Exploration of TPACK in IPAS Subjects in Optimizing Digital Literacy of Students with Special Needs

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ABSTRACT

In the fourth revolution or 4.0 era, known as the digital revolution, there have been many rapid and competitive changes. This change has a huge impact on the world of education, one of which is in elementary school. However, problems often arise during learning activities in the classroom, one of which is the lack of interest in reading or literacy in students with special needs (PDBK). By looking at conditions like this, digital literacy can solve this problem. This study examines the exploration of TPACK in IPAS subjects in optimizing the digital literacy of students with special needs. This research uses a qualitative descriptive method using three data collection techniques, namely observation, interviews, and documentation. The results showed that (1) the technologies used in social studies learning for students with special needs are an interactive map, E-comic, and Google Classroom, (2) the implementation of TPACK for students with special needs, and (3) the advantages of applying digital platforms to students with special needs indicate the increase of the motivation and involvement of students in the learning process. The research results are expected to contribute to the development of technology that is more effective and inclusive for students with special needs. This research can also be a reference for educators in designing learning that is more suitable for students with special needs.

Keywords: *digital literacy, IPAS, student with special needs, TPACK*

INTRODUCTION

Regular students and students with special needs (PDBK) have the same educational rights. Education must be implemented relatively without discrimination regarding economic, social, physical, and mental conditions (Jayadi & Supena, 2023). Learners with special needs (PDBK) are one of the human resources that must be considered because few PDBK can make the nation proud in the international world with their achievements (Widodo et al., n.d.).

Teachers are essential in classroom learning activities for students with special needs (PDBK). However, problems often arise during classroom learning activities, including the need for more interest in reading or literacy in students with special needs (PDBK). Literacy, in general can be interpreted as reading and writing activities. According to Faizah et al (2016: 2) in the guidebook The School Literacy Movement in Primary Schools states that literacy is the ability to access, understand, and use something intelligently through various activities, including reading, viewing, listening, writing, and speaking. Literacy has a vital role in achieving learning objectives in the context of learning. Literacy is not only applied to regular students but also needs to be applied to students with special needs.

The era of the fourth revolution, or 4.0, known as the digital revolution, has provided many rapid and competitive changes. This change significantly influences the world of education, one of which is in elementary schools (Veradegita et al., n.d.). Education in the digital era has an important role and responsibility and is required to be productive, creative, innovative, and able to utilize technological sophistication (Kakhkhorov & Rasulova, 2020). To support this, teachers must possess some abilities, namely

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the ability of technological, Pedagogical, and Content Knowledge or TPACK. In general, TPACK contains 3 components, namely pedagogic, content, and Technology, which can be used to develop personal abilities and find innovations in learning (Li et al., 2022). The four competencies that teachers must master to become competent and professional teachers are pedagogical competence, personality competence, social competence, and professional competence (Rusilowati & Wahyudi, 2020); (Daminov et al., 2020). Professional teachers must master TPACK competencies that can collaborate experience and material because the term TPACK is a way to ensure the implementation of learning to the demands and changes of the times (Yeh et al., 2021); (Syamdianita & Cahyono, 2021). Teachers can create learning activities inviting students to answer various problems faced in various ways to arouse intellectual potential and provide new experiences (Prokopenko et al., 2020).

Learning IPAS, especially social studies, provides an excellent opportunity to improve digital literacy in students with special needs. In social studies learning, students can be invited to utilize digital technology to help them understand geographical, economic, historical, and sociological concepts more visually, interactive, and contextualistically (Septianingsih & Safitri, 2023). Ahsani (2021) states that digital literacy is a skill that utilizes technology and information with digital-based media that is relevant to social studies learning, where information can be more easily understood with the help of digital media.

Research on the use of Technology as a learning medium for children with special needs discussed by (Lutfio et al., 2023), which is about the Technology used by children with special needs, has been modified so that it can be utilized and appropriately used by students with special needs. The following research on audio-visual media to improve the reading skills of dyslexic students was conducted by (Khotimah et al., 2023), which is about how students who experience dyslexia disorders can improve their reading skills using audio-visual media. Based on the results of previous studies, researchers have aligned with the opinions of (Khotimah et al., 2023), Which is about the implementation of a tpack to improve digital literacy in participants with special needs.

The research to be conducted on the exploration the potential of optimizing digital literacy in students with special needs is new in the research subject, namely digital literacy in students with special needs, which has yet to be studied much before. Another novelty can be seen from the research results, namely the use of interactive media in social studies learning to improve the literacy of students with special needs. Based on that, this research is interesting, as students with special needs are more interested in literacy. This research aims to increase the reading interest of students with special needs through a tpack to produce an adaptive and skilled generation using Technology. Through this study, it is hoped that this research will contribute to the field of education, especially the use of Technology to improve literacy in students with special needs.

METHOD

The method used in this research is the descriptive qualitative method. Qualitative research is research aimed at describing the utilization of technology used in learning, the implementation of TPACK, and its advantages for students with special needs. This research was conducted in SDN 1 Arjosari. The subjects of this research are fourth-grade students of SDN 1 Arjosari and teachers as a source ofinformation. The research time was August and September 2024 because the researchers needed time to observe the student learning process. The data collection methods used are (1) observation, which is carried out by observing things related to the problem under study; (2) interviews, conducted by giving questions to respondents to answer to get more complete information; (3) documentation, carried out to become real evidence in a study related to events, activities, and places.
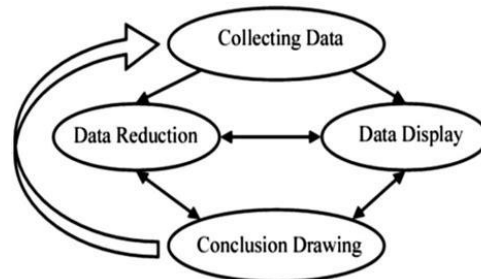
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Figure 1. Miles & Huberman research flow and techniques (in Sugiyono, 2013)

The flow and technique of this research is that the data collected is then analyzed through the stages of data collection, data reduction, data presentation, and conclusion drawing. The data collection stage is carried out by means of observation, interviews, and documentation. The data reduction stage is carried out by sorting out important and focused data in accordance with the objectives of this research.

The research is on the utilization of technology used in learning activities, the implementation oftpack, and its advantages for students with special needs. Furthermore, the data is presented inthe form of narratives or findings that describe the results of the research. The final stage is w h e n the researcher concludes the results of the data analysis that has beencarried out.

RESULTS AND DISCUSSION
Technology used in social studies learning

The results of this study show that the technology used in social studies learning in grade IV for students with special needs includes interactive maps, electronic comics, and Google Classroom, which can improve the understanding and experience of students with special needs. Interactive maps are media that allow learners to explore geographical locations through digital technology. Interactive maps help students with special needs understand geography concepts that were previously difficult to understand through conventional maps. Meanwhile, electronic comics offer an exciting and easy-to-understand format for teaching concepts of everyday life. Electronic comics have a sequential arrangement of images where each image has an interesting character. In addition, there is also the Google Classroom platform that provides a space for interaction and collaboration between friends and teachers. Google Classroom is used in group activities because teachers can upload materials and give group assignments.

Using interactive maps in a pedagogical context using an inquiry-based approach, students are encouraged to explore and discover information independently. Teachers design activities that ask students to search for specific geographical locations, in which case students not only passively receive information but also engage in critical analysis. The e-comic applies a narrative approach that can help learners relate social studies concepts to everyday experiences. The narrative presented in e-comics can make learners feel more connected to the material learned because it has relevance in the lives of learners. This narrative approach integrates visual and verbal elements that allow learners to gain a deeper understanding. Meanwhile, Google Classroom applies a collaborative approach, where learners can actively participate in online discussions with their groups. This collaboration helps learners develop critical thinking skills.

The content in the interactive map is a geographical location showing the islands of Indonesia that allows learners to explore each island and can display visuals and a brief description of the flora and fauna. In the electronic comic, the content is as narratives of daily necessities depicted through funny characters. This visual style facilitates understanding as well as educational entertainment. Meanwhile, content in Google Classroom that is done in groups can include various collaborative activities, for example, in the material on the unique habits of the people around me. The teacher creates a discussion forum where each group discusses questions encouraging learners interaction.

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Implementation of TPACK for students with special needs

There are 17 students in class IV who have different learning abilities, including slow learners and dyslexic students. Slow learners need more time to understand the material and a more gradual and structured approach (Cahyono & Budiyana, 2023). Meanwhile, dyslexic students have difficulty in reading and processing text (Komalasari, 2015). Learners with dyslexia have a different brain structure from people who are not dyslexic. Learners who experience dyslexic reading difficulties show unusual reading habits, such as feeling uncomfortable while reading and sometimes crying (Khotimah et al., 2023).

Implementing interactive maps in social studies subjects on Indonesian flora and fauna requires simplification of learning materials. The interactive map allows learners to explore the various flora and fauna on various islands in Indonesia in an interactive and fun way. Learning activities are designed for slow learners by providing precise and simple instructions. Teachers can direct learners to find information about endemic birds on certain islands and ask questions to get them more involved in learning. Meanwhile, for dyslexic learners, it is designed to be easier to read by combining friendly fonts and appropriate sizes. By providing visual elements, dyslexic learners can relate the information to their experiences to strengthen their understanding. Using interactive maps of Indonesian flora and fauna material supports both groups of learners and creates an interactive learning environment that suits their needs.

Table 1 Assessment results of students with special needs on the electronic comic platform

Category	Before Implementation	After Implementation
Slow Learners	69	69
dyslexia	75	75

The implementation of the e-comic material Me and My Needs for slow learners and dyslexic students can combine text and images that attract attention. Slow learners and people with dyslexia have similar difficulty understanding information, so e-comics are designed with simple narratives and clear storylines. Using appropriate font type and size and contrasting colors between text and background can also make reading more accessible for students (Ramadan, 2011). This e-comic depicts an everyday situation where the main character is a child interacting about basic needs. Each panel presents attractive illustrations that can make it easier for learners to follow the storyline and understand the meaning of each need. E-comics have become an effective tool to support learning for slow learners and dyslexic children.

Table 2 Assessment results of students with special needs on the electronic comic platform

Category	Before Implementation	After Implementation
Slow Learners	72	79
dyslexia	77	82

The implementation of Google Classroom in group activities can support the learning of learners with different abilities, including slow and dyslexic learners. This group activity divides learners evenly between those with high, low, and medium intelligence. Slow learners and dyslexic learners are placed in separate groups. Learners with high intelligence act as leaders who can drive the discussion. Teachers provide direction and design more structured activities to support understanding learners with special needs. They can collaborate with their group without feeling overwhelmed. In this way, Google Classroom is a learning platform that creates a collaborative and inclusive learning environment.

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Table 3 Assessment results of students with special needs on the Google Classroom platform

Category	Before Implementation	After Implementation
Slow Learners	72	80
dyslexia	75	80

Discussion

Research exploring TPACK in IPAS subjects, especially social studies, in optimizing digital literacy shows that Technology can increase understanding and interest in reading, especially for slow learners and dyslexic students. Slow learner learners are children with below-average intellectual abilities but still within the normal range (Rahayu et al., 2023). Learners with slow learner disorders have difficulty understanding subject matter that is presented at an average speed, so it takes longer to receive information (Khabibah, 2017). Learners with slow learner impairments require appropriate learning approaches and strategies, such as simplified materials. Meanwhile, dyslexic learners have neural abnormalities in the brain that make it difficult to process and identify words (Rofiah, 2015). Learners who experience dyslexia physically look normal, but people with dyslexia can be recognized through learning difficulties in reading and writing (Widodo et al., 2020). Learners who have difficulty reading dyslexia show unusual reading habits such as feeling uncomfortable while reading, and sometimes also crying (Khotimah et al., 2023). The characteristics of dyslexic learners are that they usually experience short-term memory and cannot listen to the teacher and take notes simultaneously.

Technologies such as interactive maps, e-Comics, and Google Classroom have proven effective and responsive to learner needs. Interactive maps are one of the technologies that can be used to explore geographical locations visually and interactively. In the context of slow learners and people with dyslexia, interactive maps provide a visual structure to understand the material well. Interactive maps of flora and fauna material in Indonesia can attract students' attention in literacy because of their attractive design. Besides that, it can develop students' fine motor skills, such as turning pages and touching interactive elements, making it easier for teachers to control the class and making students actively involved in the two-way learning process that will provide learning experiences. (Andriana & Rokmanah, 2023) Asserting that interactivity in learning can encourage exploration and development of analytical skills for students with difficulty learning.

E-comic is taken from the word "electronic comic" or comics that can be accessed online (Widyawati et al., 2024). Comics are summaries in the form of animated images to convey material interestingly. Electronic comics designed with simple narratives and funny characters can help slow learners and dyslexic students understand the material without feeling burdened by long texts. (Setyorini et al., 2023) Showed that visual elements in e-comics can improve information comprehension by strengthening the relationship between text and images. Thus, e-comics can be a medium for slow learners and dyslexic students to understand the material accurately and more meaningfully.

As a group digital learning platform, Google Classroom also provides significant learning benefits. Teachers design activities that allow learners to collaborate and share ideas among friends. (Tuna, 2022) showed that collaboration in a digital environment can improve learners' communication and skills. In groups of different intelligence levels, slow learners and dyslexic students will feel more confident sharing ideas because they have the support of their peers. Google Classroom also provides precise and targeted feedback. Technological Pedagogical Content Knowledge (TPACK) is a framework that combines three essential elements in learning: content knowledge (CK), which is the understanding of what material is taught; pedagogical knowledge (PK), which is the ability to teach effectively, and technological knowledge (TK) which is the ability to use Technology in the learning process (Farikah & Al Firdaus, 2020); (Rahmatiah et al., 2022). These three elements enable teachers to design learning that relies on materials and utilizes Technology to enrich students' understanding and learning experience. The relationship between Technology and pedagogy

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in this context creates an inclusive learning environment where all students can actively participate. (Hafizah, 2023) emphasizes that the appropriate use of Technology can facilitate learner-centered learning, where students have more control over their learning process. Thus, the Technology used in social studies improves concept understanding and builds learners' confidence and social skills.

Applying TPACK through interactive map media has shown increased learning outcomes for slow learners and dyslexic students. Based on the research results, slow learner learners experienced an increase in scores from 69 to 75. This shows that using supporting Technology can improve understanding of the material. For dyslexic learners, the score increase was also seen from 75 to 79. Interactive maps provide clear information visualization, so dyslexic learners can focus more on understanding concepts without relying on long texts. According to (Cynthia and Sihotang, 2023), the appropriate use of Technology helps in content comprehension and encourages learners' active engagement in learning. In addition, assistance is also needed to help learners use the Technology, provide additional explanations, and ensure they can follow the flow without experiencing confusion (Dewi et al., 2021).

Applying TPACK through e-comic media also significantly impacted the learning outcomes of slow learners and dyslexic students. Slow learner learners who previously obtained a score of 72 increased to 79. Electronic comics provide engaging narratives and visualizations supporting slow learners' learning process. For dyslexic learners, the increase in scores from 77 to 82 reflects that e-comic media can help them understand the material. E-comics are equipped with simple images and text elements to support the literacy development of learners with special needs. The way e-comic is used in learning activities is that teachers share the e-comic link and access it through digital devices such as mobile phones. Learners can read the stories that have been provided, containing narratives about daily life and basic needs such as eating, drinking, living, and interacting with friends. During reading, learners with special needs are accompanied by the teacher so that they do not get out of the flow of learning activities. The use of e-comic digital media can increase the motivation and engagement of learners with special needs in learning because the visuals and narratives are easy to follow (Berger et al., 2023).

Implementing TPACK through Google Classroom in group activities also improved learning outcomes. Students who are slow learners and dyslexic after implementation get the same score, which is 80. This shows that they collaborate well with each other. Because at the end of learning, each group sends the results of digital literacy as a review. The review process looks at students' cognitive abilities, their understanding of the material, and the questions that are born from the discussion process. The Google Classroom feature can be accessed at any time, and the material can be repeated, allowing students with special needs to learn independently according to their learning speed (Fernández-López et al., 2013). Implementing TPACK through the Google Classroom platform supports cognitive development and improves learners' digital literacy, allowing them to access relevant information and apply it independently in various learning contexts (Istiningsih, 2022).

In the use of digital devices, some rules apply, such as when allowed to bring cell phones for learning activities, cell phones should not be used to open social media, and when the learning is over, it must be returned to the box on the teacher's desk. During learning activities, teachers check the use of cell phones. In addition, teachers also collaborate with parents to supervise the use of mobile phones at home so that the use of mobile phones can be more positive. Digital literacy plays a vital role in the learning process of students with slow learning disorder and dyslexia. Digital platforms can help slow learners and dyslexic children to learn whenever and however they want. This can be done anywhere and anytime without relying on teacher assistance and can be adjusted to their learning (Paramansyah & Parojai, 2024). This independence can help them overcome challenges in reading and writing and increase their confidence and motivation to learn. Thus, digital literacy facilitates access to and understanding of information and forms a strong foundation for future academic and professional success for learners with special needs (Aldini et al., 2022). Overall, recent studies have shown that using technologies such as interactive maps, electronic comics, and Google Classroom, as well as the application of TPACK, positively contributes to improving the quality of learning for slow learners

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and dyslexic students. With the right approach, students can learn effectively, understand the concepts taught, and collaborate with their peers in a supportive environment, thus creating a more meaningful and powerful learning experience (Zubaidah, 2016).

Using digital platforms such as interactive media, e-comics, and Google Classroom has many advantages, especially for students with special needs. Interactive maps provide strong icons and colors to strengthen visual memory and help learners recognize and recall information. With interactive maps, learners can explore different places and concepts independently, such as clicking, zooming, or moving, making learning more enjoyable and easy to understand. E-comic as a visual narrative media provides an exciting way because e-comic uses an image and text format that is interesting and easily understood by learners with dyslexia; information is conveyed and presented in small chunks so that it can help learners with dyslexia process information effectively. The Google Classroom platform offers advantages in terms of more structured learning management. It also facilitates two-way communication between teachers and learners, especially for PDBK, which gets timely guidance and feedback. All three digital platforms provide significant advantages in accessibility, interactivity, and personalization of learning for students with special needs.

CONCLUSIONS AND RECOMMENDATION

The results of this study can be concluded that the use of technology in social studies learning, such as interactive maps, e-comics, and Google Classroom, is proven to provide positive results in improving digital literacy and understanding for slow learners and dyslexics. Interactive maps help visualize complex material such as the diversity of flora and fauna, making it easier for learners to understand concepts more concretely. E-comics, with their visual narrative approach, overcome reading difficulties and help learners understand content more engagingly and simply. Meanwhile, Google Classroom supports group collaboration and access to self-study materials, which is particularly beneficial for learners with special needs. The implementation of TPACK with these technologies effectively improved their grades and digital literacy, demonstrating that proper technology integration can create an inclusive and adaptive learning environment.

The recommendations given in this study are that teachers not only understand the application of technology in learning, but are also able to optimally utilize other components such as pedagogical and content. in addition, it is expected that teachers attend intensive training so that teachers are more responsive to the needs of students with special needs.

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