

## DIGITAL LEARNING TOOLS AND SOCIAL COLLABORATION IN CLASSROOMS: TEACHERS' EXPERIENCES IN ENHANCING PEER INTERACTION

### *FERRAMENTAS DE APRENDIZAGEM DIGITAL E COLABORAÇÃO SOCIAL EM SALA DE AULA: EXPERIÊNCIAS DE PROFESSORES NO APRIMORAMENTO DA INTERAÇÃO ENTRE PARES*

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#### **Abstract**

The widespread integration of digital learning tools has transformed traditional teaching methods, particularly in primary education, where fostering social development is fundamental. This qualitative exploratory study examines how teachers in private primary schools in Islamabad and Rawalpindi perceive the role of digital tools in enhancing peer interaction and collaborative learning. Grounded in Vygotsky's Social Constructivist Theory, the research investigates experiences with platforms such as Google Classroom, Seesaw, Microsoft Teams, Jamboard, and Padlet, focusing on their impact on communication, teamwork, and social cognition among young learners. Data were collected through semi-structured interviews with 16 purposively selected teachers and analyzed using thematic analysis. Findings indicate that digital tools facilitate active participation, foster inclusive learning environments, and support the development of

#### **Resumo**

*A ampla integração de ferramentas digitais de aprendizagem transformou os métodos tradicionais de ensino, particularmente na educação primária, onde o fomento do desenvolvimento social é fundamental. Este estudo exploratório qualitativo examina como professores de escolas primárias privadas em Islamabad e Rawalpindi percebem o papel das ferramentas digitais no aprimoramento da interação entre pares e da aprendizagem colaborativa. Fundamentada na Teoria Social Construtivista de Vygotsky, a pesquisa investiga experiências com plataformas como Google Classroom, Seesaw, Microsoft Teams, Jamboard e Padlet, com foco em seu impacto na comunicação, no trabalho em equipe e na cognição social entre os jovens alunos. Os dados foram coletados por meio de entrevistas semiestruturadas com 16 professores selecionados intencionalmente e analisados utilizando análise temática. Os resultados*



core social competencies, including empathy, collective problem-solving, and group decision-making. While teachers acknowledged these benefits, they also noted challenges such as limited device access, unstable internet connectivity, insufficient training, and concerns regarding excessive screen time. The study underscores the critical role of teachers as mediators of digital interaction and calls for structured professional development programs and equitable infrastructural support to optimize technology integration. This study contributes context-specific insights to global research on educational technology by highlighting the unique socio-pedagogical dynamics in Pakistan's private primary schools. It offers recommendations for policy formulation, teacher training, and curriculum design aimed at strengthening the role of digital tools for collaborative learning. Further research is suggested to explore similar dynamics in public school settings and to directly incorporate student perspectives.

**Keywords:** Digital Learning Tools. Primary Education. Peer Collaboration. Social Constructivism. Teacher Perceptions. Pakistan. Educational Technology Integration.

*indicam que as ferramentas digitais facilitam a participação ativa, promovem ambientes de aprendizagem inclusivos e apoiam o desenvolvimento de competências sociais essenciais, incluindo empatia, resolução coletiva de problemas e tomada de decisão em grupo. Embora os professores tenham reconhecido esses benefícios, eles também apontaram desafios como acesso limitado a dispositivos, conectividade instável à internet, treinamento insuficiente e preocupações com o tempo excessivo em frente às telas. O estudo destaca o papel crucial dos professores como mediadores da interação digital e defende a necessidade de programas estruturados de desenvolvimento profissional e apoio infraestrutural equitativo para otimizar a integração da tecnologia. Este estudo contribui com perspectivas específicas ao contexto da pesquisa global sobre tecnologia educacional, ao evidenciar a dinâmica sociopedagógica singular nas escolas primárias privadas do Paquistão. Oferece recomendações para a formulação de políticas, formação de professores e elaboração de currículos, visando fortalecer o papel das ferramentas digitais na aprendizagem colaborativa. Sugere-se a realização de pesquisas futuras para explorar dinâmicas semelhantes em escolas públicas e incorporar diretamente as perspectivas dos alunos.*

**Palavras-chave:** Ferramentas de Aprendizagem Digital. Educação Primária. Colaboração entre Pares. Construtivismo Social. Percepções dos Professores. Paquistão. Integração de Tecnologia Educacional.

## 1 BACKGROUND

The educational paradigm, with the arrival of digital learning tools, has faced a transformative shift in the traditional approaches to teaching and learning, and has become an internationally pivotal aspect of the educational landscape (Jones, 2022). The integration of digital learning tools in the education system has grown rapidly over the past few years, creating new possibilities to enhance teaching and learning. As technology continues to infuse various constituents of society, its influence on academic approaches and subsequent impact on young learners, raises significant questions. Today, young

children across the world are surrounded by digital devices in more or less every phase of their lives, using an extensive variety of applications to platforms, running on tablets and smartphones and language development applications. Since the advent of Apple's iPad in 2010, computer use by young children has skyrocketed, especially as teaching philosophies focus on play activities over traditional classes and formal teaching, to support young children's development, learning, play, and communication with others (Rodriguez, 2023). Most research on children and technology relates to children ages 9 to 16, but interactions with technology may have a greater impact on the development of children ages 3 to 8 (Rodriguez, 2023). Some schools now test each child's digital skills and teach children digital competence, such as knowing when and why digital learning tools are used.

Scholarly discourse has explored the broader landscape of technology integration in education, emphasizing its potential to enhance learning experiences through integrating digital learning tools, educational apps, and interactive platforms to prepare students for the demands of a digitally driven society. Subsequently, in primary education, digital learning tools have garnered significant attention in recent years. The formative years of a child's education are foundational for their future academic and social success (Soldatova & Vishneva, 2019). As educational institutions are progressively integrating digital learning tools into their curricula, it is vital to examine their impact on children's social development. This research endeavours to evaluate the profound impact of digital learning tools on children's social development during their formative years. While investigating these effects, it is also crucial to explore the subjective viewpoints of the primary facilitators – the educators. Teachers are the primary shareholders who play an important role in the successful integration of these tools in classroom settings. According to research, 76% of early childhood teachers utilize technology in their curriculum to enhance learning outcomes, and they point out a 30% increase in student engagement when using technology in classroom settings. (*Technology in Early Childhood Education Statistics Statistics: Market Data Report 2024*, n.d.).

Children who were born after 2010 are known as 'Generation Alpha' and will now be enrolling in preschools and kindergartens. These kids make up 30 percent of world population and come after Generation Z. Generation Alpha's number is growing at approximately 2.5 million every week. Children from Generation Alpha are thought to be

the most digitally literate group to go to join school yet (Culala, 2016 & McCrindle 2018). Hence, teachers need to gain the necessary skills to meet the requirements of these children joining the school in today's age.

Digital learning platforms such as Google Classroom, Seesaw, and Microsoft Teams play a crucial role in enhancing group interaction and peer collaboration among primary education students. They help students collaborate and transcend traditional boundaries. They enable real-time communication, group discussions, shared assignments, and peer feedback, hence promoting teamwork and collective problem-solving. Shared documents help students to interact constructively, exchange ideas and learn from each other's perspectives. Research indicates that such tools enhance student engagement and collaborative learning by creating interactive and student-centred environments (Trust & Whalen, 2020; Bond et al., 2021) Especially, in blended and remote learning settings, these platforms facilitate continuous group engagement, allowing students to stay connected on tasks despite physical distance. Moreover, these platforms are used by teachers as a supplement to traditional teaching approaches.

A great amount of research has examined the benefits of integrating digital learning tools in classrooms, stating enhanced engagement, peer interaction, collaboration and communication skills (Soldatova & Vishneva, 2019). However, the instruments through which these tools impact social development, and their potential challenges continue to be areas that demand a deeper comprehension (Proekt et al., 2020). This approach would help to understand how these tools shape the psychological development of young students. Moreover, focusing on teachers' perspectives and experiences regarding digital learning tools is fundamental for developing the tools that are practically applicable in the classroom setting, to enhance learning outcomes and ensure a harmonious connection between digital technology and efficient teaching.

While digital tools are increasingly integrated into classrooms, there remains limited qualitative insight into how they reshape classroom collaboration within the context of Pakistan's private primary schools. Although platforms like Google Classroom, Seesaw, and Microsoft Teams are being adopted to support teaching and learning, the specific ways in which they influence student-to-student and student-to-teacher interactions are not well documented through in-depth, context-specific studies. Most available research in Pakistan tends to focus on access, usability, or academic

outcomes, rather than exploring the nuanced social dynamics and collaborative practices that these tools foster within the primary classroom. As a result, there is a gap in understanding how digital tools impact group work, peer communication, and co-construction of knowledge among young learners in diverse private school environments. This highlights the need for more grounded, qualitative investigations that capture teachers' and students' lived experiences and offer a richer understanding of how technology is reshaping collaborative learning in early education settings.

### **1.1 Research objective**

- To explore how teachers', perceive the role of digital learning tools in enhancing students' peer interaction and collaboration.

### **1.2 Research questions**

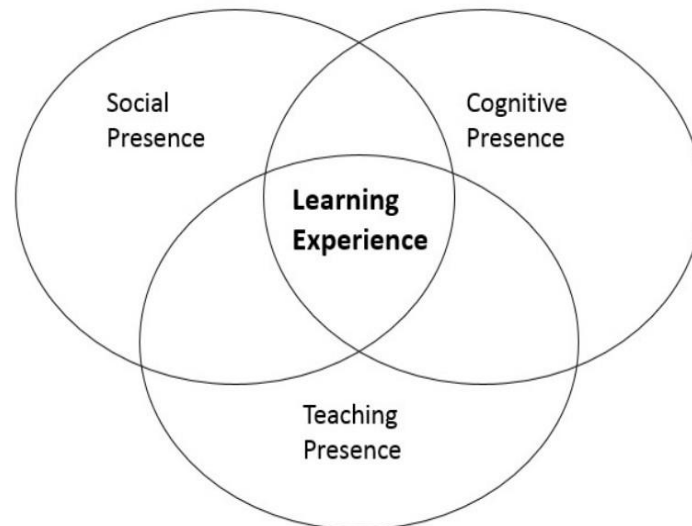
- What digital learning tools are used to promote peer collaboration in classrooms?
- How do teachers perceive their effectiveness in enhancing social skills?
- What challenges or enablers do teachers identify in implementing these tools for collaboration?

## **2 LITERATURE REVIEW**

### **2.1 Theoretical framework: social constructivism**

#### *2.1.1 Overview of social constructivism*

Lev Vygotsky's Social constructivism theory highlights the significance of the social and cultural context in which learning occurs. He explained the learning process as the formation of a "zone of proximal development" where the teacher, student, and a problem to be solved coexist. In this zone, the teacher provides a social environment where the learner can construct knowledge with the help of others (Picciano, 2017).

**Figure 1***Community of Inquiry (Garrison, Anderson, Garrison, and Archer, 2000)*

### 2.1.2 Collaborative learning and social interaction

Collaborative learning and social interaction are the key focus when it comes to social constructivism. These factors enhance the social development of children through engagement with peers. (Vygotsky, 1978). Digital learning tools offer platforms and programs that facilitate learning through group projects, and teamwork e.g. online discussion platforms or collaborative projects (Bers et al., 2018). Collaborative projects, interactive smart boards and virtual classrooms on the internet allow students to participate in valuable discussions, exchange ideas, and construct knowledge together with their peers and teachers (Salzer et al., 2020).

## 2.2 Role of peer collaboration in primary education

Quesenberry (2016) has defined social and emotional skills in a primary classroom as being responsible for oneself and others. Additionally, it involves participating in collaborative play and sharing materials. According to Savina et al.

(2017), the rise in the use of technology has created new opportunities for young students to enhance their social and emotional skills with the help of communicating, learning and interacting with others.

Research has shown that allowing young children to use shared devices together can improve their social interaction (Quesenberry et al. (2016). Although digital learning tools have many advantages for cognitive development, there are concerns about their impact on the social interaction of young learners. Researchers suggest that excessive screen time and solitary engagement with digital devices may hinder opportunities for socialization and collaborative learning (Radesky et al., 2020).

### **2.3 Digital tools supporting classroom interaction**

Globally, a range of digital tools- such as Padlet, Jamboard, and Kahoot- have been recognized for their capacity to enhance classroom interaction and foster student engagement. These platforms promote collaborative learning by allowing students to contribute in real time, share ideas visually, and actively participate in discussions and problem-solving tasks. Padlet, for example, serves as an interactive digital bulletin board where students can post responses, images, and questions, enabling asynchronous and synchronous collaboration (Danker, 2015). Jamboard, a digital whiteboard by Google, facilitates real-time brainstorming and collective idea mapping, which is particularly effective in promoting creative group work and visual thinking (Sari & Wahyudin, 2020). Similarly, Kahoot introduces game-based learning elements that encourage student participation, teamwork, and peer competition, fostering a more dynamic and interactive classroom culture (Licorish et al., 2018). Studies have shown that these tools not only increase student motivation but also improve communication and cooperation among learners, thereby transforming traditional pedagogical approaches into more participatory and student-centered models.

### **2.4 Teachers as mediators of digital interaction**

Teachers play a pivotal role as mediators of digital interaction, with their professional competence, beliefs about technology, and access to institutional support

significantly influencing the success of digital integration. According to Ertmer and Ottenbreit-Leftwich (2010), teachers' pedagogical beliefs are key determinants of whether and how digital learning tools are implemented to support meaningful classroom interaction. Teachers who view technology as a means to foster student-centered learning are more likely to integrate tools that promote collaboration and critical thinking. However, technical proficiency alone is not sufficient; ongoing professional development, peer support, and administrative encouragement are essential in empowering teachers to mediate digital learning effectively (Tondeur et al., 2017). Moreover, research indicates that teachers' comfort with digital platforms often correlates with the extent to which students engage in interactive learning experiences (Hsu, 2016). In resource-constrained environments like many schools in the Global South, the availability of support mechanisms- such as ICT coordinators, training workshops, and digital resource sharing- can significantly enhance or hinder teachers' roles as facilitators of collaborative digital learning.

Teachers in primary classrooms should be careful in selecting the right technological tools and how to use them effectively. The use of technology should be relevant, engaging, and developmentally appropriate to cater to the individual needs of each student (Quesenberry et al., 2016).

According to a survey conducted by PBS (Public Broadcasting Service) and Grunwald Associates LLC in 2010, classroom teachers in the United States believe that various technology devices and web-based systems are useful for enhancing their teaching methods and engaging students in learning. The survey, which included 1,400 teachers from preschool to secondary school, found that almost all of the teachers surveyed (97%) utilized digital media for various purposes such as searching, managing, and accessing interactive games, activities, lesson plans, and simulations. Teachers are increasingly relying on digital learning tools to manage content rather than traditional paper files and reports. The study also showed that 76% of the teachers use data management systems to keep track of assessment scores, 71% use it to refine the curriculum, 62% use it to develop individual education plans, and 54% use it for professional development or feedback. Sixty-eight percent of teachers value interactive whiteboards as a means to supplement and support their teaching. Similarly, in a mixed-methods study involving over 300 teachers in Canada, Peterson and McClay (2012) found

that the use of smart boards saved time in classroom teaching since it made it easier to demonstrate examples, which could also be saved for future use. The utilization of diverse digital learning tools in primary education has the potential to enhance the creativity and innovation of educators, as well as assist them in enhancing their teaching methods during the delivery of lessons. (Anwariningsih & Ernawati 2013). This technology enables teachers to gather, and analyze data, create multimedia presentations, and deepen understanding (Yasa et al., 2021).

The integration of technology and the support of children's experiences with digital learning tools is largely dependent on primary education teachers. Teachers in primary classrooms should be careful in selecting the right technological tools and how to use them effectively. The use of technology should be relevant, engaging, and developmentally appropriate to cater to the individual needs of each student (Quesenberry et al., 2016).

The teachers' beliefs, technological skills, and perceived barriers have an impact on how they integrate technology into their classrooms. A study revealed that primary teachers perceived many barriers to integrating computers in primary education settings, such as a lack of funding, technical support, internet access, and administrative support. The study also identified barriers such as a lack of confidence, inadequate training opportunities, a large number of children in the class, and outdated equipment (Nikolopoulou & Gialamas, 2013).

In digital literacy and pedagogical integration, teachers' professional development is an essential factor to effectively implement digital learning. Teachers play a vital role in mentoring students' interactions with digital learning tools, assisting their learning experiences, and improving their digital literacy skills (Kajander & Mäkitalo-Siegl, 2018). Thus, in order for professional development programs to be effective, educators should be provided with hands-on training, collaborative and reflection opportunities (Ertmer & Ottenbreit-Leftwich, 2013).

## **2.5 Literature gap**

While global research highlights the benefits of educational technologies in enhancing collaborative learning, there is a noticeable lack of contextual studies focusing

on South Asia, particularly Pakistan. Most existing literature tends to originate from Western or East Asian education systems, where infrastructure, teacher training, and digital access are relatively advanced (Kirkwood & Price, 2014). In contrast, Pakistan presents a unique and underexplored context where the integration of EdTech tools is influenced by varying institutional capacities, pedagogical norms, and socio-economic factors. Despite the growing use of platforms like Google Classroom, Seesaw, and Microsoft Teams in private primary schools, there is limited qualitative insight into how teachers in these settings perceive, adapt to, and facilitate digital collaboration among students. Additionally, the voices of teachers who are the primary mediators of digital learning, are often absent in the literature, creating a significant gap in understanding the practical challenges and pedagogical strategies employed on the ground (Farooq & Sultana, 2021). This gap underscores the need for context-specific research that captures teachers' lived experiences, highlights cultural and infrastructural constraints, and informs more locally relevant digital education policies.

### **3 METHODOLOGY**

#### **3.1 Research design**

This study employs a qualitative exploratory research design to investigate how digital learning tools influence classroom collaboration in private primary schools. The qualitative approach is suitable for capturing rich, contextualized insights into teachers' lived experiences, while thematic analysis allows for the identification of recurring patterns and meanings within the data (Braun & Clarke, 2006).

#### **3.2 Participants**

The study includes 16 primary school teachers from private schools in Islamabad and Rawalpindi. These participants were selected based on their active engagement with digital learning tools in classroom instruction. The interviews with these teachers were conducted as the primary data source for this study.

### **3.3 Sampling strategy**

A purposive sampling strategy was adopted to ensure the inclusion of teachers from schools where digital learning tools are actively used for instructional purposes. This sampling technique was ideal for targeting participants with direct experience and insights relevant to the study's focus on technology-supported collaboration.

### **3.4 Data collection method**

Semi-structured interviews were conducted to gather in-depth information regarding teachers' use of digital learning tools, perceptions of student collaboration, and observed changes in classroom interaction. The flexible nature of semi-structured interviews enabled participants to share their experiences freely, while also allowing the researcher to probe deeper into emerging themes.

### **3.5 Data analysis**

The data was analyzed using thematic analysis, identifying themes and producing the final report.

### **3.6 Ethical considerations**

Ethical protocols were strictly followed throughout the research process. Participants provided informed consent, and their anonymity and confidentiality were maintained. Participation was entirely voluntary, and individuals had the right to withdraw at any point without any consequences.

## **4 FINDINGS**

Teachers notice significant improvements in students' social skills, teamwork and collaboration through the use of digital learning tools.

#### 4.1 Tools used for collaboration

**Collaborative Learning:** Teachers observe that platforms such as "Google Classroom, Seesaw and Microsoft Teams, facilitate collaboration and teamwork through group projects in real-time. These platforms help learners collaborate no matter where they are physically located, enhancing cooperation and teamwork skills.

**Feedback and Communication:** One teacher highlights the learning benefits of interactive whiteboards and apps like Seesaw, ClassDojo, and Khan Academy Kids, emphasizing that these tools allow students to share their work and get feedback from their class fellows. This develops a collaborative and cooperative learning environment in the classroom.

#### 4.2 Perceived benefits of digital collaboration

Teachers consistently highlighted multiple benefits of using digital tools to support **collaborative learning** in the primary classroom. One of the most frequently mentioned advantages was **enhanced student engagement**. Platforms such as Seesaw, Google Classroom, and Microsoft Teams allowed students to participate more actively in group tasks, especially through features like shared documents, comment threads, and multimedia responses. Several teachers observed that shy or less vocal students became more involved when allowed to express themselves digitally, as these tools offered alternative modes of participation beyond verbal communication.

Another emerging theme was the **creation of feedback loops**, where students were able to give and receive feedback on peer work through tools like Padlet or Seesaw. Teachers noted that this process encouraged self-reflection and mutual learning, helping students to better understand their peers' perspectives. One teacher remarked, "When children comment on each other's work on Seesaw, they learn how to appreciate others' ideas and suggest improvements politely- it's a skill they didn't practice as much before."

**Teamwork during assignments** was also perceived to be more structured and efficient when digital tools were used. Group projects carried out using Google Docs, Jamboard, or Microsoft Teams enabled students to divide tasks clearly and contribute asynchronously, fostering a stronger sense of responsibility and collaboration. As one

participant noted, “Even when one student was absent, they could still contribute from home. That continuity has strengthened group accountability.”

### 4.3 Changes in student behavior

Teachers across different schools reported noticeable **positive changes in student behavior** as a result of engaging in digitally-mediated collaborative tasks. A dominant subtheme was **improved communication**, both in digital and face-to-face settings. Students became more confident in sharing their thoughts and ideas, particularly when engaging through text or voice notes on collaborative platforms. This digital interaction appeared to reinforce verbal communication skills in class discussions and presentations.

**Increased participation** was also a significant observation. Teachers shared that digital tools allowed for more inclusive classrooms where every student had an opportunity to contribute, regardless of their confidence levels or learning styles. As one teacher put it, “Children who were otherwise quiet in class were suddenly uploading videos, sharing opinions, and even helping others on shared platforms.”

Several educators also spoke of **growing empathy and peer support** among students. By working together online, students were exposed to different viewpoints, and this interaction fostered **social sensitivity and understanding**. One teacher explained, “I noticed students being more mindful of how they comment on others’ work- more encouraging and respectful.”

Lastly, **group decision-making** emerged as a behavior that was strengthened through digital collaboration. Many teachers recounted situations where students used polling features, group chats, or shared boards to vote on ideas or distribute responsibilities. This digital approach to decision-making helped students practice negotiation, compromise, and leadership within their groups- skills considered essential for both academic and social development.

### 4.4 Challenges identified by teachers

Teachers recognize several challenges inhibiting the active incorporation of digital learning tools:

#### *4.4.1 Technical issues*

"Unreliable internet connection" is acknowledged as a key obstacle that does not support streaming online educational videos on multimedia. Other major challenges highlighted by teachers are "limited access to digital learning tools such as educational softwares, LEDs, and lack of smart boards" and "insufficient budget impacting software subscriptions."

#### *4.4.2 Professional development*

Teachers have stressed the need for extensive and frequent training and professional development opportunities throughout the year that specifically target digital learning tools.

#### *4.4.3 Balancing screen time and mitigation strategies*

Teachers express concerns about the potential negative effects of excessive screen time and suggest mitigation strategies to address these. While digital learning tools enhance and facilitate learning activities, teachers have expressed concerns that "excessive screen time can gradually cause weak eyesight at a young age," and "excessive use of these tools can be counterproductive for their cognitive development." Moreover, overuse can lead to over dependency on technology, which can inhibit cognitive development and cause distraction from learning.

### **4.5 Support and training needs**

#### *4.5.1 Training and professional development*

Teachers elaborate on the significance of training and professional development for the effective incorporation of digital learning tools:

**Self-Learning and Collaboration:** A large number of teachers shed light on the significance of organic and self-learning by doing their research and utilizing online

resources. Many of these teachers also collaborate with their peers from the same school or different schools through online groups where they share their ideas, useful tips, and experience with the new digital learning tools to enhance their teaching methods. One teacher emphasizes their participation in an international community of IT teachers who exchange knowledge and insights, which has turned out to be extremely helpful in becoming proficient at and integrating digital learning tools successfully.

**Need for Formal Training:** Despite self-learning, primary education, teachers have voiced a requirement for "more formal training, seminars and workshops" that are specifically focused on enhancing digital literacy skills in teachers to enhance their comprehension and incorporation capabilities regarding digital learning tools. One teacher has indicated, "Professional development opportunities are of utmost importance in order to help teachers stay updated with the latest educational technology."

#### 4.5.2 *Future directions and recommendations*

Teachers envision the future of digital learning tools integration in primary education:

**Blended Learning Models:** Teachers anticipate the implementation of blended learning models that combine digital learning tools with traditional teaching methods and supplement these methods. This would provide personalized, inclusive, and engaging academic experiences for learners.

**Support Needs:** Teachers highlight the significance of "continuous professional development, training programs, specialized technical assistance, and equitable access to technology" to elevate the utilization of digital learning tools in primary education.

## 5 DISCUSSION

### 5.1 **Aligning findings with social constructivist theory**

The study investigated the impact of digital learning tools on the social development of primary education students through the lens of social constructivism. The findings of the study align with social constructivist phenomena which states that learning

and cognition are significantly enhanced by social interactions (Vygotsky, 1978). The findings reported that digital learning platforms such as Century, Khan Academy Kids, Seesaw, Padlet, and Koobits significantly enhance cognitive skills by providing personalized learning experiences and interactive educational content. Moreover, teachers highlighted platforms such as Canva and Minecraft for nurturing communication and social skills, collaborative learning, and teamwork among students. Digital learning evidently provides a practical application of social constructivist principles in modern classrooms, supported by Quesenberry et al. (2016), who showed that students working on shared devices demonstrate improved social interaction. Another study by Bers et al., (2018) concluded that in well-designed digital environments such as classroom settings, under teacher's supervision, digital learning tools can encourage social interaction through virtual communities and collaborative projects.

Several teachers have undergone training sessions by foreign EdTech experts, while others have highlighted the significance of self-learning through online courses. These findings are supported by existing literature; Kajander and Mäkitalo-Siegl (2018) concluded that the successful implementation of digital learning in pedagogy greatly relies on educators' digital literacy skills and professional training.

## 5.2 Contextual insights from Pakistan

The integration of digital learning tools in Pakistan's private primary schools is deeply influenced by contextual factors such as digital infrastructure, school funding, and teacher exposure to EdTech. Teachers interviewed from well-established private schools in Islamabad and Rawalpindi reported relatively smooth integration of collaborative digital tools due to better Wi-Fi access, availability of devices, and institutional support. In contrast, teachers from less-resourced private schools- though still within the private sector- highlighted barriers such as shared devices, unstable internet, and limited technical support. This disparity underscores how school type and socio-economic **context** significantly shape the depth and quality of digital implementation.

Additionally, the digital experience of students outside school also played a role in how effectively collaboration tools were used in the classroom. In higher-tier schools, students were often more familiar with platforms like Google Classroom and Seesaw due

to regular homework tasks and home-based reinforcement. Conversely, in lower-tier schools, even when tools were introduced, their impact on collaboration was somewhat constrained by students' limited access to technology at home. These insights suggest that digital tool integration in Pakistan cannot be viewed as a one-size-fits-all model; rather, it requires context-aware approaches that consider school resources, teacher readiness, and students' digital backgrounds.

### **5.3 Implications for practice**

The findings of this study carry several key implications for school administrators, curriculum designers, and teacher training programs aiming to strengthen collaborative learning through digital tools in the Pakistani context.

First, administrators should prioritize infrastructure development by ensuring consistent internet access, provision of shared digital devices, and access to platforms that support collaborative learning. Investments in even low-cost tools like Padlet or Google Jamboard can make a tangible difference if effectively supported.

Secondly, the study suggests the need to embed collaborative digital practices into routine classroom activities rather than treating them as occasional or supplementary. When digital collaboration becomes a regular part of lesson planning and assessment, students are more likely to internalize key social skills such as teamwork, empathy, and group decision-making. In this way, digital learning tools not only enhance academic learning but also contribute meaningfully to students' social development, which is particularly crucial at the primary level.

Finally, teacher training must go beyond basic ICT skills to include pedagogical strategies that leverage digital tools for fostering collaboration. Many teachers interviewed emphasized that their ability to use platforms effectively came from informal learning or peer support, rather than structured professional development. Therefore, targeted training workshops, peer-led learning communities, and ongoing mentoring could empower teachers to act as facilitators of digital interaction rather than passive users of technology.

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## **6 CONCLUSION AND RECOMMENDATIONS**

### **6.1 Summary of key insights**

This study set out to explore how primary school teachers in private schools in Islamabad and Rawalpindi perceive the role of digital learning tools in enhancing peer interaction and collaboration among students. The findings reveal that a wide range of tools- such as Google Classroom, Seesaw, Microsoft Teams, Padlet, and Jamboard- are being employed to support collaborative learning tasks to enhance social competencies such as collaborative learning and teamwork among students. Teachers observed that these tools contributed to increased student engagement, improved communication, and more inclusive participation, particularly for students who are typically reserved in traditional classroom settings.

The study also identified that digital platforms facilitated the development of social skills such as teamwork, empathy, and group decision-making, particularly through shared assignments, peer feedback features, and virtual discussions. However, the effectiveness of these tools was often influenced by contextual factors such as access to devices, teacher training, and school-level support structures. While teachers expressed a generally positive outlook on digital collaboration, they also highlighted challenges including inconsistent infrastructure, limited professional development, and varying student familiarity with digital environments.

### **6.2 Recommendations**

Based on these findings, the following recommendations are proposed to enhance the effective use of digital learning tools for student collaboration in similar contexts:

Professional development programs should be tailored to equip teachers not only with technical skills but also with pedagogical strategies that foster digital peer

interaction. Emphasis should be placed on using platforms like Seesaw, Jamboard, and Google Docs for group work, discussions, and collaborative assessments.

Mandatory training programs focused on digital literacy and the effective integration of digital learning tools into the curriculum should be implemented for teachers. Continuous professional development through workshops, seminars, online courses, and collaboration with educational experts should be encouraged.

School administrators and education policymakers should prioritize improving internet connectivity, providing access to shared digital devices, and ensuring reliable tech support within schools. These foundational investments are essential for sustainable EdTech integration.

Establishing platforms or networks- whether online or in-person- for teachers to exchange best practices, troubleshoot challenges, and share lesson plans can strengthen collective capacity. Peer mentoring and collaborative planning can also help normalize the use of digital tools for classroom interaction.

### **6.3 Future research**

While this study focused on teachers' perspectives within private schools, further research is needed to broaden the understanding of digital collaboration in primary education across different educational settings.

Future studies could examine differences in digital learning tool access, pedagogical approaches, and collaboration outcomes between public and private sector schools to better inform inclusive EdTech policies and practices. Moreover, gaining insights directly from students can provide a deeper understanding of how digital learning platforms influence their sense of agency, social development, and engagement with peers during collaborative tasks.

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### **Authors' Contribution**

All authors contributed equally to the development of this article.

### **Data availability**

All datasets relevant to this study's findings are fully available within the article.

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