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Teachers' Perceptions of Educational Applications in the Development of Critical and Creative Skills of Children in Primary Education (Grades I–III)

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Abstract

Educational applications are increasingly used in primary education, yet their pedagogical value depends on how teachers select, integrate, and guide their use. This study examined teachers' perceptions of the relationship between educational applications and the development of critical and creative skills among children in Grades I–III. A quantitative correlational design was applied with a sample of 100 lower primary school teachers from different school contexts, including urban and rural environments. Data were collected through a structured teacher questionnaire and analyzed using descriptive statistics and Pearson's correlation coefficient. The findings show statistically significant positive associations between teachers' reported use of educational applications and their perceptions of students' critical thinking ($r = .475$, $p < .001$), creativity ($r = .738$, $p < .001$), classroom engagement ($r = .626$, $p < .001$), and performance in tasks requiring critical and creative thinking ($r = .514$, $p < .001$). Teacher professional preparation and institutional support were also positively associated with perceived effectiveness of application use ($r = .562$, $p < .001$), while teaching experience showed a moderate positive relationship with strategic integration of applications ($r = .461$, $p < .001$). The study concludes that educational applications are perceived by teachers as supportive tools for higher-order thinking when used intentionally; however, the findings should be interpreted as perceived associations rather than direct evidence of impact. Recommendations include continuous teacher training, careful selection of applications aligned with learning objectives, and stronger institutional support for meaningful digital learning.

Keywords: Educational applications, critical thinking, creativity, teachers, primary education

Introduction

The rapid expansion of digital technology has changed the conditions under which children encounter information, communicate, play, and learn. In primary education, this change is especially visible through educational applications that combine images, sound, feedback, tasks, games, and learning analytics in formats accessible through computers, tablets, and mobile devices. These applications are not valuable simply because they are digital; their educational value depends on whether they are connected to clear learning objectives, whether they promote active thinking, and whether teachers use them to support meaningful interaction rather than passive screen time.

The issue became more visible during and after the COVID-19 pandemic, when online resources and digital tools entered schools and homes with greater intensity. However, the growth of digital learning also raised important pedagogical questions. International reports warn that technology in education should be used on the basis of evidence, equity, and appropriateness rather than enthusiasm alone (Global Education Monitoring Report Team, 2023). For younger learners, the central question is not only whether technology should be present in classrooms, but how it can be used in ways that protect development, support social interaction, and strengthen higher-order thinking.

Critical and creative thinking are increasingly recognized as essential competencies for contemporary education. The OECD (2024) describes creative thinking as the capacity to generate, evaluate, and improve original and diverse ideas across different contexts. Critical thinking involves analysis, interpretation, evaluation, reasoning, and the ability to make informed judgments. In lower primary education, these skills appear in age-appropriate forms, such as asking questions, comparing ideas, explaining reasons, solving simple problems, producing alternative answers, and expressing ideas through language, drawing, play, or digital tasks.

Teachers have a central role in this process. Educational applications may provide interactive environments, but they do not replace pedagogical judgment. Teachers decide which application is appropriate, how it is introduced, how students are guided during its use, and how digital activities are connected with discussion, reflection, collaboration, and assessment. In this sense, teachers function as mediators between digital resources and children's cognitive development. The effectiveness of an application therefore depends not only on its design but also on the professional competence, experience, and instructional decisions of the teacher.

Although research on digital technology in education has expanded, several limitations remain. Much of the literature discusses educational technology in broad terms or focuses on older students, higher education, or emergency online learning. Fewer studies examine how lower primary teachers perceive the relationship between educational applications and the development of critical thinking, creativity, engagement, and performance in the early grades. In addition, the literature often emphasizes the benefits of digital tools without sufficiently distinguishing between direct measured effects and teachers' classroom-based perceptions. This gap is important because teachers' perceptions influence the way digital tools are selected and integrated in everyday practice.

The present study addresses this gap by examining teachers' perceptions of educational applications in Grades I–III. The main purpose is to determine whether teachers' reported use of educational applications is positively associated with their perceptions of students' critical thinking, creativity, engagement, and performance in tasks requiring higher-order thinking. The study also explores whether teacher preparation, institutional support, and teaching experience are related to more effective pedagogical use of educational applications in lower primary education.

Literature Review and Conceptual Background

Educational applications can be understood as digital software designed to support learning through instructional content, practice activities, feedback, assessment, communication, or classroom management. They may be used for language learning, reading, mathematics, science, formative assessment, collaborative activities, or interdisciplinary learning. Their common feature is the promise of making learning more interactive, individualized, and motivating. However, recent reviews emphasize that digital technologies should be understood as pedagogical tools whose value depends on purpose, design, and use rather than on technological novelty alone (Haleem et al., 2022; Global Education Monitoring Report Team, 2023).

Studies on engagement show that digital tools can increase behavioral, emotional, and cognitive participation when they provide feedback, interaction, and opportunities for active involvement. Bond et al. (2020) mapped research on student engagement and educational technology and showed that engagement is a multidimensional construct that cannot be reduced to attention or enjoyment. This distinction is important for primary education because young learners may appear

motivated by screen-based activities even when the cognitive demand is low. Therefore, teachers must distinguish between superficial engagement and meaningful engagement that involves reasoning, explanation, collaboration, and reflection.

The development of critical thinking requires learning situations in which students examine information, identify relationships, justify answers, and reflect on their choices. Digital applications can support these processes when they include open-ended tasks, simulations, problem-solving activities, and prompts requiring students to explain how they arrived at an answer. Jonassen (2008) emphasized that meaningful learning technologies should function as cognitive tools that help students represent ideas and solve problems, rather than as tools that merely deliver information. Similarly, Chusni et al. (2021) found that e-learning environments may support critical thinking when they are linked with discovery learning and active problem solving.

Creativity in primary education is expressed through originality, flexibility, imagination, and the production of new ideas within the child's developmental level. Digital applications may stimulate creativity when they allow students to draw, design, compose, build, tell stories, explore alternative solutions, or combine different forms of expression. The OECD (2023) stresses that creativity and critical thinking must be intentionally embedded into everyday classroom activities and supported by teacher professional learning. Amrina et al. (2024) also underline the close relationship between critical thinking, creative thinking, and problem solving among elementary school students, suggesting that these skills should be addressed together rather than as isolated outcomes.

The developmental relevance of teacher-guided application use can also be understood through classical theories of child development. Piaget's constructivist theory emphasizes that children actively construct knowledge through interaction with their environment, which suggests that digital tasks should encourage exploration, manipulation, and problem solving rather than passive reception of information (Piaget, 1952). Vygotsky's sociocultural theory further highlights the importance of guided interaction and the zone of proximal development, indicating that teachers play a crucial role in helping children move from what they can do independently to what they can achieve with support (Vygotsky, 1978). From this perspective, educational applications become more valuable when they are integrated into guided classroom activities rather than used as isolated digital exercises.

Teacher digital competence is another important factor. The European Framework for the Digital Competence of Educators explains that teachers need competences related to selecting digital resources, managing teaching and learning, assessing students, empowering learners, and supporting students' digital competence (Redecker, 2017). Falloon (2020) extends this idea by arguing that teacher digital competence is not merely technical; it includes pedagogical, ethical, and developmental dimensions. Therefore, a teacher may know how to operate an application but still need support in designing activities that promote thinking, collaboration, and creativity.

The role of teachers can also be explained through the technological pedagogical content knowledge framework. Mishra and Koehler (2006) argue that effective technology integration requires the interaction of technological knowledge, pedagogical knowledge, and content knowledge. This framework is relevant to the present study because educational applications become pedagogically meaningful only when they are aligned with curriculum content and appropriate teaching strategies. Teachers must therefore decide not only which application to use, but how it supports the learning objective and how students will reflect on the activity.

Institutional support also affects implementation. Schools that provide devices, internet access, professional development, technical support, and a culture of collaboration create better conditions for meaningful integration of educational applications. Without such support, teachers may use applications only occasionally or superficially. Scherer et al. (2019) showed that teachers' adoption of digital technology is influenced by perceived usefulness, ease of use, and related contextual factors. These findings suggest that individual teacher motivation is important but insufficient without supportive school conditions.

The reviewed literature indicates both potential and caution. On one hand, educational applications may support engagement, critical thinking, creativity, and problem solving when they are interactive and pedagogically purposeful. On the other hand, the literature warns against assuming that technology automatically improves learning. The main gap addressed in this study is the need for evidence on teachers' perceptions in lower primary education, where students require particularly careful guidance and where digital applications are often used in different ways across school contexts. This study therefore examines perceived relationships rather than claiming direct causal impact, and it connects application use with teacher preparation, institutional support, and teaching experience.

Methods

Research Design

The study used a quantitative correlational research design. This design was appropriate because the purpose was to examine the strength and direction of relationships between variables rather than to test the effect of an experimental intervention. The study focused on teachers' perceptions of educational application use and its relationship with students' critical thinking, creativity, engagement, and performance in learning tasks.

The research was guided by five main hypotheses. The first hypothesis stated that teachers' use of educational applications is positively related to their perceptions of students' critical thinking skills. The second hypothesis stated that the diversity and creative features of applications are positively related to teachers' perceptions of students' creativity. The third hypothesis stated that application use is positively related to perceived student engagement in classroom learning activities. The fourth hypothesis stated that the frequency of application use is positively related to perceived performance in tasks requiring critical and creative thinking. The fifth hypothesis stated that teacher professional preparation and institutional support are positively related to perceived effectiveness of educational application use. An additional analysis examined the relationship between teaching experience and the effective use of applications for developing critical and creative thinking.

Participants

The final sample consisted of 100 teachers who worked with students in Grades I–III. The participants represented different levels of professional experience, educational backgrounds, and school environments. Including teachers from both urban and rural contexts made it possible to obtain a broader picture of how educational applications are used in different classroom conditions. The sample was selected through random sampling from the available population of lower primary teachers involved in the research context.

The focus on teachers was intentional. Teachers are the professionals who plan instruction, observe students' classroom engagement, evaluate learning progress, and decide how educational applications are integrated into learning activities. Their perceptions therefore provide useful evidence about the practical role of applications in everyday teaching, while also requiring cautious interpretation because they are not direct measurements of student outcomes.

Instrument and Procedure

Data were collected through a structured teacher questionnaire. The questionnaire included demographic items, such as teaching experience, educational level, and school area, as well as Likert-scale items related to the use of educational applications, student engagement, development of critical thinking, development of creativity, perceived improvement in performance, professional preparation, and school support for technology integration.

The questionnaire was designed to capture teachers' perceptions of the relationship between application use and student development. Items were formulated in a way that reflected classroom practice. For example, teachers were asked whether they use educational applications to support critical and creative thinking, whether students show greater engagement when such applications are used, whether applications stimulate creativity, and whether they notice improvements in tasks requiring reasoning, problem solving, and creative expression.

Participants completed the questionnaire voluntarily. The data were then prepared for statistical analysis. Responses were coded and reviewed for completeness and consistency before analysis. Since the study examined relationships among variables, the analysis focused on Pearson's correlation coefficient. The significance level was reported as $p < .001$ for the main results.

Data Analysis

The data were analyzed quantitatively using descriptive statistics and Pearson's correlation coefficient. Descriptive statistics were used to summarize participant characteristics and general tendencies in responses. Pearson's correlation coefficient was used to examine whether statistically significant relationships existed between teachers' reported use of educational applications and their perceptions of students' critical thinking, creativity, engagement, performance, teacher preparation, institutional support, and teaching experience.

The analysis did not aim to compare groups through t-tests or analysis of variance. Instead, it aimed to determine whether stronger or more frequent use of educational applications was associated with higher teacher perceptions of student development in the targeted areas. This approach was consistent with the correlational nature of the research questions and prevents unsupported causal claims.

Results

The results showed positive and statistically significant relationships across all main hypotheses. Because the study was based on teachers' perceptions, the findings are presented as perceived associations between educational application use and student-related outcomes. The strongest relationship was found between the creative features of applications and students' creativity as perceived by teachers, while moderate positive relationships were found for critical thinking, performance, institutional support, and teaching experience.

Table 1 presents the main correlation results for the hypotheses tested in the study.

Table 1

Pearson Correlation Results for the Main Hypotheses

Hypothesis / Analysis	Relationship Examined	R	Significance
H1	Application use and perceived critical thinking	.475	$p < .001$
H2	Creative features and perceived student creativity	.738	$p < .001$
H3	Application use and perceived student engagement	.626	$p < .001$
H4	Frequency of use and perceived performance in critical/creative tasks	.514	$p < .001$
H5	Teacher preparation/institutional support and perceived effectiveness	.562	$p < .001$
Additional analysis	Teaching experience and effective application use	.461	$p < .001$

Note. All reported correlations were statistically significant at $p < .001$.

The first hypothesis was supported. The correlation between teachers' reported use of educational applications and perceived development of students' critical thinking was moderate and positive, $r = .475$, $p < .001$. This result suggests that teachers who reported more frequent or more purposeful use of applications also tended to perceive stronger development of students' critical thinking. In practical terms, applications may be perceived as helpful when students are asked to analyze information, make choices, explain answers, or solve tasks that require reasoning.

The second hypothesis was strongly supported. The relationship between the diversity and creative features of educational applications and teachers' perceptions of students' creativity was strong and positive, $r = .738$, $p < .001$. This was the strongest relationship in the study. It indicates that applications with creative content, flexible tasks, and opportunities for expression are associated with higher teacher perceptions of students' creative development. This result is important because it suggests that the type and quality of application matter, not only the frequency of use.

The third hypothesis was also supported. The correlation between application use and perceived student engagement was strong and positive, $r = .626$, $p < .001$. Teachers reported that students were more actively engaged in classroom activities when educational applications were used. This finding suggests that digital tools can make learning more interactive and motivating, especially when they include feedback, visual support, and opportunities for participation.

The fourth hypothesis was supported by a moderate positive relationship between frequency of application use and perceived performance in tasks involving critical and creative thinking, $r = .514$, $p < .001$. This means that students who are more frequently exposed to educational applications, according to teachers' perceptions, tend to perform better in tasks that require reasoning, problem solving, and creative expression. However, the moderate strength of the relationship also indicates that frequency alone is not enough. The quality of pedagogical integration remains essential.

The fifth hypothesis was supported by a moderate positive relationship between teacher preparation, institutional support, and perceived effectiveness of application use, $r = .562$, $p < .001$. Teachers working in schools that provide support, collaboration, and resources for technology integration reported stronger perceived value of educational applications for student performance. This finding confirms the importance of school-level conditions in enabling teachers to use digital tools meaningfully.

The additional correlational analysis showed a moderate positive relationship between teaching experience and the use of educational applications for developing critical and creative thinking, $r = .461$, $p < .001$. Experienced teachers may be better able to connect digital tools with pedagogical objectives, classroom management, and students' developmental needs. At the same time, this result should not be interpreted to mean that less experienced teachers cannot use applications effectively; rather, it highlights the need for professional support and mentoring.

Discussion

The purpose of this study was to examine teachers' perceptions of the relationship between educational applications and the development of critical and creative skills among students in lower primary education. The findings indicate that educational applications are perceived by teachers as positively associated with several important dimensions of the learning process, including students' critical thinking, creativity, engagement, and performance in tasks requiring higher-order thinking. The results also suggest that teacher preparation, institutional support, and teaching experience are related to more effective integration of digital applications into classroom practice.

The moderate positive relationship between application use and perceived critical thinking suggests that educational applications may support students' ability to analyze information, make decisions, solve problems, and engage more actively with learning content. However, this relationship should not be interpreted as evidence that technology directly develops critical thinking. Rather, the findings indicate that teachers perceive such applications as supportive when they are used purposefully and when students are guided toward reflection, comparison, reasoning, and problem solving. This interpretation is consistent with Jonassen's (2008) view that technology has greater educational value when it functions as a cognitive tool rather than a simple delivery mechanism.

The strongest relationship in the study was between the creative features of applications and students' creativity as perceived by teachers. This result is particularly meaningful because creativity is not developed through repetition alone. Applications that include open-ended tasks, design activities, storytelling, drawing, construction, or problem-solving scenarios may allow children to produce original ideas and explore alternatives. The OECD (2024) emphasizes that creative thinking includes generating, evaluating, and improving ideas. Educational applications can support these processes when they provide students with opportunities to create rather than simply consume content.

The strong positive relationship between application use and student engagement confirms that digital tools can increase participation in learning activities. Younger students often respond positively to visual, interactive, and feedback-rich environments. However, engagement should be interpreted carefully. A student may be engaged with the device but not necessarily engaged in deep learning. Therefore, teacher guidance is necessary to transform attention into meaningful learning.

Teachers should ask students to verbalize their reasoning, compare solutions, work collaboratively, and connect digital tasks with classroom discussion.

The relationship between frequency of use and perceived performance in critical and creative tasks was moderate. This suggests that repeated exposure to applications may support learning outcomes as perceived by teachers, but it also shows that frequency is not the only factor. A high-quality application used with poor pedagogical planning may have limited value, while a simple application used with purposeful questioning may produce meaningful learning. This finding supports the argument that technology should be integrated as part of instructional design rather than added as a separate activity.

The findings also highlight the importance of teacher professional preparation and institutional support. The significant positive relationship between support and perceived effectiveness indicates that teachers need more than personal motivation. They need access to digital resources, reliable infrastructure, training, collaboration, and school policies that promote meaningful use. The DigCompEdu framework similarly emphasizes that digital competence involves professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and the facilitation of students' digital competence (Redecker, 2017). Falloon (2020) also stresses that digital competence includes pedagogical and developmental judgment, not only technical skill.

These findings can be compared with previous research in two ways. First, they align with studies that connect educational technology with engagement and active learning (Bond et al., 2020; Kearsley & Shneiderman, 1998). Second, they add a lower primary perspective by showing how teachers perceive the relationship between applications and early development of critical and creative skills. Unlike studies that focus mainly on digital access or general technology adoption, this study connects application use with teacher mediation, school support, and the specific competencies of critical thinking and creativity.

The role of teachers is therefore not reduced by educational applications; it becomes more complex. Teachers must evaluate digital content, protect students from inappropriate use, connect applications with curriculum goals, support collaboration, and help students reflect on what they learn. In lower primary education, this guidance is especially important because children are still developing self-regulation, attention, social skills, and independent learning habits. Technology can enrich learning, but it cannot replace the relational and pedagogical role of the teacher.

The practical contribution of the study is that it offers evidence for teachers, schools, and educational decision makers. Teachers should select applications that promote explanation, creativity, collaboration, and reflection rather than tools that only encourage repetition. Schools should support teachers through training, infrastructure, and shared planning. Policymakers should promote guidelines for age-appropriate and pedagogically meaningful use of applications in lower primary education. These recommendations are particularly important because the findings show that perceived benefits are stronger when applications are connected with professional preparation and institutional support.

Limitations and Future Research

This study has several limitations. First, the data are based on teacher perceptions rather than direct measurement of students' critical and creative thinking through standardized performance tasks. Teachers' perceptions are valuable because they reflect classroom experience, but they cannot replace direct evidence of student learning. Future studies should include direct assessments, classroom observations, student work samples, or performance-based tasks.

Second, the study used a correlational design, which means that the results indicate relationships between variables but do not prove causation. The positive relationships found in this study should therefore be interpreted as perceived associations. It cannot be concluded that educational applications alone caused improvement in students' critical thinking, creativity, engagement, or performance. Future research could use experimental or quasi-experimental designs to examine causal effects more directly.

Third, the sample included 100 teachers, which provides useful evidence but does not represent all school contexts. Future research could include larger samples, comparative analyses between urban and rural schools, and mixed-method designs involving teachers, students, and parents. Qualitative interviews and classroom observations would also help explain how teachers actually integrate educational applications and what challenges they face.

Finally, this study did not examine the effectiveness of specific applications separately. Different tools may have different pedagogical functions, such as practice, communication, collaboration, creativity, or assessment. Future studies should compare categories of educational applications and identify which types are most

useful for supporting critical thinking, creativity, engagement, and learning performance in lower primary education.

Conclusion

The study concludes that educational applications are positively associated with the development of critical and creative skills among students in Grades I–III as perceived by teachers. The findings show significant relationships with critical thinking, creativity, engagement, and performance in tasks requiring higher-order thinking. The strongest relationship was found between the creative features of applications and students' creativity, indicating that the design and pedagogical quality of digital tools are essential.

In response to the methodological nature of the study, the conclusion must be stated carefully: the research does not directly measure the impact of educational applications on students. Instead, it explores teachers' perceptions of how application use is associated with student development. This distinction is important because the correlational design and self-reported data do not allow causal claims. The findings should therefore be understood as evidence of perceived relationships that can guide future research and practice.

The study also confirms the central role of teachers. Educational applications do not automatically produce meaningful learning. Their value depends on how teachers select, explain, guide, and integrate them into the teaching process. Professional preparation, institutional support, and teaching experience all contribute to more effective use. For this reason, schools should invest in teacher training, digital infrastructure, and collaborative planning. Teachers should select applications that align with learning objectives, encourage problem solving, and give students opportunities to explain, create, and reflect.

In conclusion, technology should be viewed as a supportive pedagogical tool, not as a substitute for teachers. When used intentionally and responsibly, educational applications can enrich classroom learning and may contribute to the development of critical and creative competencies that children need for future learning and participation in society.

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