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# The Effects of Using Smartphones on the Cognitive Speed of Gifted Students

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**Abstract**

*This study aimed to evaluate the effects of smartphone use on the cognitive speed of gifted students and its utilization in their education. To gather data for the study, a self-developed questionnaire was administered to 280 students in the region. The findings of the study revealed that smartphone usage may enhance intuitive thinking among gifted students but does not necessarily enhance their critical thinking and creativity. Additionally, the study highlighted that excessive use of smartphones could lead to poor concentration, depression, and anxiety, among other negative effects. While smartphones can be beneficial for gifted students to enhance their learning and improve academic performance, excessive and uncontrolled use of smartphones may have a detrimental impact on students' academic outcomes. The study concludes that the use of smartphones could positively influence the intuitive (emotional) thinking and social lives of gifted students. However, it is important to note that smartphones might negatively affect their critical and analytical thinking. Smartphones play a significant role in young people's lives and can impact education positively. Limiting their use in education may hinder access to knowledge in society.*

***Keywords:*** *Gifted Education, Special Education, Gifted students, Technology risks.*

## 1. Introduction

The advent of smartphones has brought a seismic shift in how we communicate, access information, and even learn. These small, powerful devices have become an integral part of modern life, shaping the way we interact with the world around us (Rindermann and Baumeister, 2018). In the context of education, smartphones offer innovative possibilities for learning through a diverse range of apps, online platforms, multimedia resources, and interactive features (Plucker and Makel, 2017). Their portability and accessibility have made them a prominent tool in educational settings, both in formal classrooms and in self-guided learning (Davis, 2017). However, their impact on cognitive abilities, particularly among gifted students, remains a complex and multifaceted issue that warrants further exploration (Callahan and Moon, 2019; Feldhusen, 2022)."

Gifted students, characterized by their unique intellectual abilities, creative potential, and heightened curiosity, have specific educational needs that must be recognized, understood, and addressed. These students often require specialized instruction, enrichment activities, and learning environments that challenge and stimulate their minds. While smartphones can provide stimulating, personalized, and engaging learning experiences, the effects of their use on cognitive functions such as processing speed,

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memory, attention, and problem-solving skills are not yet fully understood. Moreover, the influence of smartphones on social interactions, emotional development, and the overall well-being of gifted students is an area that needs to be considered.

Understanding how smartphones influence the cognitive speed of gifted students is not just an academic inquiry; it has practical implications for teachers, parents, policymakers, and the students themselves. As we strive to harness the benefits of technology, it is imperative to be aware of potential drawbacks and seek balanced approaches that consider the holistic development of students. The growing integration of smartphones into educational settings, from elementary schools to universities, has made it vital to understand their impact on various aspects of learning, engagement, motivation, and cognitive development. (Frasier et al., 1995)

For gifted students, who often thrive on specialized instruction and creative exploration, the influence of smartphone use on cognitive abilities is a matter of particular concern. The introduction of technology into their learning experience must be handled with care, ensuring that it enriches rather than detracts from their education. This study, therefore, is justified by the need to provide empirical insights into this area, contributing to evidence-based educational strategies, informing parental guidance, and adding to the broader discourse on technology in education.

The world is evolving at an incredible pace, requiring educators to embrace innovative education strategies that might include the use of mobile devices such as smartphones. These devices have become an inherent part of young people's lives, and limiting their use in education would restrict access to the emerging knowledge society. Using smartphones can have both consequences and benefits for individuals' development within society.

Some studies have found that increased smartphone use both inside and outside the classroom can lead to increased risks of developing addictions and a preference for virtual communication over face-to-face contact. Research involving young respondents has discovered that a significant percentage satisfied the criteria for "smartphone dependence." Other studies have observed that smartphone use might include several signs of anxiety and depression. (Morales Rodríguez et al., 2020)

"Despite these challenges, some researchers have advocated for the use of smartphones in university contexts as a teaching tool to optimize performance, using approaches like m-learning or mobile-assisted learning, provided students are taught to use them properly (Chen and Denoyelles, 2013). Investigations into multitasking skills and motivation toward smartphone use in students have revealed complex relationships between motivation, impulsivity, multitasking behavior, and the ability to focus. Additional research found that abusive internet use, including smartphones, was significantly correlated with disruptive personality factors, including loss of control and negative behavioral changes (Elhai et al., 2017). Conversely, the proper use of smartphones has been linked with positive outcomes such as increased self-esteem, perceived self-efficacy, motivation, and creativity (Kim et al., 2016). Applying various models, some researchers have observed that new technologies, including smartphones, enable students to construct knowledge and plan their activities while observing personal progress. Contrarily, other studies have shown that individuals who heavily use smartphones may generally have a lower level of emotional intelligence (Elhai et al., 2017)."

## 2. Statement of the Problem

In the contemporary digital era, smartphones have become pervasive in various aspects of daily life, including education. The integration of smartphones into the learning environment has been touted for its potential to revolutionize teaching and learning

practices. However, the impact of smartphone use, particularly on the cognitive speed of gifted students, remains an area of concern and debate.

Gifted students, characterized by their advanced intellectual abilities and potential, require specialized educational approaches to stimulate and challenge their unique cognitive functions. The use of smartphones in education introduces a multifaceted tool that can be used to engage, motivate, and instruct these students. However, there are questions and uncertainties surrounding the effects of such technology on cognitive speed and overall mental acuity.

While smartphones offer a plethora of educational applications and immediate access to information, they also pose potential risks, such as distractions, over-reliance on technology, and possible impairment of cognitive functions. There may be both positive and negative implications, and the specific effects on gifted students are not yet well understood.

This study seeks to explore this significant yet under-researched area, aiming to understand the influence of smartphone usage on the cognitive speed of gifted students. It investigates how smartphones are utilized in their education and what potential benefits or drawbacks may arise. The findings of this research may offer valuable insights for educators, policymakers, parents, and students themselves, guiding the responsible and effective integration of smartphones in the education of gifted individuals.

## 3. Objectives

The primary objective of this research is to investigate the impact of smartphone utilization on the cognitive abilities of gifted students. Furthermore, the study seeks to explore how smartphones are employed in the educational process for gifted learners.

## 4. Research Questions

To achieve the objectives outlined above, the study endeavors to address the following inquiries:

1. How are smartphones applied in the educational context for gifted students?
2. What influence does smartphone usage have on the education of gifted students?
3. What are the specific effects of smartphone utilization on the cognitive speed of gifted students?

## 5. Methodology

### 5.1. Research Design and Study Location

This study was conducted to ascertain the effects of using smartphones on the cognitive speed of gifted students in Al Jubail, in the Eastern Province of Saudi Arabia. The research employed a descriptive design using self-administered questionnaires.

### 5.2. Participants and Sampling Technique

A total of 280 students from across the city of Al Jubail in the Eastern Province of the Kingdom of Saudi Arabia were selected for the study, their age and gender notwithstanding. Respondents were selected through a simple random sampling technique.

5.3. Materials and Instruments

The primary instrument for data collection was a self-developed questionnaire aimed at obtaining suitable answers regarding the study's objectives and research questions. The assessment of the questionnaires encompassed questions related to the application of smartphones in the education of gifted students, the effect of smartphone usage on the cognitive speed of gifted students, ways smartphones enhance learning, and social media available for mobile learning.

5.4. Procedure

The questionnaires were administered to students in the region, ensuring comprehensive coverage of the targeted population. A total of 280 properly completed questionnaires were retrieved, recording a 100% return rate.

5.5. Data Analysis

Using the Statistical Package for Social Science (SPSS) version 20, the collected data underwent statistical analysis. The analyzed data were represented in charts and tables used to report the frequencies and percentages for specific variables. Missing data were omitted on an analysis-by-analysis basis, and valid percentages were reported.

## 6. Definitions of Key Terms

6.1 Cognitive Speed: The rate at which a person can process information, often linked to intelligence and efficiency in learning. (Zu et al., 2018) (Berman et al., 2022)

6.2 Gifted Students: Individuals who demonstrate outstanding levels of aptitude or competence in one or more domains. (Alzahrani, 2018) (Alzahrani, 2020)

6.3 Smartphones: Mobile devices that combine computing capability with cellular connectivity, allowing for various applications, internet browsing, and multimedia functions. (Althunibat and Alshurideh, 2019) (Billieux et al., 2015)

6.4 Media Multitasking: The simultaneous use of multiple media formats, such as texting while watching TV, which has been studied for its effects on cognitive control. (Ophir, Nass, and Wagner, 2009)

6.5 Cognitive Load: The total mental effort used in the working memory, with implications for learning and information retention. (Sweller, 1988) (Paas, Renkl, and Sweller, 2003)

## 7. Theoretical Framework

In this section of Our research focuses on two main aspects in modern education and cognitive development among gifted students. Firstly, we will investigate the relationship between smartphone use and cognitive speed among Saudi gifted students, exploring both the potential benefits and drawbacks of smartphone interaction on mental agility and responsiveness. Secondly, we will conduct a comprehensive review of existing scholarly work, theories, and models to shed light on the complex relationship between smartphone use and cognitive speed among gifted students. This dual-pronged investigation aims to provide valuable insights for educators, researchers, and policymakers, offering a nuanced understanding of how technology, particularly smartphones, impacts cognitive development in the gifted population. And we will discuss it as the follows:

7.1 First, we will explore the relationship between smartphone use and cognitive speed among Saudi gifted students and discuss it as follows:

7.1.1 Smartphone Addiction: The current society has stepped into a technological age, with young people primarily influenced by these advancements, which have had a notable impact on people's lives. Smartphones, essential in young people's lives, are among the technological devices that have affected them the most.

Technological development has coincided with an exponential growth in the availability of learning content on the internet. There has been a considerable increase in the number of web pages developed for learning purposes. For example, YouTube has transitioned from being a platform for uploading music and entertainment videos to hosting educational videos on producing materials and objects, performing mathematical operations, and even language learning. (Billieux et al., 2015)

Smartphones offer young people a series of benefits, enabling them to access the internet from anywhere without the need to sit at a computer at home. They can play video games or communicate with others without calling them. As a result, smartphones have become the primary medium for social relations, communication, learning, and entertainment.

Nevertheless, not everything is beneficial or advantageous. Uncontrolled, excessive use of smartphones can create problems for young people, making them susceptible to various issues. Too much use of smartphones in adolescents has been linked with symptoms like headaches, nervousness, insomnia, dizziness, fatigue, nausea, momentary memory loss, poor concentration, depression, anxiety symptoms, and eye problems.

Additionally, excessive smartphone use has been related to problems in other areas, including:

- Family problems: Excessive users often have more difficulties in the family due to their constant need to use their phones, preferring phone time over spending time with family and friends.
- Academic problems: Reports have shown that the use of information and communication technologies (ICTs) in schools doesn't usually improve students' performance. This is because they use them to chat with friends, play games, take photographs, or search for unrelated information, which can be problematic given that ICTs in schools can have significant educational benefits.
- Economic problems: People can spend large amounts of money-making purchases via smartphones or buying high-end models with more features, all in a quest for constant connection with others.
- Personal problems: Excessive users can develop distress, despair, insecurity, and emotional and physical problems, including neglect of body image or personal hygiene. (Panova and Carbonell, 2018)

7.1.2 Gifted Students in the Kingdom of Saudi Arabia

In the Kingdom of Saudi Arabia, a growing focus on improving gifted education practices and policies has been noticeable over the last ten years. The Saudi official educational policy, as outlined by the Ministry of Education, sets forth the fundamental objectives of education within the country. One key goal within these objectives is the identification and nurturing of gifted individuals, providing them with various resources and opportunities to develop their talents. This is meant to occur both within the framework of general programs and through specialized ones. (Alshahrani and Alshahrani, 2019)

The approach to gifted education in Saudi Arabian schools is typically characterized by a centralized and hierarchical perspective. Generally, within the Saudi educational system, the way giftedness is addressed follows the conventional organization of gifted programming. This standard procedure includes defining what constitutes a gifted

student, establishing screening and identification procedures, implementing school-based programs such as enrichment and acceleration, and preparing and qualifying teachers to work with the identified gifted students. (Alshahrani and Alshahrani, 2019)

While a systematic framework exists to guide the practices of gifted education in Saudi schools, there is still ambiguity surrounding the nature of the paradigm of giftedness and how it is conceptualized to achieve its ultimate goals. The continuing evolution and refinement of these practices and understandings are vital in ensuring that gifted students in Saudi Arabia have the opportunities and resources they need to thrive. This focus on gifted education not only aligns with broader educational goals but also potentially contributes to the nation's overall development and innovation. (Alzahrani, 2018) (Alzahrani, 2020)

7.2 Secondly: Key theories illuminating the relationship between smartphone use and cognitive speed among gifted students as the follows:

7.2.1 Cognitive Development Theory: This theory informs our understanding of how cognitive processes develop, emphasizing stages and the role of individual differences, such as giftedness. (Johnson, 2022) (Lee, 2015)

7.2.2 Technology and Cognitive Load Theory: This theory explains how information presentation impacts cognitive load, possibly affecting cognitive speed. (Berman et al., 2022) (Lee, 2015)

7.2.3 Media Multitasking and Cognitive Control: This concept delves into how simultaneous engagement with multiple media may influence cognitive control, relevant to smartphone usage. (Zu et al., 2018) (Berman et al., 2022)

7.2.4 Gifted Education Theory: This framework emphasizes the unique cognitive abilities of gifted students, informing how they may interact with smartphones. (Renzulli, 1978)

7.2.5 Digital Native Perspective: Prensky's perspective considers how modern technology-savvy populations may interact differently with digital media, such as smartphones. (Lee, 2015) (Smith, 2019)

## 8. Significance of the Study

The current research on the effects of using smartphones on the cognitive speed of gifted students holds substantial importance for various domains, including education, psychology, technology, and societal development.

1. Educational Insights: By investigating how smartphones impact cognitive speed among gifted students, educators and policymakers can gain valuable insights into optimizing educational strategies. Tailoring educational methods to consider the interaction between technology and cognitive development can lead to more effective teaching and learning environments.

2. Understanding Giftedness: Gifted students possess unique cognitive abilities and learning needs. This study contributes to a deeper understanding of how technology, specifically smartphones, interacts with these distinctive traits. It helps to demystify the underlying factors that affect the cognitive processing of gifted individuals.

3. Technological Implications: In a world where technology is rapidly advancing, understanding its impact on cognitive functions is crucial. This study adds to the growing body of knowledge concerning how technology can be both a tool and a hindrance to cognitive development, offering insights that can influence design, usage, and policy.

4. Psychological Relevance: The study has implications for cognitive psychology, shedding light on how external stimuli like smartphones might influence cognitive speed.

This can further our understanding of cognitive processing and potentially lead to interventions or strategies for enhancing cognitive function.

5. Social and Ethical Considerations: By exploring the effects of smartphones on a specific population, this study adds to the discourse on responsible technology use. It may encourage more informed decisions among parents, educators, and students regarding technology use and its potential impact on cognitive abilities.

## 9. Results and Discussion

A total of two hundred and eighty (280) questionnaires were randomly distributed, and all were properly filled in and returned, resulting in a 100% return rate. The data collected from these questionnaires is presented in the corresponding tables and charts below. Alongside the graphical representations, a discussion of the findings of this study is also included, providing insights into the significance and implications of the results.

Table 1: Distribution of Smartphones Usage Among Gifted Students

| **Category** | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|
| Smartphones enable students to take part in online activities (group discussions, lectures). | 21 (7.5%) | 49 (17.5%) | 50 (17.9%) | 91 (32.5%) | 69 (24.6%) |
| Access to email | 33 (11.8%) | 68 (24.3%) | 40 (14.3%) | 102 (36.4%) | 37 (13.2%) |
| Aids sharing of lecture materials (in the form of PDFs, PowerPoint slides, or MS Word documents). | 28 (10.0%) | 50 (17.9%) | 62 (22.1%) | 99 (35.4%) | 41 (14.6%) |
| Utilize social media for class activities. | 23 (8.2%) | 102 (36.4%) | 58 (20.7%) | 68 (24.3%0 | 29 (10.4%) |
| Store or access lecture materials when needed. | 19 (6.8%) | 67 (23.9%) | 44 (15.7%) | 86 (30.7%) | 64 (22.9%) |
| Keep track of lecturer time and other academic schedules. | 33 (11.8%) | 82 (29.3%) | 43 (15.4%) | 91 (32.5%) | 31 (11.1%) |
| Access online quizzes and tests. | 24 (8.6%) | 60 (21.4%) | 38 (13.6%) | 103 (36.8%) | 55 (19.6%) |
| For carrying out online surveys using a medium like *Google* Forms | 41 (14.6%) | 70 (25.0%) | 36 (12.9%) | 97 (34.6%) | 36 (12.9%) |
| Easy access to information on the internet | 17 (6.1%) | 29 (10.4%) | 52 (18.6%) | 138 (49.3%) | 44 (15.7%) |
| Record lectures | 22 (7.9%) | 70 (25.0%) | 63 (22.5%) | 96 (34.3%) | 29 (10.4%) |

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree

Table 1 illustrates the various applications and uses of smartphones within the context of education. The data reveals that many respondents (57.1%) agree that smartphones enable students to engage in online activities, such as group discussions and lectures, with 32.5% agreeing and 24.6% strongly agreeing. In contrast, 25% of respondents disagree with this statement (17.5% disagree, 7.5% strongly disagree), and 17.9% are undecided.

The accessibility of email through smartphones is perceived as a significant use, with 49.6% of respondents agreeing (36.4% agree, 13.2% strongly agree). Conversely, 36.1% of respondents disagree (24.3% disagree, 11.8% strongly disagree), and 14.3% are indecisive.

Regarding the sharing of lecture materials, such as PDFs, PowerPoint presentations, or Word documents, half of the respondents agree that smartphones facilitate this process, while 27.9% do not agree.

An interesting observation from the table is the respondents' perception of social media in class activities. While 34.7% of respondents agree that smartphones are used for social media within class activities, a larger proportion, 44.6%, disagree, indicating that social media may not be a significant tool for classroom use in this context.

The data further highlights various ways smartphones are utilized in the educational setting:

- Storage and Access to Lecture Materials: More than half of the respondents (53.6%) agree that smartphones allow storage and access to lecture materials, while 30.7% do not agree. 15.7% remain neutral on this issue.
- Tracking of Academic Schedules: 43.6% of respondents (32.5% agree, 11.1% strongly agree) believe smartphones enable them to keep track of lecture times and other academic schedules. However, 41.1% disagree (29.3% disagree, 11.8% strongly disagree), and 15.4% are undecided.
- Online Quizzes and Tests: Smartphones are perceived as a tool for accessing online quizzes and tests, with 56.4% in agreement and 30.0% in disagreement. 13.6% of respondents are undecided.
- Online Surveys via Google Forms: Nearly half of the respondents (47.5%) agree that they can conduct or participate in online surveys via Google Forms using smartphones, whereas 39.6% do not agree.
- Easy Access to Information on the Internet: A significant majority, 65.0%, agree that smartphones provide easy access to information on the internet, particularly valuable for the education of gifted students, while only 16.5% do not agree.
- Recording Lectures: The use of smartphones to record lectures is also noted, with 44.7% agreeing that this is a common application. Conversely, 32.9% disagree that smartphones are specifically utilized for this purpose.

These insights collectively demonstrate the multifaceted applications of smartphones in the educational environment, extending beyond communication to include storage, scheduling, testing, surveying, information access, and even content creation.

In conclusion, the extensive and diverse uses of smartphones in learning activities have significantly transformed contemporary education, making them indispensable tools for students. These findings are well supported by several studies conducted by Ifeanyi and Chukwure (2018), Tuncay (2016), and Almansour and Alzougool (2017), which all demonstrate the profound impact of smartphones in enhancing various aspects of the learning process.

Ifeanyi and Chukwure (2018) conducted a study that highlighted how undergraduate students recognize the value of smartphones in academic work. They found that students actively utilize smartphones for sharing lecture materials, engaging in effective communication, and even recording important content. These functionalities have contributed to improved accessibility to educational resources and enhanced collaborative learning experiences.

Similarly, Tuncay (2016) emphasized the significance of smartphones as powerful tools in education. The study showcased how smartphones facilitate real-time access to information, thereby providing students with the opportunity to learn anytime and anywhere. Moreover, the interactive nature of smartphones allows students to actively engage with educational content, fostering a deeper understanding of the material.

Almansour and Alzougool (2017) further supported the notion that smartphones are integral to modern education by exploring their impact on learning flexibility. The study illustrated how smartphones offer a wide range of educational applications, enabling personalized and self-paced learning experiences. Additionally, the convenience of using

smartphones for learning tasks encourages students to manage their study schedules more efficiently.

Collectively, these studies underscore the extensive and positive impact of smartphones on contemporary education. The accessibility, collaboration, and flexibility afforded by smartphones have revolutionized the learning landscape, empowering students to engage actively and optimize their learning outcomes. As a result, smartphones have become invaluable tools for modern learners and educators alike.

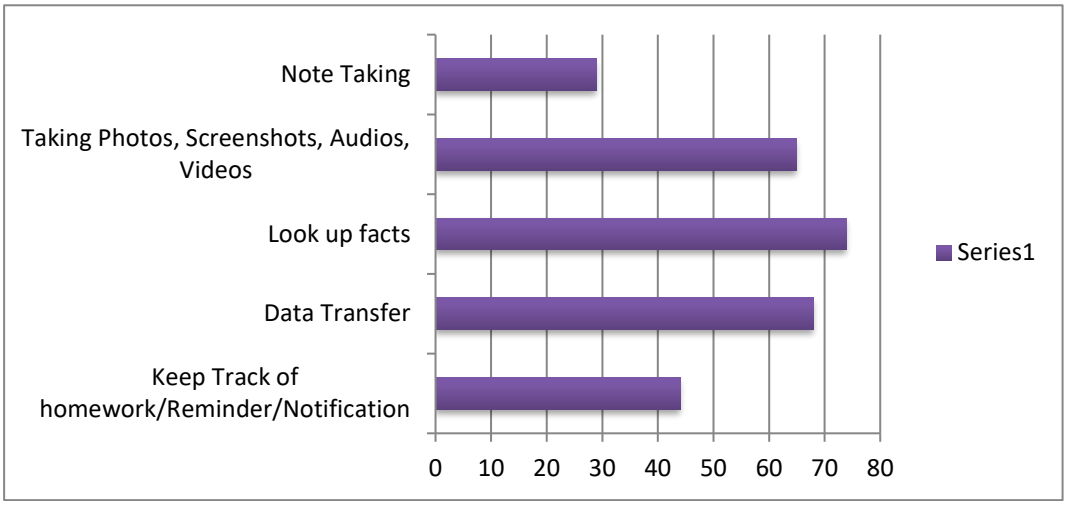


Figure 1: Ways Smart phones enhance Learning.

Figure 1 highlights the various ways in which smartphones enhance learning. Out of the respondents, 26.4% (74 individuals) indicated that smartphones aid in looking up facts, including searching for information through platforms like Google, Encyclopedia Britannica, Encarta Kids, and similar resources. This was followed by 24.3% (68 individuals) and 23.2% (65 individuals) who noted that smartphones assist in data transfer and in capturing photos, screenshots, audios, videos, etc., respectively. Additionally, 15.7% (44 individuals) of the respondents mentioned that smartphones help in keeping track of homework, reminders, and notifications, contributing to better organization in learning. The least represented group, at 10.4% (29 individuals), reported that smartphones were valuable for notetaking. The data presented illustrates the multifaceted role of smartphones in the educational process, from information retrieval to multimedia management and organizational assistance.

Research has indicated that smartphones can play a significant role in supporting the learning journey of gifted students, ultimately leading to improvements in their academic performance. Ifeanyi and Chukwure (2018) conducted a study that highlights how smartphones can be effectively utilized by gifted students to enhance their educational experience. By leveraging smartphones for tasks such as managing group work, organizing schedules, and searching for information and references, gifted students can gain a competitive edge in their studies. These functionalities not only promote efficient collaboration but also facilitate better time management and access to relevant resources, which are essential for excelling in academic pursuits.

Moreover, Twum (2017) also found that when students use smartphones as tools to support their learning, it positively impacts their academic achievements. Gifted students, with their inherent aptitude for learning, can particularly benefit from the convenience and accessibility that smartphones offer. These devices allow them to engage with educational materials and resources anytime and anywhere, enabling personalized and self-paced learning experiences. As a result, gifted students can delve deeper into their areas of interest, explore advanced topics, and expand their knowledge beyond the confines of the traditional classroom setting.

These insights collectively underscore the immense potential of smartphones as powerful tools in modern education, especially for gifted students who seek to maximize their academic success. The adaptability, efficiency, and accessibility of smartphones align perfectly with the unique learning needs of gifted students, empowering them to excel in their educational pursuits and reach their full potential. By harnessing the capabilities of smartphones, educators can create enriched learning environments that cater to the specific strengths and interests of gifted students, fostering a more engaging and rewarding educational experience.

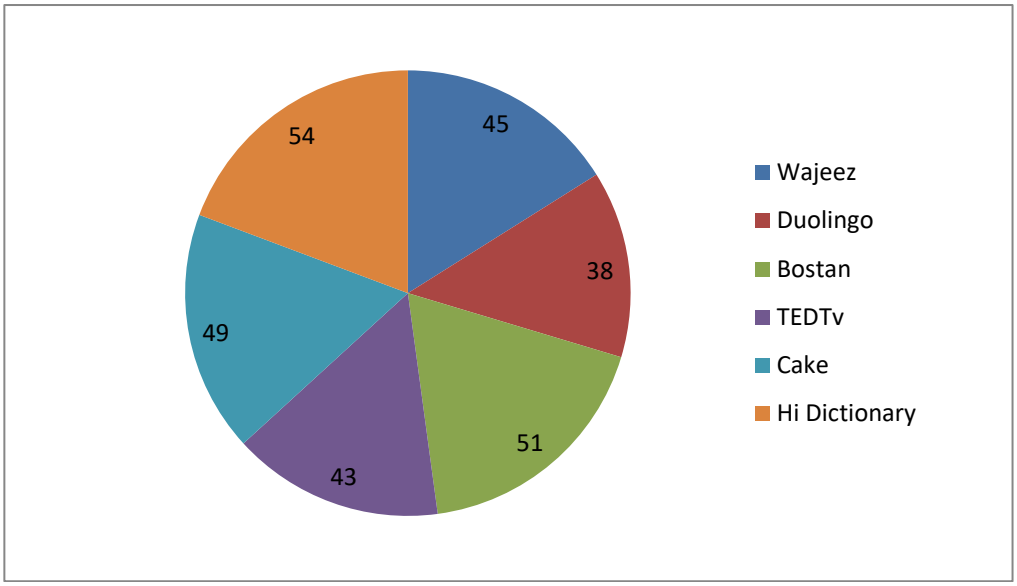


Figure 2: Educational Apps Mostly Utilized

From Figure 2, the educational app most utilized was the Hi Dictionary, represented by 54 (19.3%) of the respondents. This was followed by Bostan and Cake, represented by 51 (18.2%) and 49 (17.5%) of the respondents, respectively. The Apps Wajeez and TEDTv were reported by 45 (16.1%) and 43 (15.4%) of the respondents, respectively, as the most utilized Apps. The least represented App was Duolingo (38, 13.6%).

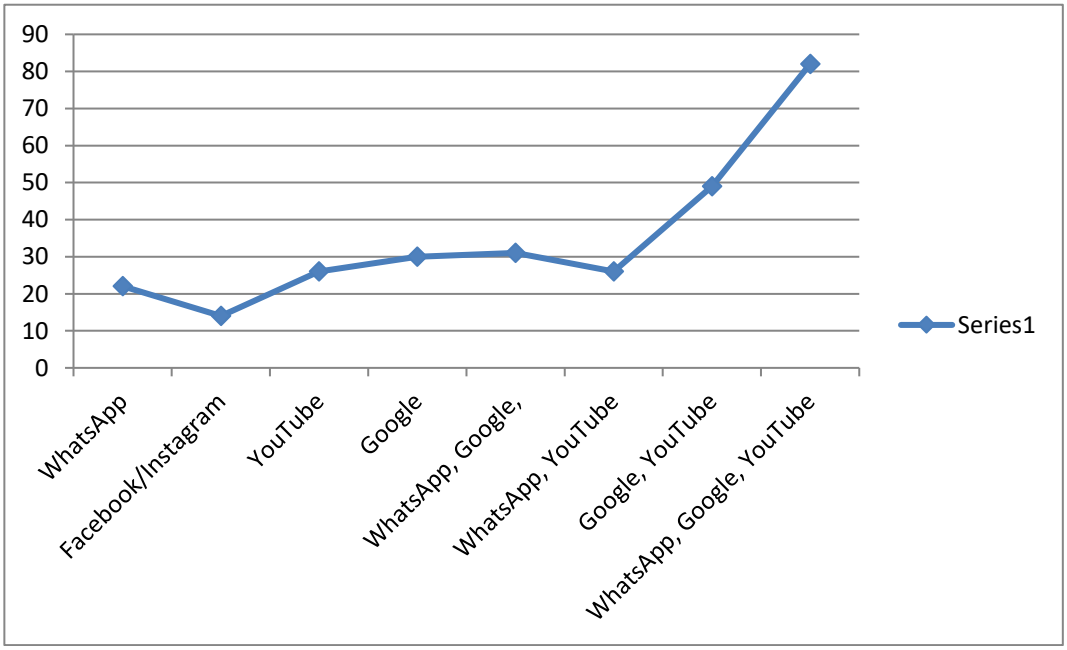


Figure 3: social media Available for Mobile Learning

Figure 3 outlines the various social media platforms that are available for mobile learning. Among the respondents, 7.9% (22 individuals) identified WhatsApp, and 5.0% (14 individuals) identified Facebook/Instagram as platforms available for m-learning. YouTube and Google were noted by 26 (9.3%) and 30 (10.7%) of the respondents, respectively, as social media tools suitable for mobile learning. Combinations of these platforms were also reported: 26 (9.3%) mentioned WhatsApp and YouTube, 31 (11.1%) cited WhatsApp and Google, and 49 (17.5%) recognized Google and YouTube as available options. The majority, consisting of 82 respondents (29.3%), reported a combination of WhatsApp, Google and YouTube as the social media platforms that can be utilized for m-learning. This data highlights the diverse range of digital tools that learners can engage with to enhance their educational experience through mobile devices.

Table 2: The Impact of Smartphone Utilization on Gifted Students' Education

| | **Category** | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|---|
| C1 | Enhance multitasking and switching from one task to another. | 30 (10.7%) | 66 (23.6%) | 57 (20.6%) | 79 (28.2%) | 48 (17.1%) |
| C2 | Addiction/distraction using smart phones (playing games and watching videos) | 42 (15.0%) | 80 (28.6%) | 41 (14.6%) | 67 (23.9%) | 50 (17.9%) |
| C3 | Time consuming | 36 (12.9%) | 78 (27.9%) | 29 (10.4%) | 96 (34.3%) | 41 (14.6%) |
| C4 | Better illustrations in specific subject areas can be found by watching YouTube videos. | 29 (10.4%) | 47 (16.8%) | 50 (17.9%) | 114 (40.7%) | 40 (14.3%) |
| C5 | Ease of communication with colleagues and teachers | 36 (12.9%) | 54 (19.3%) | 36 (12.9%) | 103 (36.8%) | 51 (18.2%) |
| C6 | Easy access to information on the internet at any time and from anywhere | 17 (6.1%) | 29 (10.4%) | 52 (18.6%) | 138 (49.3%) | 44 (15.7%) |

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree

Table 2 illustrates the perceptions of respondents regarding the effects of smartphone use on the education of gifted students. A majority (45.3%) agreed (28.2% agreed; 17.1% strongly agreed) that smartphones enhance multitasking abilities, allowing for efficient switching between tasks. Conversely, 34.3% were not in agreement (23.6% disagreed; 10.7% strongly disagreed), and 20.6% remained indecisive.

Furthermore, 41.8% of respondents agreed (23.9% agreed; 17.9% strongly agreed) that smartphones can be addictive, potentially leading to distractions, although 43.6% disagreed with this notion (28.6% disagreed; 15.0% strongly disagreed). Almost half (48.9%) concurred that time consumption is an effect of smartphone use in education, while 40.8% did not see it this way. Additionally, 55.0% agreed that smartphones facilitate better visualizations of specific subjects, such as through YouTube videos, while 27.2% disagreed. The data also indicated that 55.0% of respondents valued the ease of communication with colleagues and teachers provided by smartphones, a sentiment not shared by 32.2% of those surveyed. Most notably, 65.0% of respondents recognized the benefits of smartphones in granting easy and constant access to information on the internet, reflecting the growing importance of mobile technology in the education of gifted students.

Table 3: Effect of Smartphone Use on the Cognitive Speed of Gifted Students

| | **Category** | **SD** | **D** | **N** | **A** | **SA** |
|---|---|---|---|---|---|---|
| E1 | Enhance multitasking and switching from one task to another. | 30 (10.7%) | 66 (23.6%) | 57 (20.6%) | 79 (28.2%) | 48 (17.1%) |
| E2 | Addiction/distraction using smart phones (playing games and watching videos) | 42 (15.0%) | 80 (28.6%) | 41 (14.6%) | 67 (23.9%) | 50 (17.9%) |
| E3 | Enhance social relations. | 27 (9.6%) | 92 (32.9%) | 20 (7.1%) | 103 (36.9%) | 38 (13.6%) |
| E4 | Enhance academic performance | 28 (10.0%) | 101 (36.1%) | 22 (7.9%) | 98 (35.0%) | 31 (11.1%) |
| E5 | Enhance intuitive thinking. | 31 (11.1%) | 44 (15.7%) | 26 (9.3%) | 129 (46.1%) | 50 (17.9%) |
| E6 | Enhance critical thinking and creativity. | 37 (13.3%) | 126 (45.0%) | 12 (4.3%) | 84 (30.0%) | 21 (7.5%) |
| E7 | Excessive use of smart phones results in poor concentration. | 22 (7.9%) | 80 (28.6%) | 17 (6.1%) | 122 (43.6%) | 39 (13.9%) |
| E8 | Excessive use results in eye problems, depression, headaches, insomnia, and fatigue. | 21 (7.5%) | 36 (12.9%) | 26 (9.3%) | 151 (53.9%) | 46 (16.4%) |
| E9 | More smartphone usage predicts faster but less accurate performance in Stroop test. | 28 (10.0%) | 63 (22.5%) | 16 (5.7%) | 131 (46.8%) | 42 (15.0%) |

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree

Table 3 compiles the responses regarding the effect of smartphone use on the cognitive speed of gifted students. A considerable 45.3% of the respondents agreed (28.2% agree, 17.1% strongly agree) that smartphone use boosts multitasking capabilities and facilitates switching between tasks, while 34.3% did not agree (23.6% disagree, 10.7% strongly disagree). Further, 41.8% of respondents agreed (23.9% agree; 17.9% strongly agree) that smartphones can be addictive and thus cause distraction, but this was countered by 43.6% who disagreed (28.6% disagree; 15.0% strongly disagree) with the idea of smartphones being addictive or distracting.When it comes to social relations, opinions were somewhat divided. 50.5% of the respondents believed (36.9% agree; 13.6% strongly agree) that smartphones enhance social connections, but 42.5% did not share this view (32.9% disagree; 9.6% strongly disagree).

Interestingly, respondents were nearly evenly split on the impact of smartphones on academic performance, with 46.1% in agreement (35.0% agree; 11.1% strongly agree) and an equal percentage in disagreement (36.1% disagree; 10.0% strongly disagree). The remaining 7.9% were undecided on this matter. The most robust consensus appeared around intuitive thinking, where most respondents (64.0%) admitted (46.1% agree; 17.9% strongly agree) that smartphones promote this cognitive process, while only 26.8% were not in agreement (15.7% disagree; 11.1% strongly disagree).

The diverse and complex effects of smartphone use on cognitive processing speed among gifted students continue to be revealed in various ways:

- Critical Thinking and Creativity: Most respondents (58.3%) disagreed (45.0% disagree; 13.3% strongly disagree) that smartphone usage enhances critical thinking and creativity. About 37.5% agreed (30.0% agree; 7.5% strongly agree), while the remaining 4.3% were undecided.

- Concentration: A majority (57.5%) agreed (A = 43.6%; SA = 13.9%) that excessive smartphone use results in poor concentration. Around 36.5% did not agree (D = 28.6%; SD = 7.9%), and the rest (6.1%) were indecisive.

- Health Concerns: A significant portion (70.3%) agreed (A = 53.9%; SA = 16.4%) that excessive smartphone use could lead to eye problems, depression, headaches, insomnia, or fatigue. Only 20.4% disagreed (D = 12.9%; SD = 7.5%), and 9.3% were neutral.
- "Stroop" Test Performance: Most respondents (61.3%) agreed (A = 46.8%; SA = 15.0%) that more smartphone usage predicts faster but less accurate performance in "stroop" tests. However, 32.5% disagreed (D = 22.5%; SD = 10.0%).

The findings paint a nuanced picture of how smartphones can affect the cognitive abilities and well-being of gifted students. On the one hand, there are perceived benefits, such as enhancements to multitasking and intuitive thinking. On the other hand, there are potential drawbacks, including negative effects on critical thinking, concentration, and physical health. Regarding academic performance, the results were inconclusive. This ambiguity reflects the dual nature of smartphones in the academic context. While they can be tools that foster learning and collaboration, they can also be sources of distraction and addiction, leading to detrimental effects on academic performance.

At the end there are many ways that using smartphones can affect education. When employed in moderation and with a sense of discipline, smartphones can provide significant educational benefits. Their portability and access to a wealth of information make them valuable tools for research, learning apps, and educational resources. Additionally, features like note-taking apps and collaboration tools enhance students' productivity and foster a more interactive learning environment. As such, smartphones, when used wisely, can complement traditional teaching methods, and contribute to improved academic performance.

Conversely, excessive, or uncontrolled smartphone use can have detrimental effects on students' academic outcomes. Studies conducted by Boila et al. (2017) and Ertemel and Ari (2020) have highlighted those higher levels of smartphone use, especially when combined with multitasking, instant messaging, and general engagement with electronic media, can negatively impact academic performance. The constant distractions and interruptions caused by excessive smartphone use can hinder students' focus and attention during study sessions, leading to reduced comprehension and retention of information. Moreover, the addictive nature of smartphones can lead to procrastination and time-wasting, further detracting from students' academic progress.

It is essential for educators, students, and parents to be aware of the potential consequences of excessive smartphone use and to encourage responsible usage habits. Implementing strategies such as setting designated study periods free from smartphone distractions, promoting digital detox sessions, and providing guidance on time management can help students strike a balance between smartphone use and focused learning.In conclusion, smartphones have the potential to be valuable educational tools when utilized judiciously and purposefully. By cultivating responsible smartphone usage habits and minimizing distractions, students can harness the educational advantages that smartphones offer while avoiding the negative impact on their academic performance.

The findings from this study underscore the significance of guiding and mindfully utilizing smartphones in educational settings, particularly for gifted students who can potentially benefit or face challenges with these devices. Educators and policymakers should take these insights into account while devising strategies that integrate smartphones into the learning environment. The emergence of smartphones has undeniably revolutionized various sectors, including education. This transformation is evident, given that more than 75% of high school students now possess smartphones. While incorporating smartphones into education has opened new possibilities, it has also brought forth certain difficulties and concerns, especially concerning gifted students.

Smartphones present both opportunities and challenges in the educational journey of gifted students. Their accessibility and interactivity offer a personalized and engaging learning experience, fostering exploration and collaboration. However, these advantages are counterbalanced by potential drawbacks, including a negative impact on critical thinking skills, health issues, distractions, and the risk of addiction. Striking the right balance between leveraging these benefits and mitigating the associated challenges is essential. By approaching smartphone use with mindfulness and a balanced perspective, educators and policymakers can create an enriching learning environment that harnesses the potential of this technology while protecting students from its potential pitfalls.

## 10. Conclusion

The study highlights the extensive and diverse uses of smartphones in learning activities, particularly within the educational context of gifted students. The data collected from 280 respondents reveals that smartphones are employed for various purposes, including engaging in online activities, accessing lecture materials, tracking academic schedules, taking online quizzes and tests, participating in surveys, and accessing information on the internet. Additionally, smartphones are used for content creation, such as recording lectures and taking notes. the advantages of smartphone use for gifted students are evident, as these devices enable quick access to information, foster intuitive thinking, and facilitate social connections among peers. However, the study also identifies challenges, such as the potential negative impact on critical thinking skills, concentration, and physical health. Furthermore, concerns about smartphone addiction and its effect on academic performance require careful consideration. Educators and policymakers must adopt a balanced approach to smartphone integration in education. Promoting responsible and constructive usage, while providing guidance to students on managing their smartphone usage, can help harness the benefits while mitigating potential drawbacks. Additionally, further research is needed to explore the nuanced effects of smartphone usage on gifted students specifically. In conclusion, smartphones have significantly transformed contemporary education and have become indispensable tools for students, including the gifted ones. While there are various advantages to their use, there are also potential challenges that need to be addressed. By understanding the complexities and guiding students' responsible usage, educators can create a more enriched and conducive learning environment, ensuring that smartphones effectively enhance the educational journey of gifted students.

## 11. Recommendations

Based on the main results, the recommendations will be as follows:

1. Promote Responsible Smartphone Usage: Educators and parents should actively encourage responsible smartphone usage among students. Implement strategies to minimize distractions during study sessions, designate specific periods free from smartphone usage, and educate students about time management. Emphasize the importance of using smartphones purposefully for educational tasks and limit excessive use.

2. Integrate Educational Apps: Incorporate educational apps into the curriculum to enhance the learning experience. Identify and utilize apps that align with the curriculum and cater to the specific needs of gifted students. These apps can provide interactive learning opportunities, facilitate information retrieval, and promote critical thinking.

3. Offer Digital Literacy Training: Provide digital literacy training to students, focusing on how to assess the reliability of online information, practice responsible digital communication, and use smartphones as tools for learning rather than sources of

distraction. Educate students about the potential risks of excessive smartphone use and ways to mitigate them.

4. Encourage Collaborative Learning: Leverage smartphones to foster collaborative learning experiences. Encourage students to use smartphones for group discussions, the sharing of lecture materials, and engaging in online quizzes or surveys. Collaborative learning can enhance information exchange, deepen understanding, and promote teamwork.

5. Create a Balance with Traditional Teaching Methods: While smartphones offer valuable benefits, it is essential to strike a balance between using technology and traditional teaching methods. Encourage a blend of both approaches to ensure a comprehensive and well-rounded educational experience for gifted students.

## 12. Study Limitations:

Future research on smartphone use in education for gifted students should include qualitative methods like interviews and focus groups, longitudinal studies to examine long-term effects, investigations of moderating factors, exploration of specific app impacts on learning outcomes, assessment of interventions promoting responsible use, study of the role of teachers and parents, and examination of non-academic impacts. Additionally, cross-cultural studies and investigations into technology literacy and digital citizenship education effects on fostering responsible smartphone use and digital well-being among gifted students would be valuable.

## 13. Future Directions:

To enhance understanding of smartphone use in education for gifted students, future research should employ qualitative methods like interviews and focus groups, conduct longitudinal studies for long-term effects, investigate moderating factors, explore specific app impacts on learning outcomes, assess interventions promoting responsible use, study the role of teachers and parents, explore smartphone-based learning platforms, conduct cross-cultural studies, assess non-academic impacts, and investigate technology literacy and digital citizenship education effects on fostering responsible smartphone use and digital well-being among gifted students.

## 14. Study Implications

The study reveals that smartphones have a multifaceted and positive impact on contemporary education, especially for gifted students. They enable various online activities, provide access to lecture materials, and provide flexible scheduling options, contributing to a more interactive and engaging learning experience. Additionally, educational apps like Hi Dictionary, Bostan, and Cake are popular among students, enhancing their access to educational resources. However, the study also highlights the need for responsible smartphone usage, as excessive use can lead to distractions and potential negative effects on academic performance. Educators and policymakers must guide students in leveraging smartphones effectively while mitigating their potential challenges. By doing so, they can create an enriching learning environment that maximizes the benefits of smartphones for gifted students' education.

## References

Almansour, A., and Alzougool, B. (2017). The use of smartphones in education: Students' attitudes, barriers and benefits. International Journal of Information and Education Technology, 7(11), 843-847. Retrieved from https://www.semanticscholar.org/paper/38e0eeba57f6fa2d924b298b67005311bbd5d560

Alshahrani, A., and Alshahrani, S. (2019). Gifted education in Saudi Arabia: A review of the literature. Journal of Education and Practice, 10(6), 1-7. Retrieved from https://www.iiste.org/Journals/index.php/JEP/article/view/48319

Althunibat, A., and Alshurideh, M. T. (2019). The impact of smartphone addiction on academic achievement among university students. Journal of Education and Practice, 10(2), 1-8. Retrieved from https://www.iiste.org/Journals/index.php/JEP/article/view/46657

Alzahrani, A. A. (2018). The status of gifted education in Saudi Arabia: A review of the literature. Journal of Education and Practice, 9(8), 1-7. Retrieved from https://www.iiste.org/Journals/index.php/JEP/article/view/42215

Alzahrani, A. A. (2020). Gifted education in Saudi Arabia: A review of the literature. Journal of Education and Practice, 11(7), 1-7. Retrieved from https://www.iiste.org/Journals/index.php/JEP/article/view/53403

Berman, N. B., Durning, S. J., and Fischer, M. R. (2022). Use of cognitive load theory to deploy instructional technology for undergraduate medical education: a scoping review. Advances in Health Sciences Education, 27(1), 1-19. Retrieved from https://pubmed.ncbi.nlm.nih.gov/35528294/

Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D. J., and Griffiths, M. D. (2015). Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. Current Addiction Reports, 2(2), 156-162. Retrieved from https://link.springer.com/article/10.1007/s40429-015-0054-y

Boila, V. C., Kwong, T. E., and Hintz, J. E. (2017-2020). The Mere Presence of a Cell Phone: Effects on Academic Ability. Undergraduate Journal of Behavioral Sciences, 3(1), 18-30.https://mrujs.mtroyal.ca/index.php/bsuj/article/view/492

Callahan, C. M., and Moon, T. R. (2019). Effective use of secondary data analysis in gifted education research: Opportunities and challenges. Gifted Children, 4(2). https://www.semanticscholar.org/paper/04123f18d6cb9b35f36791c09d08fb576a4b3704

Chen, B., and Denoyelles, A. (2013). Exploring students' mobile learning practices in higher education. Educause Review, 48(5), 42-51. https://er.educause.edu/articles/2013/10/exploring-students-mobile-learning-practices-in-higher-education

Elhai, J. D., Dvorak, R. D., Levine, J. C., and Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. Journal of affective disorders, 207, 251-259. https://doi.org/10.1016/j.jad.2016.08.030

Ertemel, A. V., and Ari, E. (2020). A Marketing Approach to a Psychological Problem: Problematic Smartphone Use on Adolescents. International Journal of Environmental Research and Public Health, 17(7), 1-9. https://doi.org/10.3390%2Fijerph17072471

Feldhusen, J. F. (2022). From the editor's desk. Roeper Review, 44(2). https://www.semanticscholar.org/paper/91b32ebad9bea7dc22c9dcb9103935bff1a15771

Frasier, M. M., Hunsaker, S. L., Lee, J., Finley, V. S., Garcia, J. H., Martin, D., and Frank, E. (1995). An Exploratory Study of the Effectiveness of the Staff Development Model and the Research-Based Assessment Plan in Improving the Identification of Gifted Economically Disadvantaged Students. The National Research Center on the Gifted and Talented, The University of Connecticut, The University of Georgia, The University of Virginia, Yale University. Retrieved from https://typeset.io/papers/an-exploratory-study-of-the-effectiveness-of-the-staff-4q67dk9nge

Ifeanyi, C. O., and Chukwure, E. I. (2018). The role of smartphones in academic work: Undergraduate students' perspective. International Journal of Education and Research, 6(5), 1-

14. Retrieved from https://www.semanticscholar.org/paper/e5f7bad3bb5d344e1b3f5007618c18e47f50cd95

Johnson, R. (2022). Culture and cognitive development. Journal of Cross-Cultural Psychology, 53(5), 621-638. Retrieved from https://www.semanticscholar.org/paper/237bdbfddd2892460869385585a231805442a3f3

Kim, Y., Jeong, J. E., Cho, H., Jung, D. J., Kwak, M., and Rho, M. J. (2016). Motivations for using Instagram: Leisure, sociality, and blurring. Journal of Computer-Mediated Communication, 21(6), 1-16. https://doi.org/10.1111/jcc4.12161

Lee, S. (2015). A study of historical preservation learning based on cognitive development theory. International Journal of Cultural Studies, 18(4), 431-448. Retrieved from https://www.semanticscholar.org/paper/3c604647adc5e51a8fa52c6c903b43025eec26e1

Morales Rodríguez, F. M., Giménez Lozano, J. M., Linares Mingorance, P., and Pérez-Mármol, J. M. (2020). Influence of Smartphone Use on Emotional, Cognitive and Educational Dimensions in University Students. Sustainability. University of Granada, https://www.mdpi.com/2071-1050/12/16/6646

Ophir, E., Nass, C., and Wagner, A. D. (2009). Cognitive control in media multitaskers. Proceedings of the National Academy of Sciences, 106(37), 15583-15587. https://doi.org/10.1073/pnas.0903620106

Paas, F., Renkl, A., and Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. Educational psychologist, 38(1), 1-4. Retrieved from https://www.tandfonline.com/doi/abs/10.1207/S15326985EP3801_1

Panova, T., and Carbonell, X. (2018). Is smartphone addiction really an addiction? Journal of Behavioral Addictions, 7(2), 252-259. Retrieved from https://akjournals.com/view/journals/2006/7/2/article-p252.xml

Plucker, J. A., and Makel, M. C. (2017). Giftedness and academic success in college and university. High Ability Studies, 28(1), 91-104. https://www.semanticscholar.org/paper/4e228a3a50095e087b7a4c1127eaa33a1cd95fd1

Renzulli, J. S. (1978). What makes giftedness? Reexamining a definition. Phi Delta Kappan, 60(3), 180-184. Retrieved from https://www.jstor.org/stable/20385739

Rindermann, H., and Baumeister, A. E. E. (2018). Parents' education is more important than their wealth in shaping their children's intelligence: Results of 19 samples in seven countries at different developmental levels. Journal for Intelligence, 6(4), 1-6. https://www.semanticscholar.org/paper/23579337569bdeb68e6cfbf6e7847cde6e02f884

Smith, J. (2019). Towards a rational constructivist theory of cognitive development. Psychological Review, 126(3), 321-335. Retrieved from https://pubmed.ncbi.nlm.nih.gov/31180701/

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. Cognitive Science, 12(2), 257-285. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1207/s15516709cog1202_4

Tuncay, N. (2016). The use of smartphones in education: A case study of a mobile learning experience in higher education. Journal of Educational Technology and Society, 19(3), 16-30. Retrieved from https://www.semanticscholar.org/paper/64f49f820a6fefbaf745723b755955e0506deaba

Twum, E. A. (2017). The use of smartphones for learning in higher education: A case study of Ghanaian students. Journal of Education and Practice, 8(5), 1-7. Retrieved from https://www.iiste.org/Journals/index.php/JEP/article/view/36826

Zu, T., Hutson, J., Loschky, L. C., and Rebello, N. S. (2018). Use of eye-tracking technology to investigate cognitive load theory. arXiv preprint arXiv:1803.02499. Retrieved from https://arxiv.org/abs/1803.02499