

Bridging the Digital Divide: Inclusive Digital Literacy for Individuals with Cognitive Disabilities

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Abstract— This paper introduces an innovative, semi-structured approach that is being implemented at DIGI Lab Siegen, where small groups of individuals with cognitive disabilities participate in a digital literacy course. The program is designed not only to impart technical knowledge but also to foster a sense of inclusion, as participants become familiar with key digital concepts and terminology. Furthermore, the initiative aims to facilitate digital inclusion, assistive technology adoption, and long-term sustainability by ensuring continued learning opportunities and community engagement. This concept, still in its early stages, raises questions about scalability, adaptability, and the long-term impact of semi-structured digital inclusion models.

Keywords— *digital literacy; cognitive disabilities; assistive technology; inclusion; digital divide.*

I. INTRODUCTION

Despite rapid advancements in Information and Communication Technologies (ICT), a significant portion of the population, particularly individuals with cognitive disabilities, remains at risk of digital exclusion [1]. Digital technologies have become an integral part of modern life, influencing everything from accessing government services to securing employment and maintaining social connections. However, for individuals with cognitive impairments, these advancements often serve to widen the gap rather than bridge it. Although employers may express inclusive intentions, the practical provision of digital tools and support for individuals with intellectual disabilities remains limited [2]. This lack of systemic support is evident not only in the workplace but also in educational settings: in many low- and middle-income countries, the implementation of adapted digital education for students with intellectual disabilities is still in its early stages, with only a minority of schools modifying curricula or providing appropriate digital tools and support [3].

This exclusion contributes to a growing digital divide, where affected individuals struggle to fully participate in modern society, reinforcing broader patterns of social inequality [4]. It is exacerbated by inflexible instructional formats and the limited adaptability of assistive technologies. Although accessibility standards have improved over time, people with cognitive disabilities still encounter numerous challenges in navigating most websites and digital applications [5]. Moreover, many digital inclusion initiatives continue to adopt standardized instructional models rooted in a “one-size-fits-all” philosophy [6]. These models often assume uniformity in learners’ needs, learning styles, and

cognitive abilities, which can hinder meaningful engagement for individuals with cognitive disabilities. To effectively support this group, more flexible and personalized instructional frameworks are needed.

DIGI Lab Siegen seeks to address this issue by providing a space where individuals with cognitive disabilities can collaboratively improve their digital literacy. The initiative is grounded in three core objectives:

- Empowering individuals with cognitive disabilities to use digital tools and actively participate in society.
- Enabling personalized adoption of assistive technologies by supporting guided, hands-on exploration and recommending suitable tools based on individual needs and observed interaction patterns.
- Supporting long-term digital engagement through an iterative, needs-responsive model anchored in local collaboration and practical contexts.

The rest of the paper is structured as follows. In Section II, we describe the structure and content of the semi-structured training sessions. Section III reflects on scalability and future adaptations. Section IV offers conclusions and outlines future work directions.

II. DIGITAL LITERACY TRAINING AT DIGI LAB SIEGEN

To develop an inclusive and adaptive digital learning environment, it was essential to identify participants whose needs and capabilities aligned with the goals of the program.

Participants were recruited through the University of Siegen’s partnership with a local organization that supports individuals with cognitive disabilities. Age was not a selection criterion. Instead, participants were selected based on the following functional capabilities:

- The ability to understand simple instructions and express basic needs.
- The capacity to concentrate for at least 15 minutes.
- The willingness to collaborate in group settings and follow basic social norms.
- Sufficient motor skills to operate a keyboard or mouse, or the ability to interact with digital devices through alternative input methods such as voice control.

This approach enabled the inclusion of a diverse group of learners and laid the foundation for adaptive, individualized instruction.

The DIGI Lab Siegen model is built around a semi-structured, iterative approach. Participants were assigned to

small groups of 3 to 4 individuals. Each session consisted of 45 minutes, followed by a 10-minute break and another 35-minute block. This structure is designed to align with typical attention spans observed among individuals with cognitive disabilities.

Unlike traditional digital literacy programs that assume a linear learning process, this initiative acknowledges that understanding develops gradually, and that full retention of information is not the primary goal. Instead, the emphasis is on fostering familiarity with technology, regular interaction, and confident navigation in digital environments.

Each session begins with a brief theoretical explanation, presented in simple language and supported by visual aids. To ensure comprehension, participants are encouraged to ask and answer questions. The session then moves on to skill-building games that reinforce core concepts such as clicking, dragging, tapping, and scrolling through playful interaction. Some games are designed with controlled failure mechanisms (e.g., ending after a set number of mistakes), while others permit continued play despite errors, thereby helping to reduce anxiety related to performance. If a particular game is found to be unsuitable or ineffective for a participant, a customized alternative is prepared for the following session. After the game segment, participants practice real-world tasks, followed by a short review and occasionally repetition of previous games to reinforce long-term learning. The program's flexibility allows content to be adjusted based on participants' individual progress. This learner-centered, responsive approach encourages participants to engage with digital environments confidently and autonomously.

One of the most important aspects of the DIGI Lab Siegen model is its focus on social and cognitive inclusion rather than solely on technical training. Through participation in semi-structured lessons, individuals with cognitive disabilities gain more than functional knowledge. They become better equipped to take part in everyday digital communication that might otherwise remain inaccessible to them. Even basic familiarity with digital concepts enhances their ability to interact with family members, caregivers, and broader social networks.

DIGI Lab Siegen also integrates assistive technology testing into its program. By continuously analyzing participants' needs and collaboratively evaluating existing solutions, the lab supports individuals in identifying the most effective and personalized tools for improving their interaction with technology.

III. SCALABILITY AND FUTURE CONSIDERATIONS

As the DIGI Lab Siegen model evolves, future research should explore how specific cognitive characteristics influence learning outcomes in semi-structured environments. Longitudinal observation may help uncover patterns in knowledge retention, attention, and motivation, providing a foundation for designing adaptive tools and instructional strategies that better align with individual learning needs.

Although DIGI Lab Siegen is currently a localized initiative, it offers a flexible framework that could be

transferred to other contexts. This raises key questions for future implementation:

1) *How can semi-structured digital literacy training be customized for different cognitive abilities and learning paces?*

2) *How can out-of-classroom interactions with technology be supported to encourage the practical application of acquired digital skills?*

3) *How can this approach be replicated in different cultural and socio-economic contexts?*

By addressing these questions, future research and initiatives can build on the DIGI Lab Siegen experience to develop broader strategies for digital inclusion.

IV. CONCLUSION

Digital literacy programs for individuals with cognitive disabilities must go beyond conventional approaches. The DIGI Lab Siegen model offers a semi-structured, group-based learning experience that prioritizes familiarity, confidence, and inclusion over rigid technical mastery. Participants gain exposure to key digital concepts, helping them feel more engaged and integrated into society. While the initiative is still evolving, it provides a compelling case for rethinking digital literacy as an iterative, socially embedded process rather than a one-time educational intervention.

As this idea is being presented, a discussion is encouraged on ways in which semi-structured, small-group digital literacy training might be refined, expanded, and adapted to different contexts, ensuring that individuals with cognitive disabilities are not only users of technology but also confident participants in digital society.

REFERENCES

- [1] Y. Wang et al., "Digital exclusion and cognitive impairment in older people: findings from five longitudinal studies," *BMC Geriatrics*, vol. 24, p. 406, 2024, doi:10.1186/s12877-024-05026-w.
- [2] E. Dean, V. Garrels, H. Sigstad, and C. Wendelborg, "Employer willingness to hire people with intellectual disability: The influence of employer experience, perception of work, and social responsibility," *Journal of Vocational Rehabilitation*, vol. 57, pp. 1–11, 2022, doi:10.3233/JVR-221201.
- [3] K. Sunardi, M. Yusuf, G. Gunarhadi, P. Priyono, and J. L. Yeager, "The implementation of inclusive education for students with special needs in Indonesia," *Excellence in Higher Education*, vol. 2, no. 1, pp. 1–10, 2011.
- [4] K. Björnsdóttir, H. S. Gunnarsdóttir, and E. D. Gunnarsdóttir, "The digital exclusion of people with intellectual disabilities during the COVID-19 pandemic," *Scandinavian Journal of Disability Research*, vol. 26, no. 1, pp. 523–535, 2024, doi:10.16993/sjdr.1131.
- [5] S. Gartland et al., "The state of web accessibility for people with cognitive disabilities: A rapid evidence assessment," *Behavioral Sciences (Basel)*, vol. 12, no. 2, p. 26, 2022, doi:10.3390/bs12020026.
- [6] E. R. Pagaduan and L. R. Natividad, "Uniformity or uniqueness? Rethinking the 'one-size-fits-all' approach in education," *SSRN*, Jan. 8, 2025. [Online]. Available: <https://ssrn.com/abstract=5086464>. doi:10.2139/ssrn.5086464