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Family Involvement on the Effective Use of Education Technology in China: Status, Influence and Suggestions

Yanyan Liang[1,a,*]

[1]*UNESCO Regional Office for East Asia, Xiushui Street, Chaoyang District, Beijing, China*
a. y.liang@unesco.org
**corresponding author*

Abstract: The integration of Educational Technology (EdTech) into learning environments is transforming both formal education and family-based learning across the globe. In China, where the educational landscape is rapidly evolving, families play a crucial role in mediating the use of EdTech. This paper first explores the current state of EdTech use in households in China, including the types of EdTech tools used, the role of the family, and the existing regional differences. The influence of family factors on the adoption and effectiveness of EdTech for learning at home is further examined. Parents' attitudes toward technology, particularly their willingness to engage with EdTech tools, play a pivotal role in determining how effectively these tools are used at home. Families' socioeconomic status and parents' education level also influence their ability to guide their children. Family relationships and how parents and children interact with technology also shape the effectiveness of EdTech. The paper concludes with recommendations for stakeholders, including parents, schools, and policymakers, on better leveraging EdTech for children's academic and cognitive development. The findings suggest that family-centered EdTech design, enhanced collaboration between schools and families, and continuous parental learning can help maximize the potential of these technologies to improve learning experiences.

Keywords: Educational technology, family involvement, socioeconomic status, home learning environment, family-oriented design.

1. Introduction

For children's learning, families, aside from schools, are crucial settings where significant learning activities happen constantly. With EdTech becoming increasingly integrated into educational systems worldwide, its use has also become more prevalent in families for learning purposes. This might be a promising development as EdTech is particularly useful when employed in informal learning, sometimes even superior to formal schooling [1]. Regarding informal learning, families are such an important informal environment that can bring benefits to children's academic achievements as well as well-rounded development [2]. However, the effectiveness of EdTech within families remains limited, hindered by factors such as poorly designed tools that are not user-friendly, a lack of knowledge and skills among family members, and the existing digital divide, which prevents EdTech from reaching its full potential to enhance learning outcomes [3,4].

This paper aims to investigate the relationship between family and EdTech, examining the current state of EdTech usage in households, the factors that significantly influence children's engagement

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with EdTech for learning, and strategies to enhance their academic performance and cognitive development through effective integration of EdTech at home. As EdTech increasingly becomes integral to educational systems, understanding how family factors shape both the adoption and effectiveness of these technologies is essential for improving student learning outcomes, particularly in contexts like China, where the educational landscape is rapidly evolving.

While the influence of family on EdTech use is acknowledged, a systematic review that examines this phenomenon within a Chinese context remains lacking. Three key research gaps exist: first, there is a need for more research on how cultural factors shape family attitudes and behaviors toward EdTech, particularly in non-Western contexts like China, where current studies are limited. Second, while the impact of socioeconomic status on EdTech use has been explored, there is insufficient research on interventions to mitigate the digital divide, highlighting the need for policy initiatives and family support programs. Finally, the long-term effects of family-mediated technology use on children's educational outcomes remain unclear, necessitating longitudinal studies to understand how sustained EdTech use influences academic achievement and cognitive development over time.

This study aims to, firstly, examine the current state of EdTech use among Chinese families with primary school students. Secondly, evaluate how family factors affect the adoption and effectiveness of EdTech and how EdTech can play a conducive role in family education. Last but not least, provide insights and recommendations for families on how to enhance children's learning outcomes through the effective use of EdTech.

2. Current Status of EdTech Use at Home in China

2.1. Types of EdTech Tools Used

The use of Educational Technology (EdTech) tools in Chinese households has surged in recent years, driven by technological advancements, educational reforms, increased parental education level, and the COVID-19 pandemic. The tools employed range from online learning platforms and mobile applications to more sophisticated technologies like artificial intelligence (AI) and virtual reality (VR). Widely used platforms include services such as Zuoyebang, Yuanfudao, and DingTalk which offer diverse learning materials, video tutorials, and personalized exercises. In addition, mobile apps like Mo Study and Xuexi Qiangguo provide access to a wealth of educational resources, often supporting self-directed learning for both primary and secondary school students. Tools such as smart pens, tablets, and AI-powered tutoring systems also find prominence, especially in affluent families, providing interactive learning experiences. Huawei Hilink educational companion robot is one such AI-powered tutoring tool. Moreover, virtual reality (VR), augmented reality (AR), and mixed reality (MR) have also been adopted in many schools, museums, and mobile applications to enrich learning experiences and enhance learning effectiveness.

2.2. The Role of EdTech in Family Education

In China, the role of EdTech extends beyond formal schooling, increasingly integrating into family education. EdTech tools facilitate parental involvement in children's learning processes, enabling parents to monitor progress, set goals, and assist with daily studies [5]. For example, apps like Parent School empower parents by providing regular updates on their children's performance and areas requiring attention. Another subsequent advantage of this is that with more of these parent-children interactions going on, closer generational relationships can be forged. Additionally, EdTech supports supplemental education, particularly for families seeking to enhance their children's knowledge outside of school hours. In many cases, families use these tools to bridge educational gaps, providing more personalized and tailored educational experiences for their children. This reflects a shift from purely school-based education toward a blended model of learning that takes place both in and out of

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school. Furthermore, EdTech serves as a valuable teaching resource in families. With parents' or other carers' supervision and guidance in children's engagement with EdTech, children are more likely to learn to utilize EdTech to serve their learning purposes appropriately and efficiently. This will become more relevant as technology advances to better prepare children for the digital age.

2.3. Regional Differences in the Use of EdTech in Families

China's vast geography and diverse socioeconomic landscape have resulted in significant regional disparities in EdTech adoption and usage. In urban areas, especially in first-tier cities like Beijing, Shanghai, and Shenzhen, families often have access to the latest EdTech tools and enjoy higher internet penetration rates, better infrastructure, and more disposable income. Conversely, in rural regions, EdTech adoption remains limited by inadequate digital infrastructure, lower income levels, and limited parental familiarity with technology [6]. These regional differences create a "digital divide" in family education, where students in wealthier regions gain disproportionate benefits from technology-enhanced learning. This inequality is further exacerbated by the uneven distribution of educational resources, as urban families can often afford premium EdTech services, while rural students rely on more basic tools or government-subsidized programs.

3. The Influence of Family Factors on EdTech Use and Effectiveness

3.1. Parental Involvement and Attitudes Toward EdTech

Parents' attitudes toward technology, particularly their willingness to engage with EdTech tools, play a pivotal role in determining how effectively these tools are used at home. Research shows that positive parental attitudes toward technology not only influence their own engagement but also shape children's perceptions and utilization of educational technologies. When parents embrace EdTech and demonstrate enthusiasm for its use, children are more likely to adopt similar positive attitudes, leading to increased engagement with these tools [7].

Active parental involvement, such as assisting with online lessons or supervising app use, significantly enhances students' engagement and learning outcomes. Studies indicate that children whose parents actively participate in their learning process - by discussing educational content, helping with assignments, or exploring educational apps together - tend to achieve better academic results. For instance, parental guidance can facilitate a deeper understanding of the material and encourage students to develop effective learning habits [8].

3.2. Socioeconomic Status (SES) and the Digital Divide

The digital divide continues to be a major focus in understanding the uneven impact of EdTech. Research by Van Dijk reveals that children from wealthier families tend to have better access to educational technologies, often using them for more advanced, interactive learning [4]. In contrast, children from lower-income families may use EdTech in more passive ways due to a lack of devices or understanding of how to maximize their potential. This gap is exacerbated during remote learning, such as in the COVID-19 pandemic, when disparities in home environments significantly influenced educational outcomes [9].

Family SES not only influences access to EdTech but also the types of learning experiences children have. Families with lower SES may lack the digital literacy needed to guide students, whereas higher-SES families often provide enriched learning environments at home. This inequality suggests a crucial area for intervention and policy, particularly in ensuring equitable access to EdTech and family support across different economic backgrounds.

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3.3. Home Learning Environment and Parental Education Level

The home learning environment - including physical spaces, family routines, and parental educational background - plays a critical role in students' success with EdTech. According to a study by Melhuish et al., a well-structured home environment, with designated learning spaces and regular routines, fosters more effective technology use [10]. Parental education level also contributes to how effectively EdTech is used at home. Studies by Schmitt et al. indicate that parents with higher education levels are more likely to create a supportive learning environment, helping children navigate complex digital platforms and educational apps [3]. Research by Hsu et al. also highlights how parents' familiarity with technology, reflective of their educational background, influences their ability to guide their children, with higher-tech-savvy parents often providing better support [1]. In general, the home learning environment, parental education level, and the associated parents' familiarity with technology create supportive conditions that enhance children's learning.

3.4. Family Dynamics and Support in Using Technology

Family dynamics, including family relationships and how parents and children interact with technology, also shape the effectiveness of EdTech. Family cohesion, communication styles, and even sibling interactions can impact how technology is perceived and utilized for learning. For example, cooperative family environments tend to promote shared learning experiences with EdTech, whereas families with less cohesion may struggle to leverage technology for collaborative or interactive learning.

Family support in using technology - that is, parents guiding their children in using educational technologies - can foster a collaborative learning experience that maximizes the benefits of EdTech. Barron et al. explore how families negotiate screen time and technology use, with findings suggesting that family rules around technology significantly shape children's EdTech habits [2]. The balance between autonomy and regulation appears to be critical, as overly restrictive environments may limit exploratory learning, while too much freedom can lead to misuse or distraction.

4. Suggestions for Families to Enhance Children's Learning Outcomes through EdTech

4.1. Family-Oriented EdTech Design

One promising avenue for improving EdTech's impact on children's education is through family-oriented design. By developing tools that encourage joint participation between parents and children, families can engage in co-learning activities that reinforce educational content and build stronger learning habits.

Co-using family-oriented EdTech tools offers multiple educational benefits. First, it strengthens learning through dialogue, as conversations between parents and children during or after EdTech use can deepen understanding; for instance, while playing an educational game, parents can ask questions or clarify concepts. Additionally, this shared use promotes cognitive engagement by encouraging parents and children to collaboratively solve problems, thereby modeling higher-order thinking skills like analysis and evaluation, which enhances critical thinking.

Moreover, co-use boosts motivation and persistence; children are more likely to engage and persevere through challenging tasks when supported by a parent, providing essential emotional encouragement. Finally, such interactions foster positive learning habits, allowing parents to model effective behaviors like time management, goal-setting, and self-regulation, which help children develop lifelong skills beyond the specific content of the EdTech tool.

In China, family-oriented EdTech products have become increasingly popular, driven by the emphasis on educational achievement and digital literacy. An example is BabyBus, an educational

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platform aimed at preschoolers, offering a series of interactive games and learning activities that cover subjects like early literacy, numeracy, and social skills. It incorporates several family-oriented features. Firstly, it encourages parent-child co-play, allowing parents to assist children in solving puzzles or engaging in storytelling activities. Secondly, the app offers parental control options, enabling parents to set playtime limits and monitor their child's in-app activities, creating a more controlled learning environment. Lastly, it promotes offline interaction by suggesting real-life activities, such as crafting or practicing numbers and letters, that parents and children can do together outside of the digital space. With these features in place, children's language and numerical skills, learning habits, motivation, and interpersonal interaction can be enhanced.

4.2. Collaboration Between Families and Schools

Strengthening collaboration between families and schools is key to maximizing EdTech's effectiveness. When schools provide guidance and support to families on how to effectively incorporate educational technologies into home learning, it creates a more holistic learning environment that extends beyond the classroom and could also help bridge the digital divide among families. Research has demonstrated that such collaboration can significantly enhance student outcomes. For example, a study by Goodall & Montgomery emphasized that active parental engagement facilitated through school guidance - improves students' academic performance and engagement with technology, particularly in primary education [11].

Schools can implement several practical measures to support families in enhancing EdTech use. Firstly, providing digital literacy training through workshops can empower parents to better understand EdTech, enabling them to assist their children effectively; research by Erdogdu & Erdogdu indicates that such training significantly boosts student performance, particularly among those from lower socioeconomic backgrounds [12]. Secondly, maintaining regular communication with parents about new EdTech tools and educational apps keeps them informed and encourages active participation in their children's learning. Harris & Goodall found that strong school-family communication not only improved student outcomes but also positively influenced parental attitudes toward EdTech [13]. Lastly, fostering parent-teacher partnerships through regular meetings focused on EdTech can help address challenges like technology access, screen time management, or motivational issues, enhancing alignment between school and home educational goals. Epstein argues that active parental engagement, supported by schools, can significantly improve students' ability to navigate and benefit from EdTech [14].

In countries like China, where EdTech adoption is growing rapidly, such a collaborative relationship between schools and families is particularly important in ensuring equitable access to digital tools and optimizing their effectiveness for all students.

4.3. Lifelong learning for parents

For parents to effectively support their children's EdTech use, they must engage in lifelong learning to stay abreast of emerging technologies and educational trends. As educational tools and platforms rapidly evolve, parents' ability to guide their children through these digital environments is crucial. A study by Livingstone et al. found that parents who regularly update their digital literacy skills are more effective in mediating their children's use of technology, which in turn leads to improved educational outcomes [15].

Lifelong learning for parents involves not only improving their familiarity with specific EdTech tools but also understanding broader trends in digital education. For instance, Chaudron et al. argue that parents need to be aware of both the potential benefits and challenges of digital tools, such as how to balance screen time with other activities or how to assess the educational value of different

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apps [16]. By regularly engaging with resources such as parent workshops, online courses, or EdTech-focused newsletters, parents can enhance their capacity to support their children's learning.

Moreover, a study by Plowman, McPake, & Stephen highlights the importance of parents developing a "digital learning culture" at home, where technology use is integrated into everyday learning activities [17]. This approach encourages parents to not only supervise but also participate in their children's use of technology. Joint participation in digital activities, such as co-watching educational videos or co-creating digital projects, has been found to strengthen the parent-child relationship while promoting a more meaningful use of EdTech.

By actively pursuing their own digital education, parents can create a more supportive home environment for learning. In doing so, they are better equipped to guide their children through the challenges of technology use while maximizing the educational benefits EdTech can offer.

5. Conclusion

In conclusion, families hold a pivotal role in the successful integration and effectiveness of EdTech in children's education, particularly within the evolving Chinese educational context. The use of EdTech tools in Chinese households has surged in recent years, covering a whole spectrum of EdTech types. It facilitates parental involvement in children's learning processes, forges closer generational relationships, bridges educational gaps by virtue of more personalized and tailored educational experiences, and helps children adapt more easily to the digital age. However, the digital divide remains a critical challenge, with disparities in access and digital literacy limiting the benefits for students in lower-income or rural areas. Parental involvement and attitude, socioeconomic status, home learning environments and parental education level, and family dynamics significantly influence whether EdTech is effectively used for learning purposes. To maximize the benefits of EdTech, families need to adopt a proactive approach that includes co-learning, continuous development of digital literacy, and collaboration with schools. Future research should focus on how cultural differences and long-term family involvement shape EdTech's impact on student achievement.

Overall, this study underscores the importance of considering family factors in the design, implementation, and policy-making surrounding EdTech. By addressing these elements, China can better support its students in navigating the digital age and achieving more equitable educational outcomes.

The findings of this study provide valuable insights for policymakers, educators, and particularly families on how to enhance children's educational outcomes through EdTech in home learning. By understanding the family factors that influence EdTech use, stakeholders can design more effective interventions that support equitable access to technology and promote better learning environments at home. Meanwhile, the findings can also offer possible educational pathways that are conducive to closer family engagement.

Further research is needed to compare EdTech use across different countries and cultural contexts. Longitudinal studies are also needed to look into the long-term effects of sustained EdTech use on children's academic achievement and cognitive development over time. Additionally, more comprehensive studies on the variety of EdTech tools available to families would provide a clearer understanding of the potential benefits and limitations of these technologies. What is more, it is also anticipated to have more focused studies that are dedicated to different age groups to chart the course for EdTech improvement more in-depth.

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