012), 1–16. https://doi.org/10.1080/10494820.2011.641673

[11] Riah F Elcullada Encarnacion, Annjeannette Alain D Galang, and Byron Joseph A Hallar. 2021. The impact and effectiveness of e-learning on teaching and learning. *Online Submission* 5, 1 (2021), 383–397.

[12] Family Educational Services Foundation. 2023. *Family Educational Services Foundation.* https://fesf.org.pk/

[13] Flaticon. [n. d.]. Flaticon. https://www.flaticon.com/. Accessed: 2024-02-20.

[14] Kolibri. [n. d.]. Kolibri: A Free, Open Source Education for All | Learning Equality. https://learningequality.org/kolibri/.

[15] Paul Lynch, Tom Kaye, and Evangelia Terlektsi. 2020. *Pakistan Distance-Learning Topic Brief: Primary-level Deaf Children.* Helpdesk Response 16. EdTech Hub. https://doi.org/10.53832/edtechhub.0043

[16] Marc Marschark and Margaret Harris. 2013. Success and failure in learning to read: The special case (?) of deaf children. In *Reading comprehension difficulties.* Routledge, 279–300.

[17] Marc Marschark and Harry Knoors. 2012. Educating Deaf Children: Language, Cognition, and Learning. *Deafness & Education International* 14, 3 (2012), 136–160. https://doi.org/10.1179/1557069X12Y.0000000010 arXiv:https://doi.org/10.1179/1557069X12Y.0000000010

[18] Ananthi Masitry, Mazlina Majid, Muhammad Toh, Sutarman Mkom, and Tutut Herawan. 2013. An Investigation on Learning Performance among Disabled People Using Educational Multimedia Software: A Case Study for Deaf People. *International Journal of Bio-Science and Bio-Technology* 5 (12 2013), 9–20. https://doi.org/10.14257/ijbsbt.2013.5.6.02

[19] A.A. Navarro-Newball, D. Loaiza, C. Oviedo, A. Castillo, A. Portilla, D. Linares, and G. Álvarez. 2014. Talking to Teo: Video game supported speech therapy. *Entertainment Computing* 5, 4 (2014), 401–412. https://doi.org/10.1016/j.entcom.2014.10.005

[20] Jakob Nielsen. 2005. *Ten Usability Heuristics.* http://www.nngroup.com/articles/ten-usability-heuristics/

[21] PescAPPs. 2016. Memory Kids. Retrieved from https://play.google.com/store/apps/details?id=com.pescapps.Memory&hl=en.

[22] Mindula Rowel, ADAI Gunasekara, GAI Uwanthika, and DB Wijesinghe. 2023. E-Learning Platform for Hearing Impaired Children with Handwritten Character Recognition using CNN. *International Journal of Research in Computing* 1, 1 (Mar. 2023). https://www.ijrcom.org/index.php/ijrc/article/view/64

[23] Andrés Darío Castillo Saavedra. 2001. *Herramienta Software didáctica como soporte en la enseñanza del lenguaje oral para niños con dificiencia auditiva" Vivoso".* Ph. D. Dissertation. Pontificia Universidad Javeriana. Cali.

[24] Samaa Shohieb. 2019. A Gamified e-Learning Framework for Teaching Mathematics to Arab Deaf Students: Supporting an Acting Arabic Sign Language Avatar. *Ubiquitous Learning: An International Journal* 12 (01 2019), 55–70. https://doi.org/10.18848/1835-9795/CGP/v12i01/55-70

[25] Elizabeth Thomas. 2022. Evaluation of DeafKidz Defenders Pilot - Key Findings Summary Report. DeafKidz International. https://deafkidzinternational.org/wp-content/uploads/2022/12/DeafKidz-Defenders-Summary-Report-2022.pdf Accessed: 2024-03-22.

[26] Promethean World. 2023. How Modern Technology Has Evolved Traditional Teaching. https://www.prometheanworld.com/resource-center/blogs/how-modern-technology-has-evolved-traditional-teaching/.

[27] Alexandros Yeratziotis and Panayiotis Zaphiris. 2018. A Heuristic Evaluation for Deaf Web User Experience (HE4DWUX). *International Journal of Human–Computer Interaction* 34, 3 (2018), 195–217. https://doi.org/10.1080/10447318.2017.1339940 arXiv:https://doi.org/10.1080/10447318.2017.1339940

[28] Fardan Zamakhsyari, Achmad Wibowo, and Mohammad Milad. 2022. Enhance User Interface to Deaf E-Learning Based on User Centered Design. *MATICS: Jurnal Ilmu Komputer dan Teknologi Informasi (Journal of Computer Science and Information Technology)* 14, 2 (2022), 57–63. https://doi.org/10.18860/mat.v14i2.17703

A   DESCRIPTIVE FEEDBACK

The insights gathered from comment boxes submitted by participants included:

- "a separate section for activities where teacher can choose different activities for students"
- "study Kolibri studio [14] for comparing your solution"
- "if teachers are given more control over adding images for vocabulary words"
- "UI can be much better. Play around with more colors"
- "black color is not a user-friendly color"
- "different activity more" - *deaf*
- "give teacher access to design or add activity"
- "navigation sidebar icons should be a bit larger"
- "undo or redo option for teachers while making activity should be there for better results"
- "better color contrast should be used (especially for girl & boy)"
- "at the end of activity there should be animation for showing grade"
- "other activity more idea" - *deaf*
- "time limit of 60 secs should be there for each question"
- "some videos are small in size in activity"
- "provide instructions while generating activity"