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Parent-Child Cooperation via an Interactive Educational Application: Academic Performance and Motivation

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Abstract

This study aims to solve an important issue: how parental involvement affects children's academic performance and motivation when using interactive educational applications, for example, 17zuoye. The study involved 200 8th-grade students from two Chinese schools, aged 11 to 13 years. In order to measure their academic performance and motivation, the researchers conducted five closed-book examinations in five different subjects and used the Academic Motivation Scale (AMS). As a result, the average academic performance of group B students, who studied in collaboration with their parents, was higher than the performance of group A students in all five subjects (Mathematics, Chinese, Geography, Biology, Literature). The differences in learning outcomes between the two student groups were significant, confirming the positive impact of an interactive application such as 17zuoye. The intrinsic and extrinsic motivation of Group B students was also higher. The reason for these results may be parental support, which provides a more structured and motivating learning environment. In addition, parental involvement allows students to seek additional explanations and assistance when completing tasks. By comparing children's performance with and without parental involvement, the study seeks to identify factors that influence the effectiveness of interactive applications. This article can be especially useful for researchers who develop new educational technologies and interventions that can improve student learning outcomes.

Key words: *digital technologies in education; interactive learning; motivation to study; parental involvement; student performance*

Introduction

Parents play a fundamental role in their children's lives and have a substantial impact on children's well-being from infancy to adulthood (Bornstein et al., 2022). In the modern age, the role of parents in their child's education has changed (Abdallah & Alriyami, 2022). Educational applications now allow parents to actively participate in the learning process, thus helping their children achieve higher academic results (Malczyk & Lawson, 2017). These applications provide children with an interactive platform to learn and interact with educational content in a fun and exciting way (Herwin & Dahalan, 2022). Parent-child interaction through educational applications is an extremely relevant research topic (Kartel et al., 2022; Kong, 2018; Lerner et al., 2022; Novianti & Garzia, 2020; Yang & Zhao, 2020), since mobile applications have become an integral part of modern education (Nipa & Kermanshachi, 2020; Papadakis & Kalogiannakis, 2017).

Interactive educational software includes programs or mobile applications that use interactive and engaging features to deliver certain educational content to users. The key purpose of this software is to enhance the learning process (Rowe et al., 2021). Applications that can track a child's progress and provide immediate feedback most effectively improve academic performance (Herwin & Dahalan, 2022). However, their effectiveness may depend on various factors, for example, parental involvement (Zhang et al., 2022). Parental involvement can take many forms, including helping with homework, supervising, attending parent-teacher meetings, and participating in educational activities with children (Ribeiro et al., 2021). With the advent of educational applications, parents have a great opportunity to contribute to their child's learning. They can use these applications to monitor their children's progress, as well as to provide guidance and feedback (Ansari & Khan, 2020). In combination with parental involvement, interactive software can create a collaborative learning environment that, in turn, increases academic achievement (Choi & Cho, 2020; Musah et al., 2023). However, there is a gap in understanding the specific dynamics and impact of parent-child collaboration facilitated by interactive educational applications. The effectiveness of parent-child collaboration in achieving educational outcomes is not only influenced by the interaction itself but it also heavily relies on the quality and characteristics of the educational applications used for this purpose. This research addresses these gaps by providing a comprehensive analysis of the influence of parent-child collaboration using a specific educational application over six months and across a diverse sample. This contributes to a deeper understanding of how the nature and quality of educational applications affect the effectiveness of parent-child collaboration. Thus, the study aims to offer empirical insights into how this collaboration influences students' motivation and academic achievement. By focusing on this intersection, the study scrutinizes the potential of educational technologies to transform the learning experience in the context of parental involvement.

The structure of the study includes an analysis of parental involvement regarding its impact on children's educational achievements through interactive applications. Starting with an introduction that emphasizes the importance of the topic, the research formulates a hypothesis about higher results among children studying with parental support. The literature review describes the scientific context, and the methodology details the approaches used in the study. Ethical aspects specify the measures for the protection of participants' data. The sections of results and data analysis test the hypothesis, while the conclusion summarizes the findings and outlines ways to further explore the issue. Thus, this article aims to compare the academic performance and motivation of children who use an interactive educational application in collaboration with their parents with the children who use it independently. The hypothesis of the study is as follows: "Children using an educational application with parental involvement will show better results compared to those who use it without parental involvement." The methodology used in this research focuses on studying the impact of parental participation on academic performance and motivation of students using the interactive educational application 17zuoye both with and without parental participation. Individual tests were specifically designed for this study to assess the knowledge of students in five subjects after six months of using the application. The study is of practical value as it investigates how parents can utilize interactive educational applications to support their children's learning and increase their motivation. Moreover, it highlights the importance of parental involvement in supporting their children's academic development. The findings from the study may prove beneficial for parents seeking ways to assist their children in achieving success in school and improving their academic performance. From a scholarly perspective, the study adds to the body of knowledge on interactive educational applications and their role in supporting children's learning.

The present study seeks to obtain new experimental data on the role of parent-child cooperation in the context of school education. The study investigates the impact of parental participation on children's academic achievement and motivational levels while engaging with interactive educational applications. Specifically, the paper evaluates and contrasts the effectiveness and motivational outcomes of children utilizing educational applications independently in relation to those who use them with parental support. By comparing the results, this article attempts to shed light on the role of parent-child cooperation. The main objectives of the study are:

1. Explore the impact of 17zuoye on the performance of students from two groups: Group A (without parental cooperation) and Group B (with parental cooperation);
2. Analyze the obtained data using statistical methods and determine if there were significant performance differences between the two student groups and in which subjects;
3. Establish differences in motivation between the groups using the Academic Motivation Scale (AMS).

Literature review

Several previous studies describe a relationship between parent-child cooperation and children's learning decisions. These studies have focused on concepts such as interest, fun, friendship, support, and responsibility (Sun et al., 2022). Parent-child cooperation in school education refers to the active participation of parents in the learning process of their children. This, in turn, implies partnerships between parents and teachers in order to support children's education (Ribeiro et al., 2021). Collaboration between families and schools requires mutual commitment and concerted action to achieve a common goal. Hence, it is important to focus on the concept of parental involvement (Paccaud et al., 2021). This concept is defined by various terms, such as "parental involvement", "family-school partnership" or "educational partnership", and can be associated with different forms and goals of cooperation (Fleischmann & de Haas, 2016; Jónsdóttir et al., 2017).

One of the most common structures for understanding parental involvement describes it in three dimensions: "behavior at home", "school activities", and "parent-teacher communication" (Hoover-Dempsey et al., 2005). However, due to its multi-dimensional nature, this concept is difficult to apply practically in empirical research (Monceau & Larivée, 2019). Active participation can help develop and enhance parent-teacher relationships. More importantly, parental involvement can improve children's self-confidence and self-efficacy, as well as learning satisfaction (Paccaud et al., 2021). For schools and teachers, parental involvement can be a truly valuable resource, as it can create a positive school climate and increase the professional competence of teachers (Vasarik Staub et al., 2018). Previous studies have shown that parental involvement has a positive effect on students' academic achievement, behavior regulation, social skills, leadership, mental health, self-esteem, and learning enjoyment (Abdallah & Alkhrabsheh, 2019; Hornby & Lafaele, 2011; OECD, 2018). Nevertheless, in some cases, the effect can be relatively scarce and superficial (Luder et al., 2020). One of the main problems of parental involvement is the lack of knowledge or experience in using certain software, which can lead to frustration and confusion for both parents and children (Martinez et al., 2012). In some cases, children fail to articulate their learning needs. In others, parents are unable to provide the necessary guidance and feedback (Schwab, 2018). In addition, when software is not age-appropriate or does not match a child's interests or learning needs, it may be ineffective (de Boer et al., 2012). Other decisive factors include a lack of time, competing priorities, busy schedules, or other responsibilities that limit the amount of time parents can devote to using educational software. Similarly, children may have their own competing needs (Luder et al., 2020). A study by Mascheroni et al. (2016) found that a significant number of parents view video games and interactive applications as a means to develop certain digital skills. The rules for children's use of technology have become less stringent as parents have begun to realize that digital experiences can be educational. This ultimately changes parents' negative perception of digital technologies as only a means

of entertainment. As a result, they no longer wish to limit the time their children spend on their phones, laptops, tablets etc. (Tour, 2019). Modern technology allows for the creation of new learning approaches that would enhance traditional teaching methods (Smutny, 2023). Therefore, interactive educational applications are utilized by millions of people worldwide (Mondal et al., 2024). In the educational context, parents use these applications to help their children consolidate what they have learned in class and to provide additional support if needed (Herwin & Dahalan, 2022). Educators are oftentimes challenged to support parents with digital literacy activities to help them become familiar with modern educational applications (Downes et al., 2020; Tomczyk et al., 2024). Student-centered software design can help create learning environments where social interaction and collaboration provide an effective educational setting (Rawlins & Kehrwald, 2014). Instead of relying on traditional methods such as textbooks and lectures, interactive educational applications employ a variety of multimedia tools to create an immersive learning experience. These tools include videos, animations, simulations, and interactive quizzes designed to engage and motivate students (Hussain et al., 2020). Educational applications typically have a range of features that can be customized to suit each student's needs and preferences. This way, all students can gain the best learning experience adapted to their individual strengths and weaknesses (Hinze et al., 2017). Moreover, these applications offer assessment tools that can track student progress and provide immediate performance feedback. This feature can help students identify areas where they need more support and focus their efforts on improving their performance (Kartel et al., 2022). Another key advantage of interactive educational software is that it can be used outside of the classroom (Alqahtani & Mohammad, 2015). Many applications are available on mobile devices, allowing students to continue learning and practicing at home, which can be especially beneficial when involving parents in the educational process.

The influence of parents on their children's motivation is also worth discussing, as motivation plays a crucial role in managing and maintaining goal-directed behavior (Costa & Faria, 2017). Motivation is considered an important factor that influences overall human performance and behavior (Veresha, 2016). According to researchers and practitioners in the field of education, motivation is a key element in ensuring sustainable student achievement (Sumanasekera et al., 2021). Motivation can be defined as the sum of the efforts to mobilize an individual towards one or more specific goals, as well as to ensure the continuity of this movement (Küçüközkan, 2015). Since motivation is related to human behavior and cognitive development, various factors can influence it, such as a person's interests, values, attitudes, and desire for action. This phenomenon has a multidimensional structure, which is why parents can positively influence a child's motivation for learning (Liu et al., 2016). It is important to note a research gap in the current thematic area, namely a lack of generalizability. Many studies focus on specific groups and have a short-term perspective. Moreover, the quality of software they analyze frequently varies. However, the effectiveness of parent-child collaboration can depend on the quality and characteristics of educational applications.

Methodology

The study aimed to determine the effectiveness of implementing the 17zuoye interactive application into the educational process. 17zuoye is an online learning platform designed to help K-12 students in China learn more effectively and improve their academic performance (17zuoye, 2023) (Figure 1).

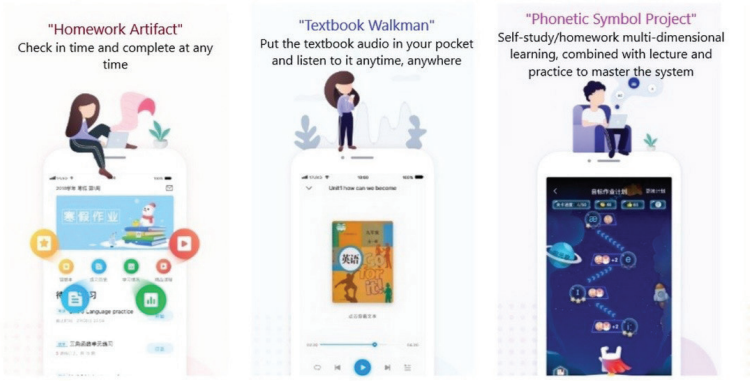

Figure 1. Screenshot of 17zuoye

The platform offers a variety of tools and resources for students, teachers, and parents, including homework, quizzes, interactive lessons, and other educational materials. In addition, it provides features such as progress tracking, performance analysis, and personalized recommendations to help students identify the skills they need to improve (Feijóo et al., 2021). Table 1 presents the architecture of this application.

Table 1
Architecture of 17zuoye

Components	Description
User Interfaces	Student Interface, Teacher Interface, Parent Interface
Core Functional Modules	Task Management, Assessment and Correction, Adaptive Learning, Academic Reports, Educational Guides
Subject Modules	Subject-specific Modules aligned with the curriculum
Artificial Intelligence Algorithms	Efficient task distribution, adaptive learning content recommendations, automatic task correction
Data Management	Secure storage and management of user data, and data analytics for performance tracking
Authentication and Security	User authentication and authorization, data encryption and privacy measures, compliance with data protection regulations
Communication and Notifications	In-app messaging, push notifications for assignments, grades, and updates

The tests used to examine students in five subjects (Mathematics, Chinese, Geography, Biology, Literature) were developed specifically for this study. They were

designed to reflect the level of knowledge that students have acquired after 6 months of studying using integrated modern technology. Students received 1 point for each correct answer in the test; the maximum number of points for each subject was 50. Each of the five exams lasted one hour. Student motivation was measured using the Academic Motivation Scale (AMS), developed by Vallerand et al. (1989) and adapted for Chinese students by Zhang et al. (2015). The scale consists of 28 statements rated on a seven-point Likert scale and is divided into three categories: extrinsic motivation (12–84 points), intrinsic motivation (12–84 points), and amotivation (4–28 points; a higher score indicates lower motivation). Cronbach's alpha was calculated to assess the reliability of the AMS in this sample, revealing high internal consistency for each subscale: extrinsic motivation ($\alpha = 0.89$), intrinsic motivation ($\alpha = 0.91$), and amotivation ($\alpha = 0.87$). These values meet international standards for the reliability of psychometric scales, confirming the suitability of the AMS for assessing academic motivation among Chinese students.

Additionally, an exploratory factor analysis was conducted to confirm the construct validity of the AMS. Principal Component Analysis with Varimax rotation yielded three factors corresponding to the theoretically predicted subscales. The total explained variance was 71.4%, indicating an appropriate factor structure. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.88, and Bartlett's test of sphericity ($\chi^2 = 3611.29$, $p < 0.001$) confirmed that the correlation matrix was suitable for factor analysis. Factor loadings for individual items ranged from 0.68 to 0.86, indicating a strong degree of alignment with their respective latent constructs.

Participants

The study was conducted from January to July, 2021. It involved 200 eighth-grade students (100 boys and 100 girls) from two schools in China. The participants' age ranged from 11 to 13 years. All participants were randomly divided into two groups: Group A, which engaged in independent learning, with students using the 17zuoye app without parental assistance, and Group B, which involved collaboration, with students using the app alongside parents who had received training to provide effective support. Ethical approval and consent were obtained to ensure the confidentiality of the participants. The respondents received invitations to participate in the study during classes. Preliminary consent was obtained from parents who expressed their desire to participate in the study and were willing to cooperate with their children. Only one child and one parent (mother or father) from the same family could participate. These conditions were set in order to accommodate the situation when there is only one parent in the family, and also to exclude families with twins attending the same class. To ensure group equivalence prior to the main stage of the study, a preliminary test was conducted. One month before the start of the research, students in both schools completed tests in the five subjects under investigation, mirroring the final tests used at the conclusion of the study. The preliminary test results revealed no significant

differences between the groups ($p > 0.05$), confirming that they had comparable baseline knowledge levels. Furthermore, prior to the start of the experiment, academic motivation was assessed using the AMS scale, which also identified no statistically significant differences between the groups in extrinsic motivation ($p = 0.644$), intrinsic motivation ($p = 0.558$), or amotivation ($p = 0.711$). These findings verify that, before the intervention, participants in the two groups were homogeneous in terms of academic achievement and motivation.

Research design

The study has an experimental research design and uses the 17zuoye application that provides lessons in subjects such as Mathematics, Chinese, Geography, Biology, and Literature. All 200 participants were randomly divided into two groups: Group A and Group B (100 children in each). Those in Group A studied the above-mentioned subjects using the 17zuoye app without cooperating with their parents. In contrast, Group B students learned the subjects with parental assistance. All the necessary educational materials were developed by 17 teachers from two participating schools. Parents could support their children in using 17zuoye in several ways: help their children understand and complete assignments, provide explanations, clarify doubts, and offer recommendations on how to approach tasks; establish a structured study schedule, ensuring that children allocate sufficient time for completing assignments and studying the educational content provided by the application; monitor their children's academic performance to identify areas where their children may need additional support and provide it.

Thus, the parents' support for their children was multifaceted:

1. Assistance with assignments: Parents aided their children in understanding and completing tasks within the application. This involved explaining complex concepts, addressing uncertainties, and offering insights on how to approach various tasks.

2. Organizing a study schedule: Parents played a pivotal role in establishing a structured study schedule, ensuring that children had sufficient time to complete tasks and explore the educational content provided by the application.

3. Monitoring and supporting academic performance: Parents actively monitored their children's academic performance using the application's feedback features. This enabled them to identify areas where their children might need additional support or revision, as well as provide assistance accordingly when needed.

To minimize potential uncontrolled parental involvement in both research groups, several important measures were implemented. Parents in Group B underwent a three-hour training session explaining key aspects of interacting with their child while using the educational application. They received clear instructions on how to support students, which incentive strategies to employ, and how to monitor and analyze the child's progress. This training ensured a standardized approach to parental involvement, thereby reducing variability in the level of engagement.

As for Group A, parents were informed that the children were expected to work with the educational application independently, without active parental intervention. While it was impossible to entirely eliminate informal parental involvement, the researchers introduced measures to monitor this aspect. Specifically, over a six-month period, students in both groups kept weekly logs of their study activities, recording whether they used the educational application independently or with adult support. Analysis of these logs made it possible to identify potential deviations from the established research protocol. In addition, Group A students were surveyed regarding the extent of their parents' involvement in their learning process and the frequency of parental interactions during application use. The results indicated that most students in this group indeed worked independently, confirming the validity of the control group designation. Meanwhile, in Group B, the number of active sessions in which both the child and parent were logged into the application simultaneously was recorded, allowing partial tracking of the actual level of parental involvement in the learning process.

In early February, Group B students and their parents were given access to 17zuoye, which was installed on school computers as well as on students' personal computers. All participants received access to five courses in corresponding subjects and studied them as part of their school curriculum. Classes took place both online and offline according to the school schedule. The number of hours allocated for studying each subject was the same. The student knowledge assessment took place in July 2022 and was held in school classrooms. After the intervention, the students were asked to complete the Academic Motivation Scale (AMS) questionnaire.

Data analysis

For each of the two study groups – Group A, where students used the educational application independently, and Group B, where learning took place with parental involvement – key descriptive statistical indicators were calculated. These included the mean, standard deviation, median, as well as variance and kurtosis. Such parameters provided a preliminary assessment of the AMS data distribution and helped identify possible trends in test results across the five academic subjects.

Following this initial descriptive analysis, the Mann-Whitney U-test was employed to evaluate the statistical significance of differences between the groups. For each of the five subjects and the three subscales of academic motivation, the U statistic and its corresponding asymptotic significance level (p) were computed. Low U values and $p < 0.05$ pointed to significant differences between the groups, suggesting that parental involvement exerts a meaningful impact on students' academic performance and motivation.

In addition to the U-test, z-values were also calculated to gauge the degree of deviation from the null hypothesis, which posited no differences between the groups. All statistical computations were performed using SPSS Statistics 26.

Ethical issues

The current study was professionally designed, properly executed, and approved by school authorities as well as the parents/guardians of all participants. All of them gave written consent for the study. The researchers guaranteed the anonymity and safety of the participants' data. In addition, a research protocol had been developed prior to the start of research activities and was followed by all participants and supervisors.

Results

The primary objective of the study was to investigate the impact of the 17zuoye application on students' academic performance. The performance was analyzed using SPSS Statistics software and involved calculating the mean, standard deviation, kurtosis, standard error of the kurtosis, standard error of the mean, and variance. Table 2 shows the distribution of the values between the two groups. The table presents the mean, standard deviation, kurtosis, standard error of the mean, and variance of academic performance for five subjects in both groups.

Table 2
Academic performance of Group A and Group B participants

Group		Mathematics	Chinese	Geography	Biology	Literature
A	Mean	24.15	24.73	25.08	26.95	24.43
	N	100	100	100	100	100
	Standard deviation	2.302	2.609	4.092	3.554	3.503
	Standard error of the kurtosis	.478	.478	.478	.478	.478
	Kurtosis	-.965	-1.254	-1.335	-1.026	-1.302
	Standard error of the mean	.230	.261	.409	.355	.350
	Variance	5.301	6.805	16.741	12.634	12.268
B	Mean	31.72	35.35	31.48	31.43	33.15
	N	100	100	100	100	100
	Standard deviation	4.018	4.576	3.344	2.471	2.815
	Standard error of the kurtosis	.478	.478	.478	.478	.478
	Kurtosis	-1.119	-1.332	-1.215	-1.422	-1.017
	Standard error of the mean	.402	.458	.334	.247	.282
	Variance	16.143	20.937	11.181	6.106	7.927

According to the table, Group A, which used 17zuoye without parental cooperation, had the highest mean score in Biology (26.95). This score indicates relatively better performance in this subject compared to others. In turn, the lowest score was in Mathematics (24.15). In Group B, the situation is somewhat different: the highest mean score of 35.35 is observed in Chinese and the lowest of 31.43 in Biology. Thus, the mean scores of Group B students, who studied in cooperation with their parents, exceed those of Group A students in all subjects. Group B consistently demonstrated higher average scores across all subjects, indicating the positive influence of parental collaboration on academic performance. The values of standard deviation and variance suggest variability in grades within each group, with Group B typically showing a

broader range of scores. The standard deviation for Group A ranged from 2.302 to 4.092, with the highest value recorded in Geography, and the lowest in Mathematics. These results show that the data is distributed over a large range of values. For Group B, this value ranged from 4.576 in Chinese to 2.471 in Biology. The standard error of the mean in Group A ranged from 0.230 to 0.409, while in Group B it ranged from 0.247 to 0.458. All kurtosis values were negative in both groups.

The data were subsequently analyzed using the Mann-Whitney U test, a non-parametric test suitable for comparing two independent groups. The results of the analysis, including median values and mean ranks, are presented in Table 3.

Table 3

Comparison of Academic Performance Using the Mann-Whitney U Test

Subjects	Group A (n=100) Median (Ranks)	Group B (n=100) Median (Ranks)	U-value	Z-score	p-value
Mathematics	24 (80.6)	32 (120.4)	560.5	-10.87	<0.001
Chinese Language	24 (79.8)	35 (121.2)	120.0	-11.95	<0.001
Geography	25 (82.2)	31 (118.8)	1292.0	-9.08	<0.001
Biology	27 (85.0)	31 (115.0)	1572.5	-8.41	<0.001
Literature	24 (80.2)	33 (120.8)	198.5	-11.76	<0.001

The analysis revealed significant differences in academic performance in all five subjects. The asymptotic significance does not exceed the threshold value of 0.05. This implies that the academic performance of students in Group B, who studied with parental assistance, was significantly better than that of students in Group A. These results confirm the positive effect parent-child cooperation has on student achievement.

The third objective of the current study was to evaluate the student motivation using the Academic Motivation Scale (AMS). Table 4 presents the results.

Table 4

Academic Motivation Scale indicators

	Group	Extrinsic motivation	Intrinsic motivation	Amotivation
A	Mean	48.87	43.19	14.29
	Standard deviation	5.306	3.037	1.665
	Median	48.00	43.00	14.00
	Standard error of the mean	.531	.304	.167
	Kurtosis	-1.256	-.801	-1.189
B	Mean	56.79	52.42	10.28
	Standard deviation	5.082	5.607	1.016
	Median	57.00	52.00	10.00
	Standard error of the mean	.508	.561	.102
	Kurtosis	-1.263	-1.300	-1.053

Thus, the mean values of extrinsic and intrinsic motivation among Group B students are higher than those of Group A students. Nevertheless, the amotivation values are lower, suggesting higher motivation among children who used 17zuoye in cooperation

with their parents. Thus, Group B, receiving parental support, demonstrates higher mean scores in both extrinsic and intrinsic motivation and lower scores in amotivation. Consequently, the general level of motivation was higher among students who engaged in the educational process alongside their parents. This finding aligns with the hypothesis that parental involvement positively influences student motivation. Table 5 provides the detailed results of the Mann-Whitney U Test, which was used to compare the differences in Academic Motivation Scale (AMS) values between the groups.

Table 5
Comparison of Motivation Subscales Using the Mann-Whitney U Test

Subscale	Group A (n=100) Median (Ranks)	Group B (n=100) Median (Ranks)	U-value	Z-score	p-value
Extrinsic Motivation	49 (81.2)	57 (119.8)	1579.0	-8.37	<0.001
Intrinsic Motivation	43 (75.4)	52 (125.6)	705.0	-10.51	<0.001
Amotivation	14 (120.0)	10 (80.0)	147.0	-11.96	<0.001

The differences in AMS scores were also significant across all three subscales (extrinsic motivation, intrinsic motivation, and amotivation). These scores once again confirm the positive impact of parent-child collaboration on student motivation. The higher motivation in Group B is statistically significant, affirming conclusions about the beneficial influence of parental involvement in educational activities.

Discussion

Differences in academic performance

The observed differences in academic performance between Group A and Group B could be due to a variety of factors that underscore the complex dynamics of parent-child collaboration in the context of using 17zuoye. Differences in academic performance may be related to the specific educational needs and preferences of individual students. Some students in Group B may have excelled in an environment enriched with parental guidance, finding it conducive to their learning style. On the other hand, students in Group A may not have achieved such effectiveness in independent learning, which could explain their relatively lower academic performance. The significant improvement in Group B may be associated with the advantages of having parents who can provide support and supervision.

Impact of parental involvement on motivation

The higher level of motivation observed in the group that learned with parental involvement can be attributed to the ability of collaborative learning with parents to create a more engaging and supportive learning environment. The students may have experienced a greater sense of parental interest, responsibility, and personalized support. Several previous studies have reported that parental involvement improves student performance both during classes and when doing homework (Paccaud et al., 2021), which is consistent with the findings of the current study. Active interaction can

enhance parent-teacher relationships and make parents not only more satisfied with the school, but also more confident in their child's well-being (Fishman & Nickerson, 2015). One of the studies spanning over 10 years (Baumrind et al., 2010) emphasizes the role of parents in children's education. Adolescents whose parents were directive or democratic were more competent and could better adjust to the learning environment than those whose parents were authoritarian, permissive, or condescending (Baumrind et al., 2010). When examining various factors, the authors found that the coercive power-assertive practices of verbal hostility and psychological control often applied by authoritarian parents had the most negative impact on preschool children. On the contrary, confrontive discipline and maturity demands contributed to the effectiveness of both education and parenting. The results have shown that the adverse effects of authoritarian parenting and the positive effects of authoritative parenting can last for 10 years. Hence, when parents properly influence their children's lives, children become more competent. Another study has demonstrated that raising children by constantly interacting with them and helping them make the right decisions are the most important aspects of parenting (Ubale et al., 2015). Additionally, a recent study by Kupzyk et al. (2023) implemented targeted academic interventions to assess the academic performance of children from preschool to the 12th grade. This research demonstrated that parental involvement, particularly in a mentoring capacity, was especially effective for children in the 3rd grade and younger. The form of active participation proved to be less effective for older children, starting from the fourth grade. Thus, the results indicate that the child's age plays a crucial role in determining the most beneficial form of parental support in educational institutions. Future research should investigate the role of parental involvement depending on the child's age.

Motivation and parental involvement

Some researchers (Núñez et al., 2019) claim that motivation is entirely mediated by parental involvement. In turn, other studies (Reeves et al., 2020) show that children's motivation is enhanced by perceived parental involvement, especially when parents are confident in their children's abilities. Based on the self-determination theory, scientists (Stavrulaki et al., 2021) have explored motivation and the relationship between academic performance and parenting style. They have found that different types of motivation (intrinsic, extrinsic, and amotivation) affect academic performance and act as partial mediators of the relationship between authoritative parenting and life satisfaction. There are several factors that contribute to the positive impact of parental involvement in a child's education. One of the main reasons is the ability of parents to create a structured and supportive learning environment that encourages their child's learning (Arfa, 2024). It is assumed that additional help and explanations from parents help children to better understand the educational material and feel more confident when completing tasks (Tayyab et al., 2024). The joint use of educational software can influence children's motivation due to constant feedback and encouragement from parents (Wilke et al., 2024).

Parent-child relationship dynamics

The parent-child relationship remains insufficiently studied. The results of another study suggest that although parents generally have a positive attitude toward school culture, they remain passive in cooperating with teachers (Mlinarević & Tokić, 2018). An article by Højholt and Kousholt (2019) highlights the complex and sometimes conflicting aspects of school life. More importantly, the article explores the social dynamics between children and parents who share common interests and face different challenges. The benefits of parent-child collaboration found in this study may help researchers further investigate parental involvement in children's everyday conflicts.

Conclusion

This study found that students who learned school subjects in collaboration with their parents performed better than students who studied independently. There were significant differences in academic performance between the two groups of respondents. Similarly, the Academic Motivation Scale values of Group B students were higher than those of Group A students. Accordingly, collaboration between parents and their children using interactive educational applications such as 17zuoye positively affects student academic performance and motivation. The current results can be attributed to several factors. Firstly, the involvement of parents creates a more structured and supportive learning environment, which facilitates learning. Secondly, parents provide additional explanations and assistance in completing tasks, thereby increasing students' understanding of the educational material and self-confidence. Finally, the joint use of educational software strengthens children's motivation through constant feedback and encouragement from parents. These factors contribute to a more effective and motivated learning process, as confirmed by significant differences in academic performance and motivation between groups with and without parental involvement.

This article has practical and scientific value and provides important insights into parent-child collaboration in the learning process. The study highlights the role of parents in helping their children succeed in school and describes how cooperation with a parent can affect the learning outcomes and motivation of a child. By providing this valuable information, the article contributes to the development of effective strategies aimed at improving children's learning outcomes and increasing their motivation.

Research limitations

The findings of this study should be interpreted in light of certain limitations. Firstly, the study was conducted in only two educational institutions, which may limit the generalization of the results to the broader Chinese population. Secondly, although diaries were used to monitor the extent of parental involvement and cooperation, it was not possible to verify the accuracy of the self-reported data through direct observation, representing a constraint on the study. Moreover, the research does not account for many other factors that could influence students' motivation and academic performance.

Future research

Future studies may address the limitations of the current study. Furthermore, it is important to delve deeper into the specific mechanisms and strategies of collaboration between parents and children that contribute to improved academic performance and motivation. Additionally, examining the long-term consequences of such collaboration on students' learning outcomes and their transition to higher education can provide valuable insights into sustainable educational interventions. Future research may also focus on the impact of various forms of parental involvement on children's learning outcomes and motivation. This may include exploring different patterns of interaction, such as joint assignments, parental involvement in learning projects, and other forms of support. It is important to study the age characteristics of students and adapt the methods of parental participation depending on children's needs and level of development. The study of cultural and socio-economic factors requires special attention as these factors can influence the effectiveness of parental involvement in the educational process. Finally, there is a need to develop and implement new educational technologies that could integrate parental participation more effectively.

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Suradnja roditelja i djeteta putem interaktivne obrazovne aplikacije: akademski uspjeh i motivacija

Sažetak

Ova studija ima za cilj riješiti važno pitanje: kako roditeljska uključenost utječe na školski uspjeh i motivaciju djece pri korištenju interaktivnih obrazovnih aplikacija, na primjer, 17zuoye. U istraživanju je sudjelovalo 200 učenika 8. razreda dviju kineskih škola, u dobi od 11 do 13 godina. Kako bi izmjerili njihov akademski uspjeh i motivaciju, istraživači su proveli pet zatvorenih ispita iz pet različitih predmeta i koristili skalu akademske motivacije (AMS). Kao rezultat toga, prosječni akademski uspjeh učenika skupine B, koji su učili u suradnji s roditeljima, bio je viši od uspjeha učenika skupine A u svih pet predmeta (Matematika, Kineski, Geografija, Biologija, Književnost). Razlike u ishodima učenja između dviju skupina učenika bile su značajne, potvrđujući pozitivan učinak interaktivne aplikacije kao što je 17zuoye. Intrinzična i ekstrinzična motivacija učenika B skupine također je veća. Razlog za ove rezultate mogla bi biti podrška roditelja, koja pruža strukturiranje i motivirajuće okružje za učenje. Osim toga, sudjelovanje roditelja omogućuje učenicima traženje dodatnih objašnjenja i pomoći prilikom rješavanja zadataka. Uspoređujući učinak djece sa i bez uključivanja roditelja, studija nastoji identificirati čimbenike koji utječu na učinkovitost interaktivnih aplikacija. Ovaj članak može biti posebno koristan za istraživače koji razvijaju nove obrazovne tehnologije i intervencije koje mogu poboljšati ishode učenja učenika.

Ključne riječi: *digitalne tehnologije u obrazovanju; interaktivno učenje; motivacija za učenje; uključenost roditelja; uspješnost učenika*

Uvod

Roditelji igraju temeljnu ulogu u životima svoje djece i imaju značajan utjecaj na dobrobit djece od djetinjstva do odrasle dobi (Bornstein i sur., 2022). U moderno doba promijenila se uloga roditelja u obrazovanju djeteta (Abdallah i Alriyami, 2022). Obrazovne aplikacije sada omogućuju roditeljima da aktivno sudjeluju u procesu učenja, čime pomažu svojoj djeci u postizanju viših akademskih rezultata (Malczyk i Lawson, 2017). Ove aplikacije djeci pružaju interaktivnu platformu za učenje i interakciju s obrazovnim sadržajem na zabavan i uzbudljiv način (Herwin i Dahalan,

2022). Interakcija roditelj-dijete kroz obrazovne aplikacije izuzetno je relevantna tema istraživanja (Kartel i sur., 2022; Kong, 2018; Lerner i sur., 2022; Novianti i Garzia, 2020; Yang i Zhao, 2020) budući da su mobilne aplikacije postale sastavni dio modernoga obrazovanja (Nipa i Kermanshachi, 2020; Papadakis i Kalogiannakis, 2017).

Interaktivni obrazovni softver uključuje programe ili mobilne aplikacije koje koriste interaktivne i zanimljive značajke za isporuku određenoga obrazovnog sadržaja korisnicima. Ključna svrha ovoga softvera jest poboljšati proces učenja (Rowe i sur., 2021). Aplikacije koje mogu pratiti djetetov napredak i pružiti trenutačnu povratnu informaciju najučinkovitije poboljšavaju akademski uspjeh (Herwin i Dahalan, 2022). Međutim, njihova učinkovitost može ovisiti o različitim čimbenicima, na primjer, roditeljskoj uključenosti (Zhang i sur., 2022). Roditeljska uključenost može imati mnoge oblike, uključujući pomoć s domaćom zadaćom, nadgledanje, prisutnost na roditeljskim sastancima i sudjelovanje u obrazovnim aktivnostima s djecom (Ribeiro i sur., 2021). S pojavom obrazovnih aplikacija, roditelji imaju veliku priliku doprinijeti učenju svojega djeteta. Oni mogu koristiti te aplikacije za praćenje napretka svoje djece, kao i za pružanje smjernica i povratnih informacija (Ansari i Khan, 2020). U kombinaciji s uključenošću roditelja, interaktivni softver može stvoriti okružje za suradničko učenje koje zauzvrat povećava akademska postignuća (Choi i Cho, 2020; Musah i sur., 2023). Međutim, postoji jaz u razumijevanju specifične dinamike i utjecaja suradnje roditelj-dijete koju olakšavaju interaktivne obrazovne aplikacije. Učinkovitost suradnje roditelja i djeteta u postizanju obrazovnih ishoda nije samo pod utjecajem same interakcije, već također uvelike ovisi o kvaliteti i karakteristikama obrazovnih aplikacija koje se koriste u tu svrhu. Ovo istraživanje rješava te nedostatke pružajući sveobuhvatnu analizu utjecaja suradnje roditelja i djeteta korištenjem specifične obrazovne aplikacije tijekom šest mjeseci i na raznolikom uzorku. To pridonosi dubljem razumijevanju kako priroda i kvaliteta obrazovnih aplikacija utječu na učinkovitost suradnje roditelj-dijete. Stoga studija ima za cilj ponuditi empirijske uvide u to kako ta suradnja utječe na motivaciju i akademska postignuća učenika. Usredotočujući se na ovo sjecište, studija pomno ispituje potencijal obrazovnih tehnologija za preobrazbu iskustva učenja u kontekstu uključenosti roditelja.

Struktura istraživanja uključuje analizu roditeljske uključenosti u pogledu utjecaja na obrazovna postignuća djece putem interaktivnih aplikacija. Polazeći od uvoda koji naglašava važnost teme, istraživanje formulira hipotezu o višim rezultatima djece koja uče uz roditeljsku podršku. Pregled literature opisuje znanstveni kontekst, a metodologija detaljno opisuje pristupe korištene u studiji. Etički aspekti određuju mjere zaštite podataka sudionika. Odjeljci s rezultatima i analizom podataka testiraju hipotezu, dok zaključak sažima nalaze i ocrtava načine za daljnje istraživanje problema. Stoga ovaj članak ima za cilj usporediti akademski uspjeh i motivaciju djece koja koriste interaktivnu obrazovnu aplikaciju u suradnji s roditeljima s onima koja je koriste samostalno. Hipoteza studije je sljedeća: „Djeca koja koriste obrazovnu aplikaciju uz sudjelovanje roditelja pokazat će bolje rezultate u usporedbi s onom koja je koriste

bez uključivanja roditelja.“ Metodologija korištena u ovom istraživanju usmjerena je na proučavanje utjecaja sudjelovanja roditelja na akademsku izvedbu i motivaciju učenika koji koriste interaktivnu obrazovnu aplikaciju 17zuoye sa i bez sudjelovanja roditelja. Za ovo istraživanje posebno su osmišljeni pojedinačni testovi kojima se procjenjuje znanje učenika iz pet predmeta nakon šest mjeseci korištenja aplikacije. Studija je od praktične vrijednosti jer istražuje kako roditelji mogu koristiti interaktivne obrazovne aplikacije za podršku učenju svoje djece i povećanje njihove motivacije. Štoviše, naglašava važnost uključenosti roditelja u podržavanje akademskoga razvoja njihove djece. Nalazi studije mogli bi se pokazati korisnima za roditelje koji traže načine da pomognu svojoj djeci u postizanju uspjeha u školi i poboljšanju njihovoga akademskog uspjeha. Iz znanstvene perspektive, studija dopunjuje korpus znanja o interaktivnim obrazovnim aplikacijama i njihovoj ulozi u potpori dječjem učenju.

Ovo istraživanje nastoji doći do novih eksperimentalnih podataka o ulozi suradnje roditelj-dijete u kontekstu školskoga obrazovanja. Studija istražuje utjecaj sudjelovanja roditelja na akademska postignuća i razine motivacije djece tijekom korištenja interaktivnih obrazovnih aplikacija. Konkretno, rad ocjenjuje i uspoređuje učinkovitost i motivacijske ishode djece koja samostalno koriste obrazovne aplikacije u odnosu na one koja ih koriste uz podršku roditelja. Usporedbom rezultata ovaj članak pokušava rasvijetliti ulogu suradnje roditelj-dijete. Glavni ciljevi studije su:

1. Istražiti utjecaj 17zuoye na uspješnost učenika dviju skupina: skupine A (bez suradnje roditelja) i skupine B (uz suradnju roditelja)
2. Statističkim metodama analizirati dobivene podatke i utvrditi postoje li značajne razlike u uspjehu između dviju skupina učenika u kojim predmetima
3. Utvrdite razlike u motivaciji između skupina pomoću skale akademske motivacije (AMS).

Pregled literature

Nekoliko prethodnih studija opisuje odnos između suradnje roditelja i djeteta i odluka djece o učenju. Ove studije usredotočile su se na koncepte kao što su interes, zabava, prijateljstvo, podrška i odgovornost (Sun i sur., 2022). Suradnja roditelj-dijete u školskom obrazovanju odnosi se na aktivno sudjelovanje roditelja u procesu učenja svoje djece. To zauzvrat podrazumijeva partnerstvo između roditelja i učitelja kako bi se podržalo obrazovanje djece (Ribeiro i sur., 2021). Suradnja između obitelji i škola zahtijeva uzajamnu predanost i usklađeno djelovanje kako bi se postigao zajednički cilj. Stoga je važno usredotočiti se na koncept roditeljske uključenosti (Paccaud i sur., 2021). Ovaj koncept definiran je različitim terminima, kao što su „uključenost roditelja“, „partnerstvo obitelji i škole“ ili „obrazovno partnerstvo“, a može se povezati s različitim oblicima i ciljevima suradnje (Fleischmann i de Haas, 2016; Jónsdóttir i sur., 2017).

Jedna od najčešćih struktura za razumijevanje roditeljske uključenosti opisuje je u tri dimenzije: „ponašanje kod kuće”, „školske aktivnosti” i „komunikacija roditelj-učitelj” (Hoover-Dempsey i sur., 2005). Međutim, zbog svoje višedimenzionalne prirode, ovaj

je koncept teško primijeniti u praksi u empirijskim istraživanjima (Monceau i Larivée, 2019). Aktivno sudjelovanje može pomoći u razvoju i poboljšanju odnosa roditelj-učitelj. Što je još važnije, sudjelovanje roditelja može poboljšati dječje samopouzdanje i samo učinkovitost, kao i zadovoljstvo učenjem (Paccaud i sur., 2021). Za škole i učitelje roditeljska uključenost može biti uistinu vrijedan resurs jer može stvoriti pozitivno školsko ozračje i povećati profesionalnu kompetenciju učitelja (Vasarik Staub i sur., 2018). Prethodne studije pokazale su da uključenost roditelja ima pozitivan učinak na akademska postignuća učenika, regulaciju ponašanja, društvene vještine, vodstvo, mentalno zdravlje, samopoštovanje i užitak u učenju (Abdallah i Alkhrabsheh, 2019; Hornby i Lafaele, 2011; OECD, 2018). Ipak, u nekim slučajevima učinak može biti relativno oskudan i površan (Luder i sur., 2020). Jedan od glavnih problema uključenosti roditelja jest nedostatak znanja ili iskustva u korištenju određenoga softvera, što može dovesti do frustracija i zbunjenosti i roditelja i djece (Martinez i sur., 2012). U nekim slučajevima djeca ne uspijevaju artikulirati svoje potrebe učenja. U drugima roditelji nisu u mogućnosti pružiti potrebne smjernice i povratne informacije (Schwab, 2018). Osim toga, kada softver nije primjeren dobi ili ne odgovara djetetovim interesima ili potrebama učenja, može biti neučinkovit (de Boer i sur., 2012). Drugi odlučujući čimbenici uključuju nedostatak vremena, konkurentske prioritete, zauzet raspored ili druge odgovornosti koje ograničavaju količinu vremena koju roditelji mogu posvetiti korištenju obrazovnoga softvera. Slično tome, djeca mogu imati vlastite natjecateljske potrebe (Luder i sur., 2020). Studija Mascheronija i sur. (2016) otkrili su da značajan broj roditelja gleda na videoigre i interaktivne aplikacije kao na sredstvo za razvoj određenih digitalnih vještina. Pravila za dječju upotrebu tehnologije postala su manje stroga jer su roditelji počeli shvaćati da digitalna iskustva mogu biti poučna. To u konačnici mijenja negativnu percepciju roditelja o digitalnim tehnologijama samo kao sredstvu zabave. Kao rezultat toga, više ne žele ograničavati vrijeme koje njihova djeca provode na telefonima, prijenosnim računalima, tabletima itd. (Tour, 2019). Moderna tehnologija omogućuje stvaranje novih pristupa učenju koji bi poboljšali tradicionalne metode poučavanja (Smutny, 2023). Stoga interaktivne obrazovne aplikacije koriste milijuni ljudi diljem svijeta (Mondal i sur., 2024). U obrazovnom kontekstu, roditelji koriste ove aplikacije kako bi pomogli svojoj djeci da dodatno utvrde ono što su naučili u razredu i pružili dodatnu podršku ako je potrebna (Herwin i Dahalan, 2022). Učitelji su često pred izazovom da podrže roditelje u aktivnostima digitalnoga opismenjavanja kako bi im pomogli da se upoznaju s modernim obrazovnim aplikacijama (Downes i sur., 2020.; Tomczyk i sur., 2024). Dizajn softvera usmjeren na učenika može pomoći u stvaranju okružja za učenje u kojima društvena interakcija i suradnja pružaju učinkovito obrazovno okružje (Rawlins i Kehrwald, 2014). Umjesto oslanjanja na tradicionalne metode kao što su udžbenici i predavanja, interaktivne obrazovne aplikacije koriste razne multimedijske alate za stvaranje impresivnoga iskustva učenja. Ti alati uključuju videozapise, animacije, simulacije i interaktivne kvizove osmišljene za angažiranje i

motiviranje učenika (Hussain i sur., 2020). Obrazovne aplikacije obično imaju niz značajki koje se mogu prilagoditi potrebama i preferencijama svakoga učenika. Na taj način svi učenici mogu steći najbolje iskustvo učenja prilagođeno njihovim individualnim snagama i slabostima (Hinze i sur., 2017). Štoviše, ove aplikacije nude alate za ocjenjivanje koji mogu pratiti napredak učenika i dati trenutačnu povratnu informaciju o izvedbi. Ova značajka može pomoći učenicima da prepoznaju područja u kojima trebaju više podrške i usmjere svoje napore na poboljšanje svoje izvedbe (Kartel i sur., 2022). Još jedna ključna prednost interaktivnoga obrazovnog softvera jest to što se može koristiti izvan učionice (Alqahtani i Mohammad, 2015). Mnoge aplikacije dostupne su na mobilnim uređajima, što omogućuje učenicima nastavak učenja i vježbanja kod kuće, a to može biti posebno korisno kada se roditelji uključe u obrazovni proces.

Vrijedno je raspravljati i o utjecaju roditelja na motivaciju njihove djece jer motivacija igra ključnu ulogu u upravljanju i održavanju ciljano usmjerenoga ponašanja (Costa i Faria, 2017). Motivacija se smatra važnim čimbenikom koji utječe na cjelokupnu ljudsku izvedbu i ponašanje (Veresha, 2016). Prema istraživačima i praktičarima u području obrazovanja, motivacija je ključni element u osiguravanju održivoga postignuća učenika (Sumanasekera i dr., 2021). Motivacija se može definirati kao zbroj napora da se pojedinac mobilizira prema jednom ili više specifičnih ciljeva, kao i da se osigura kontinuitet toga kretanja (Küçüközkan, 2015). Budući da je motivacija povezana s ljudskim ponašanjem i kognitivnim razvojem, na nju mogu utjecati različiti čimbenici, kao što su interesi, vrijednosti, stavovi i želja osobe za djelovanjem. Ovaj fenomen ima višedimenzionalnu strukturu, zbog čega roditelji mogu pozitivno utjecati na djetetovu motivaciju za učenje (Liu i sur., 2016). Važno je uočiti prazninu u istraživanju u trenutačnom tematskom području, točnije nedostatak mogućnosti generalizacije. Mnoge studije usmjerene su na specifične skupine i imaju kratkoročnu perspektivu. Štoviše, kvaliteta softvera koju analiziraju često varira. Međutim, učinkovitost suradnje roditelj-dijete može ovisiti o kvaliteti i obilježjima obrazovnih aplikacija.

Metodologija

Istraživanje je imalo za cilj utvrditi učinkovitost implementacije interaktivne aplikacije 17zuoye u obrazovni proces. 17zuoye je platforma za *online* učenje osmišljena kako bi pomogla učenicima K-12 u Kini da uče učinkovitije i poboljšaju svoj akademski uspjeh (17zuoye, 2023) (Slika 1).

Slika 1.

Platforma nudi razne alate i resurse za učenike, učitelje i roditelje, uključujući domaće zadaće, kvizove, interaktivne lekcije i druge obrazovne materijale. Osim toga, pruža značajke kao što su praćenje napretka, analiza uspješnosti i personalizirane preporuke kako bi se pomoglo učenicima da prepoznaju vještine koje trebaju poboljšati (Feijóo i sur., 2021). Tablica 1 prikazuje arhitekturu ove aplikacije.

Tablica 1
Arhitektura 17zuoye

Komponente	Opis
Korisnička sučelja	Sučelje za učenike, sučelje za nastavnike, sučelje za roditelje
Temeljni funkcionalni moduli	Upravljanje zadatcima, ocjenjivanje i ispravljanje, prilagodljivo učenje, akademska izvješća, obrazovni vodiči
Predmetni moduli	Predmetno specifični moduli usklađeni s nastavnim planom i programom
Algoritmi umjetne inteligencije	Učinkovita raspodjela zadataka, prilagodljive preporuke sadržaja učenja, automatska korekcija zadataka
Upravljanje podatcima	Sigurno skladištenje i upravljanje korisničkim podatcima te analitika podataka za praćenje učinka
Autentikacija i sigurnost	Autentifikacija i autorizacija korisnika, enkripcija podataka i mjere zaštite privatnosti, usklađenost s propisima o zaštiti podataka
Komunikacija i obavijesti	Razmjena poruka unutar aplikacije, *push* obavijesti za zadatke, ocjene i ažuriranja

Testovi korišteni za ispitivanje učenika iz pet predmeta (Matematika, kineski, Zemljopis, Biologija, Književnost) razvijeni su posebno za ovo istraživanje. Osmišljeni su tako da odražavaju razinu znanja koju su studenti stekli nakon 6 mjeseci učenja uz korištenje integrirane moderne tehnologije. Učenici su za svaki točan odgovor u testu dobivali 1 bod; maksimalni broj bodova za svaki predmet bio je 50. Svaki od pet ispita trajao je jedan sat. Motivacija učenika mjerena je skalom akademske motivacije (AMS), koju su razvili Vallerand i sur. (1989) i prilagodili za kineske studente Zhang i sur. (2015). Ljestvica se sastoji od 28 tvrdnji ocijenjenih na Likertovoj ljestvici od sedam stupnjeva i podijeljena je u tri kategorije: ekstrinzična motivacija (12 - 84 boda), intrinzična motivacija (12 - 84 boda) i amotivacija (4 - 28 bodova; viši rezultat ukazuje na manju motivaciju). Cronbachova alfa izračunata je za procjenu pouzdanosti AMS-a u ovom uzorku, otkrivajući visoku unutarnju dosljednost za svaku podskalu: ekstrinzičnu motivaciju ($\alpha = 0,89$), intrinzičnu motivaciju ($\alpha = 0,91$) i amotivaciju ($\alpha = 0,87$). Ove vrijednosti zadovoljavaju međunarodne standarde za pouzdanost psihometrijskih ljestvica, potvrđujući prikladnost AMS-a za procjenu akademske motivacije među kineskim studentima.

Dodatno, provedena je eksplorativna faktorska analiza kako bi se potvrdila konstruktivna valjanost AMS-a. Analiza glavnih komponenti s Varimax rotacijom dala je tri faktora koji odgovaraju teorijski predviđenim podskalama. Ukupna objašnjena varijanca iznosila je 71,4 %, što ukazuje na odgovarajuću faktorsku strukturu. Kaiser–Meyer–Olkin (KMO) mjera adekvatnosti uzorkovanja bila je 0,88, a Bartlettov test sferičnosti ($\chi^2 = 3611,29$, $p < 0,001$) potvrdio je da je korelacijska matrica prikladna za faktorsku analizu. Faktorska opterećenja za pojedinačne stavke kretala su se od 0,68 do 0,86, što ukazuje na visok stupanj usklađenosti s njihovim odgovarajućim latentnim konstruktima.

Sudionici

Ovo istraživanje provodilo se od siječnja do srpnja 2021. godine. U istraživanju je sudjelovalo 200 učenika osmih razreda (100 dječaka i 100 djevojčica) iz dvije škole u Kini. Dob sudionika bila je od 11 do 13 godina. Svi su sudionici nasumično podijeljeni u dvije skupine: Grupa A, koja je sudjelovala u samostalnom učenju, s učenicima koji su koristili aplikaciju 17zuoye bez roditeljske pomoći, i Grupa B, koja je uključivala suradnju, s učenicima koji su koristili aplikaciju zajedno s roditeljima koji su prošli obuku za pružanje učinkovite podrške. Dobiveno je etičko odobrenje i pristanak kako bi se osigurala povjerljivost podataka. Ispitanici su tijekom nastave dobivali pozive za sudjelovanje u istraživanju. Dobivena je preliminarna suglasnost roditelja koji su izrazili želju za sudjelovanjem u istraživanju i bili voljni surađivati sa svojom djecom. Moglo je sudjelovati samo jedno dijete i jedan roditelj (majka ili otac) iz iste obitelji. Ovi uvjeti su postavljeni kako bi se prilagodilo situaciji kada je u obitelji samo jedan roditelj, ali i kako bi se isključile obitelji s blizancima koji pohađaju isti razred. Kako bi se osigurala grupna ekvivalencija prije glavne faze studije, proveden je preliminarni test. Mjesec dana prije početka istraživanja, učenici u obje škole završili su testove iz pet predmeta koji su bili predmet istraživanja, što odražava završne testove korištene na kraju istraživanja. Preliminarni rezultati ispitivanja nisu otkrili značajne razlike između skupina ($p > 0,05$), potvrđujući da su imale usporedive osnovne razine znanja. Nadalje, prije početka eksperimenta, akademska motivacija procijenjena je pomoću AMS ljestvice, koja također nije utvrdila statistički značajne razlike između skupina u vanjskoj motivaciji ($p = 0,644$), intrinzičnoj motivaciji ($p = 0,558$) ili amotivaciji ($p = 0,711$). Ovi nalazi potvrđuju da su prije intervencije sudionici u dvjema skupinama bili homogeni u smislu akademskoga uspjeha i motivacije.

Dizajn istraživanja

Studija ima eksperimentalni istraživački dizajn i koristi aplikaciju 17zuoye koja pruža lekcije iz predmeta kao što su Matematika, Kineski, Geografija, Biologija i Književnost. Svih 200 sudionika nasumično je podijeljeno u dvije skupine: Grupa A i Grupa B (po 100 djece u svakoj). Oni u skupini A proučavali su gore navedene predmete pomoću aplikacije 17zuoye bez suradnje s roditeljima. Nasuprot tome, učenici skupine B učili su predmete uz pomoć roditelja. Sve potrebne obrazovne materijale izradilo je 17 učitelja iz dviju škola sudionica. Roditelji mogu podržati svoju djecu u korištenju 17zuoye na nekoliko načina: pomoći djeci da razumiju i dovrše zadatke, pružiti objašnjenja, razjasniti nedoumice i ponuditi preporuke o tome kako pristupiti zadatcima; uspostaviti strukturirani raspored učenja, osiguravajući da djeca odvoje dovoljno vremena za izvršavanje zadataka i proučavanje obrazovnoga sadržaja koji nudi aplikacija; pratiti akademski uspjeh svoje djece kako bi identificirali područja u kojima bi njihova djeca mogla trebati dodatnu podršku i pružili je.

Stoga je podrška roditelja svojoj djeci bila višestruka:

1. Pomoć pri zadatcima: Roditelji su pomagali djeci u razumijevanju i rješavanju zadataka unutar aplikacije. To je uključivalo objašnjavanje složenih koncepata, rješavanje nesigurnosti i nuđenje uvida u to kako pristupiti različitim zadatcima.
2. Organiziranje rasporeda učenja: Roditelji su odigrali ključnu ulogu u uspostavljanju strukturiranoga rasporeda učenja, osiguravajući da djeca imaju dovoljno vremena za obavljanje zadataka i istraživanje obrazovnoga sadržaja koji nudi aplikacija.
3. Praćenje i podrška akademskom uspjehu: Roditelji su aktivno pratili akademski uspjeh svoje djece koristeći značajke aplikacije za povratne informacije. To im je omogućilo da identificiraju područja u kojima bi njihova djeca mogla trebati dodatnu podršku ili reviziju, kao i da pruže pomoć u skladu s tim kada je to potrebno.

Kako bi se smanjila potencijalna nekontrolirana uključenost roditelja u obje istraživačke skupine, provedeno je nekoliko važnih mjera. Roditelji u skupini B prošli su trosatnu obuku koja je objašnjavala ključne aspekte interakcije s njihovim djetetom tijekom korištenja obrazovne aplikacije. Dobili su jasne upute kako podržati učenike, koje strategije poticaja koristiti te kako pratiti i analizirati djetetov napredak. Ova obuka osigurala je standardizirani pristup roditeljskoj uključenosti, čime je smanjena varijabilnost u razini uključenosti.

Što se tiče skupine A, roditelji su obaviješteni da se od djece očekuje samostalan rad s obrazovnom aplikacijom, bez aktivne intervencije roditelja. Iako je bilo nemoguće u potpunosti eliminirati neformalnu uključenost roditelja, istraživači su uveli mjere za praćenje ovoga aspekta. Konkretno, tijekom razdoblja od šest mjeseci, učenici u obje grupe vodili su tjedne zapisnike svojih studijskih aktivnosti, bilježeći jesu li obrazovnu aplikaciju koristili samostalno ili uz podršku odraslih. Analiza ovih zapisa omogućila je identificiranje mogućih odstupanja od utvrđenoga protokola istraživanja. Osim toga, učenici A skupine ispitani su o tome koliko su njihovi roditelji uključeni u njihov proces učenja i učestalost roditeljskih interakcija tijekom korištenja aplikacije. Rezultati su pokazali da je većina učenika u ovoj skupini doista radila samostalno, potvrđujući valjanost određivanja kontrolne skupine. U međuvremenu, u skupini B zabilježen je broj aktivnih sesija u kojima su i dijete i roditelj istovremeno bili prijavljeni u aplikaciju, što je omogućilo djelomično praćenje stvarne razine uključenosti roditelja u proces učenja.

Početkom veljače učenici B skupine i njihovi roditelji dobili su pristup 17zuoyeu koji je instaliran na školskim računalima, kao i na osobnim računalima učenika. Svi su sudionici dobili pristup pet tečajeva iz odgovarajućih predmeta i proučavali ih kao dio školskoga kurikula. Nastava se odvijala *online* i *offline* prema školskom rasporedu. Broj sati predviđen za učenje svakoga predmeta bio je isti. Provjera znanja učenika održana je u srpnju 2022. godine i održana je u školskim učionicama. Nakon intervencije, studenti su zamoljeni da ispune upitnik Skale akademske motivacije (AMS).

Analiza podataka

Za svaku od dviju studijskih skupina – skupinu A, u kojoj su učenici samostalno koristili obrazovnu aplikaciju i skupinu B, pri čemu se učenje odvijalo uz sudjelovanje roditelja – izračunati su ključni deskriptivni statistički pokazatelji. To uključuje srednju vrijednost, standardnu devijaciju, medijan, kao i varijancu i kurtozu. Takvi su parametri omogućili preliminarnu procjenu distribucije podataka AMS-a i pomogli u identificiranju mogućih trendova u rezultatima testova u pet akademskih predmeta.

Nakon ove početne deskriptivne analize, korišten je Mann-Whitneyjev U-test za procjenu statističke značajnosti razlika između skupina. Za svaki od pet predmeta i tri podskale akademske motivacije, izračunata je U statistika i njezina odgovarajuća asimptotička razina značajnosti (p). Niske vrijednosti U i $p < 0,05$ ukazali su na značajne razlike između skupina, što sugerira da roditeljska uključenost ima značajan utjecaj na akademsku izvedbu i motivaciju učenika.

Uz U-test, također su izračunate z-vrijednosti kako bi se izmjerio stupanj odstupanja od nulte hipoteze, koja nije pokazala razlike između skupina. Svi statistički izračuni izvedeni su korištenjem SPSS Statistics 26.

Etička pitanja

Trenutačna studija je profesionalno osmišljena, pravilno izvedena i odobrile su je školske vlasti kao i roditelji/staratelji svih sudionika. Svi su dali pisani pristanak za istraživanje. Istraživači su jamčili anonimnost i sigurnost podataka sudionika. Osim toga, prije početka istraživačkih aktivnosti razvijen je istraživački protokol koji su slijedili svi sudionici i mentori.

Rezultati

Primarni cilj studije bio je istražiti utjecaj aplikacije 17zuoye na akademski uspjeh učenika. Izvedba je analizirana pomoću softvera SPSS Statistics i uključivala je izračun srednje vrijednosti, standardne devijacije, kurtoze, standardne pogreške kurtoze, standardne pogreške srednje vrijednosti i varijance. Tablica 2 prikazuje distribuciju vrijednosti između dviju skupina. Tablica 2 prikazuje srednju vrijednost, standardnu devijaciju, kurtozu, standardnu pogrešku srednje vrijednosti i varijancu akademskoga uspjeha za pet ispitanika u obje skupine.

Prema tablici, skupina A, koja je koristila 17zuoye bez suradnje roditelja, imala je najviši srednji rezultat iz Biologije (26,95). Ovaj rezultat ukazuje na relativno bolje rezultate u ovom predmetu u usporedbi s ostalima. S druge strane, najslabija ocjena bila je iz Matematike (24,15). U skupini B situacija je nešto drugačija: najviša srednja ocjena od 35,35 zabilježena je u Kineskom, a najniža 31,43 u Biologiji. Tako su prosječni rezultati učenika B skupine, koji su učili u suradnji s roditeljima, veći od onih učenika A skupine iz svih predmeta. Skupina B dosljedno je pokazivala više prosječne rezultate u svim predmetima, što ukazuje na pozitivan utjecaj suradnje roditelja na akademski uspjeh. Vrijednosti standardne devijacije i varijance sugeriraju varijabilnost u ocjenama

unutar svake skupine, pri čemu skupina B obično pokazuje širi raspon rezultata. Standardna devijacija za skupinu A kretala se od 2,302 do 4,092, pri čemu je najveća zabilježena u zemljopisu, a najniža u Matematici. Ovi rezultati pokazuju da su podatci raspoređeni u velikom rasponu vrijednosti. Za skupinu B, ova se vrijednost kretala od 4,576 na Kineskom do 2,471 na Biologiji. Standardna pogreška srednje vrijednosti u skupini A bila je u rasponu od 0,230 do 0,409; u skupini B – od 0,247 do 0,458. Sve vrijednosti kurtosisa bile su negativne u obje skupine.

Tablica 2

Podatci su zatim analizirani pomoću Mann-Whitney U testa, neparametarskoga testa prikladnoga za usporedbu dviju neovisnih skupina. Rezultati analize, uključujući srednje vrijednosti i srednje rangove, prikazani su u Tablici 3.

Tablica 3

Analiza je otkrila značajne razlike u akademskom uspjehu u svih pet predmeta. Asimptotska značajnost ne prelazi graničnu vrijednost od 0,05. To implicira da je akademski uspjeh učenika B skupine, koji su učili uz roditeljsku pomoć, bio značajno bolji od učenika skupine A. Ovi rezultati potvrđuju pozitivan učinak suradnje roditelja i djeteta na postignuća učenika.

Treći cilj ovoga istraživanja bio je procijeniti motivaciju učenika pomoću skale akademske motivacije (AMS). Tablica 4 prikazuje rezultate.

Tablica 4

Dakle, srednje vrijednosti ekstrinzične i intrinzične motivacije među studentima B skupine veće su od onih učenika A skupine. Ipak, vrijednosti amotivacije su niže, što ukazuje na veću motivaciju djece koja su koristila 17zuoye u suradnji s roditeljima. Dakle, skupina B, koja prima podršku roditelja, pokazuje više srednje rezultate u ekstrinzičnoj i intrinzičkoj motivaciji i niže rezultate u amotivaciji. Posljedično, opća razina motivacije bila je viša kod učenika koji su se uključili u obrazovni proces uz roditelje. Ovaj je nalaz u skladu s hipotezom da roditeljska uključenost pozitivno utječe na motivaciju učenika. Tablica 5 prikazuje detaljne rezultate Mann-Whitney U, koji je korišten za usporedbu razlika u vrijednostima skale akademske motivacije (AMS) između skupina.

Tablica 5

Razlike u AMS rezultatima također su bile značajne u sve tri podskale (ekstrinzička motivacija, intrinzična motivacija i amotivacija). Ovi rezultati još jednom potvrđuju pozitivan utjecaj suradnje roditelja i djeteta na motivaciju učenika. Veća motivacija u skupini B statistički je značajna, što potvrđuje zaključke o povoljnom utjecaju roditeljske uključenosti u obrazovne aktivnosti.

Rasprava

Razlike u akademskom uspjehu

Uočene razlike u akademskom uspjehu između skupine A i skupine B mogle bi biti posljedica niza čimbenika koji naglašavaju složenu dinamiku suradnje roditelja i djeteta u kontekstu korištenja 17zuoye. Razlike u akademskom uspjehu mogu biti povezane sa specifičnim obrazovnim potrebama i preferencijama pojedinih učenika. Neki su učenici u skupini B mogli biti izvrsni u okružju obogaćenom roditeljskim vodstvom, smatrajući da je pogodno za njihov stil učenja. S druge strane, učenici u skupini A možda nisu postigli takvu učinkovitost u samostalnom učenju, što bi moglo objasniti njihov relativno slabiji akademski uspjeh. Značajno poboljšanje u skupini B može se povezati s prednostima roditelja koji mogu pružiti podršku i nadzor.

Utjecaj roditeljske uključenosti na motivaciju

Viša razina motivacije uočena u skupini koja je učila uz sudjelovanje roditelja može se pripisati sposobnosti suradničkoga učenja s roditeljima kako bi se stvorilo okružje za učenje koje je više angažirano i podržavajuće. Učenici su možda iskusili veći osjećaj roditeljskoga interesa, odgovornosti i personalizirane podrške. Nekoliko prethodnih studija pokazalo je da roditeljska uključenost poboljšava izvedbu učenika i tijekom nastave i prilikom izrade domaće zadaće (Paccaud i sur., 2021), što je u skladu s nalazima trenutačne studije. Aktivna interakcija može poboljšati odnose roditelj-učitelj i učiniti roditelje ne samo zadovoljnijima školom, već i sigurnijima u dobrobit svojega djeteta (Fishman i Nickerson, 2015). Jedna od studija koja traje više od 10 godina (Baumrind i sur., 2010) naglašava ulogu roditelja u obrazovanju djece. Adolescenti čiji su roditelji bili direktivni ili demokratični bili su kompetentniji i mogli su se bolje prilagoditi okružju učenja od onih čiji su roditelji bili autoritarni, permisivni ili popustljivi (Baumrind i sur., 2010). Ispitujući različite čimbenike, autori su otkrili da su prisilne prakse verbalnoga neprijateljstva i psihološke kontrole koje često primjenjuju autoritarni roditelji imale najnegativniji učinak na djecu predškolske dobi. Naprotiv, suprotstavljena disciplina i zahtjevi za zrelošću pridonijeli su učinkovitosti i obrazovanja i roditeljstva. Rezultati su pokazali da štetni učinci autoritarnoga roditeljstva i pozitivni učinci autoritativnoga roditeljstva mogu trajati 10 godina. Dakle, kada roditelji pravilno utječu na živote svoje djece, djeca postaju kompetentnija. Drugo istraživanje pokazalo je da su odgoj djece kroz stalnu interakciju s njima i pomaganje u donošenju ispravnih odluka najvažniji aspekti roditeljstva (Ubale i sur., 2015). Osim toga, nedavna studija Kupzyk i sur. (2023) proveli su ciljane akademske intervencije za procjenu akademskoga uspjeha djece od predškolske dobi do 12. razreda. Ovo je istraživanje pokazalo da je roditeljska uključenost, posebice u svojstvu mentora, bila posebno učinkovita za djecu u 3. razredu i mlađoj. Oblik aktivnoga sudjelovanja pokazao se manje učinkovitim za stariju djecu, počevši od četvrtoga razreda. Dakle, rezultati pokazuju da dob djeteta igra presudnu ulogu u određivanju najpovoljnijega

oblika roditeljske podrške u obrazovnim ustanovama. Buduća bi istraživanja trebala istražiti ulogu roditeljske uključenosti ovisno o djetetovoj dobi.

Motivacija i uključenost roditelja

Neki istraživači (Núñez i sur., 2019) tvrde da je motivacija u potpunosti posredovana roditeljskom uključenošću. S druge strane, druge studije (Reeves i sur., 2020) pokazuju da je motivacija djece poboljšana percipiranom roditeljskom uključenošću, osobito kada su roditelji sigurni u sposobnosti svoje djece. Na temelju teorije samoodređenja, znanstvenici (Stavrulaki i sur., 2021) istraživali su motivaciju i odnos između akademskoga uspjeha i stila roditeljstva. Otkrili su da različite vrste motivacije (intrinzična, ekstrinzična i amotivacija) utječu na akademski uspjeh i djeluju kao djelomični posrednici u odnosu između autoritativnoga roditeljstva i zadovoljstva životom. Nekoliko je čimbenika koji pridonose pozitivnom učinku uključenosti roditelja u obrazovanje djeteta. Jedan od glavnih razloga jest sposobnost roditelja da stvore strukturirano i podržavajuće okružje za učenje koje potiče učenje njihova djeteta (Arfa, 2024). Pretpostavlja se da dodatna pomoć i objašnjenja roditelja pomažu djeci da bolje razumiju nastavno gradivo i osjećaju se sigurnije pri izvršavanju zadataka (Tayyab i sur., 2024). Zajedničko korištenje obrazovnoga softvera može utjecati na motivaciju djece zbog stalnih povratnih informacija i poticaja roditelja (Wilke i sur., 2024).

Dinamika odnosa roditelja i djeteta

Odnos roditelja i djeteta ostaje nedovoljno proučena. Rezultati drugog istraživanja upućuju na to da iako roditelji općenito imaju pozitivan stav prema školskoj kulturi, ostaju pasivni u suradnji s učiteljima (Mlinarević i Tokić, 2018). Članak Højholta i Kousholta (2019) naglašava složene i ponekad proturječne aspekte školskoga života. Još važnije, članak istražuje društvenu dinamiku između djece i roditelja koji dijele zajedničke interese i suočavaju se s različitim izazovima. Prednosti suradnje roditelja i djeteta otkrivene u ovoj studiji mogu pomoći istraživačima u daljnjem istraživanju uključenosti roditelja u svakodnevne aktivnosti djece.

Zaključak

Ovo je istraživanje pokazalo da su učenici koji su učili školske predmete u suradnji s roditeljima bili bolji od učenika koji su učili samostalno. Postojale su značajne razlike u akademskom uspjehu između dvije skupine ispitanika. Slično tome, vrijednosti Skale akademske motivacije za učenike B skupine bile su veće od onih za učenike A skupine. Sukladno tome, suradnja između roditelja i njihove djece korištenjem interaktivnih obrazovnih aplikacija kao što je 17zuoye pozitivno utječe na akademski uspjeh i motivaciju učenika. Trenutačni rezultati mogu se pripisati nekoliko čimbenika. Prvo, uključivanje roditelja stvara strukturiranije okružje za učenje koje pruža više podrške, što olakšava učenje. Drugo, roditelji daju dodatna objašnjenja i pomoć pri rješavanju zadataka, čime se povećava razumijevanje nastavnoga gradiva i samopouzdanje učenika.

Konačno, zajedničko korištenje obrazovnoga softvera jača motivaciju djece stalnim povratnim informacijama i poticajima roditelja. Ovi čimbenici pridonose učinkovitijem i motiviranijem procesu učenja, što potvrđuju značajne razlike u akademskom uspjehu i motivaciji između grupa sa i bez uključenosti roditelja.

Ovaj članak ima praktičnu i znanstvenu vrijednost te pruža važne uvide u suradnju roditelja i djeteta u procesu učenja. Studija naglašava ulogu roditelja u pomaganju svojoj djeci da uspiju u školi i opisuje kako suradnja s roditeljem može utjecati na ishode učenja i motivaciju djeteta. Pružajući ove vrijedne informacije, članak doprinosi razvoju učinkovitih strategija usmjerenih na poboljšanje ishoda učenja djece i povećanje njihove motivacije.

Ograničenja istraživanja

Nalazi ove studije trebaju se tumačiti u svjetlu određenih ograničenja. Prvo, studija je provedena u samo dvije obrazovne ustanove, što može ograničiti generalizaciju rezultata na širu kinesku populaciju. Drugo, iako su dnevnici korišteni za praćenje stupnja roditeljske uključenosti i suradnje, nije bilo moguće provjeriti točnost podataka koje su sami prijavili izravnim promatranjem, što je predstavljalo ograničenje u studiji. Štoviše, istraživanje ne uzima u obzir mnoge druge čimbenike koji bi mogli utjecati na motivaciju i akademski uspjeh učenika.

Buduća istraživanja

Buduće studije mogle bi riješiti ograničenja trenutačne studije. Nadalje, važno je dublje proniknuti u specifične mehanizme i strategije suradnje između roditelja i djece koji pridonose boljem akademskom uspjehu i motivaciji. Dodatno, ispitivanje dugoročnih posljedica takve suradnje na ishode učenja studenata i njihov prijelaz u visoko obrazovanje može pružiti vrijedan uvid u održive obrazovne intervencije. Buduća bi se istraživanja također mogla usredotočiti na utjecaj različitih oblika roditeljske uključenosti na ishode učenja i motivaciju djece. To može uključivati istraživanje različitih obrazaca interakcije, kao što su zajednički zadatci, uključenost roditelja u projekte učenja i drugi oblici podrške. Važno je proučiti dobne karakteristike učenika i prilagoditi načine sudjelovanja roditelja ovisno o potrebama i stupnju razvoja djece. Proučavanje kulturnih i socioekonomskih čimbenika zahtijeva posebnu pozornost budući da ti čimbenici mogu utjecati na učinkovitost roditeljske uključenosti u obrazovni proces. Konačno, postoji potreba za razvojem i implementacijom novih obrazovnih tehnologija koje bi mogle učinkovitije integrirati sudjelovanje roditelja.