The Use of Information Technology in Preparation for International Educational Research

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***Abstract*—This study examines the challenges faced by elementary school students in Kazakhstan while completing electronic assessments as part of the electronic Progress in International Reading Literacy Study (ePIRLS) in the context of digital literacy. The research focuses on the difficulties students encounter when engaging with digital materials, especially in terms of computer literacy, the ability to navigate digital texts, and the execution of technical operations on computers. The study aims to identify the primary barriers to students' success in the ePIRLS assessment, with a particular emphasis on the relationship between digital literacy levels and performance. The research employs a mixed-methods approach, including surveys conducted with both teachers and students, to gather data on their experiences and challenges with digital tools and platforms. The results of these surveys indicate that low levels of digital literacy and a lack of experience with electronic resources significantly hinder students' ability to effectively engage with tasks in the ePIRLS assessment. This often leads to mistakes in task completion and negatively impacts educational outcomes. The study also highlights that students' unfamiliarity with digital tools and their limited experience with online platforms contribute to difficulties in understanding the interface of digital tests. As a result, many students struggle to interpret and interact with the materials presented in digital formats. The research emphasizes the importance of developing digital literacy skills from an early age, suggesting that schools integrate digital tools and platforms into everyday learning activities. To improve performance, it is recommended that educational institutions use specialized applications to enhance students' computer skills and provide training on navigating digital texts and online environments. By strengthening digital literacy, students will be better prepared to engage with modern educational resources and perform effectively in digital assessments.**

***Keywords*—Progress in International Reading Literacy Study (PIRLS), education, functional literacy, reading literacy, computer literacy, elementary grade, program**

I. Introduction

Functional literacy is recognized as a critical indicator of the social and intellectual potential of a society. A high level of functional literacy reflects a country's political stability, cultural achievement, and socio-economic development, whereas a low level can lead to inequality and unrest [1]. International assessments, such as Progress in International Reading Literacy Study (PIRLS), serve as benchmarks for evaluating educational outcomes and the global competitiveness of education systems.

With the rapid evolution of information technology, traditional paradigms of teaching and learning are undergoing transformation. This shift has given rise to new approaches in education, including the integration of digital tools and online platforms into curricula [2]. Kazakhstan, actively involved in international comparative studies, is undergoing educational reforms that emphasize digitalization. To facilitate these changes, a robust digital environment in schools is essential. This includes not only technological infrastructure but also pedagogical adaptation to ensure relevance in a technology-driven society.

To align with international trends and prepare students for a knowledge-based economy, Kazakhstan is focusing on embedding Information and Communication Technologies (ICT) into school curricula. The goal is to foster digital competence, including the ability to work with computer systems, analyze data, understand artificial intelligence and machine learning basics, and navigate digital environments such as cloud and mobile technologies [3]. In this context, not only the acquisition but also the validation of knowledge has transitioned into digital formats, promoting transparency and academic rigor.

This study is based on the theory of functional literacy, which is a multidimensional concept that encompasses the essential skills individuals need to effectively function in a modern, knowledge-based society. This encompasses traditional skills like reading and writing, as well as competencies in science, mathematics, health, legal contexts, and critically digital environments. With the growing importance of digital media, digital literacy has emerged as a necessary extension of functional literacy. It refers to the ability to use digital tools to access, evaluate, and create information effectively [4].

Among the key types of functional literacy relevant to this research are:

- Reading literacy
- Science literacy
- Math literacy
- Computer literacy
- Health literacy
- Legal literacy

In this study, we define "functional literacy" as the practical application of reading, writing, and numerical skills in everyday situations. "Computer literacy" means the ability to use digital tools and platforms effectively, while "reading literacy" includes comprehension, interpretation, and critical analysis of text, both in printed and digital formats. "Digital literacy" is a broader concept that includes both computer literacy and the ability to critically use digital technologies. It refers to the skill of effectively accessing, evaluating, creating, and communicating information using digital technologies.

II. Literature Review

Recent studies have emphasized that digital literacy is no

longer optional but a prerequisite for academic and career success. According to Eshet-Alkalai digital literacy encompasses a wide range of cognitive, motoric, sociological, and emotional skills necessary for functioning in digital environments [5]. Other researchers, such as Ng argue for a holistic model of digital literacy that includes technical, cognitive, and social-emotional dimensions [6].

Several international studies have identified challenges in transitioning to digital assessment formats. For example, Fraillon J., Ainley J., Schulz W., Friedman T., Gebhardt E. in the International Computer and Information Literacy Study (ICILS) found that students from countries with limited access to technology performed worse on computer-based tasks compared to their peers in digitally advanced nations [7]. Similarly, the OECD (2021) reported in its PISA findings that digital skills are highly correlated with socio-economic background and school digital infrastructure [8].

In the context of PIRLS, the shift to electronic testing (ePIRLS) introduced a new layer of complexity. According to Mullis I.V., Martin M.O., Foy P., Hooper M. the introduction of digital reading tasks revealed performance gaps not solely attributable to reading skills, but also to students' comfort with digital navigation and interface comprehension [9]. Similar trends were observed in a study conducted by Tondeur J., Van Braak J., Ertmer P.A., Ottenbreit-Leftwich A. which highlighted that students from digitally less-prepared schools often struggle with tasks involving hyperlinks, scroll functions, and multitasking across digital pages [10].

In Kazakhstan, the national reports from the ePIRLS 2021 cycle indicated that many students faced challenges related to basic digital operations, such as typing responses or locating specific information within a digital text. These findings are consistent with earlier assessments by the Ministry of Education and Science (Kazakhstan), which pointed to uneven ICT infrastructure and teacher preparedness as key barriers to effective digital learning implementation.

Studies in other regions echo similar issues. For instance, research conducted in Eastern European countries found that students in underfunded schools often lack the digital fluency needed to succeed in computer-based assessments [11]. In African contexts, Mtebe J.S. and Raisamo R. documented that lack of teacher training and outdated hardware hinder students' ability to interact effectively with educational technologies [12].

Collectively, these studies illustrate a global divide in digital readiness that extends beyond access to devices. They underscore the importance of teacher training, curriculum integration, and systemic investment in digital infrastructure.

Digital literacy has become a core component of modern functional literacy frameworks. The shift toward digital formats in international assessments such as ePIRLS highlights critical gaps in educational systems, especially in developing countries. By examining both global and local data, this research aims to contribute to a more nuanced understanding of how digital competencies intersect with traditional academic skills. This, in turn, can support more effective educational reforms in Kazakhstan and other similar contexts.

III. Materials and Methods

This study employed a quantitative research approach using an online survey to identify factors influencing first-year students' performance on ePIRLS-type digital reading tasks. The survey involved 50 students, including 27 bilingual students studying in Kazakh and 23 students studying in Russian. The distribution of students is shown in Fig. 1.

The questionnaire included both closed and semi-open questions designed to assess students' level of computer literacy, experience with digital texts, and skills in navigating electronic learning environments. The questions were adapted to the age-specific characteristics of the target group and were pre-tested on a small sample to ensure the validity of the instrument.

Data collection was conducted using the cloud-based service Google Forms, which ensured accessibility and facilitated automated response processing. The collected data were analyzed using Microsoft Excel, applying descriptive statistical methods to calculate proportions, means, and to construct charts representing response distributions.

Additionally, a qualitative analysis was carried out to examine students' difficulties, based on their answers to open-ended questions and teacher observations during the testing process. The findings were compared with students' performance on ePIRLS tasks, enabling the identification of key challenges and the development of targeted recommendations to improve students' digital literacy skills.

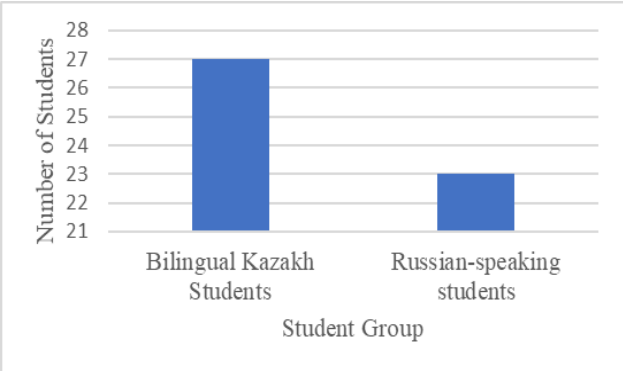

Fig. 1. Distribution of students in PIRLS study survey.

IV. Research Results

To determine the consistency of the data obtained with previous scientific research, a table has been compiled that reflects the main areas of similarity and difference. The table compares the results of this study with those presented in several significant scientific publications. In particular, there is evidence of trends related to the impact of digital literacy on text comprehension, the role of student motivation and engagement in the digital environment, and difficulties encountered during the transition from traditional to digital reading. Additionally, differences due to specific sample or methodology are noted. Table 1 serves as a basis for further discussion of the theoretical and practical implications of the research.

To assess the students' digital literacy and basic computer skills, we administered a short questionnaire (Table 2). The survey consisted of the following seven questions. The results of the questionnaire responses are presented in Fig. 2.

Q1 shows the results regarding the use of e-books among students. The lack of experience reading text from the screen, as well as difficulties in performing the necessary technical actions to fully familiarize oneself with the text, can

significantly reduce the quality of the test. Unfamiliarity with the format causes difficulties for students and indicates their lack of preparation for using digital resources. Some study participants had never worked with electronic educational materials or texts before, highlighting their low level of digital literacy.

Table 1. Comparative table of research results

Source	Year	Main findings	Connection to the current study
Delgado, P., & Salmerón, L. [13]	2021	There was a decrease in the ability to understand text when reading from a screen compared to reading on paper.	Confirms the findings regarding the low level of reading comprehension among elementary school students when reading electronic texts.
OECD (PISA) [14]	2015	It highlighted the importance of digital literacy for successfully completing text comprehension tasks.	It coincides with the observation that students with low digital literacy have difficulty working with ePIRLS.
Mangen, A. *et al.* [15]	2013	Differences in tactile sensations can affect memory and comprehension when reading from a screen.	This article explains the difficulties that students face when memorizing and searching for information in digital texts.
Wolf, M. & Barzillai, M. [16]	2009	Digital reading requires different cognitive skills than paper reading.	Emphasizes the importance of developing new strategies for reading on screens.
Liu, Z. [17]	2005	Digital reading often involves scanning and browsing, which limits in-depth comprehension.	This corresponds to the results of a survey, in which students missed important parts of the text.

Table 2. Questions in the questionnaire

Q1	Have you ever read educational materials from a screen (e-books or textbooks)
Q2	Do you know how to use a computer confidently?
Q3	Are you having trouble typing your answer on the keyboard?
Q4	Can you find Kazakh letters and symbols on the computer keyboard (.,-\\|)
Q5	Can you change the writing language on the computer?
Q6	Can you work with a computer mouse?
Q7	Can you search for information on the internet?

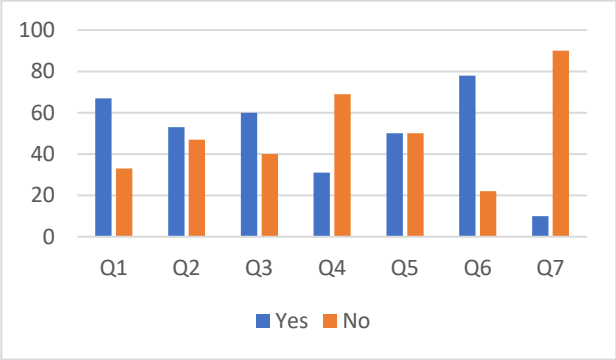

Fig. 2. Survey results.

The next difficulty identified is that students often skip important parts of the text and make technical mistakes. For example, they may scroll through several pages at once, accidentally go to the end of the text, or click on the wrong page. In order to successfully complete the electronic test, students need to have good computer skills. If their computer skills are not up to the task, it can negatively affect their test results and lead to incorrect answers (Q2).

Another missed opportunity was not returning to previous screens to look for information. Being able to go back and re-read text to improve understanding. Being able to refer to the text even when there is an opportunity to go back to a page with information, to address comprehension difficulties. Students did not do this. One reason for this may be students' lack of awareness.

At the same time, we would like to present the opinion presented in the article "Designing, developing and teaching in e-textbooks: what we have learned and where we are going" published in the electronic research and practice journal of Computers in Education. The experiment shows that students respond equally to information in electronic and paper formats. At the same time, there are many practical tasks involving computational experiments that require different approaches. After explaining the expectations of e-textbooks, this part focuses on instructional design using e-textbooks [18].

But here is an opinion: «As respondents point out, reading on a screen is fundamentally different from reading paper. Students reading texts on screens spend less time actually reading, mostly just browsing and scanning the text, rather than reading it, which leads to decreased comprehension and memory. However, users create digital libraries they can access if necessary». It was shown that there is a difference in comprehension and memorisation between the two formats, regardless of how similar they may seem [19]. In keeping with the demands of modernity, we should not just read electronic texts, but adapt them for comprehension.

When it comes to students using smartphones, there are several important points to consider. Respondents often become distracted while reading from their smartphones, moving to other reference points and spending most of their time on them. From the survey results, we can see that 73% of students still prefer to read books in printed format (Fig. 3), indicating one of the reasons why they still struggle with understanding book-based information in electronic format.

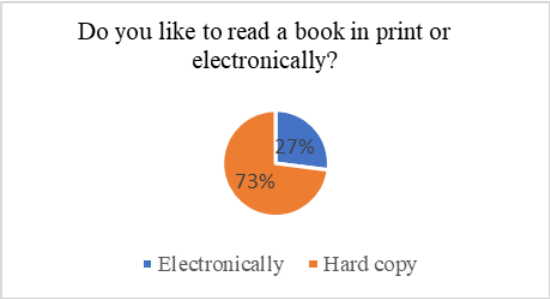

Fig. 3. Survey results.

When reading a text on paper, students can make notes in the form of bookmarks, underlining, and short notes on the margins (if it's not a textbook) or on individual worksheets. However, when reading digital texts, these tools for marking up the text are different. For example, the PIRLS digital format has introduced one such tool, the "marker," which readers can use to highlight certain parts of the text. But without experience with this tool, it was something that elementary school students either did not use at all or was simply distracting (learners simply «coloring» the text took time, the student's attention was diverted to something else).

Students should learn how to work with additional tools.

Note that this difficulty differs from the one described above. These are students who understand the manual, master the mechanism of navigating from screen to screen, and understand how to read the entire text. However, they try to complete tasks without reading the whole text in the "questions" window. This feature drastically differentiates the computer-based test format from paper-based tests, which require scrolling through all the pages to reach the questions. Information may be in different parts of the text and it is necessary to summarize information units from different parts. When teaching reading on screens, preparatory work with interfaces should be developed first, so that you don't reach the question unit until you've finished reading, or the reader can use the "Go To Questions" button only after reading the full text. With this method, students can do self-regulation exercises: they have the option to answer questions at any time and stop themselves when they realize they need to read the text first.

Some 4th-graders had problems with completing tasks that required an open answer. This was due to their lack of keyboard proficiency, as they did not know where certain punctuation marks were located on the keyboard or how to properly format a period or uppercase letter, etc. (Q3-Q5) This analysis investigates the challenges faced by fourth-grade students during the ePIRLS assessment, specifically in relation to their digital literacy skills.

Keyboard Proficiency and Open-Ended Responses:

The data reveals that a significant number of students struggled with open-ended questions, often providing incomplete or symbolic responses. This difficulty can be attributed to their limited keyboard proficiency. Students exhibited challenges in:

Basic Keyboard Skills: Many students lacked familiarity with keyboard layout and struggled with tasks such as punctuation and capitalization.

Language Switching: Students demonstrated difficulty in switching between different writing languages, particularly when required to input symbols or alternate alphabets.

Open-Ended Response Formulation: Students found it challenging to formulate comprehensive, open-ended answers, often providing brief or incomplete responses. This may be linked to the increased demands of writing in a digital format, where the time required for typing can influence response length.

Keyboard Proficiency and Open-Ended Responses

The data reveals that a significant number of students struggled with open-ended questions, often providing incomplete or symbolic responses. This difficulty can be attributed to their limited keyboard proficiency, defined here as the ability to efficiently and accurately use a computer keyboard for inputting text and symbols. Keyboard proficiency is a foundational element of digital communication, and its deficiency hampers students' capacity to express their ideas effectively in digital formats.

Students exhibited challenges in the following areas:

- Basic Keyboard Skills: Many students lacked familiarity with keyboard layout and struggled with tasks such as punctuation, capitalization, and typing special characters.
- Language Switching: Students demonstrated difficulty switching between writing languages (e.g., Kazakh, Russian, English), particularly when inputting non-Latin symbols or using alternate keyboard layouts.
- Open-Ended Response Formulation: Students found it challenging to formulate comprehensive responses. The increased cognitive load associated with typing, especially for those with low typing speed, likely contributed to brevity and incomplete thoughts.

Digital literacy refers to a set of competencies required to locate, evaluate, create, and communicate information using digital technologies. This includes not only technical skills but also critical thinking and problem-solving within digital contexts. While students demonstrated some familiarity with everyday devices such as smartphones and tablets, their experience using computers in educational settings remains limited. Despite this, most students reported minimal issues navigating the ePIRLS interface. However, qualitative responses indicated key barriers to performance:

- Keyboard Navigation: Difficulties in locating specific letters (especially in Kazakh), toggling keyboard language settings, and navigating through the ePIRLS interface.
- Information Retrieval: Challenges in locating relevant information within digital texts, remembering prior responses, and switching between pages or items.
- Word Processing and Composition: Struggles with accurately typing words and constructing coherent open-ended responses.

The use of a computer mouse is essential for students when working on electronic assignments. Texts can often be long, and students may only read the portion that appears on the screen, without using the mouse to scroll down. This can hinder full comprehension of the information. Additionally, the questionnaire asked about whether students knew that it is possible to floggle the text down, and 38 students responded that they knew, while 12 did not. This indicates that experience is important (Q6).

The PIRLS Learning Assessment System updates each cycle to keep educational research and educational development at the forefront through checks by the PIRLS Learning Development Group (RDG) and National Research Coordinators (NRCs). This remains relevant to PIRLS practice and learning policy. However, PIRLS is a trend study and the organization behind it has remained constant throughout the cycles [20]. The ePIRLS assessment has undergone a significant shift towards evaluating students' digital literacy skills. Tasks now necessitate a higher level of cognitive complexity, demanding students to not only comprehend textual information but also organize and synthesize data presented in various formats, such as tables and charts.

This shift is evident in the increased emphasis on:

Data Integration: Students must demonstrate a unified understanding of the text by combining information across rows and columns within tables, requiring them to analyze and integrate data from multiple sources.

Visual Literacy: The assessment now incorporates visual and illustrative materials, emphasizing the need for students to effectively interpret information presented in tables, charts, and other visual formats.

Navigational Proficiency: ePIRLS tasks evaluate students'

ability to navigate a simulated online environment, assessing their skills in web browsing, information retrieval, and discerning the relevance of online content to specific questions.

This evolution highlights the critical role of digital literacy in contemporary learning. Students need to be equipped with the skills to navigate the digital landscape, analyze data presented in various formats, and critically evaluate the relevance and accuracy of information found online. This necessitates a pedagogical approach that emphasizes interactive learning experiences, incorporating digital tools and resources that prepare students for the demands of modern assessments like ePIRLS. (Q7).

Technical difficulties included the navigation bar, various tabs and pop-ups, links, graphic symbols, etc. In addition to these challenges, other problems were noted: often students were unable to organize themselves to apply the virtual teacher's "tips" on the screen. In the aforementioned survey, we also observed students' work with Internet links.

If we look at the answers, in Kazakh classes 37%, and in Russian classes - 70%. These indicators show that there is still work to be done (Fig. 4).

During the questionnaire, some participants answers may not be clearly understood. Some pupils are afraid that any response may affect their personality or academic performance. For this reason, some may not express their thoughts openly, but rather respond with a thought that it may affect their grades.

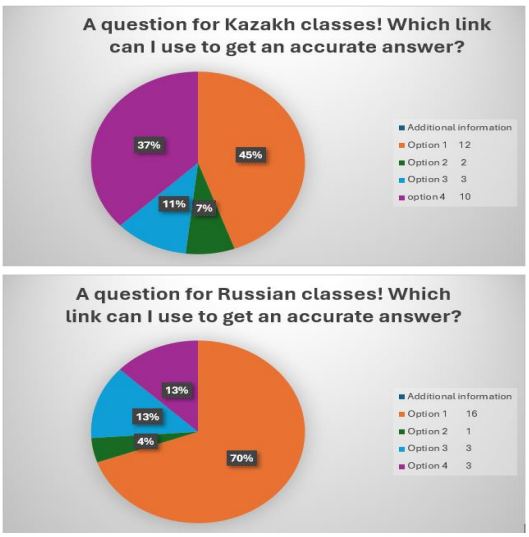

Fig. 4. Survey results.

Let us outline several directions of work to overcome these difficulties. The third direction of work on overcoming difficulties in reading text from the screen-forming clear strategies for reading digital texts in junior schoolchildren. The main direction in preparing for the PIRLS study is to investigate the level of students' reading literacy and indicate the way to improve it. However, a student cannot be allowed to fail to demonstrate existing knowledge, ability, experience because of low technical computer literacy. Even simple operations used with the student on a daily basis and not practiced result in difficulty in execution. For this reason, I recommend programs and applications that you can use to eliminate the above problems.

First of all, we are all familiar with «Google Forms» and "Outlook Forms". "Google Forms" is Google's online tool that you can use to create surveys, vote, collect comments and user information (https://forms.google.com/). Google forms has the following advantages:

1) Intuitive interface, no special knowledge is required to create a quiz.
2) Colorful design. There are many different themes, and you can also create a theme yourself - just upload a photo and Google forms will automatically choose the appropriate color scheme.
3) Create complex different questions from simple text fields. You can add YouTube videos and photos.
4) There is no limit to the number of tests, questions and answers you get.
5) The created tests can be included in a blog or website, emailed, posted on social media or shared with the student directly in class.
6) It is possible to edit the text with peers [21].
7) Automatic evaluation of answers and scores a service for creating online surveys, part of Microsoft 365. The main function was the ability to create surveys. Forms allowed the results to be exported to Microsoft Excel (forms.office.com). With these two online tools, we can provide students with texts electronically and allow them to learn how to answer several open and closed-ended questions about the text. Students work with the keyboard, use the mouse, and label the answers to the questions. From illustrative texts, obtains information, responds to watching videos. Can prepare for a PIRLS study using all computer operations. It also allows teachers to determine the level of students' preparation. Children practice, teachers take the conclusions and by them determine students' difficulties and work on them (Fig. 5).

Fig. 5. A task template created using Outlook Forms.

The next program is learningapps.org. a large library of exercises, multiple work formats, and allows for video, audio, and even text-to-speech. Here the learner learns how to work in the interface by completing tasks in a variety of formats. Students turn in electronic reading texts via word or other electronic resources and then test their knowledge by

composing assignments in this program. Computer aptitude is enhanced. Will learn to work with graphically-illustrated texts (Fig. 6).

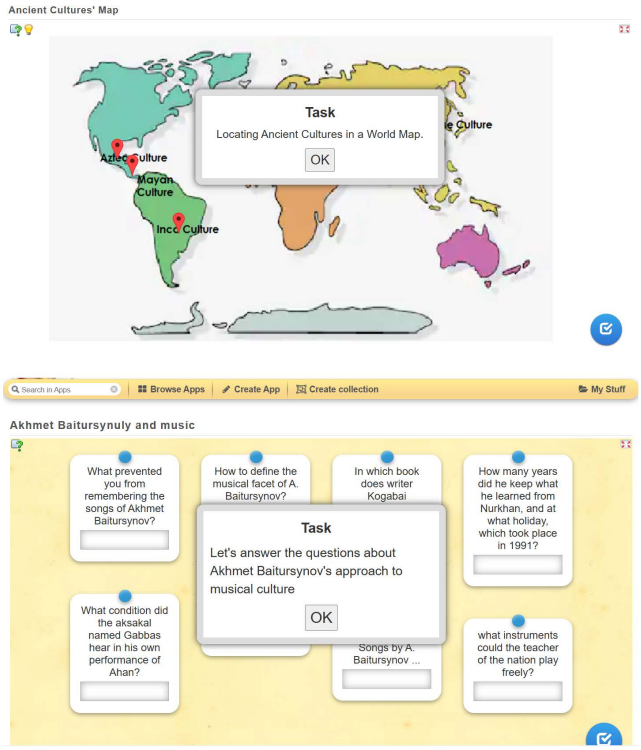

Fig. 6. An example of a task created on the learningapps.org platform.

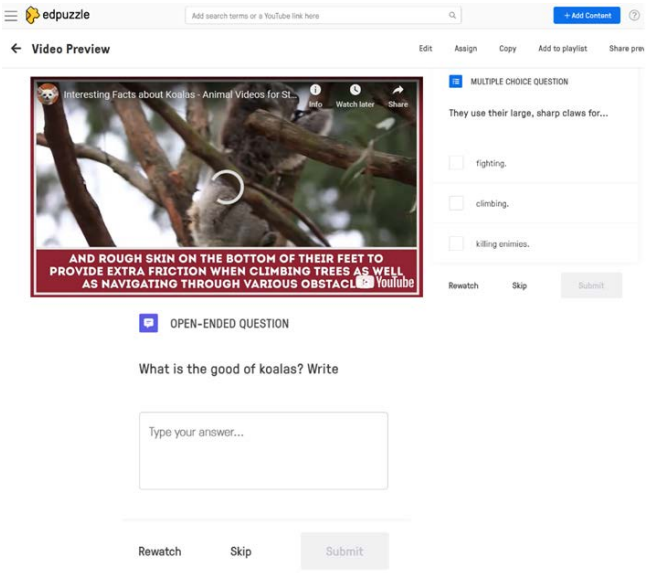

Fig. 7. The task template created in the Edpuzzle application.

The Edpuzzle app is a free service for creating interactive videos containing audio and text comments, questions and tasks. The platform allows you to download videos from sources such as YouTube, Vimeo, Khan Academy, TED-Ed, LearnZillion, as well as add personal video files from your computer.

One of the main functions of Edpuzzle is integration with Google Classroom, which helps simplify the organization of the learning process. When creating a video, you can create interactive tasks, including open-ended quizzes or answer selection tasks, as well as add a voice, comments, or completely rewrite the plot of the video. In addition, the program provides tools for managing lessons and monitoring student activity. The teacher can track which students have seen the videos, as well as analyze the results of tasks that help improve the effectiveness of the educational process (Fig. 7).

Another tool that allows you to take an electronic test is Online Test Pad. The platform allows students to work on full texts and complete assignments in various forms, which helps to diversify the learning process and adapt tasks and needs. The Online Test Pad is a quick test execution feature. The service makes it an effective knowledge assessment tool, allowing teachers to quickly track and analyze the results of student assignments. Due to this versatility, the Online Test Pad is the optimal solution for organizing electronic testing, which helps to increase the accuracy of knowledge and simplify data analysis (see Fig. 8).

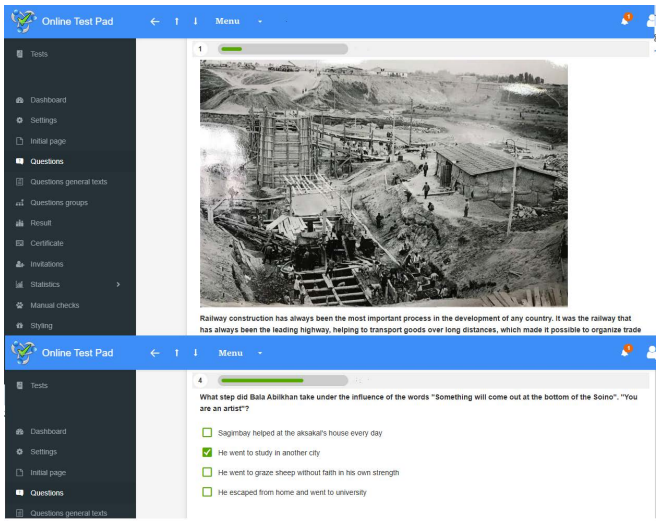

Fig. 8. An example of a task in the online Test Pad program.

In social terms, linguistic diversity is a richness that can be used to improve learning skills, that is, the ability to understand and use language forms that are required by society and valued by human beings. Young readers are able to create meaning and knowledge from texts found in a variety of forms. They learn in order to learn, to participate in a community of readers in school and daily life, and for personal enjoyment. Learning to read and managing learning should be done throughout life, from the need for knowledge to the taste for learning, it is one of the pillars, a concept that is the key to obtaining any learning. The ability to understand refers to the knowledge of autonomous use of a set of cognitive and metacognitive strategies that allow the processing of texts. Consequently, «society demands from the school system trained students who can develop autonomously in various social domains; and recognizes learning as one of the axes through which other subjects pass. Thus, the ability to learn well gives the discipline a great advantage over others who do not master the field personally, academically, and professionally». Understanding the meaning of a text depends on accessing its information in a literal, logical, critical and transformative sense, as well as prior knowledge of our lives [22, 23]. Reading literacy should be seen as a means of survival and not as comprehension of a single text alone. It is essential to use the knowledge acquired on issues that may arise in the future and, therefore, to be able to put it into practice, not just in education [24, 25]. In

preparing the student for future existence, the school should focus on the students' ability to apply it to reading comprehension. The educational process should focus on improving students' reading literacy and computer literacy required by society. Work from elementary school should be done on this path. The work started on time shows high performance.

Nowadays, electronic testing is not something new. From thousands of programs, it is necessary to choose those that are suitable for achieving the goal. It is also necessary to take into account age characteristics and convenience of use. Students' computer literacy can only be improved through habituation and learning. Therefore, students' daily use of electronic resources greatly influences their literacy improvement.

The analysis of student responses and performance during the ePIRLS assessment revealed several significant challenges related to digital reading literacy among respondents. These findings highlight the complexity of navigating digital environments and underscore the need for targeted pedagogical strategies to support digital reading comprehension. These challenges and proposed implications are summarized in Table 3.

Table 3. Students' digital literacy challenges and ways to overcome them

Category	Findings	Implications
Difficulties in Digital Navigation and Interface Use	Many students struggled with navigating digital texts, especially in using hyperlinks, scrolling through content, and locating key information across pages.	A lack of familiarity with digital interfaces impacted students' ability to engage fully with digital content. There is a need for increased exposure to digital platforms in the classroom.
Low Proficiency in Typing and Digital Interaction	Students showed limited typing skills and struggled with basic digital tools like checkboxes and dropdown menus. Some responses were incomplete or irrelevant.	Technical proficiency in digital environments is a critical skill gap. Enhancing typing and digital interaction skills should be prioritized to improve overall performance.
Cognitive Overload in Multimodal Digital Tasks	Tasks that involved interpreting multimodal information (text, graphs, tables) were particularly challenging for students.	The complexity of digital reading tasks demands cognitive skills beyond traditional literacy. There is a need for training in synthesizing information from multiple sources.
Superficial Reading Strategies	Many students engaged in superficial reading strategies, focusing on keywords rather than reading for comprehension or context.	Teaching deeper, more analytical reading strategies is essential to improve comprehension and critical thinking in digital environments.
Positive Impact of Preparatory Use of Digital Platforms	Students with prior exposure to digital learning tools (e.g., Google Forms, Edpuzzle, LearningApps.org) performed better in digital assessments.	Familiarity with digital educational tools can improve both technical and cognitive skills. Regular exposure to these tools is recommended for better preparation.

V. Discussion

Improving digital literacy among students is not only a response to contemporary educational needs but also a strategic investment in the future of individuals and societies. In the context of rapid digital transformation, fostering digital skills has far-reaching implications for academic success, professional development, and social adaptability. Numerous studies have emphasized the link between digital competence and enhanced educational and economic outcomes, suggesting that digital literacy should be a core component of modern education systems.

Several studies confirm that digital literacy enhances academic achievement by enabling students to access, evaluate, and synthesize information more efficiently. Familiarity with digital tools improves research skills, facilitates collaborative learning, and supports personalized learning pathways (Table 4).

Table 4. Impact of digital literacy on academic outcomes

Digital Skill	Academic Impact
Information Retrieval	Improved research quality and efficiency
Multimedia Usage	Higher student engagement
Digital Collaboration Tools	Enhanced group project outcomes

Digital literacy has become a prerequisite for employability in nearly every sector (Table 5). As labor markets become increasingly automated and data-driven, employers prioritize candidates with robust digital skills. This includes not only proficiency in standard office software but also the ability to work with cloud platforms, data analysis tools, and communication technologies.

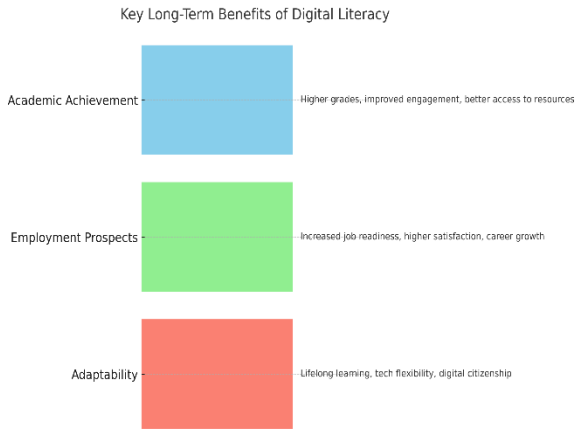

Fig. 9. Long-term benefits of digital literacy.

Table 5. Digital competencies and employment potential

Competency	Employment Advantage	Evidence
Word Processing & Spreadsheets	Administrative and clerical roles	ILO Report, 2021
Data Literacy	Analytical and technical positions	McKinsey, 2022
Remote Communication Tools	Hybrid/remote job compatibility	LinkedIn Jobs Report, 2023

Students equipped with digital skills are more adaptable in rapidly changing technological landscapes. Digital literacy

fosters lifelong learning and problem-solving, enabling individuals to update their skills continuously and respond effectively to digital disruption across all life domains (Fig. 9).

VI. Limitations of the Study

Despite providing valuable insights into the use of ICT in preparing students for international educational assessments, this study has several limitations that should be acknowledged.

Firstly, the research was conducted with a relatively small and homogeneous sample of 50 first-year university students from a single educational institution and academic program, which limits the generalizability of the findings to other populations. It is important to note that this sample may not be representative of all students, and the results may not apply to students from different disciplines, universities, or cultural backgrounds.

Secondly, the study focused on short-term outcomes and did not examine the long-term impact of digital literacy development on academic success, adaptability to digital environments, or employability. It would be valuable to conduct further research to explore these aspects over a longer period of time and in a wider range of contexts.

Third, while the study included multiple aspects of functional literacy, such as digital and computer literacy, future research could explore additional factors that may influence students' readiness for digital assessments, such as socioeconomic status, prior experience with ICT, and access to digital resources.

While the findings from this study provide valuable insights into the challenges by first-year students face with digital reading tasks in ePIRLS, the current research is constrained by a relatively small and homogenous sample of 50 participants. This limitation may restrict the generalizability of the results to broader populations. Future research would benefit from a larger and more diverse sample, including students from various educational backgrounds, regions, and with varying levels of access to digital resources. Expanding the sample size and diversity could allow for a more nuanced understanding of the factors affecting digital literacy and performance in digital reading tasks.

Furthermore, future studies could explore longitudinal data to assess how digital literacy skills develop over time and how they are influenced by different educational interventions. Investigating the effectiveness of specific teaching strategies, such as tailored digital literacy training or the integration of ePIRLS-like tasks into regular classroom activities, would also provide important insights into how best to prepare students for digital assessments.

VII. Conclusion

Functional literacy plays a critical role in determining the potential of a society, with a high level of literacy reflecting political and cultural achievements, while a low level may lead to social instability. In the context of education, functional literacy is multifaceted, encompassing areas such as reading, writing, mathematics, science, health, legal, and computer literacy. As technology evolves, the need for digital literacy has become even more pronounced. This is especially evident in international assessments like PIRLS (Progress in International Reading Literacy Study), where students' ability to comprehend and navigate digital texts is being increasingly tested.

Recent shifts in educational assessments, such as the introduction of ePIRLS, highlight the growing importance of computer literacy. Students face challenges when interacting with digital content, including difficulties in performing basic technical operations, reading digital texts effectively, and responding to multiple-choice and open-ended questions. These difficulties often stem from insufficient computer literacy and lack of familiarity with the digital tools necessary for successful test-taking. As a result, students' ability to engage with digital content and effectively manage technical operations can significantly affect their academic performance.

Addressing these challenges requires integrating digital literacy into school curricula, ensuring that students are equipped with the necessary skills to navigate the digital landscape. Programs that teach basic computer skills, enhance students' ability to work with digital texts, and familiarize them with electronic testing tools are essential. By doing so, educational systems can help students develop the competencies they need to succeed in modern assessments like ePIRLS and, more broadly, in an increasingly digital world. Therefore, fostering digital literacy from an early age is vital for the competitiveness and development of future generations.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Gulmira Nurbekova and Balaussa Orazbayeva conducted the literature search, analyzed the data and wrote the paper. Akerke Dildabek and Raushan Zhilmagambetova visualized the data and reviewed the manuscript. All authors have accepted the final version of the manuscript.

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