

A Survey On Learning Platform For Disabled Students

¹Hancy Rozetta, ²Haritha J S, ³Jibi Mol K A, ⁴Vaishnavi Vinod, ⁵Jisha C Thankappan
^{1,2,3,4}Student, ⁵Assistant Professor

^{1,2,3,4,5}Department of Computer Science and Engineering

^{1,2,3,4,5}College Of Engineering, Kidangoor, Kottayam, Kerala, India

¹hancyhat@gmail.com, ²harithajsjaya2000@gmail.com, ³jibijoseph2003@gmail.com,
⁴vaishnavivinod2004@gmail.com, ⁵jisha.ct@ce-kgr.org

ABSTRACT: In an era of highly developing digital accessibility, the need for an online learning platform that meets all the challenges and barriers faced by differently abled students is still a concern. Since traditional methods of teaching are not accessible by disabled students, many platforms nowadays focus on including several technologies including speech-to-text and text-to-speech to empower disabled individuals to learn using Machine Learning and Deep Learning methods. The purpose of this survey is to have a systematic review of existing platforms for students with disabilities using the latest technologies and tools. This paper also examines challenges and limitations, user experiences, and thus helps to develop an inclusive learning platform with all advanced and easily accessible features.

INDEX TERMS: Learning Platform for Disabled Students, Accessibility, Assistive Tech- nology, Image Description, Differently Abled, Web Accessibility

I. INTRODUCTION

Revolutionized education system with the rapid technological advancements have a great impact on learning methodologies, making it easily accessible. However the traditional educational platforms addresses all the challenges but it is still an open question when it comes to the differently abled students. Online learning platforms have the potential to bridge this gap by providing flexible and personalized learning experiences. By studying the accessibility features, user experience, and limitations of these platforms, we could identify their strengths and weaknesses. Through a comprehensive review of existing surveys, this research will provide valuable insights into the potential of technology-enhanced learning for differently-abled students. Therefore by the findings of these comprehensive study it will contribute to the development of a more inclusive and an effective educational platform, ultimately empowering differently abled students to reach their full potential. By leveraging technologies like speech-to-text, text-to-speech, and real time sign language translation platform which reduces the differences in accessibility, making learning more immersive and adaptable to individual needs.

II. LITERATURE SURVEY

Pam Millet [1] discusses the potential of speech-to-text (STT) for real-time captioning, especially for students who are deaf or hard of hearing, and its need to be accurate for effective use. The study evaluates the accuracy of eight STT tools (Interact Streamer, Ava, Otter, Google Slides, Microsoft Stream, Microsoft Translator, Camtasia Studio and YouTube) for different scenarios: i) a university lecture given by a native English speaker in real time ii) a video of the lecture, and iii) a conversation between 3 students in real time, using real speech under controlled acoustical conditions. A 15-minute excerpt from a previously recorded lecture in a university course in Educational Audiology was used as the material to assess accuracy in a standard lecture setting. The lecture was simultaneously recorded on Audacity, converted to an MP4 file, and then used as the input for video captioning to test each tool's ability to caption pre-recorded content. A script was written for a group conversation with three students regarding a biology course project for small group work video captioning to evaluate how well each STT tool could handle multiple speakers and casual conversation. Each STT tool's transcription output was saved and analysed for accuracy Along with highlighting the limitations of existing accommodations like CART (Computer Assisted Real-time Translation), it also looks at the difficulties

encountered in typical classroom settings because of noise, speaker variability, and room acoustics. The technique used for evaluating STT accuracy was based on total accuracy (percentage of words transcribed accurately) and meaning accuracy (impact of errors on comprehension). The captioning accuracy for most of the apps and software evaluated in this study was greater than 90% accuracy, although none achieved the accuracy of the two gold standards, CART and post production commercial captioning. This study also gives qualitative observations on errors, especially homophones and punctuation issues that were commonly found in STT tools. The paper concludes that Speech-to-text technologies for video captioning were found to be very accurate, increasing the potential of its usage in classroom.

Ananya Gubbi Mohanbabu, Amy Pavel [2] paper emphasizes the importance of context (e.g., webpage purpose, surrounding text) in image descriptions which affects blind and low-vision (BLV) users to understand images in a better way, especially on websites with varied content like e-commerce, social media, and news. It discusses the limitations of current models (GPT-V, Gemini, and LLaVa) that generate image descriptions without considering the context, therefore lacking accuracy, and relevance. The authors of this paper developed a Chrome Extension to generate context-aware image descriptions by extracting webpage details (e.g., text, title, URL) that allows users to get relevant, visually informed descriptions aligned with the purpose of the webpage. They also considered the difference in Context-free Long description, Context-free Short description, Context-Aware long description and Context-Aware short description to find which one was more useful and relevant. The paper describes the technical process behind generating these descriptions, including how the system assesses text relevance and processes webpage context. Dataset consisted of 24 images from web from four categories: e-commerce, news, social media, and blogs. First, relevant context is extracted from the webpage HTML including the webpage title, webpage URL, webpage text, and the alt text of the selected image and then the information is distilled. An image relevance score (which considers proximity and layout of each text segment to the image and the content similarity between the image content and text segment content) for each extracted text segment on the webpage is computed ($\text{RelevanceScore} = 0.55 * \text{proximityScore} + 0.1 * \text{layoutScore} + 0.35 * \text{similarityScore}$). Initial context-aware image description, the alt text, the title, and the extracted context text with image relevance scores along with the image to GPT-4V to extract visually concrete text. GPT-4V is instructed to create a description based on the image and the visually concrete text. Evaluation of the description was based on accuracy i.e refers to whether or not each sentence contained a hallucination, objectivity i.e whether image descriptions contain subjective details without evidence in the picture, and relevance i.e whether there is relevance of the sentence to the image. Some of the risks found in this approach was potential hallucinations, and privacy concerns. The proposed system works best for images that have relevant text context but the performance degrades in cases where the images lack text context and for cases where the text content is unrelated or only loosely related to the images. Feedback from 12 BLV participants were taken who compared context-aware and context-free descriptions and the findings showed that participants preferred context-aware descriptions. In conclusion, the paper discusses about the proposed system to generate context-aware descriptions for images encountered on web using relevant context from the webpage HTML and its effectiveness.

Dr. Shazia Mansoori [3] discusses on integrating the New Education Policy (NEP) 2020 in India, together with the Rights of Persons with Disabilities (RPWD) Act 2016 thus building an equitable and inclusive education of the disabled students. NEP 2020 focuses on education free of barriers. Barriers create environments within which students with disabilities cannot learn because of the absence of physical, technological or even societal means. The paper showcases the importance to distribute government resources to ensure that ATs are affordable to the poor groups of every society. ATs are divided in three main categories based on the level of sophistication and associated costs. This classification assists academics in opting for technologies according to the needs of the students, available financial resources and physical facilities: Low-Tech ATs are inexpensive and easy-to-use tools that do not consume electrical energy or any other power source. These are very effective in providing support or need a wide range of written materials. Mid-Tech ATs Devices are reasonably priced, work on electrical power and offer more features. Prefabricated acoustic shells are also highly recommended for use by visually impaired students or deaf/hard of hearing students with cognitive disabilities who require more than basic supportive aids. High-Tech ATs are sophisticated interactive devices that can be programmed and even fitted with other technical features like speech generating devices, braille and talking book players, and interactive white boards. This paper provides valuable tools for ascertaining the level of knowledge and the extent of use of ATs by students and

educators alike. ATs support inclusive classrooms, promoting equity and accessibility for differently-abled students. Also it helps students to become more self-sufficient and to enhancing their learning experience. Different technologies target specific disabilities, providing tailored support for vision and hearing impairments. Some of the disadvantages that may occur are ATa can be expensive, making them less accessible for students from lower-income backgrounds. While awareness of ATs is growing, many students and teachers still lack the necessary training, impacting effective implementation. Excessive reliance on ATs may reduce engagement with traditional learning methods.

Mario Perez- Enriquez, Jose Luis Lopez-Cuadrado [4] paper incorporates live transcription, live transcription, sign language, and audio description channels in a customizable interface for accessibility. Developed through iterative feedback cycles involving collaboration with accessibility experts and direct user testing, especially with individuals with disabilities. The system was tested for compatibility with screen readers and assistive devices to adhere to WCAG (Web Content Accessibility Guidelines) standards. Feedback was gathered from diverse users in real-world scenarios to ensure the platform's accessibility and functionality. The platform primarily addresses auditory and visual disabilities, potentially limiting its inclusivity for users with other types of disabilities. This platform marks a significant step toward inclusive online learning but might benefit from further expansion to accommodate a broader range of disabilities and contexts. The platform automatically generates notes and subtitled recordings, making easy for them to understand. It allows users to personalize the interface by adjusting layouts, font sizes, and colors. Testing with real users, with disabilities, ensures that all the requirements have been satisfied or not. The platform mainly addresses people with auditory and visual disabilities. Its performance may vary according to the internet connectivity and the device used. It will also increase the complexity of the platform .

B. K. Balasuriya [5] proposed system leverages artificial intelligence and computer vision to provide a comprehensive learning solution for visually impaired children aged 6-14. It incorporates object recognition for both indoor and outdoor environments, using techniques like CNNs, RNNs, and Grid-Based Probability Detection. Additionally, a description generation module employs RNNs to provide verbal descriptions of objects, enhancing understanding. The system further incorporates speech recognition and command modules, allowing users to interact hands-free using voice commands. While offering advantages like independence, adaptability, and cost efficiency, the system faces challenges such as high computational demands, setup complexity, dependence on external APIs, and potential accuracy issues due to environmental variations. By integrating both speech and sign recognition, the system offers an engaging and accessible interface designed to meet the unique needs of children with visual impairments. The system's capability to recognize objects both indoors and outdoors delivers a flexible and dynamic learning experience. Designed with open-source tools and software. In this platform requires considerable processing power for real-time CNN and RNN operations. The CNN and RNN models need a lot of training data. They also require careful hyperparameter tuning. Recognition accuracy can be affected by lighting. Background changes can also impact accuracy.

Jose Maria Fernandez-Batanero [6] presents a comprehensive review of the implementation pattern for improving accessibility and inclusion for students with disabilities in higher education. This pattern is based on a structured approach that targets three primary areas: infrastructure, teaching-learning processes, and institutional management. It includes offering a tactile environment that supports mobility and sensory needs through having ramps, reserved spaces, accessible signboards, and adaptive facilities. Building adaptations serve as a long-term solution for the present and future students with disabilities. It emphasizes curriculum adaptation and teaching techniques, such as Universal Design for Learning, accessible materials, and differentiated instructional methods. The UDL ensures the different types of learning would be in place to ensure that the classes are interesting and engaging and inclusive. In addition to policies and services such as counselling, transition services, and financial aid are included. Student services focused on students with disabilities contribute to a supportive university environment and better retention rates of the students while transitioning to higher education. Implementation of accessible infrastructure and UDL is costly, particularly for older buildings and less funded institutions. Inadequate faculty training on inclusive teaching methods might lead to inconsistent use of inclusion practices that hinder participation. The sustainability depends much on the institutional policies and the consistent funding which could shift or be cut out completely in the long term. Students with disabilities face challenges like difficulty in learning, communication, and mobility. Supportive factors include help from teachers, use of special tools, and a welcoming environment. It includes studies from many countries. It focuses on different types of disabilities. It gives a broad view of inclusion

challenges worldwide. Since many studies used qualitative approaches, the findings may be more context specific. The focus is mainly on physical disabilities. Students with autism spectrum disorder get less attention. Students with disabilities face challenges like difficulty in learning, communication, and mobility. Supportive factors include help from teachers, use of special tools, and a welcoming environment. It includes studies from many countries. It focuses on different types of disabilities. It gives a broad view of inclusion challenges worldwide. Since many studies used qualitative approaches, the findings may be more context-specific. The focus is mainly on physical disabilities. Students with autism spectrum disorder get less attention.

Prajwal S. Shirur [7] paper focuses on building an accessible websites for differently abled individuals using open source tools .Visually impaired, hearing or speech impaired and people with MVM are the targeted disabilities focused here. Based on relevant studies it was found that accessing web contents by visually impaired people is quite difficult. A more advanced solution is brought to help those people with disabilities. Also other features like cost effectiveness, scalability and compatibility are also considered. Methodology behind this framework is that the user's disabilities is identified by providing a dialog box which allows users to select their disability. Based on the chosen option web accessibility tools are provided. For visually impaired, tools like text to speech, web scrapping and a magnifier tool is used. 3D sign language avatar, sign language keyboard and optional camera based sign-to-text converter is used for hearing or speech impaired. It also incorporated head tracking, facial expression recognition and speech to text conversion is used for minimal voluntar motion. The paper describes a case study on an Indian Government website in which these tools were implemented with 25 users from various backgrounds to assess usability and accessibility. The system uses open- source tools and avoids the need for external hardware.

Subhash Tatala [8] paper focuses mainly on people with dyslexia. Dyslexia is a common learning difficulty that primarily affects the ability to read, write, and spell. To help people with this disorder, a Web virtual Reality (WebVR) based education platform is proposed. The proposed system is implemented using technologies like Django, A-Frame and MySQL. It also discusses about the implementation method of the Online Learning Platform for Students with Disabilities involves developing a system that allows students with disabilities to perceive and understand various types of content, control the user interface, and access different forms of display. This system is designed to meet the Web Content Accessibility Guidelines (WCAG) standards set by the World Wide Web Consortium (W3C) and the Thai Industrial Standards Institute. The system operates according to educational quality and standards, contributing to the expansion of the economy and digital societies. The framework used in the development of the Online Learning Platform for Students with Disabilities integrates information technology architecture and database structure to store students' profiles and learning outcomes in relational databases. This platform allows teachers to manage courses, set activities, design evaluations, and select software and digital media for teaching students with disabilities effectively.

Table 1: Technologies Used

Papers	DL	ML	NLP	VR	CN
[1]	✓	✓	✓		
[2]	✓	✓	✓		
[3]			✓	✓	
[4]		✓			
[5]					✓
[6]			✓		
[7]	✓				✓
[8]			✓	✓	

III. CONCLUSION

The purpose of this survey is to examine the existing status of learning platforms targeted at the members of the society with some limitations. This research intends to explore the features of accessibility, usability, and effectiveness of such existing platforms, and suggest ideal practices while marking their gaps. The results of this survey would help in creating a more supportive and welcoming online space for students with disabilities and inform better programs in the future. More specifically, this survey will be focused on the following features including accessibility which, refers to the level of incorporation of platform elements such as the screen readers, alt-text, font size scaling and others into the platform, intuitiveness which describes the degree of difficulty relating to the use and navigation of the platforms for students with various abilities. This survey seeks to address the above questions and present the strengths and weaknesses of existing learning platforms and form future strategies towards more accessible online learning environments. In conclusion this study sets to investigate the use of digital learning platforms to accommodate the diverse needs of differently-abled students. Though a lot of positive changes have been seen in recent times, barriers still remain especially in the areas of accessibility, user experience design and teaching and learning approaches. In order to overcome the digital divide and ensure that education is inclusive for all, it is essential that design that is focused on the end user is developed, appropriate access mechanisms are incorporated and there are effective teaching methods designed. By tackling these key issues, we can enable differently-abled learners to actively engage in the 21st century era and help them accomplish their educational aspirations.

IV. REFERENCES

- [1] P. Millett, "Accuracy of Speech-to-Text Captioning for Students Who Are Deaf or Hard of Hearing," in 2023 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Rotterdam, Netherlands, 2023, pp. 1234-1238.
- [2] A. G. Mohanbabu and A. Pavel, "Context-Aware Image Descriptions for Web Accessibility," in Proceedings of the ASSETS '24 Conference, St.John's, NL, Canada, Oct. 27–30, 20244
- [3] S. Mansoori, "Assistive Technologies for Differently-abled Students," International Journal of Creative Research Thoughts (IJCRT), vol. 10, no. 11, pp. 821-829, Nov. 2022.

[4] M. Perez-Enr´ıquez, J. L. L´opez-Cuadrado, and I. Gonz´alez-Carrasco, "Platform for accessible online learning," in Proceedings of the XXIV International Conference on Human Computer Interaction (INTERACCION 2024), A Coru˜na, Spain, June 2024, pp 1- 4.

[5] RB. K. Balasuriya, N. P. Lokuhettiarachchi, A. R. M. D. N. Ranasinghe, K. D. C. Shivantha, and C. Jayawardena, "Learning platform for visually impaired children through artificial intelligence and computer vision," in Proc. 11th Int. Conf. Softw., Knowl., Inf. Manag. Appl. (SKIMA), Malabe, Sri Lanka, 2017, pp. 1–7.

[6] J. M. Fern´andez-Batanero, M. Montenegro-Rueda, and J. Fernandez Cerero, "Access and Participation of Students with Disabilities: The Challenge for Higher Education," International Journal of Environmental Research and Public Health, vol. 19, no. 19, p. 11918, Sep. 2022. doi:10.3390/ijerph191911918

[7] P. S. Shirur, S. Raghuvanshi, and V. Bali, "Developing Accessible Websites for Differently Abled People Using Open- Source Tools," International Journal of Software Innovation, vol. 10, no. 1, pp. 1-20, 2022. DOI: 10.4018/IJSI.303576S. Tatale, R. Parmar, N. Bhirud, and S. Pawar, "Education using Virtual Reality for students with learning disabilities," in 2019 5th International Conference on Computing Communication Control and Automation (ICCUBEA), Pune, India, 2019, pp. doi:10.4018/IJSI.303576.

[8] O. Poobrasert, S. Luxsameevanich, and A. Banlawanit, "Online Learning Platform for Students with Disabilities: Possible Path to Progress," in Proceedings of the 2022 XII International Conference on Virtual Campus (JICV), 2022, pp. 1-6

