

DIGITAL ACCESSIBILITY FOR CHILDREN WITH DISABILITIES

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Abstract

The paper in this case illustrated how digital accessibility is important for children with disabilities by demonstrating how technology, if included, can further augment the learning experience. There are a lot of digital tools, but their usage depends on the individual requirements of the children. The study made it clear that there were also requirements for providing accessible websites and apps along with the appropriate virtual learning environments. However, the research noted discrepancies in the uniform application of accessibility requirements. It emphasized the need to change the outlook to use more inclusive design principles, which would lead to a fairer environment for learning in a digital space. In the end, this work identifies the value of digital accessibility in relation to how children with disabilities have equal educational opportunities.

Index Terms— Digital accessibility, Children disabilities, Inclusive design, Virtual learning, Educational tools.

I. INTRODUCTION

It is important to guarantee digital accessibility for children with disabilities so that they can fulfill the right to access digital content and online resources in a way that is accessible to them. Even though many of the digital platforms out there are meant for general audiences, they forget about the needs of children who have visual, auditory, or cognitive impairments. Although accessible design is simply a technical requirement, it is first and foremost a moral and legal imperative for more inclusive design. This report attempts to understand how websites and applications can be accessible if children have different needs. It will also point out the benefits of specialized accessibility tools in virtual learning environments in primary and secondary education [7]. It further aims to look into the case studies of the implementation of these programs in preschools and elementary schools, focusing mainly on practical solutions and best practices. Yet, there are still significant challenges to designing inclusive digital spaces and getting that right, requires a systematic approach that puts accessibility first, on every single step of the way [11]. The challenges facing this novel type of virtual environment will be addressed in this report through an examination of design strategies that lead to successful implementation, the tools for accessibility enhancement, and examples of specific, real-world hardware implementations.

II. UNDERSTANDING DISABILITIES IN DIGITAL CONTEXT

The enabling of inclusive online environments is due to digital disabilities. As with the existing physical platform, these platforms demand that interactions from people who have visual, auditory, and/or cognitive disabilities on digital platforms that are also digital platforms

constitute substantially different challenges. Substantially different challenges than with existing physical platforms. For example, visual impairments might restrict a child's navigation around the websites, reading text, and interpretation of visual cues, just to name a few, and generate accessibility barriers [5]. While auditory impairments take access to audio-based content out of the question, captions and transcripts are necessary. Something to remember is that although it's for kids, cognitive disruptions can also encapsulate the child's potential cognition toward complex navigation or dense information, so the design has to be clear and intuitive.

In other words, not all websites and apps are accessible by default, but integrated inclusive design practices can greatly enhance the accessibility of digital functionality with children with disabilities. These practices guarantee that digital content is perceivable, operable, and understandable to all users. But changing the technical means to achieve true inclusivity will not be enough; it needs an ethical commitment to equal access [9]. Noncompliance with legal standards like the Americans with Disabilities Act (ADA), as well as the Web Content Accessibility Guidelines (WCAG), doesn't just represent a legal risk but a risk to our future equity in the digital space.

But barriers exist to accessible design, since many times there is no awareness or resources. In order to address these challenges, we need holistic thinking about accessibility, both from the standpoint of technical as well as ethical issues. It is the understanding that is necessary to help guide developers, educators and policymakers to build digital environments that actually are inclusive for all children.

III. DESIGNING ACCESSIBLE WEBSITES AND APPS FOR CHILDREN

3.1 Visual Impairments

Creating websites and apps that are accessible to visually impaired children is not something that can be accomplished with blinders on. A good example of a need that screen reader compatibility achieved was to enable visually impaired users to understand and navigate content. It involved the structuring of commercial websites, wherein headings and hierarchy were clear, and links were logical and also descriptive. Though many digital platforms rely on images to carry information, alt text used alongside captions that make sense was vital in visual content being accessible [1]. These elements helped screen readers to accurately speak images, for visually impaired children to better understand them.

Both high-contrast modes and grayscale palettes were equally important. Children with color vision deficiencies found that such features helped with visibility, particularly. In addition, scalable fonts were a bonus that offered the user an opportunity to change text size according to their needs. True accessibility, however, was not only visual adjustments. This means it must be consistent in order to ensure a seamless digital engagement of children with varied visual impairments [10]. Besides competing with standards of technical guidelines, the incorporation of these accessibility measures also represented a willingness to ensure that accessibility levels were high for all children.

3.2 Auditory Impairments

Accessible design was essential for creating a positive digital interaction for children with auditory impairments. They played an important role in captions and transcriptions in that users could access audio content without listening to audible sound. While there was basic captioning on most platforms, a more detailed transcription was often needed to be especially nuanced pieces of information accurately [4]. An additional layer of accessibility was contributed by sign language

video overlays that provided a visual language alternative for those children who used sign language to communicate.

Auditory accessibility, however, exceeded simple visual aids. Users could adjust their volume to customize playback and volume speed. To assist children who cannot hear, visual indicators are added for sound, such as flashing icons or visual waveforms, to audio cues [6]. Some of these elements were varied in terms of function, but collectively they brought forth a more inclusive digital space for children with different auditory needs.

3.3 Cognitive Impairments

Designing for young people with cognitive impairments requires a focus on readability and simplicity. Simplified navigation has become critical, with clear menus, intuitive layouts and minimal steps to access key facts. This approach reduced the cognitive load and facilitated a less difficult interplay. Although text-based content material became necessary, the use of clear and concise language aided some understanding. In addition, icons and emblems played a key role; they served as visible cues, reinforced textual content and aided comprehension.

However, certain elements had to be avoided. For instance, waving around the visuals and animation were to be discouraged because they make one right or just an overload for you in the sense [12]. What we instead got was a calm, consistent, and easy-to-use content presentation. These design techniques were to build a digital environment for children with cognitive impairments in which they could effectively interact and traverse with content unencumbered with unnecessary hindrance and distraction.

IV. ACCESSIBILITY TOOLS FOR VIRTUAL LEARNING ENVIRONMENTS

4.1 Visual Accessibility Tools

The usability of virtual learning environments for children with visual impairments was dependent on visual accessibility tools. For example, screen readers translated text into speech and 'read' online content to students. Magnification software also participated in the access work during which text and images were enlarged for those with low vision. While these were the tools that worked, their integration needed to be thoroughly thought through about how digital content would be structured and designed [3].

High-contrast templates for online content were another key feature, offering clarity and fewer visual distractions. These templates contained bold color contrast to have contrasting colors of the elements on the screen for visually impaired students. Yet sustained use of these tools was contingent both upon the software and also continual and generalizable use of design principles in virtual platforms. That provided a holistic approach needed for there to be different visual needs in educational settings.

4.2 Auditory Accessibility Tools

Hearing accessibility tools can help provide a new digital knowledge environment for hard-of-hearing children. This is to give an example of, for instance, captioning equipment along with visually trackable materials for college lectures, for example, so one could follow the speakers. Following this, an audio-to-text software program was used to convert speech into written formats in order to be provided in real-time [4]. While these tools did improve accessibility immensely, using these tools properly also limits any potential communication barriers.

Besides, visible indicators were helpful as cues for potential sounds, including beeps or alarms, to prevent any recording from being unattended. The incorporation of audio description concerning

the visual part of the content began to be important as well, adding voice elements to pictures and diagrams as well as other visual elements. This allowed hearing-impaired students to achieve complete control of content because there were no limitations in the usage of pictorial illustrations [13]. However, the constant and extraordinary usage of these hearing aids has remained significant in enhancing the experience of the digital studio for hearing-impaired children.

4.3 Cognitive Accessibility Tools

Cognitive accessibility tools were very important in supporting children with cognitive impairments in virtual learning environments. Interactive learning tools such as visual organizers etc. improved understanding and participation. Children could decompose complex information into bite-size chunks using visual organizers and thus could recall relevant information. Written content was sonicated by text-to-speech tools into auditory terms, helping children process the text more effectively.

Cognitive accessibility was more than tools, however. To foster focus and reduce overwhelm, techniques designed to reduce cognitive load, in other words, to break inbound information into smaller segments and simplify visual layouts, were required [5]. The learning was not only available but also did not seem inaccessible to learners with differing cognitive capacities.

What's more, the emergence of adaptive learning platforms was a game changer heralding personalized learning experiences. These platforms could deliver the right pace, type, and level of content specifically suited to that child's needs and capabilities based on that child. However, a total, user-centered approach was needed for integrating these tools and techniques, because digital platforms need to take account of the different cognitive requirements of children in educational settings.

V. CASE STUDIES OF SUCCESSFUL ACCESSIBILITY IMPLEMENTATIONS

5.1 Preschools

Virtual Surfers are websites and applications in preschools that easily integrate into children's learning experiences. One example turned into a kindergarten that implemented screen reader compatibility, modes with high ratings, and sparsely populated texts for images. These changes promoted greater involvement of children with visual impairment and assured full participation in the digital acquisition of knowledge of activities [8]. Consequently, these children even affirmed higher recognition and comprehension of the outcome. However, the outcome of this implementation became dependent on the responsiveness to regular change and upkeep of the essential accessibility features that stimulated relevance.

5.2 Elementary Schools

An inclusive virtual environment for mastering aspects of the subject has been developed by the standard faculty and complements several content delivery technologies. Some of these are integrated captioning, audio descriptions, and interactive features focused on the needs of children with hearing or cognitive disabilities [2]. Moreover, the college adopted the 'one size fits all' policy to the design so that all undergraduates, regardless of their disability, can access the digital content with similar ease. Measurable outcomes included participation in different sporting events and higher educational attainment in a remarkable range of sports, especially for college students with disabilities. The methods, however, seem to work, but there is a need for instructors to be continually professionally developed in order to fully exploit the capabilities of the facility.

VI. CHALLENGES AND FUTURE DIRECTIONS

6.1 Barriers to Achieving Digital Accessibility

Overcoming the hurdles of funding to make virtual learning fully accessible for children with disabilities and lack of understanding and resistance to adopting inclusive design practices were some of the hurdles [6]. Though there are these challenging situations, these have stopped to great implementation of smart equipment and platforms.

6.2 Ongoing Updates and Maintenance is required

Digital accessibility tools had to be constantly refined and updated to work. Meanwhile, technology was building, and we wanted to make sure that if we were going to continue being usable, we were going to have to make sure that accessibility features matched up with technology.

6.3 Trends in Accessibility for the Future

The future looked at bringing AI and immersive technologies (VR and AR) together to increase accessibility. The potential for these innovations was to bring more personalized and interactive learning experiences to children with disabilities.

6.4 Recommendations for Educators, Developers, and Policymakers

It is recommended that Educators, Developers, and Policymakers familiarize themselves with the modalities of online platforms like Upwork as well as the work of the new office culture.

Educators, developers, and policymakers should work together to increase digital accessibility [11].

VII. CONCLUSION

Digital accessibility is important for children with disabilities, the report stressed. But there's a lot more still to do on inclusive design approaches. The end result of advocating for accessibility is that students of all abilities are engaged and are better able academically because they are focused in an ideal digital learning environment.

REFERENCES

1. Alper, M. and Goggin, G., 2017. Digital technology and rights in the lives of children with disabilities. *New media & society*, 19(5), pp.726-740.
2. Alves, P., Miranda, L. and Morais, C., 2017. The influence of virtual learning environments in students' performance. *Universal Journal of Educational Research*, 5(3), pp.517-527.
3. Bocevaska, A., Savoska, S., Ristevski, B. and Blazheska-Tabakovska, N., 2018. Analysis of accessibility of the e-learning platforms according to the WCAG 2.0 standard compliance.
4. Borges, L.C., Araujo, M.R., Maciel, C. and Nunes, E.P., 2016, October. Participatory design for the development of inclusive educational technologies: A systematic review. In 2016 IEEE Frontiers in Education Conference (FIE) (pp. 1-9). IEEE.
5. Burke, D.D., Sanney, K.J. and Clapper, D., 2019. Digital Accessibility in the Hospitality and Tourism Industry: Legal and Ethical Considerations. *Wm. & Mary Bus. L. Rev.*, 11, p.371.
6. Fermín-González, M., 2019. Research on virtual education, inclusion, and diversity: A systematic review of scientific publications (2007-2017). *International Review of Research in Open and Distributed Learning*, 20(5), pp.146-167.

7. Kieserling, M. and Melle, I., 2019. An experimental digital learning environment with universal accessibility. *Chemistry Teacher International*, 1(2), p.20180024.
8. Navarro, S., Zervas, P., Gesa, R. and Sampson, D., 2016. Developing teachers' competences for designing inclusive learning experiences. *Educational Technology and Society*, 19(1), pp.17-27.
9. Raja, D.S., 2016. Bridging the disability divide through digital technologies. Background paper for the World Development report.
10. Royackers, L., Timmer, J., Kool, L. and Van Est, R., 2018. Societal and ethical issues of digitization. *Ethics and Information Technology*, 20, pp.127-142.
11. Shinohara, K., Bennett, C.L., Wobbrock, J.O. and Pratt, W., 2017. Teaching accessibility in a technology design course. Philadelphia, PA: International Society of the Learning Sciences..
12. Thompson, E.L., 2017. Legal and ethical considerations for digital recreations of cultural heritage. *Chap. L. Rev.*, 20, p.153.
13. Wilson, N., Thomson, A., Thomson, A. and Holliman, A.F., 2019, July. Understanding inclusive design education. In *Proceedings of the Design Society: International Conference on Engineering Design* (Vol. 1, No. 1, pp. 619-628). Cambridge University Press