

# Smartphones and Mobile Apps: Case Study on Usage Behavior of Elementary School Students

## Insights from a Rural Area in Northern Germany

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**Abstract**—With digitization and the spread of smartphones in many areas of life, mobile devices have also become increasingly relevant in education. While comprehensive research exists especially for smartphone use among teenagers and students, the findings for elementary school students are limited. Based on a survey, this case study provides exploratory insights into the smartphone usage behavior of elementary school students in a rural region in northern Germany. The responses of 33 students in grades 3 and 4 (ages 8 to 10) show that many students already own a smartphone at this age and use it daily, sometimes for several hours, especially for gaming and media consumption. The influence of owning an own smartphone on usage and leisure activities is reviewed. School use is of little relevance among the elementary school students surveyed.

**Keywords**—Elementary School, Mobile Apps, Smartphones, Education

## 1 Introduction

Increasing digitization is changing many areas and industries and, in addition to politics, public administration, medicine and retail, is also affecting education [1]–[4]. This is especially true for smartphones: as early as 2011, researchers predicted for the United States of America that mobile learning devices would soon be used permanently and by every student [5]. Mobile apps, which are also one of the most important functions of smartphones in other areas such as retail or medicine, play a special role here and allow a wide range of application possibilities [6]–[9].

Parents in particular have a strong interest in making mobile technologies available to their children for learning, also because they can better participate in their children's learning process this way [10], [11].

Numerous studies show that smartphones are used primarily as a communication tool (i.e., for chatting) among children and young people, but also among students

[12]–[14]. Thus, chat groups on WhatsApp can not only serve communication, but also strengthen the community and collaboration [14].

Also, research describes the use of apps and especially chat apps for language learning [15], [16]. Gamification approaches can be used to learn mathematics [17].

It should be emphasized that smartphone use is changing the leisure activities of children and young people [18], [19, p. 44]. The "KIM Study" of around 1,200 children and young people between the ages of 6 and 13 from all over Germany shows that smartphones and the Internet are now the most important interest after friends and sports. In particular, mobile devices are used for messaging and telephoning, followed by the Internet and games. Despite the high level of interest in smartphones and the Internet: Watching TV, meeting friends, learning, playing indoors and outdoors, own family and sports are still more relevant as leisure activities [18].

The aim of this case study is to provide insights into the smartphone usage behavior of elementary school students and thus supplement existing knowledge. To this end, a total of 33 students in the third and fourth grades of an elementary school in a rural area in northern Germany are surveyed about how they use smartphones - both in their leisure and for school purposes - and they do in their leisure. First, the material and methodology are discussed. For the most part, the survey results are presented descriptively. Subsequently, the results are discussed against the background of existing findings from the field of education in the broadest sense.

## **2 Material & Methods**

The case study is based on a survey conducted at an elementary school in a rural region in Schleswig-Holstein in northern Germany. Students in grades 3 and 4 were surveyed.

In addition to sociodemographic data, the questionnaire asks about two topics: smartphone use, especially in school contexts, and leisure time activities.

With regard to smartphone use, the questionnaire asks about frequency of use (DeviceUse), ownership of a smartphone (OwnDevice), use cases (DeviceUsePlay, DeviceUseChat, ...) and enjoyment of device use (DeviceLikeUse).

For use in a school context, frequency of use (DeviceUseSchool) and app use (AppUseLearn, AppUseCalc, ...) are asked.

Related to leisure time activities, the questionnaire asks about leisure time activities (DoSports, DoMusic, ...).

A pre-test of the questionnaire with a small group of students reveals that the previously proposed scales (Likert scale from 1 to 5) are often perceived as too complicated. The students state that they are partly overwhelmed by distinctions such as "frequently" and "very frequently". Therefore, especially the questions about use cases and leisure activities are changed to binary scales (0 = rather rarely, 1 = rather often). Table 1 shows the scales of the queried items.

**Table 1.** Scale used per questionnaire item

Item(s)	Scale
Gender	Binary (1 = male)
DeviceUse	Ordinal (1 = never, 6 = several hours daily)
OwnDevice	Binary (1 = true)
DeviceUsePlay, DeviceUseChat, (...)	Binary (0 = rather rarely, 1 = rather often)
DeviceUseSchool	Interval (1 = very rarely, 6 = very often)
AppUseLearn, AppUseCalc, (...)	Binary (1 = true)
DeviceLikeUse	Interval (1 = not at all, 5 = very much)
DoSports, DoMusic, (...)	Binary (0 = rather rarely, 1 = rather often)

The questionnaire is completed jointly with the students of two classes (grades 3 and 4), each in a large group, generating 33 usable responses.

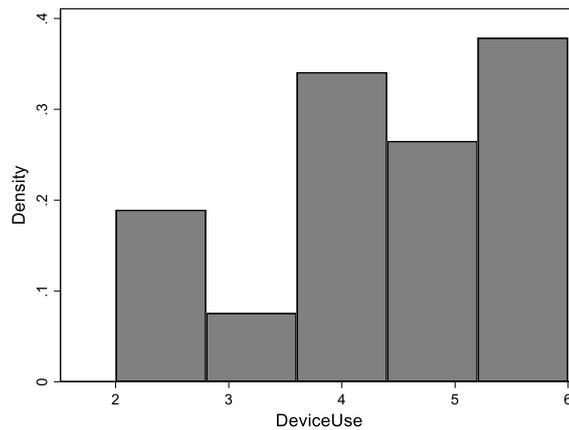
### 3 Results

The survey yields responses from 17 girls and 16 boys. The majority of the students are nine years old at the time of the survey (cf. tbl. 2).

**Table 2.** Participant’s distribution of gender and age

Age	Female	Male	Total
8	3	4	7
9	6	11	17
10	8	1	9
Total	17	16	33

In the third grade, 15 responses are collected, and in the fourth grade, 18. Of the students surveyed, 22 (67%) already own their own mobile device.



**Fig. 1.** Distribution of usage frequency

Fig. 1 shows that the majority of students use smartphones rather frequently, i.e., according to their own statements, in some cases for several hours a day. No student states that they never use a smartphone. It is striking that the frequency of use differs between students who own a smartphone ( $M = 5.04$ ,  $SD = 1.13$ ) and those who do not own a smartphone ( $M = 3.27$ ,  $SD = 1.10$ );  $t(31) = -4.27$ ,  $p = .0002$ . If a student owns a smartphone, the frequency of use increases significantly ( $\beta = 1.77$ ,  $t = 4.27$ ,  $p = .000$ ).

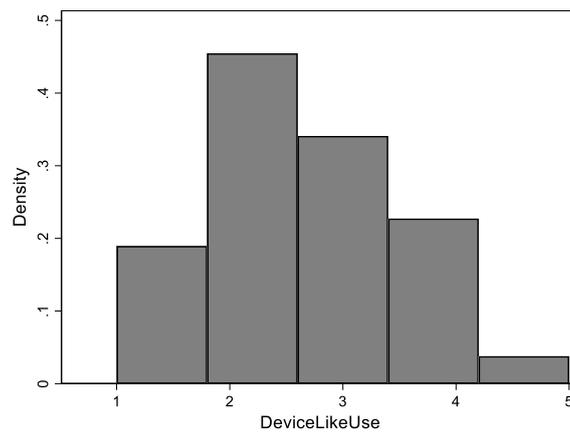


Fig. 2. Distribution of enjoying usage

Despite the high prevalence of smartphones among students, students do not seem to experience explicit great pleasure in using smartphones (cf. fig. 2).

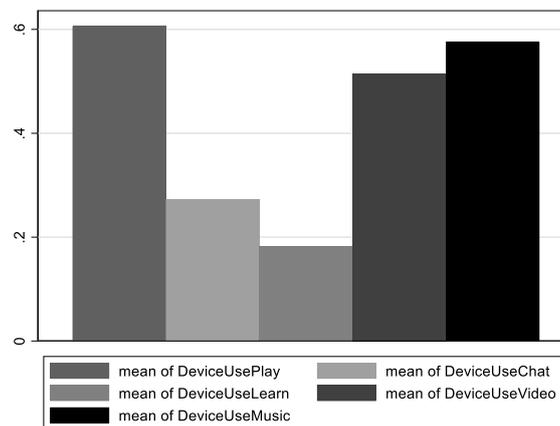


Fig. 3. Device usage across different activities (Except school)

In terms of use cases, the survey data show that smartphones are used by elementary school students in particular for playing games and consuming media (videos and music). Device use for chatting and especially for learning appears to be of little relevance among young students (cf. fig. 3).

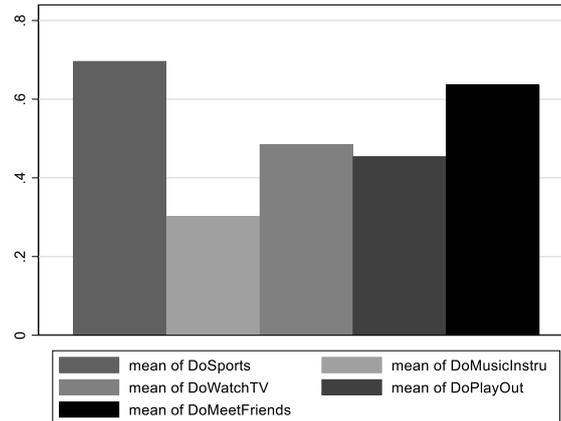


Fig. 4. Activities in leisure

In terms of leisure activities (away from the smartphone), most respondents said they played sports and met friends. Playing a musical instrument seems to be the least relevant among students (cf. fig. 4).

Table 3. Correlation of own device and leisure activities

Activity	OwnDevice	Sports	Music	WatchTV	PlayOut	Meet Friends
OwnDevice	1.0000					
Sports	-0.0466	1.0000				
MusicInstrument	-0.3730	0.0043	1.0000			
WatchTV	0.0429	-0.2839	-0.2439	1.0000		
PlayOut	-0.1291	0.2047	0.0602	-0.3985	1.0000	
MeetFriends	-0.0000	0.1869	-0.0498	-0.1490	0.4370	1.0000

If a student owns his or her own smartphone, this has hardly any impact on leisure activities (compared to not owning a smartphone) (cf. tbl. 3). Playing a musical instrument is an exception. Here, owning one's own smartphone has a significant negative effect ( $\beta = -.363$ ,  $t = -2.24$ ,  $p = .033$ ).

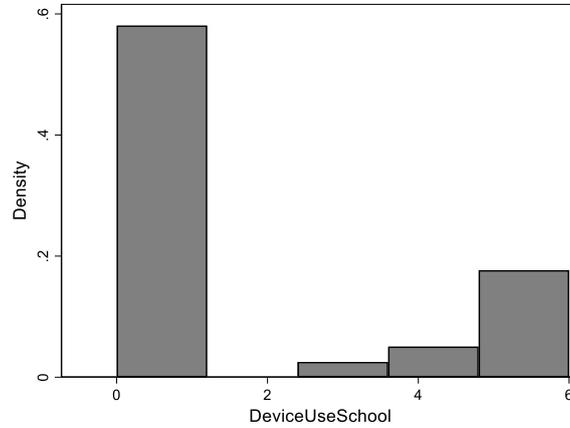


Fig. 5. Distribution of device usage for school

With regard to school use, the survey data show that most students tend not to use their smartphones for school (cf. fig. 5). There is no significant difference between the groups "own device" ( $M = 1.95$ ,  $SD = 2.10$ ) and "no own device" ( $M = 1.54$ ,  $SD = 1.92$ );  $t(31) = -0.54$ ,  $p = .5919$ . Learning apps (e.g., vocabulary or knowledge quizzes) or the calculator are most likely to be used for school on the smartphone (cf. fig. 6).

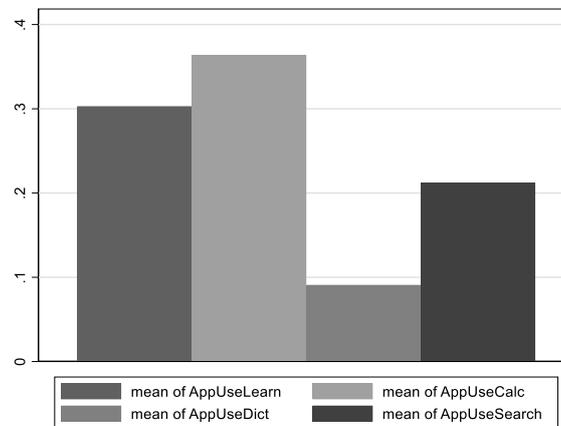


Fig. 6. Usage of school-related apps

#### 4 Summary and Conclusion

The aim of this case study was to provide insights into the smartphone usage behavior of elementary school students using the example of a rural region in northern Germany. To this end, an explorative survey was conducted on how the surveyed

students use the smartphone in general and in the school context in particular, and how they spend their free time. The data collected was processed descriptively and related to existing findings.

In summary, the results show that even children of primary school age use smartphones intensively. This use is particularly favored by owning their own device. At 67 percent, children in the relatively small sample presented here are significantly more likely to own their own device compared to the Germany-wide KIM study from 2018 (51 percent) [18].

When it comes to smartphone use, the results of the survey correspond to those of the KIM study. Smartphones are mainly used for games, music and videos [18]. Frequent use for gaming opens up opportunities for learning with gamification approaches for elementary school students as well [17]. Less relevant to elementary school students is the use of chatting, which is the main use case for university students in Korea, for example [11], [13]. For the use of smartphones as a (supportive) learning tool in elementary school, this means that chatting is probably less suitable as a learning method [15], [16].

In terms of leisure activities, the results of the present case study fit with previous findings that (despite high smartphone use) sports and friends are still of highest relevance for the children [18], [20]. However, owning a smartphone is negatively associated with playing a musical instrument. The fears of some educators seem to be confirmed here [21]. However, due to the small sample, a larger scale study should be undertaken in this regard to test the statement.

With regard to school use, some researchers had predicted that smartphones would become an integral part of everyday educational school life. At least for the sample presented here from a rural region in the north of Germany, this has not yet occurred [5]. So far, elementary school students have used smartphones only sporadically, especially with learning and calculator apps.

Overall, the survey shows a high relevance of the smartphone for elementary school students in their leisure time activities, without "analog" activities such as meeting friends or playing sports seeming to take a back seat. Nevertheless, the proportion of smartphone use at school plays only a secondary role among the respondents.

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