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Temporal patterns and educational use of smartphones among Algerian secondary learners

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Abstract. This study examines the relationship between smartphone use and duration, as well as educational applications and other features used by Algerian secondary school students. Through a questionnaire, data were collected from 375 learners (53.3% female and 46.7% male) in the Setif district of Algeria using a quantitative research design and a questionnaire. In SPSS v27, we analysed the data by mean, standard deviation, and Pearson correlation. A correlation was found between the duration of smartphone use, preferred usage times, and educational use among learners. We found students who use their smartphones less than 4 hours per day tend to peak between 4:30 PM and 6:30 PM, while others who use their smartphones more than 4 hours per day tend to peak between 8:30 PM and after 00:00 PM. Students who used their smartphones for educational purposes often did so during specific times, primarily in the evenings and at night, typically in shorter bursts (1 hour or less per day). Longer smartphone use for educational purposes (2 hours or more) is most likely to occur in the afternoon and early evening. However, the study also revealed that students use their smartphones to browse social media and watch fun reels and videos all day, but most of the time, it is from 4:30 PM till 00:00 AM, and their peak time is between 8:30 PM and 10:00 PM. Game playing peaks in the evening, between 8:30 PM and 10:00 PM. One of the most important recommendations we can make is to learn as much as possible about how learners use their smartphones and how they think about them.

Keywords: smartphone, learners, duration time, prefer time, educational smartphone use

1. Introduction

Today, smartphones are an integral part of our lives, especially for students who have grown up with them. Students use smartphones not only for calling and texting but also for gaming, video consumption, and social media access. Given the accessibility of educational apps and materials, smartphones can serve as valuable learning tools [24]. The increasing use of smartphones among students raises educational concerns. Compared to adults, students are often perceived as lacking self-regulation in smartphone use, necessitating guidance from parents and teachers. Consequently, researchers are constantly studying the effects of smartphone use on students [11]. High school students have seamlessly integrated smartphones into their daily lives for both social and academic purposes. These pocket-sized devices provide them immediate access to a wealth of learning resources, organisational tools, and collaborative platforms, facilitating their academic journey and social interactions [32]. However, there are also concerns about its side effects, such as smartphone addiction.

Adolescents most commonly use mobile phones to access the internet. Compared to computers, mobile phones are the most common means of accessing online information among European adolescents [23]. In addition, students have revealed an impressive array of smartphone educational apps. Translation, dictionary reference,

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video-based learning, and seamless document sharing are all accomplished with these devices. However, the allure of smartphones extends beyond educational utility. There is a significant risk of distraction even when they are used during leisure time. Mobile phones connect 98.6% of internet users in China, or 817 million people, of whom 18% are teenagers [8].

The constant task switching and multitasking induced by smartphone use hinder students' concentration, deep thinking, and, ultimately, their learning outcomes [38]. Interestingly, those who use smartphones compulsively report higher stress and lower happiness levels [12]. The findings of Ladani et al. [19] indicate that patterns of use, particularly for entertainment and social interaction, are prevalent among secondary school learners. According to additional studies, some adolescents spend over seven hours daily engaging in activities like social media engagement, gaming, and content streaming [13, 17]. While Vogels, Gelles-Watnick and Massarat [36] found that 95% of American teenagers own smartphones, and 51% use them almost constantly. These behaviours appear to result from self-control issues, with perceived enjoyment and social pressure playing crucial roles in maintaining these behaviours. Most students downplay the negative effects of smartphone use on factors like sleep quality, concentration, and stress, revealing a profound need for guidance in making informed decisions about smartphone use. Moreover, recent research has shown that teenagers increasingly depend on their smartphones. Also, students with access to smartphones tend to devote more time to leisure activities, particularly social media, which negatively impacts their academic performance [18]. It has been found that most past studies have failed to consider all possible applications of smartphones, meaning that they have focused on analysing the impact of specific applications (in general: social media) that have been extensively documented. The time spent on social media negatively correlated with academic performance in every case [7], or they have focused on the amount of time spent on smartphones in class or at home without identifying the relationship between the amount of time used for educational purposes and entertainment, and when? In addition, what is the relationship between the preferred time students use their smartphones and the purpose of their usage? The purpose of this study is to shed light on these issues.

Therefore, the present study seeks to answer the following research questions:

1. Is there a relationship between a student's preferred time of smartphone usage, the duration of their smartphone usage, and their educational smartphone usage?
2. Is there a relationship between the duration of students' smartphone usage and the duration of their educational smartphone usage?

2. Theoretical and empirical background

2.1. Smartphone use

Over the past decade, smartphone use among high school students has risen dramatically. According to Ifeanyi and Chukwuere [14], smartphones can positively and negatively affect students depending on how they are used. A clear and significant negative association exists between smartphone use and academic performance among adolescents [27]. Smartphone interruptions have been found to reduce students' attention spans, impede working memory, and compromise cognitive processing during lectures [38]. Rękas and Burzyńska [31] found that 21.7% of adolescents admitted to being addicted to smartphones, 22.2% admitted to a problem with face-to-face relationships, among 460 participants, and girls neglected home or school duties significantly more often than boys. Amez and Baert [2] indicated that excessive smartphone use significantly predicted lower GPAs, increased school dissatisfaction,

and reduced motivation. Also in this context, a smartphone addiction risk was negatively related to academic performance [33]. Students who use smartphones during lectures tend to retain less information and have a less profound understanding of the material [10, 38]. In addition to undermining genuine learning, smartphones can facilitate cheating practices [32]. Smartphones can, however, significantly increase students' access to educational resources when used appropriately. Ladani et al. [19] found that smartphone use prevalence among adolescents was 89.8%, with a significant portion of users engaging in gaming, videos, and social media. However, the specific duration of use was not detailed, in addition to fostering student engagement, collaboration, and honing digital skills.

On the other hand, it has been shown that excessive smartphone use is associated with lower GPAs, reduced study time, and ineffective study strategies [22, 33]. Moreover, Zhang et al. [40] found a significant negative relationship between smartphone time and academic performance that further substantiated this finding. Multiple factors contribute to this phenomenon, including constant smartphone checking that disrupts concentration, multitasking that interferes with memory retention, and the allure of social media that continually distracts from studying. According to Agostini and Petrucco [1], late-night smartphone use affects students' overall well-being by disrupting sleep patterns. Smartphones are undeniably valuable educational tools, but students must develop self-control.

2.2. Duration of smartphone use and addiction

Smartphone addiction is a grave concern characterised by excessive and poorly controlled smartphone use, leading to impairment and distress [27]. Furthermore, addiction is defined as spending more than 4 hours a day on smartphones [29]. In this study, we used the same method as the Peng et al. [29] study, where prolonged time spent on smartphones (more than 4 hours per day) was interpreted as smartphone addiction. There has been an increase in the prevalence of this addiction among high school students worldwide. Smartphone addiction has been linked to daily smartphone usage [27, 34]. People who spend more than five hours a day on their smartphones are more likely to develop addiction tendencies [5]. If smartphone use becomes habitual, even moderate users (2–4 hours per day) can succumb to addiction [34]. Addiction has been associated with frequent smartphone use, even for short periods. Checking one's phone more than 60 times daily clearly indicates smartphone addiction [20]. The use of smartphones at night disrupts sleep patterns and contributes to anxiety [21]. Approximately 10% to 30% of adolescents display problematic smartphone behaviours, such as compulsive checking, excessive use, and withdrawal symptoms when separated from their devices [5, 34]. There are many consequences of smartphone addiction, including academic performance, job performance, relationships, mental health, and physical health. Among adolescents, it has been associated with higher rates of anxiety, depression, reduced sleep quality, loneliness, and decreased physical activity levels [5, 27]. Smartphones and social media platforms provide instant gratification and dopamine release, contributing to overuse. Schools face the challenge of integrating smartphones appropriately while preventing addiction. Digital citizenship education, designated device-free periods, monitoring inappropriate use, and communication with parents are some strategies [30]. Counselling can also help addicted students regain self-control and establish a healthier relationship with mobile technology. By teaching mindfulness and setting boundaries, schools can help students manage their smartphone usage and promote healthier lifestyles.

3. Methodology

3.1. Data collection and sample

Schooling in Algeria starts at the age of six, and the educational system consists of three levels: primary school (lasts for 5 years), middle school (lasts for 4 years), and secondary school (lasts for 3 years). The research employed a quantitative approach, with descriptive exploratory research. Participants included secondary school learners from the Setif district in eastern Algeria (n = 370). A random sample was selected after removing 39 incomplete responses, resulting in a final sample of 370 learners. All learners are in secondary schools. Moreover, the learners were in their second year. The learners were between 16 and 17 years old. Of the 370 participating learners, 200 (53.3%) were female, and 175 (46.7%) were male.

3.2. Instrument development

The information used for this study was gathered through a questionnaire developed by the authors, which was distributed during class. The questionnaire comprised a mix of question types, including dichotomous items (yes/no), checklists, and categorised content as follows: the first part had five questions as daily time spent using smartphone, what time of day do you most frequently use your smartphone, as well as How much time spent with your smartphone for educational purpose. The second part, which differed in daily smartphone usage, had four questions, which asked learners a question like “I use my smartphone to play games” or “I use my smartphone to learn from it”.

3.3. Reliability

In order to establish the reliability of the questionnaire, the questionnaire was distributed to 68 secondary school students as part of a pilot study. The Cronbach’s alpha was calculated using SPSS v27 to determine its reliability. Table 1 shows the results.

Table 1
Reliability of the questionnaire.

Variable	Number of item	α
Daily smartphone use	5	0.707
The differs daily smartphones usage	4	0.688

3.4. Data analyze

Pearson correlation coefficients were calculated using SPSS v27 to determine the association between variables. We also used some statistics, such as mean, standard deviation, percentage, cross-tabulation, and figures.

4. Results

According to the descriptive analysis (table 2), 94.9% of students own a smartphone. Additionally, 54.4% of the students noted that they used their smartphones for less than 4 hours per day, while 44.3% use their smartphones for more than 4 hours per day. At the same time, 24.5% reported that they used their smartphone most frequently from 20:00 and 23.2% from 16:30. While 44.3% used their smartphones for less than 1 hour per day for educational purposes.

Table 2
Descriptive statistic.

Descriptive variable	Variable	Frequency	Percentage
Sex	Male	175	46.7%
	Female	200	53.3%
Do you have a smartphone?	Yes	356	94.9%
	No	18	04.8%
How much time do you spend with your smartphone on the internet?	1 hour per day	28	7.6%
	2 hours per day	49	13.2%
	3 hours per day	63	17%
	4 hours per day	64	17.3%
	5 hours per day	55	14.9%
	6 hours per day	37	10%
	7 hours per day	18	4.9%
	8 hours per day	56	15.1%
	Missing item	5	1.3%
What time of day do you most frequently use your smartphone?	From 6:00 to 8:00	20	5.3%
	From 16:30 to 18:30	87	23.2%
	From 18:00 to 20:00	77	20.5%
	From 20:00 to 22:00	92	24.5%
	From 22:00 to 00:00	70	18.7%
	Before 00:00 o'clock	24	6.4%
	Missing item	5	1.3%
How much time do you spend with your smartphone for educational purposes?	Less than 1 hour per day	166	44.3%
	1 hour per day	97	25.9%
	Less than 2 hours per day	75	20.0%
	2 hours per day	30	08.0%
	Less than 3 hours per day	2	00.5%
	3 hours per day	0	00
	Missing item	5	01.3%
The duration of smartphone usage	Less than 4 hours per day	204	54.4%
	More than 4 hours per day	166	44.3%

4.1. RQ1: Is there a relationship between a student's preferred time of smartphone usage, the duration of their smartphone usage, and their educational smartphone usage?

A Pearson correlation coefficient was used to examine the correlation between when students most frequently use their smartphones and the time they spend online. Table 3 shows that there was a big positive correlation, r = 0.677, significant at the 0.01 level (2-tailed), and medium negative correlation r = -0.567 significant at the 0.01 level (2-tailed) between what time of day do you most frequently use your smartphone and how much time spent with your smartphone for educational purpose.

Figure 1 shows the relationship between daily smartphone usage time and when students use their smartphones most frequently. First, the graph is divided into 6 time periods throughout the day and night, from 6:00 AM to after 00:00 AM (midnight). Second, there are eight categories of daily smartphone usage, ranging from 1 hour per day (1h/d) to 8 hours per day (8h/d). We adopted three categories: light users (1-3 hours per day), moderate users (4-5 hours per day), heavy users (6-8 hours per day). For users with 1-4 hours of daily usage, the peak time is usually between 4:30 PM and 6:30 PM. The peak hour for users who use five hours daily is between 8:30 PM and 10:00 PM. However, students who use smartphones 6-8 hours daily have peak usage

Table 3
Correlation between students' preferred time of smartphone usage and other variables.

	What time of day do you most frequently use your smartphone?		
	Pearson correlation	**Sig. (2-tailed)**	**Remark**
How much time do you spend with your smartphone on the internet?	.677	.000	Correlation is significant at the 0.01 level (2-tailed)
How much time do you spend with your smartphone for educational purposes?	-.567	.000	Correlation is significant at the 0.01 level (2-tailed)

between 10:00 PM and 00:00 AM. Third, after 8:30 PM, light users (1-3 hours per day) show a sharp decline in usage. The usage levels of moderate users (4-5 hours/day) remain high into the evening. Heavy users (6-8 hours per day) show increased activity during the evening and night hours. From 6:00 AM to 8:00 AM, early morning usage is generally low across all categories. There is a slight increase for some moderate to heavy users during this period. After midnight, light to moderate users show minimal activity. After midnight, heavy users (especially 6-8 hours/day) maintain noticeable usage levels. Therefore, as daily usage time increases, peak usage time shifts later in the day. Users who are heavier have a more consistent usage pattern throughout the day and night. Students who are lighter have more pronounced peaks and valleys in their usage patterns. Smartphone usage patterns vary significantly based on the total daily usage time, with heavier users using their smartphones more during the late evening and night hours compared to lighter users who concentrate their usage during the day.

Figure 2 displays the relationship between different times of day and how long students use their smartphones for educational purposes. The graph is divided into 5-time categories (<1h, 1h, <2h, 2h, <3h) across 6 time periods throughout the day and night. First, short usage (<1h) is most common, with peaks late at night (10:00 PM – 00:00 AM). Next most prevalent is 1-hour usage, which occurs most frequently between 8:30 PM and 10:00 PM. Overall, longer usage periods (2h and 3h) are less common. A variety of usage patterns can be observed during the day: morning (6:30–4:30 AM) – low usage across all durations, afternoon/evening (4:30–6:30 PM) – a spike in usage, especially for 1-2 hour periods, night (8:30 PM – 00:00 AM) – peak usage for shorter durations (<1h and 1h), after midnight – sharp decline in all usage durations. During the evenings and at night, students tend to use smartphones for education in shorter bursts. Longer smartphone use for educational purposes (2 hours or more) is most likely to occur in the afternoon and early evening. In conclusion, this analysis indicates that students' educational use of smartphones is concentrated in shorter periods, with peak usage occurring in the evening and night hours. The pattern might reflect study habits.

Table 4 shows a correlation between the time of day students most frequently use their smartphones. As independent variable and some other dependent variables there was a big correlation, r = 0.662, significant at the 0.01 level (2-tailed), between the independent variable and "I use my smartphone to learn from it", there is a big negative correlation r = -0.692, significant at the 0.01 level (2-tailed) between the independent variable and "I use my smartphone to play games", whilst, there is a small negative correlation between the independent variable and "I use my smartphone to browse social media" and "I use my smartphone to watch fun reels and short videos".

Figure 3 shows smartphone usage patterns for various purposes at different times

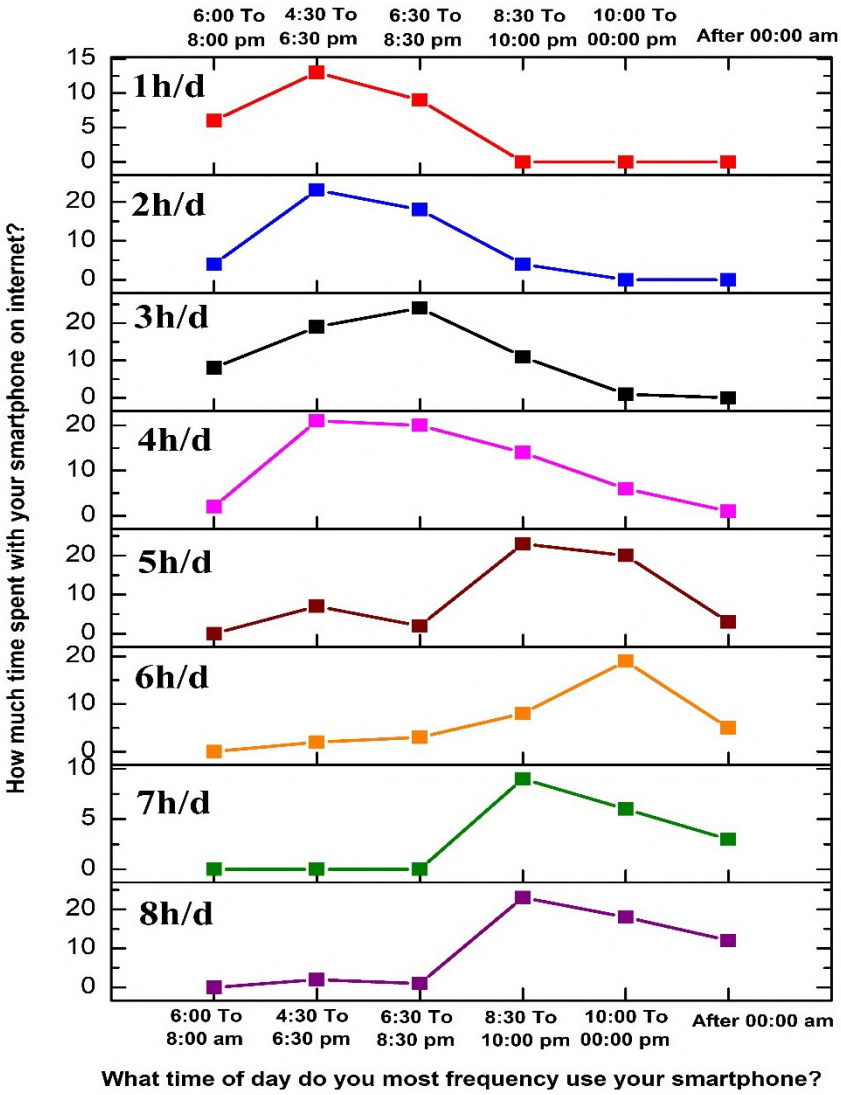

Figure 1: Students' preferred times for using their smartphones and their time spent with them.

of day. Learning from it: first, peak usage of smartphones for learning occurs between 4:30 PM and 6:30 PM. There is a significant decline in learning-related use after 8:30 PM. Very little learning activity happens after midnight. Second, playing games: game playing peaks in the evening, between 8:30 PM and 10:00 PM. Playing games during the daytime is less common. After midnight, there is a slight increase in gaming. The third activity is browsing social media: social media use continues to increase throughout the evening. It peaks between 8:30 PM and 10:00 PM. During the early morning hours, social media usage is relatively low. Fourth, watching fun reels and videos: this activity is similar to browsing social media. The peak time is between 8:30 and 10:00 PM. Usage is low in the early morning but increases steadily throughout the day.

In conclusion, educational use is highest in the late afternoon to early evening. Entertainment activities (gaming, social media, and videos) peak in the late evening. Smartphone use for all purposes generally decreases after midnight, with a slight uptick in gaming. The period from 8:30 PM to 10:00 PM seems to be the most active time for smartphone use across all categories except learning. This data suggests that students tend to use their smartphones for learning earlier in the day, shifting to more

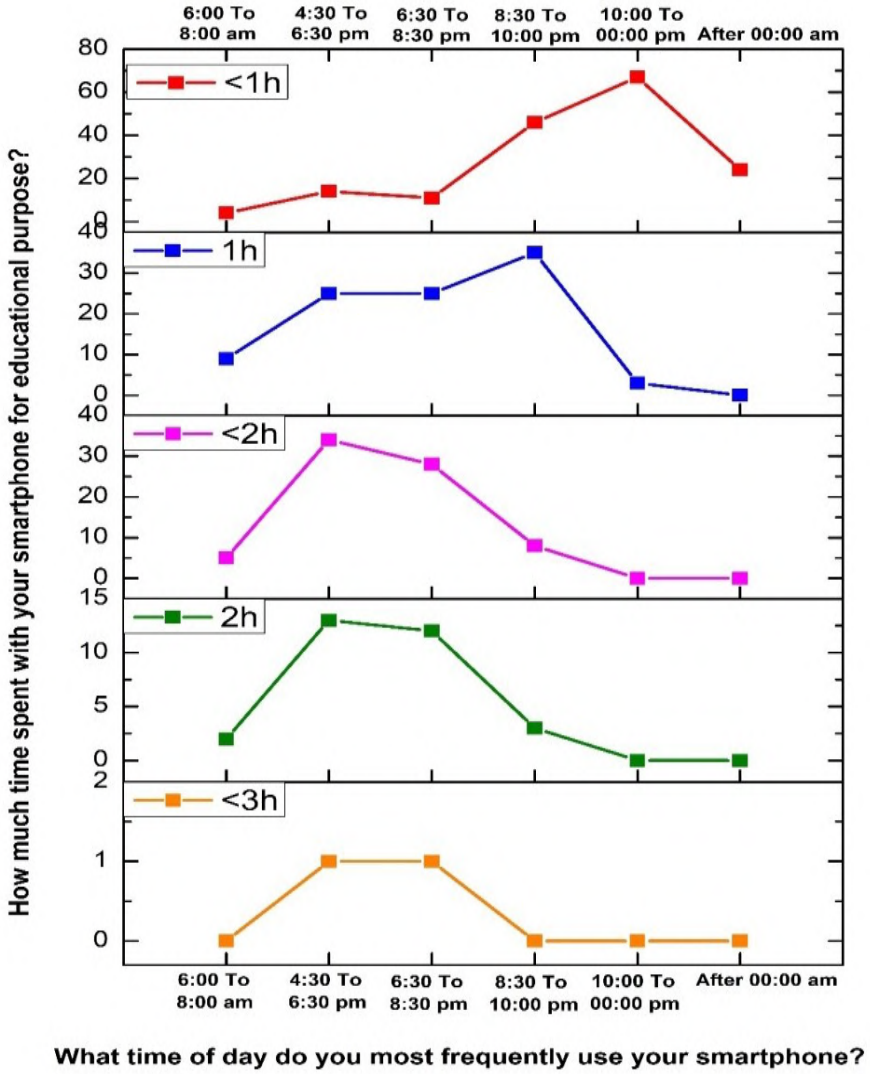

Figure 2: Students' preferred times for using their smartphones and their time spent with them for educational purposes.

entertainment-focused activities as the evening progresses. The pattern indicates a potential impact on sleep schedules, given the high usage of entertaining content close to bedtime.

4.2. RQ2: Is there a relationship between the duration of students' smartphone usage and the duration of their educational smartphone usage?

Table 5 shows that there was a medium negative correlation, r = -0.419, significant at the 0.01 level (2-tailed), between Duration smartphone usage and "How much time spent with your smartphone for educational purposes?".

Figure 4 depicts the relationship between overall daily smartphone usage duration (more than 4 hours vs. less than 4 hours) and the time spent using smartphones for educational purposes among students. We have two groups compared: the black line refers to students who use smartphones less than 4 hours per day (<4h), and the red line refers to students who use smartphones more than 4 hours per day (>4h). In both groups, the percentage of students using smartphones for educational purposes decreases as time spent on education increases, indicating fewer students use smartphones for longer periods. Furthermore, many heavy smartphone users (>4h) use smartphones for short educational periods. In general, students who use

Table 4
Correlation between students' preferred time of smartphone usage and other variables.

	What time of day do you most frequently use your smartphone?		
	Pearson correlation	**Sig. (2-tailed)**	**Remark**
I use my smartphone to learn from it	.662	.000	Correlation is significant at the 0.01 level (2-tailed)
I use my smartphone to play games	-.692	.000	Correlation is significant at the 0.01 level (2-tailed)
I use my smartphone to browse social media	-.138	.008	Correlation is significant at the 0.01 level (2-tailed)
I use my smartphone to watch fun reels and short videos	-.110	.036	Correlation is significant at the 0.05 level (2-tailed)

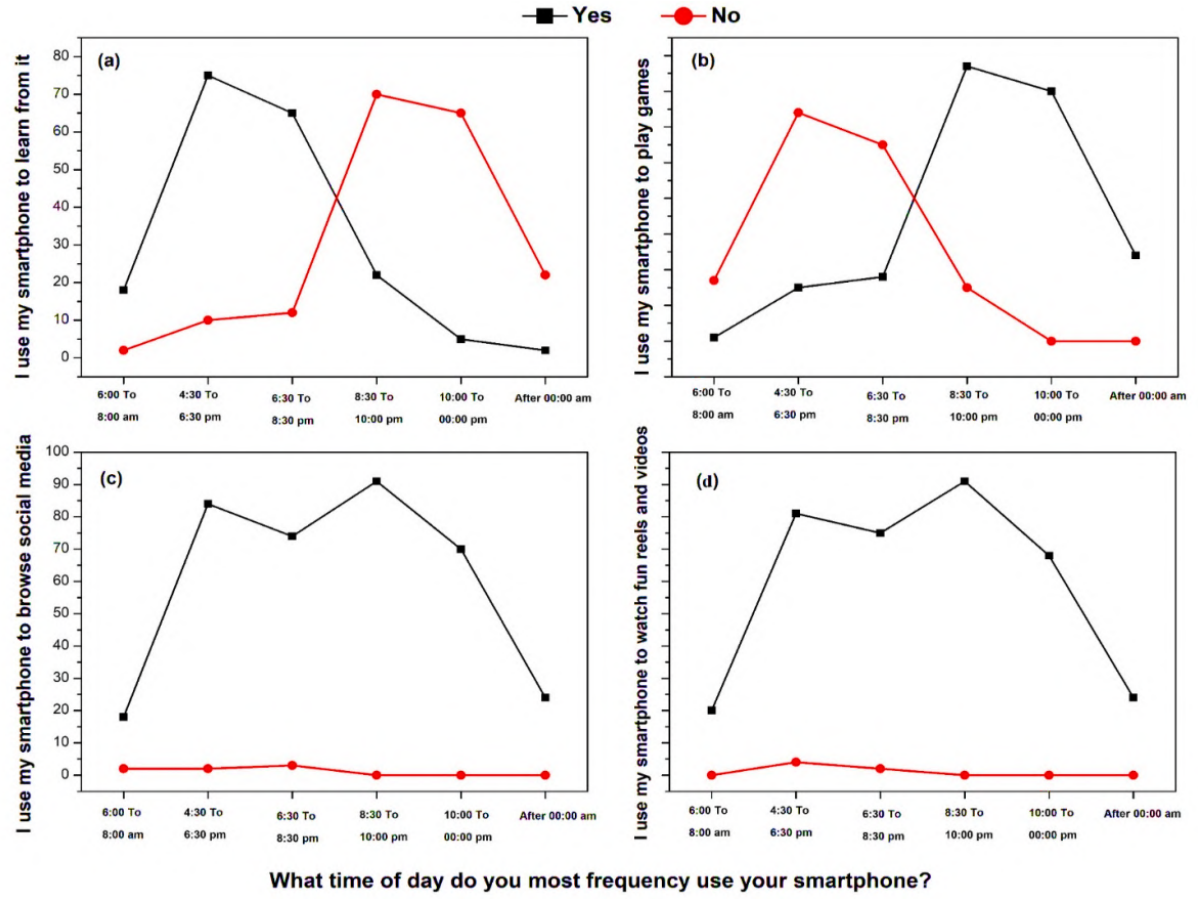

Figure 3: Students' preferred times for using their smartphones and their several uses.

smartphones most often use them for short educational purposes. Third, moderate educational usage (1h to 2h): here, the trend reverses, with a larger percentage of lighter smartphone users (4h) using their smartphones for educational purposes. When using smartphones for education, moderate smartphone users may be more focused. The percentages for both groups decline significantly after long educational usage (2h and beyond). Very few students from either group use smartphones for educational purposes for long periods. The lines cross between the <1h and 1h marks: it appears that there is a critical point where the behaviour of heavy and light

Table 5
The correlation between the duration of students' smartphone usage and the duration of their educational smartphone usage.

	Duration smartphone usage		
	Pearson correlation	**Sig. (2-tailed)**	**Remark**
How much time do you spend with your smartphone for educational purposes?	-.419	.000	Correlation is significant at the 0.01 level (2-tailed)

smartphone users in terms of educational use shifts. Students who use smartphones more frequently may be less likely to use them for prolonged educational purposes. Moderate smartphone users seem to have a more balanced approach to using their devices for education. This analysis suggests that while heavy smartphone users are more likely to use their smartphones for brief educational purposes, moderate users tend to have more sustained educational engagement with their smartphones.

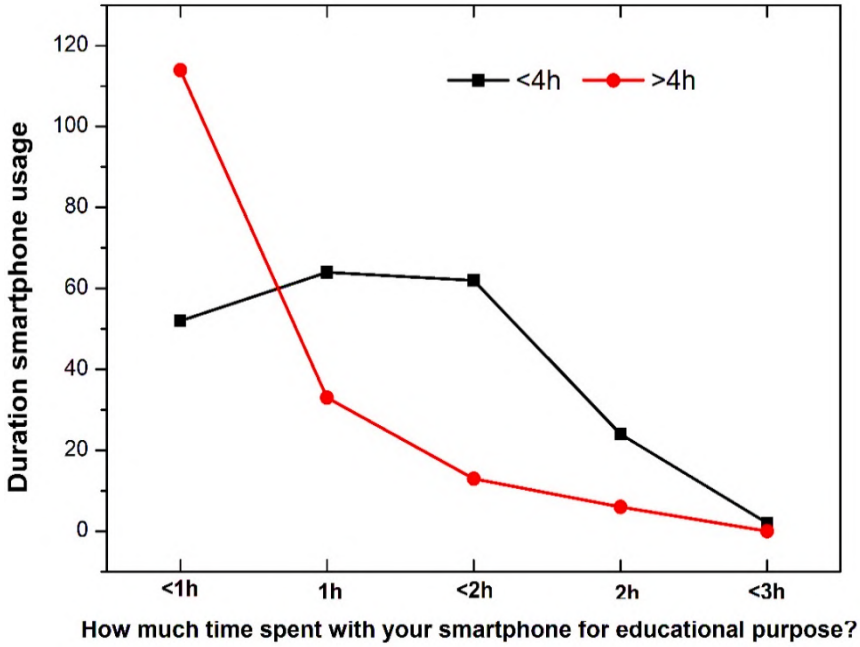

Figure 4: The duration students spend using their smartphones and their use for educational purposes.

Table 6 shows a correlation between duration of smartphone usage as an independent variable and some other dependent variables. There was a medium correlation, r = 0.550, significant at the 0.01 level (2-tailed), between the independent variable and I use my smartphone to learn from it, there is a big negative correlation r = -0.791, significant at the 0.01 level (2-tailed) between the independent variable and I use my smartphone to play games. At the same time, there is a small negative correlation between the independent variable and "I use my smartphone to browse social media" and "I use my smartphone to watch fun reels and short videos".

Figure 5, we present data on smartphone usage among students, comparing those who use their phones for less than 4 hours per day (<4h) to those who use them for more than 4 hours per day (>4h). The graph is divided into four panels, each highlighting a different aspect of smartphone use – first, social media browsing. The

Table 6
The correlation between the duration of students' smartphone usage and other variables.

	Duration smartphone usage		
	Pearson correlation	**Sig. (2-tailed)**	**Remark**
I use my smartphone to learn from it	.550	.000	Correlation is significant at the 0.01 level (2-tailed)
I use my smartphone to play games	-.791	.000	Correlation is significant at the 0.01 level (2-tailed)
I use my smartphone to browse social media	-.126	.016	Correlation is significant at the 0.05 level (2-tailed)
I use my smartphone to watch fun reels and short videos	-.117	.026	Correlation is significant at the 0.05 level (2-tailed)

vast majority of smartphone users use social media on their smartphones. More users are in the (<4h) group compared to the (>4h) group. In addition, both groups watch fun reels and videos on their phones. Social media use follows a similar pattern, with slightly more users in the (>4h) group. Learning: there is a significant difference between the two groups. Almost all students in the (<4h) group use their phones to study. Most students in the (>4h) group do not use their phones for learning. Fourth, playing games shows the greatest difference between the two groups. Most students in the (<4h) group do not play games on their phones. In contrast, almost all students in the (>4h) group use their phones to play games. Both groups are interested in entertainment activities (social media, videos). Those who use their phones less (<4h) are more likely to use them for learning. Heavy users (>4h) are likelier to play games on their phones. Excessive smartphone use (>4h) is associated with more entertainment-oriented and less educational activities. As a result of this analysis, we can understand how smartphone usage duration correlates with different learning and entertainment activities among students.

5. Discussion

Firstly, the results show a relationship between students' preferred times of smartphone usage and the duration of their usage; this correlation is a multifaceted issue influenced by various factors. Students often have specific periods during the day when they are more inclined to use their smartphones, which could be linked to their daily routines, academic schedules, and personal preferences. The results indicate that students who use smartphones for over four hours daily prefer evenings, particularly after 8:00 PM, when they are free from academic obligations. There is a similarity between this result and Elsheikh, Elsharkawy and Ahmed [6], while other students who use their smartphones less than four hours a day use them more early in the morning or evening, particularly between 4 PM and 8 PM. They might find morning or afternoon usage more convenient. Nighttime smartphone use can lead to prolonged usage, sleep disruption, and diminished academic performance [4]. We can say that late-night smartphone use (8:30 PM to midnight) is a sign of addiction, which aligns with global research on digital overuse [4, 35]. Among secondary school students, smartphone use duration is closely related to preferred use times. Students typically have more free time in the evening, which allows them to use their smartphones longer. Students are free from school and homework demands during this time, allowing them to spend more time on social media, gaming, or watching videos. As a result,

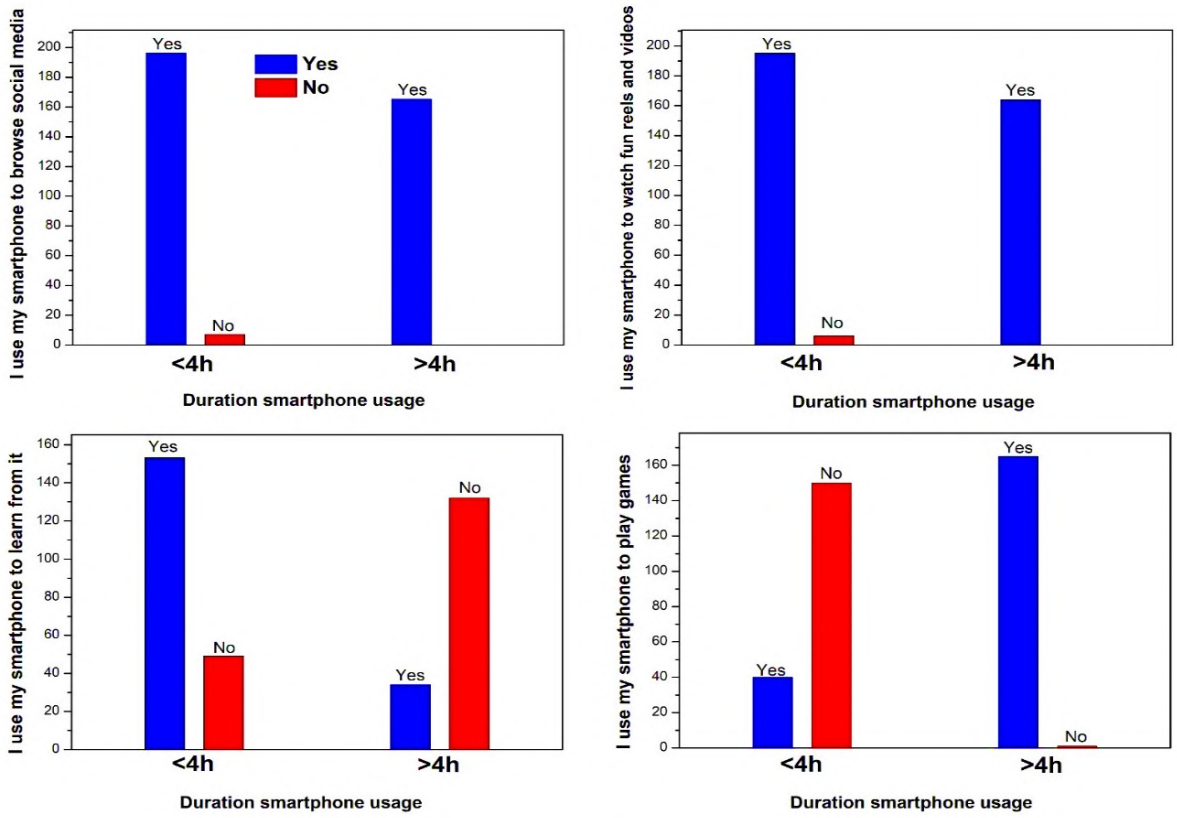

Figure 5: The duration of time students spend using their smartphones and their several uses.

smartphone usage is most prevalent in the evenings and at night. Generally, the morning is a hectic time with limited discretionary activities available. The morning routine leaves little time for extended smartphone use because students are busy preparing for school. Maybe this available time disparity explains why students use their smartphones longer at night than in the morning. Perhaps this available time disparity explains why students use their smartphones longer at night than in the morning. The late-night smartphone use observed in this study is a sign of potential addiction and resonates with the identification of smartphone overuse by Karakose, Tülübaş and Papadakis [16].

Nevertheless, this differs from findings by Papadakis [28] on structured, purposeful use of educational apps for young children, where screen time is carefully curated. While excessive recreational use disrupts sleep and academic performance [35], well-designed educational apps have the potential to enhance skills such as computational thinking without negatively affecting performance. However, our study reveals how smartphone use among secondary school learners often becomes a prolonged recreational activity with limited educational benefit, despite Papadakis [28] highlighting the positive potential of carefully designed educational apps. Moreover, in contrast to the framework by Papadakis [28] of sustained, playful learning through apps, the study found that educational use tends to occur in shorter evening bursts (under 1 hour), suggesting developmental differences in how technology engages users. This finding supports observations by Gómez-Cuesta et al. [9] about educational use peaking in the afternoon/early evening, though our results indicate a more fragmented pattern of timing preferences.

Secondly, the results also show a relationship between the preferred time of students' smartphone usage and the duration of their educational smartphone usage. These

findings particularly reinforce the call by Tülübaş, Karakose and Papadakis [35] for structured digital use policies, since the observed patterns of late-night recreational use coincide with diminished educational engagement. This underscores how technology's dual roles in education can be challenging to balance, and emphasises the need for age-specific, purpose-driven design principles [9, 28]. Another finding indicates that 94.9% of respondents own a smartphone and use it daily for over four hours. This is similar to some findings in Algeria [25, 26]. Also, there is a relationship between the duration of smartphone usage and the duration of educational smartphone usage among secondary students. For this reason, it is important to understand how smartphone usage relates to educational purposes [37]. Numerous studies have investigated the potential benefits of smartphones in education. Smartphone usage has been examined in relation to academic performance. There is a negative association between smartphone use and academic success among university students [3]. According to these findings, students' academic performance is negatively impacted by the amount of time they spend on their smartphones, thus reducing the amount of time they have available for study-related activities. Our research confirmed this, but with a different perspective: students spend more time on their smartphones and less on educational purposes. Moreover, Felisoni and Godoi [7] found that for every 100 minutes spent using smartphones daily, students' school ranking dropped 6.3 points. In our study, we found that students who spent more than 4 hours per day with their smartphones spent less than 1 hour (30 minutes) with their smartphones for educational purposes, but students who spent less than 4 hours per day spent less than 2 hours per day (1 hour and 30 minutes) for educational purposes. The results of our study are similar to those of Wentworth and Middleton [39], which found that US university students who spent more time on technology spent less time studying, negatively impacting their grades. This may be a confirmation of Felisoni and Godoi [7] finding that excessive smartphone use in and outside of the classroom is associated with poor academic performance.

Junco, Heiberger and Loken [15] found that students who used their smartphones for educational purposes during the day performed better academically. These results suggest different factors, including academic requirements, self-discipline, and individual preferences, may influence the educational and non-educational usage ratio. Smartphone usage negatively impacts educational purposes for a number of reasons. Smartphones can cause distractions, resulting in multitasking or task switching. The amount of time students spend on smartphones means more time spent playing games, browsing through social media, and watching videos and short clips, as shown in figures 3, 4, 5. There is a similarity between this result and Ladani et al. [19]. Because smartphones are commonly regarded by students as entertainment devices and not as tools for learning, their attention is also diverted from their academic pursuits.

6. Conclusion

Although smartphones are valuable educational tools, students often use them for leisure, which can distract them from academic focus. Overall, students generally use smartphones for longer periods but prefer to use them in the evening. Even though students who spend much time on social media or watching videos have a longer overall smartphone usage duration, they do not devote special time to it since they use it constantly. Conversely, those who play games on their smartphones tend to use them longer at night or in the evening. Students who use their smartphones for academic purposes prefer evenings over daytime, depending on their study habits and needs. The insights gained underscore the need for educational policies and

interventions that encourage students to use their smartphones more productively and in a balanced manner. Educators and policymakers should prioritise educational smartphone use in daily routines to maximise benefits and minimise distractions. In order to develop more targeted strategies that support student learning and well-being, future research should continue to examine the nuances of smartphone usage, taking factors such as age, gender, and socio-economic status into account.

7. Limitation

It is important to note that there are some limitations. The questionnaire results may not be accurate, and some learners' answers may not be accurate. The study's population limits the ability to generalise its findings. In this study, only a few learners were selected from a single district, so the sample size is small. Several limitations necessitate further research in this area.

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