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Fostering Media and Digital Literacies to Visually Impaired Students: Challenges and Solutions

Olga Pechinkina [a, *], Tatiana Vepreva [a]

[a] Northern (Arctic) Federal University named after M.V. Lomonosov, Russian Federation

Abstract

Visually impaired students (VIS) face challenges in developing media and digital literacies, which are essential for academic success, personal independence, and social participation. This review article synthesises theoretical and empirical research on these challenges and corresponding solutions within higher education. The analysis reveals that while visually impaired students often possess strong technical and operational digital skills due to their reliance on assistive technologies, persistently they experience difficulties with cognitive and social-emotional dimensions. The former concerns critical evaluation of the information and trustworthy information sources; the latter implies collaboration, secure online communication and media product creation. Meanwhile, students with visual impairment encounter a number of obstacles that hinder their development and efficiency, such as digital content that turns out to be inaccessible, sighted peers and faculty which do not realise challenges VIS are permanently faced with, assistive technologies that even being updated do not allow some ordinary activities, for instance, skimming and scanning texts. Solutions operate at multiple levels: societal awareness campaigns, proactive university policies, lecturer training, advance preparation of accessible materials, alternative assessment formats, and technological innovations including screen-reader-compatible collaborative tools, audio description for films, and real-time image quality feedback. Digital competence for visually impaired students should explicitly prioritise accessibility, self-advocacy, and troubleshooting skills. Fostering media and digital literacies among visually impaired students is framed as a matter of equity, human rights, and social justice requiring coordinated efforts from researchers, educators, policymakers, and technology developers.

Keywords: visually impaired students, information literacy, media literacy, digital literacy, digital competence, screen readers, information access, inclusive environment, sighted peers.

1. Introduction

Media literacy is a continuously developing skill that cannot be finally formed as new technologies, agencies, factors, aspects, circumstances, etc. appear, and an individual has to master this skill intentionally and persistently. Nowadays when we interact with a huge amount of information sources and innumerable media texts, constantly identify trustworthy and fake information, become familiar with new technologies, we clearly realise that this skill is indispensable. Moreover, we should always remember that access to information is considered to be a fundamental human right. Owing to researchers, educationalists, and specialists in various fields, an extensive array of approaches, methods, techniques, means, and instruments aimed at developing media literacy is available. Scientists all over the world contribute to its growth and

* Corresponding author
E-mail addresses: o.pechinkina@narfu.ru (O. Pechinkina)

expansion for various target audiences, different spheres, and diverse goals. But just close your eyes and imagine that you need to find some information, access it, evaluate it, analyse it, and create a new media text without seeing anything. Studies show that people with disabilities face functional barriers in both analogue and digital technologies, leading to widespread exclusion due to limited access and usability tailored to their needs (Malik et al., 2024). Those without disabilities often fail to grasp or prioritise these accessibility requirements. Everyday tasks – like answering phone calls, reading bills and invoices, captioning audio, or navigating websites – demand inclusive design to integrate people with disabilities into mainstream social networks. Thus, visually impaired (VI) people have to acquire these skills like anyone else as they are required to possess the same depth and width of knowledge in all subjects they study and progress but they should do even more, as their interaction with numerous sources of information is mediated with some additional technology. Media literacy and corresponding skills are the crucial elements for personal independence and augmented quality of life for VI people as they help "take jobs, communicate and learn, and thus expand the world of blind and visually impaired persons in many significant ways" (Weigand et al., 2013: 191). As for everyday life, researchers state (Khowaja, 2021) that persons with visual impairments need double education in comparison with the sighted ones because they cannot get many professions such as plumbers, drivers, constructors and others, so, education becomes crucial for them, gives financial autonomy and independence.

According to World Health Organization (https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment) at least 2.2 billion people have a near or distance vision impairment. The reasons of the impairment can be different as well as the level of it but every third or fourth person can face challenges incited by eye issues. Here one disputable situation arises: in official and non-official documents people with an impairment (visual, hearing, etc.) are named disabled. Meanwhile, an individual with the impairment may not pay attention to how they are perceived and they do not perceive themselves as disabled, but their peculiarity can determine how the society conceptualise them due to powerful social constructions of disability (Quirke et al., 2018). Although many visually impaired students (VIS) have positive social experience, one-third of all students with visual impairment certified that they feel lonely, isolated and dissatisfied with social interaction (Miyauchi, 2020). Considering schoolchildren who are younger than students, they "have difficulties with technical and communicative aspects, lack knowledge about risks and dangers of on-line communication, it is hard for them to create a media product" (Voronova, 2021: 157). It turns out that visually impaired people may often have rather high levels of technical and cognitive sub-factors of digital skills but lower levels of the social sub-factor (Arslantas, Gul, 2022). As digital instruments are indispensable for VIS to access information, they master them quickly and confidently, whereas skills in information management, effective collaboration, communication, and proper media texts creation can lag behind.

Social media are an integral part of the contemporary society, and people with visual impairments are their active users but quite often the content of social networks such as pictures, videos remains inaccessible for VI users (Bühler, Pelka, 2014). Complexity of the information, its amount, difficult language, navigation options, pop up advertisements, timed response requirements, etc. worsen the situation.

In the domain of higher education, it is vital for all students to develop digital literacy (Arslantas, Gul, 2022; Fedorov, Levitskaya, 2015; Tinák, Gálik, 2026). And it is much more vital for visually impaired students as modern technologies offer wide possibilities to mitigate the impairment and actively participate in society. Computers have become instruments that help people with visual impairment to carry out "their ADL (activities of daily living) tasks at home and at work" (Bühler, Pelka, 2014: 17). It is realised in two ways. Firstly, digital media support everyday life offline tasks, for example, communication, and orientation. Books turn out to be easily reachable due to audio versions of e-books (Fume et al., 2014). Secondly, they facilitate access to societal offers and discourses. Thus, some barriers become surmountable. Meanwhile, new technologies require new knowledge, skills and competencies that could empower VI people to manage constantly upgrading technologies (Bühler, Pelka, 2014). Hence, digital literacy becomes indispensable for VI individuals to boost their media education and master their media literacy, meanwhile ICT is considered to be "the great equaliser" for visually impaired persons (Arslantas, Gul, 2022) as it helps overcome barriers people with impairments can face. Groupmates as well as university teachers should also be aware of and handy with the digital instruments used by VIS as

this knowledge and skill allow them to facilitate interaction with VIS, increase their participation in education, and enhance their professional growth.

Nowadays digital literacy is a comprehensive concept that embraces three dimensions (Arslantas, Gul, 2022). These key dimensions include: technical or operational aspects (such as locating and installing software, storing and transferring data, managing peripherals); cognitive skills (involving critical thinking when searching for and evaluating information, choosing appropriate software, and producing one's own media content); and social-emotional components (using technology for social interaction, communication, and learning while being conscious about personal privacy and safety) (Arslantas, Gul, 2022).

However, studies have shown that individuals, so called "digital natives" who were born after the digital technologies became a part and parcel of everyday life, tend to be skilled at locating and retrieving information, navigating search engines with ease, and engaging in online communication without hesitation. Yet, they may struggle with critically evaluating the information they find, telling reliable sources apart from unreliable ones, and even producing their own digital content (Arslantas, Gul, 2022). This finding led researchers to the conclusion that being born in a digital world does not mean empowering one's digital literacy.

As for visually impaired students, research proves (Arslantas, Gul, 2022) that most of them possess basic ICT skills (they can write and manage documents, send e-mails, communicate, realise online banking, search, for instance, health information, etc.), they know how to face technology-related obstacles but there are more options to increase their participation and performance in education. Researchers (Arslantas, Gul, 2022) highlight the fact that there are still cases when VI citizens lack digital literacy skills to master mobile learning technologies and environment and they are not keen on checking the accuracy of the information retrieved. Moreover, the researchers studied factors that may influence the digital literacy skills of VI people and concluded that these can be types of visual impairment, the duration of technology usage, the age of starting to use the technology, and school type. Nonetheless in our research we do not focus on the reasons and factors that determine the level of media and digital literacy of an individual but try to make challenges that face visually impaired students more visible and salient for the community and motivate for the search of solutions to handle the current situation.

Therefore, this article seeks to provide a systematic review and analysis of contemporary scholarly research concerning the obstacles that students with visual impairment encounter when acquiring media and digital literacy skills, to identify and present evidence-based solutions and recommendations for mitigating these challenges within higher education and digital society. To achieve the aim, a number of objectives should be fulfilled. Firstly, we conceptualise the key frameworks of media literacy, digital literacy, and digital competence specifically tailored to the needs and contexts of visually impaired students. Secondly, we identify the primary challenges that visually impaired students encounter when accessing information, evaluating digital content, using assistive technologies, collaborating, communicating, and creating their own media texts in academic and everyday settings. Thirdly, we synthesise existing solutions, pedagogical models, technological innovations, and recommendations proposed by researchers and practitioners. Finally, we formulate a set of practical, multi-level recommendations for lecturers, university management, technology developers, and society to foster a more inclusive digital environment for visually impaired students.

2. Materials and methods

This article is a narrative review of the scientific literature concerning the development of media and digital literacies among visually impaired students, with a particular focus on the challenges these students face and the corresponding solutions proposed by researchers and practitioners. The review synthesises theoretical and empirical studies published in peer-reviewed journals, conference proceedings, and other academic sources. Studies were included in the review if they met the following criteria: (a) they addressed media literacy, digital literacy, or digital competence in the context of visual impairment; (b) they focused on educational settings (primarily higher education, though some studies on schoolchildren were also considered); (c) they presented empirical findings, theoretical frameworks, pedagogical models, or practical recommendations; and (d) they were published in academic sources such as peer-reviewed journals, books, or conference proceedings. The selected sources were analysed using theoretical methods, including analysis, synthesis, comparison, and generalisation.

3. Discussion

Nowadays media education and media literacy of people with visual impairment depend on digital technologies and assistive technologies that are utilised "to increase, maintain, or improve the functional capabilities of persons with disabilities" (Ayiah, 2017: 3) and include "hardware, software, and web-based resources like touch-screen technologies, large-screen monitors, optical scanners, light boxes, specialised keyboards, headsets with microphone, screen readers (such as JAWS, NVDA, Window Eyes, VoiceOver, etc.), speech-to-text converters, and browser add-ons with easy access to magnification or talking dictionaries" (Ayiah, 2017: 3), Braille displays and speech output (Weigand et al., 2013). The list can be enlarged with virtual worlds, virtual reality, etc.

One more concept should be cited – inclusive media, "a term that describes techniques, methods and theories for making media, in its many forms, more accessible to persons with disabilities" (Fels, 2014: 1). To name a few, inclusive media comprise, for example, closed captions or subtitles designed for individuals who are deaf or hard of hearing (when spoken speech is transformed into the written one) and audio description for people with visual impairments (when the audio track is complemented with audio description of meaningful visuals). Here one challenge arises – when the text is translated from one medium to another, meaning can be lost as the context and specific elements become unavailable, thus, the quality of the original text may be reduced or lost (Fels, 2014).

When students with some disabilities enter the higher education institutions, they face a number of obstacles although they already have experience in studying and research. One of the obstacles is readiness of the institution to accept such students, even if the institution possesses various assistive technologies and equipment (Amin et al., 2021; Quirke et al., 2018). Researchers emphasise that the reason of a low level of VIS entering the university is not the impairment itself but insufficiency of learning opportunities and support (Quirke et al., 2018). Frequently, the faculty staff, peers, lecturers and students lack appropriate detailed knowledge about particular impairment and are not familiar with services and equipment available on campus. This hampers not only educational process but communication as well.

According to the research (Amin et al., 2021), five visually impaired students were exposed to an in-depth interview. Later, the responses were thoroughly analysed and the researchers formulated five main challenges visually impaired students face in their life: financial issues, social stigma, accessibility, peer acceptance, and difficulty in studying at higher educational institutions. The first challenge, financial one, is common for many university students (both visually impaired and sighted) who do not receive scholarship or consider it inadequate.

The second challenge is the stigma of society when some deviations from the established norms may lead to negative perception and labelling. Although university students are mainly accepted by their peers, it happens that their impairment can overweight their abilities in peers' perception. Besides, it was also emphasised that campus residents, even support staff, sometimes have low level of understanding of VIS needs and limitations, the number of staff and lecturers qualified to support VIS is limited or they feel unprepared (Miyauchi, 2020).

The third challenge lies in twofold accessibility. One of it is accessing information, reference materials, etc. both in digital and print forms. To read print materials, a special computer or device is needed, whereas not all departments, faculties and services are equipped. As for digital form, not all screen-readers decipher all formats, for example, some of them can hardly read PDF format or tables, almost none of them can access formulae. Moreover, as the research shows (Bohnsack, Puhl, 2014), only one out of five MOOC-platforms tested was accessible for persons with visual impairment, others had some technical shortcomings from the point of view of VIS with respect to accessibility and navigation; meanwhile, MOOCs (Massive Open Online Courses) are a feasible opportunity for VIS to pursue their studies. Thus, a new term was introduced – E-Accessibility – that refers to the fact that assistive technologies used by VI people guarantee the accessibility of digital content (AlOshan, 2013).

Furthermore, accessing information with special equipment requires additional time. The study proved that students with visual impairment need triple amount of time for an assignment as compared with sighted peers (Al-Mouh et al., 2014).

Another accessibility challenge is a spatial one. Though visually impaired students orient rather well in the space they are familiar with, they may encounter difficulties when traveling to locations they seldom visit. Although most universities offer walkways and other pedestrian infrastructure, these facilities can sometimes fall into poor conditions, caused by factors like

precipitations and weather in general or vehicles breaking the traffic regulations on campus. The fourth challenge concerns peers' acceptance. Peers can be supportive and understanding but only few of them become close friends to VIS. The fifth challenge is educational process at the university that requires attending lectures, completing assignments, taking exams and quizzes. All these activities frequently include visual teaching aids, whiteboards that are inaccessible for students with visual impairments or require special equipment and time.

Assistive technologies intended to help VI people still may not always be supportive due to the following factors: 1) the use of the computer mouse is out of reach and is replaced by keyboard functions that is not so handy, 2) screen readers recognise text-based materials leaving graphic information aside or requiring additional software, and 3) screen overview is inaccessible for VI people depriving them of fast survey or quick understanding but requiring enduring line by line reading.

Meanwhile, some competencies and skills of VI people can counterbalance the abovementioned challenges: 1) fluent typewriting enhances chances to interact with the text, 2) reading and writing Braille becomes an alternative and proves patience and self-discipline, 3) courage to familiarise with additional software and hardware such as Braille displays, video magnifiers, scanner, etc. master their practical skills. The challenges VI people face and training they undergo to meet challenges result in additional competencies, namely, the ability to visualise concepts mentally, a more profound technical grasp of how applications and devices operate, improved knowledge of navigating an application's layout, features, and controls, along with strong memory retention to recall all commands and functions effectively (Weigand et al., 2013).

Talking about required skills and competencies, we should specify several concepts, namely, information literacy, media literacy, digital literacy, and digital competence, as they all are crucial and indispensable for people with visual impairment.

Should *information literacy* of VI people be on basic level or should it achieve higher levels? Generally, information literacy can be interpreted as a repertoire of skills involved in determining the extent of information needed, then accessing, evaluating, and synthesising it for a specific purpose (AlOshan, 2013). To search for information, the vast majority of VI participants interviewed (94 %) rely on search engines as their primary daily information source; they also trust their friends and relatives (78 %) and social media (67 %) when they need information on the topic. Official websites and libraries are among the rarely cited sources. To evaluate the information, VI respondents pay attention to timeliness and authority when assessing web-based information, ranking currency (n = 31) as the most important criterion, followed by author credentials (n = 26). They also assessed accuracy through citation (n = 24), author subjectivity (n = 22), and website familiarity (n = 21). Conversely, mentions by librarians or URL origins were of minimal concern. The most commonly cited difficulty among VIS (n = 25) was determining the credibility of sources, reflecting their efforts to validate information. Similar difficulties were connected with assessing information (n = 23), being aware that an answer is available online but failing to find it (n = 22), creating prolific search queries (n=21), and rejecting irrelevant results (n = 21) (AlOshan, 2013). According to the same research (AlOshan, 2013), starting a search, clarifying the search scope, and finalising the search were considered the least challenging tasks.

The definition of *media literacy* was summarised by A. Voronova as "the whole set of ideas regarding the rules of behaviour and communication, risks and dangers of media space, skills and capabilities necessary for work in the media sphere in order to solve educational tasks and to communicate with the society" (Voronova, 2021: 156), the skills to operate both hardware and software for work in the media sphere are also incorporated. With the focus on the inclusive education context, the researcher introduced a model of media literacy training with its peculiarities, mechanisms and conditions (Voronova, 2021). The aim of the model was to foster media literacy among students with special needs in the context of media education. The objectives to be realised were to: 1) "teach the notion "media literacy" to the school children with special needs, 2) teach the rules of behaviour, communication, risks and dangers in the media sphere to the students, 3) teach the necessary skills for work in media sphere to the school children with special needs" (Voronova, 2021: 158).

The suggested model relies on the theory of media education, activity approach to personality development, systematic approach, and reflexive approach. The principles underlying the model are: "principle of taking individual abilities into consideration, "no harm" principle, principle of motivation and personal motives formation in order to lay foundation for media literacy, and principle of pedagogical optimism" (Voronova, 2021: 158). The content incorporates

"the awareness of "media literacy" concept; knowledge of behaviour rules, rules of communication, risks and dangers in the media space; skills of using computers, gadgets and media space; media space understanding, the ability to create media products; the development of critical thinking, communicative skills, cognitive activities, creative thinking; the development of value systems regarding the use of media" (Voronova, 2021: 158).

The model will be feasible while meeting the following conditions: 1) information support both for parents and teachers, 2) extracurricular activities focused on media literacy training such as trainings themselves, thematic sessions, individual project activities, panel discussions, debates, and visual materials (Voronova, 2021). The researcher claims (Voronova, 2021) that if all the prerequisites are met, the model is supposed "to develop critical thinking, information selection skills (for the information coming from media sphere) among children with special needs; to develop communicative skills among the children with special needs via Internet use; to train media literacy among school children with special needs and to teach them the ideas concerning the role media literacy plays nowadays; to decrease the risks of internet addiction disorder among school children with special needs" (Voronova, 2021: 159).

Digital literacy is a comprehensive concept encompassing the skills required for effective functioning in a digital environment. The researchers conceptualise digital literacy through three intersecting dimensions: technical, cognitive, and social-emotional. The technical dimension involves operational proficiencies, including device management, file protection, troubleshooting, and data transfer. The cognitive dimension pertains to critical thinking for evaluating digital information, selecting appropriate software, and creating content that demonstrates understanding. The social-emotional dimension addresses responsible online interaction, communication, learning, and the safeguarding of personal safety and privacy (Arslantas, Gul, 2022).

The research carried out in Turkey analysed digital literacy experiences of people with VI (60 interviewees) (Arslantas, Gul, 2022). The results can be grouped in five themes. The first one is ICT knowledge and usage. This theme covers technical proficiency with devices and software for text editing, browsing, file management, software installation, and Web 2.0 tools. The respondents claimed that smartphones dominated daily use and computers were only for homework. A significant gap was identified: all students were confident smartphone users, but only two felt similarly about computers due to mobility, voice-over quality, voice recognition, navigation, and keyboard usability. iOS was universally preferred over Android for voice-over quality. Most had basic computer skills (navigation, file management), but only two could install software independently. Text editing was common but limited to basic operations; only two had spreadsheet skills; none used presentation software or knew formatting/layout. Browsing was unproblematic, though information accuracy was rarely checked. Summing up, the respondents highlighted such key challenges as software accessibility, limitations in image recognition and voice-over apps. These barriers, particularly affecting digital content creation, prevented progression beyond basic skills.

The second theme was communication. Social media was the primary communication channel for all, reducing dependency on others and enabling quick help access. Email was universally used for homework and file sharing. Two digital literate participants used video-based tools; others preferred text or voice via messaging apps. The most frequent challenges turned out to be miscommunication through dictation apps and image-based content. Some interviewees avoided photo-based platforms due to anxiety about understanding image content, despite auto-captioning improvements.

The third theme was collaboration. ICT collaboration tool was mostly unfamiliar and avoided. Though some respondents were aware of such tools, none had online collaboration experience. The interactive complexity prevented usage.

The fourth theme was information management. Most interviewees accessed online information (digital libraries, news, Wikipedia, forums) and could locate specific content. Digitally competent participants organised information via note-taking apps and cloud services; others used only basic computer functions (folders, file operations). Information evaluation was a major challenge, assessing source reliability and extracting pertinent information was the most difficult aspect.

The final theme was professional development. All respondents viewed digital literacy as essential for professional environments and career development. One teaching student noted digital literacy skills were necessary to avoid ridicule from future students. These skills were seen as enabling computer-based task management despite physical difficulties. One participant planned to learn programming for remote work (Arslantas, Gul, 2022).

The question is if the definition of *digital competence* for VI people differs from the common one. Such question arises as people with visual impairment need some specific skills and technology competencies to cope with search, access, analysis and evaluation of the information required. The recent research (Kamei-Hannan et al., 2023) summarises the general definition of digital competence as a comprehensive skill set that enables individuals to interact with technology and digital content in a thoughtful, proficient, and ethical manner. It involves the practical capacity to operate digital devices and navigate online structures, along with the intellectual ability to seek out, scrutinise, and determine the reliability of digital information. Moreover, it should include the creativity to produce content and the awareness to communicate and share it effectively. Crucially, it also demands a strong sense of responsibility, encompassing the protection of personal privacy, adherence to legal and ethical standards, and the demonstration of respectful and constructive behaviour within online communities.

With respect to VI people and their needs, the same research broadens the definition of digital competence needed by people with visual impairment considering four components: 1) selection, use, and troubleshooting technology, 2) creation of content, 3) critical evaluation of information, and 4) safe and responsible behaviour in digital environments (Kamei-Hannan et al., 2023). The definition claims that "digital competence is the knowledge, skills, and ability to efficiently and effectively select, use, and troubleshoot technology tools to access, design, create, consume, synthesise, and communicate information, while critically evaluating the authenticity, validity, usefulness, and appropriateness of content, including the ability to engage with others through safe and responsible behaviour in digital environments" (Kamei-Hannan et al., 2023: 11). Thus, the definition of digital competence for students with visual impairments emphasises accessibility, including access to multiple devices for task completion, it encompasses skills in problem-solving, self-determination, and self-advocacy, enables students to troubleshoot technology and articulate technical needs.

The researchers critically analysed skills required by VIS and provided a list of digital competencies that included 41 competencies, among them such as "Braille transcription, customising settings, device gestures, device procurement, digital citizenship, email, embosser and printer use, environmental awareness and individual adjustments, Internet access, keyboard commands, learning platforms, low vision accessibility skills, multi-media presentations, recreational use, touch typing, troubleshooting, accessibility knowledge, digital advocacy, media selection, resource awareness, science instruments, visual interpreting, wearable technology, webinar software" (Kamei-Hannan et al., 2023: 13) and others.

Finally, the researchers provided a scheme (Kamei-Hannan et al., 2023: 15) interpreting digital competence for VI citizens, where 1) digital literacy is a component of digital competence being of a higher order, and 2) digital access is an indispensable element for all VI people as they interact with the information mainly with the help of digital tools (Figure 1).

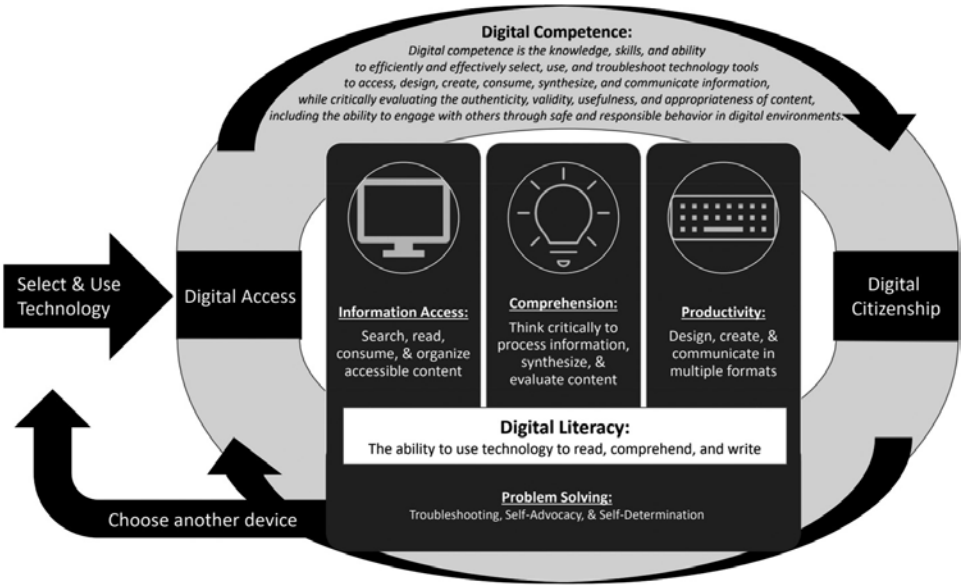


Fig. 1. Digital competence framework

At the university students are taught to create academic texts where text structure plays a significant role. Whether it is an oral presentation or a written research paper, the structure predetermines the logic and the form. For instance, one of the conventional structures of a research paper is IMRaD structure. So, the readers are sure to find some background information and the aim of the study in the introduction section, methodology used in the research – in the material and methods section, findings of the investigation – in the results section, and interpretation of the outcomes – in the discussion section. The only glance at the texts allows to choose the required section or find appropriate information, even if the sections are not titled. But perception of the text and creation of one's own texts remain a challenge for visually impaired students (Sorin et al., 2014). Digital materials – including web pages, spreadsheets, text files, and similar formats – are primarily designed for visual perception. For this reason, a large amount of information is conveyed through spatial arrangement in such formats as text or more complex formats, for example, tables, charts, images, etc. Every salient block in the text has its aim and structures the message of its author; every structural object of the text has different properties and interacts with other text's objects, making visual perception of the text crucial for its understanding by the readers (Sorin et al., 2014). The challenge is how to make these objects and logic outlined by them accessible for students with visual impairment. Keeping in mind that the interaction of VIS with the text is realised with a text-to-speech instrument, some recommendations should be considered. Firstly, titles and subtitles can highlight logical structure of the text as headings properties will help VIS build a better mental representation of the document, enhance memorisation and stimulate prior knowledge (Sorin et al., 2014). Headings can be typed in bold or emphasised with indents making them salient for text-to-speech instruments. If possible, headings should be read by a different voice than the rest of the text. Secondly, enumerations can focus on a hierarchy or a variety of objects, especially, if the lists are presented with the indentation.

Formatting still remains time-consuming and challenging for VIS, though they are required to present numerous academic texts throughout their studies at the university and professional texts afterwards. If the text is edited awkwardly, it is likely to be misinterpreted and dismissed. Although word processors along with a screen reader software can tackle the issues, "the task can be painstaking, tedious, slow, frustrating, overwhelming, and sometimes impossible" (Morales et al., 2014: 635). Meanwhile, the skill to format the documents is crucial for VIS as it maintains their independence, mitigates a barrier towards equality, makes them more competitive in educational and professional settings, and finally, ensures one's quality of life. Sometimes, in the cases when written texts are required, people with visual impairment frequently could rely on sighted peers to meet the text standards, namely, formatting and layout. But occasionally such help is not available or not cheap and visually impaired people still need a tool to format their documents independently. Within the research, scientists (Morales et al., 2014) interviewed both VIS and sighted people who helped the former format the documents to identify formatting strategies and problems. The results show that most VIS start writing their documents with the plain text without any formatting, afterwards they scrutinise the text line by line to find out content errors, and finish with rereading line by line to format it. Doing so, they encounter some problems such as indentation, font styles, footers and headers when using Braille technologies, or listening to every space, moving back and forth while listening to screen readers. Some prototype tools were created but still they are not in widespread use.

In academic and professional settings, collaborative writing has become increasingly prevalent, supported by a range of digital tools such as Google Docs, Overleaf, and Microsoft Word. However, the accessibility of these platforms remains a critical concern for individuals who are visually impaired. Based on semi-structured interviews with 20 visually impaired academics and professionals, the study (Das et al., 2019) identifies four interconnected challenges: 1) managing an evolving ecosystem of largely inaccessible tools, 2) navigating complex collaborative awareness features, 3) weighing the burdens of advocating for accessibility against their benefits, and 4) contending with power dynamics shaped by ableist and professional hierarchies. Addressing these issues is essential for reducing inequities in higher education and the workplace.

The researchers (Das et al., 2019) formulated recommendations how to make collaborative writing more efficient with respect to VI peers: 1) adopt screen reader-compatible practices: use inline comments with special characters (e.g., initials, semicolons) for inline readability; avoid nested replies or overlapping comments; employ divide-and-conquer for independent sections to minimise real-time conflicts; 2) enhance awareness negotiation: sighted collaborators should read

changes aloud in co-located sessions, flag key edits via email, and tolerate asynchronous workflows; teams should establish norms early, humanising accessibility discussions with humour or transparency; 3) design implications for tools: integrate spatial audio, varied voice qualities (pitch, timbre), or summarisations for edits/comments; enable bidirectional notifications (e.g., unread alerts to sighted users); display screen reader compatibility pre-update; 4) realise organizational strategies: leaders in power should mandate accessible tools; train on interdependence to redistribute invisible labour; prioritise usability beyond basic compliance, fostering inclusive socio-material configurations.

Challenges of VI people in taking pictures can also be vanquished. Thus, the researchers (Mandal et al., 2023) elaborated a new database intended to serve as a basic tool for developing models, and algorithms derived from them, that are able to accurately predict and provide feedback on the perceptual quality and distortions present in pictures. This multi-task deep learning model simultaneously predicts overall image quality and seven distortion types (blur, shakiness, overexposure, underexposure, noise, none, other) and a guided photography framework provides real-time audio/text feedback on distortions and suggests corrective actions.

While interacting with social media, we cannot but face emoji – a thing that can be challenging for VI people. Therefore, to mitigate the challenge, recommendations were formulated for both parties: sighted and VI communicators (Tigwell et al., 2020). The former are kindly requested to: 1) limit the number of emoji. Repeated emoji cause screen readers to announce each descriptor individually, leading to frustration. That is why one emoji would suffice; 2) be mindful of placement. It is reasonable to avoid putting emoji in usernames or at the beginning of posts. It is better to place decorative emoji at the end of content so screen reader users can skip them. Communicators should remember that a screen reader reads an emoji as its text descriptor (e.g., "sun"), not the intended emotion ("sunny"); 3) not convey critical information via emoji alone. Descriptors often do not match visual intent or context. The addresser should ensure that essential meaning is also expressed in plain text; 4) consider the reader. On public platforms while posting any text the addresser should keep in mind that emoji will be encountered by visually impaired people. That is why it is important to evaluate the content's accessibility before sharing.

For visually impaired people (especially screen reader users) the researchers suggest to: 1) learn screen reader's settings. Some screen readers (e.g. NVDA) allow to reduce repeated emoji announcements (e.g. reading "three laughing faces" instead of repeating the descriptor); 2) use alternative non-textual methods when needed. Emoticons (e.g., :-), ^^, :-/) are often easier to type and more reliably interpreted than emoji, especially when using Braille or dictation. GIFs, audio, and video can provide richer context; 3) copy previously used emoji. If searching for an emoji is too difficult, an old instance of it in a conversation can be found and copy-pasted; 4) be aware of cultural and platform differences. Emoji descriptors vary across screen readers (e.g., JAWS vs. VoiceOver), and visual designs differ across devices. When misunderstandings occur, it can be helpful to ask the sender for clarification. Thus, although technology develops, it should not be over relied on, both senders and recipients must adapt to improve emoji accessibility.

Visually impaired individuals face significant exclusion from cinema due to inaccessible infrastructure and a lack of audio descriptions in films. Entering a cinema hall is a challenging task, and once inside, they often rely on sighted companions to explain non-verbal elements like actions, settings, costumes, facial expressions, and silent pauses. Without such assistance, they struggle to connect scenes in sequence, especially during flashbacks, long silences, or background music. Horror and thriller films are particularly difficult because they rely heavily on visual and sound effects. Even when dialogues are present, the absence of description for non-verbal cues makes it impossible to accurately visualise the director's intended scene. Furthermore, filmmakers rarely acknowledge blind audiences during story conception, and mainstream cinema is not produced with accessibility in mind. Respondents noted that even popular films about disability are often not fully accessible to them (Tripathi, Tripathi, 2020).

The primary solution is the widespread adoption of audio description (AD) – a pre-recorded narration that describes scenes, settings, costumes, body language, and actions during natural pauses in dialogue. Films like "Sanju" (the first Indian film released with AD) and "Dangal" (AD added later) demonstrated that AD allows visually impaired viewers to synchronise scenes, visualise flashbacks, understand the filmmaker's vision, and develop critical film literacy skills. Assistive technologies such as the XL Cinema App synchronise AD tracks with a mobile phone's headphones, enabling an independent cinema experience without disturbing others. Experts

advocate making AD mandatory and integrating it during production to reduce costs. Additionally, alternative techniques like "audio film" (enhanced sound design), "auteur description" (incorporating the director's vision), and audio introductions can further enrich comprehension. With these tools, visually impaired people can achieve satisfaction levels comparable to sighted audiences (Tripathi, Tripathi, 2020).

Based on the study (Zhang et al., 2023), VI people have diverse digital content creation needs that extend far beyond currently accessible tasks. While many comfortably create text-based and audio content (e.g., documents, podcasts), they express strong interest in visually heavy content such as static visuals (slides, photos), videos, and interactive media (websites, apps). However, these remain highly challenging to create. Their key needs include: 1) professional success: meeting workplace and educational demands for visually formatted documents, slides, and resumes; 2) self-expression: pursuing personal artistic interests like photography, video editing, and visual design, which sighted society often assumes VI individuals do not care about; 3) social participation: sharing visual content with sighted family/friends and ensuring their own creations are accessible to other disabled people. To meet these needs, participants desire several improvements that can be grouped into technical improvements (real-time, non-visual feedback for evaluating visual components (e.g., colours, alignment, fonts, lighting), along with an automatic "visual grammar checker" that assesses how professional or visually appealing a design is, together with accessible advanced editing features in mainstream tools (e.g., for contrast, filters, precise audio/video trimming); physical or tactile controls to replace inefficient keyboard commands) and social and systemic changes (greater accessibility awareness from creative software companies, including involving VI people in development teams); standardised, screen-reader-friendly interfaces across platforms; training resources and "roadmaps" for accessible plugins and tools; inclusive educational and workplace standards that do not overemphasise visual formatting; combating societal biases that assume people with visual impairment cannot or should not engage in visual creativity.

4. Results

One of our objectives is to formulate several recommendations to mitigate issues faced by the visually impaired students but these recommendations do not include such needs as transportation, accommodation, access to the campus and so on. They concern informational and operational aspects as explained below.

The first recommendation to start with is to enhance the society's understanding of people with visual impairment. As this medical condition does not concern the majority of population, the topic is not widely covered in the media or does not get comprehensive visibility. Thus, in case of occurrence sighted people do not clearly realise how to behave, communicate, facilitate, or perceive people with visual impairment (Amin et al., 2021; Khowaja, 2021). More active disclosure and awareness could overcome the stigma of the society and empower both parties. Here the mass media can manifest to the best advantage disseminating information on the issues.

University management could take a more proactive position and be at the leading edge, as the number of students with visual impairment who proceed to higher education is increasing. Special courses can be organised for administrative and academic staff, as well as for students to provide knowledge about physiological, psychological and technical aspects that will result in a more supportive and mindful environment. Special units or departments can be set to get and disseminate information about novelties of all types related to the issue concerned. University online systems, official website and official portal should be upgraded to meet challenges of the VIS. The plan of activities for students with visual impairment (educational, recreational, research, volunteering, etc.) can also be systematically widened. Assistive technologies should be regularly updated and maintained by corresponding university services. Libraries, especially university ones, often become empowerment institutions, as they provide free IT infrastructure, internet access, courses and individual support for people with visual impairment to ease their access to the digital society (Bühler, Pelka, 2014).

Although the administration and faculty staff define the mainstream guidelines, perhaps the most responsibility lies with lecturers and teachers as their perception, knowledge, and attitude determine their willingness to foster a successful inclusive environment (Miyauchi, 2020). Specified teacher training programmes are needed even if they take time. Such programmes should incorporate both theoretical and practical content as well as face-to-face interaction and teaching experience with VIS. Training programmes should be complemented with internal and external

support that facilitates teachers' work at different levels, such as adaptation of learning materials, consultations and support for students (Miyauchi, 2020). But even when the environment is supportive, there are still subjects hardly accessible for VIS, for instance, Science as it remains challenging to carry out laboratory experiments and observe chemical, physical or biological reactions (Miyauchi, 2020).

Faculty staff and lecturers should prepare print copies for VIS in advance, as the students with visual impairment need more time to read these materials with the help of special devices or they can read them beforehand to orient themselves during the lecture or practical class. It is not enough to read the text but students are supposed to navigate the text, find and make footnotes, cite a particular quotation, make references, etc. Visually impaired students study and are evaluated on an equal basis with their sighted peers, so they should not lag behind because they are unable to access textbooks and print materials (Quirke et al., 2018). In their condition, reading a text, whatever innovative technologies they use, remains a time-consuming process. The written text is converted into an audio format but it excludes the opportunity to skim or scan the text to find required information – the student has to listen to the whole text. Thus, the text in any format prepared in advance can minimise this barrier. But before preparing print materials for VIS it is necessary to clarify what formats are read by student's devices or what software they use to access print materials.

Lecturers and academic staff could follow some recommendations that are not so difficult to follow (Al-Mouh et al., 2014). Firstly, they can divide text information into small and easily understandable blocks with simple layout and noticeable headings. Secondly, they should provide text alternative for visuals (images, tables, graphs, etc.) whether in an audio or print description. Thirdly, fill-in the gaps assignments are also accessible for VIS, not with conventional underscores but with a question instead.

We should add a small note to the recommendation. Some subjects imply that students are to read a number of books, articles, dissertations and so on. For lecturers it signifies that a list of texts for reading should be ready several weeks or months in advance to guarantee that students with visual impairment have enough time to read the required texts.

If during the lectures, seminars or practical classes computers are used, lecturers should inquire about special hardware or software beforehand and in case when the proper equipment is missing, be sure to provide it. Otherwise, it could be impossible to solve the problem in situ or it could take time, disturb all the other students and disrupt the lesson plan. As for time for reading, it can take three times longer than sighted students, result in fatigue or headache.

Some assignments can be completed by VIS in online format but the lecturer should be sure that such format does not interfere with social aspect when a student does not isolate himself/herself from his/her peers and groupmates.

Preparing and planning in advance become a prerequisite for faculty staff and lecturers. This also concerns both formative and summative assessment. Standard exam formats can be inappropriate for VIS to demonstrate their knowledge, skills and competences. Thus, lecturers, tutors or administration should make adjustments to enable students with visual impairment to demonstrate their abilities. The examination process can be shifted to computerised exams, VIS can be given extra time or a tutor/facilitator can read and write the exam assignments while a student with visual impairment completes the tasks orally (Quirke et al., 2018).

People around VIS should be informed and ready that their assistance may be needed because even with all innovative technologies some aspects remain challenging, for instance, proof-reading and editing a bibliography, meeting the presentation requirements, etc.

Communicating with others presumes non-verbal elements such as gestures, posture, facial expression, and gaze as they impart a significant amount of information that turns out to be missed by VIS (Kunz et al., 2020). Hence, in mixed groups of VIS and sighted peers the emphasis is laid upon verbal channel of communication that results in slowing down of interaction and adding cognitive load. In cases of instantly changing situations, for instance, brainstorming sessions or mindmap creation when notes are constantly extended and the layout is transformed, students with visual impairment need permanent comments.

Modern technologies allow people with visual impairment to be active game players as game developers target blind and visually impaired users as well. One of the examples of online games or mobile applications is a gamebook – a book that depicts a fictional world where the readers make choices while participating in the story (Dobosz et al., 2014). The choice made defines the further

narration directing the user to the appropriate paragraph or page. The experiment revealed that visual impairment did not have a significant impact but previous experience did and the age of the users – young players were more efficient than the older ones. As for other online or mobile games, their range is rather extensive for visually impaired people. The variety of games includes action games, MUD (Multi-User Dungeon) games, arcade games, shooter games, horror games, strategy games, sports games and many others. Some of them can be found on websites, for instance, https://tiflo-games.ru or http://www.tiflocomp.ru.

5. Conclusion

This review article has examined the current state of research on fostering media and digital literacies among visually impaired students, with a particular emphasis on the challenges these students encounter and the solutions proposed to address them. The synthesis of theoretical and empirical studies leads to several key conclusions.

First, media and digital literacies are indispensable for visually impaired students, not only as tools for academic success but also as enablers of personal independence, financial autonomy, social participation, and overall quality of life. Second, while many visually impaired students possess strong technical and operational skills – largely due to their reliance on digital instruments to access information – they often lag behind in cognitive and social-emotional dimensions of digital literacy. Specifically, difficulties persist in critical evaluation of information, distinguishing trustworthy from untrustworthy sources, creating media products, effective collaboration, and safe online communication. These gaps are exacerbated by inaccessible digital content, poorly designed platforms, and a lack of awareness among sighted peers, faculty, and administrative staff. Third, the challenges faced by visually impaired students in higher education are multifaceted. They include financial issues, social stigma, twofold accessibility barriers (informational and spatial), limited peer acceptance, and difficulties inherent in the educational process itself. Assistive technologies, while invaluable, are not a panacea; they introduce their own challenges, such as the inability to skim or scan texts, incomplete recognition of graphic information and complex formats (e.g., tables, formulae), and the need for additional time – often three times longer than sighted peers – to complete assignments.

Specific domains such as academic text perception, formatting, collaborative writing, photography, emoji communication, cinema, and digital content creation present unique and often under-researched obstacles. Fourth, the literature offers a range of solutions that operate at multiple levels. At the societal level, enhanced media coverage and awareness campaigns can reduce stigma and improve understanding of visual impairment. At the institutional level, it is essential for universities to take initiative by implementing proactive policies, enhancing their digital platforms, setting up specialised assistance departments, ensuring implementation of innovative assistive technologies, and offering ongoing training for both administrative and teaching personnel.

At the pedagogical level, lecturers are urged to prepare materials in advance, clarify accessible formats, provide text alternatives for visuals, divide information into manageable blocks, adjust assessment formats, and allow extra time for examinations. At the technological level, advances such as deep learning models for image quality assessment, screen reader-compatible collaborative writing practices, audio description for cinema, and accessible emoji communication strategies show promise in mitigating specific barriers. Fifth, the review highlights that definitions of digital competence for visually impaired students must be broadened beyond standard conceptualisations. Digital competence for this population should explicitly prioritise accessibility, self-determination, self-advocacy, troubleshooting skills, and the ability to articulate technical needs.

Finally, several gaps and directions for future research emerge from this review. There is a need for more empirical studies that test the effectiveness of specific interventions and training programmes across diverse educational and cultural contexts. Additionally, the voices of visually impaired students themselves remain underrepresented in the literature; participatory and co-design approaches could yield more relevant and practical solutions. With ongoing advancements in technology – such as artificial intelligence, virtual reality, and more advanced assistive devices – we need to continue research in order to prevent the creation of new obstacles and to ensure that the goal of digital inclusion is fully achieved for all people with special needs around the world.

All in all, facilitating media and digital skills among students with visual impairment goes beyond technical or teaching concerns – it is an issue of fairness, human rights, and social equality.

With coordinated efforts from researchers, educators, policymakers, technology developers, and society, the barriers that currently exclude visually impaired students from full participation in the digital world can be progressively broken.

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