The Use of Social Media for the Development of Digital Literacy of Students: From Adequate Use to Cognition Tools

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Abstract—The study focuses on the possibility of turning social media into an effective tool to improve digital literacy and facilitate cognition. In view of this, a one-month experiment involving 268 eighth graders from two Moscow schools was conducted; the participants were divided into a control and an experimental group. The students were encouraged to independently search and develop social network skills to solve educational issues and improve cognition. Objective performance tests were conducted based on the curriculum results. According to the academic performance, the mean grade on a 12-point scale in the experimental group increased from 7.77 to 8.76 points, while in the control group the change remained within the statistical error (7.64 and 7.76, respectively). A strong correlation between the grades obtained in different groups (0.8 when comparing the final results in two groups) was found. The study can be put into practice within the framework of the widespread introduction of social media in school curricula as a tool to access information, develop digital literacy and the ability to use digital cognition tools being supervised and supported by a skillful teacher.

Keywords—Social media; digital literacy; education development; cognition tools
1 Introduction

Over the past 10 years, social media or social networks have become a crucial part of the information landscape and the most important part of social reality. Initially, social media used to be a communication tool; today they have become a medium of political influence, the basis for the business processes of many companies, and an important modern education tool [1], [2]. Studies on the use of social media by school and university students were mainly focused on studying the consequences of their active involvement in this service. In most cases, the researchers pointed to the development of a number of behavioral and psychological disorders associated with the excessive use of social networks. There is a unanimous opinion that active involvement in social media has a negative impact on academic performance at any age [3] – [6]. It is also indicated that the most typical disorders associated with the use of social media are impaired attention, inability to concentrate arbitrarily for a long time, weakening willpower, addiction, anxiety and constant desire to check messages [7].

The correlation between social media as a communication tool and the behavior of adolescents has been carefully studied. It was revealed that in this age group the two most powerful motivations are the desire to gain recognition and the desire to belong to a particular group [8] – [10]. Social networks naturally facilitate the formation of groups and are intended for this. However, marketing techniques and modern product promotion strategies based on the characteristics of the user psychology leads to greater addiction. Thus, adolescents often want to correspond to an unrealistic ideal, which is found on a social network and there may be depression caused by the inability to match it [4]. Social networks are often a cause of social exclusion in adulthood [11].

On the other hand, researchers, in particular in medicine and psychology, note the beneficial effects of social media on some social groups. They help older people improve memory, increase social motivation, develop communication and cognitive abilities [12], [13]. There is a great number of studies that examine the way social media can be used in education [14] – [16]. This is especially relevant as students are already using social media to search for and exchange information in their area of interest.

Nevertheless, the researchers note that social networks have already penetrated into our daily life and they will continue to play a decisive role due to a number of important services that they provide: ease and speed of communication, access to information at any time. It is believed that the key function of social media is the selection of information from the enormous amount of available data based on the natural differentiation of group interests. For example, within the group of people interested in biology each participant finds and shares the content that is most interesting to them. Social media can be effective cognitive tools due to the “group filtering” tool [14], [17], [18]. Modern social media make it possible to effectively use office applications, in particular cloud storage and data access services, to build distributed computing and communication systems, as well as to quickly exchange information. These services are important cognition and development tools, and the tools of creative activity and the creation of new products in the information economy [19], [1]. Therefore, in order to bring up an adequate and skilled citizen of the new era, it is necessary to constantly improve digital
literacy and master the tools provided by the modern digital environment [20], [21]. This can be promoted by the use of social media in schooling and higher education.

The present study considers the possibility of using social networks as a basis for increasing digital literacy and teaching students to use them as a tool to improve self-development and self-education. In this aspect, social media have not been sufficiently and practically studied.

2 Methods and Materials

The study took place at First Moscow State Medical University. It involved 268 8th graders from two Moscow schools. The study period was 30 days long (1 month). The students were invited to participate in the study through the announcement made at their schools. Participation was completely voluntary and it was agreed with the parents, teachers, and the school administration. To ensure the ethics of the study, the results did not affect the final assessment of the participants. The short study period is due to the need to save time and energy of the participants to successfully complete their current school curriculum. Thus, participation in the study was not expected to adversely affect academic performance and well-being. The study course used in the experiment was a continuation of the adopted school curriculum. Therefore, the experiment did not require any extra efforts to address the issues related to the study organization. The participants were not aware of the participation of their fellow students and teachers. Communication was carried out through specially created anonymous accounts on social networks. Thus, we did not have access to the personal data of each study participant.

There were two groups: an experimental group consisting of 132 participants and a control one involving 136 participants. The number of male and female participants in both groups was equal; however, this is insignificant for the purpose of the study. To complement the course, we used multimedia educational materials posted on the Internet, in particular on Facebook, YouTube, Twitter, and Instagram. Most of the communication with the teacher also took place on these social media platforms. The teachers and students were instructed in the use of certain social media features to increase the effectiveness of learning and facilitate the search for educational materials. Thus, while studying the academic subject, the students also had an integrated digital literacy course. In case of questions or difficulties associated with the education-related use of social networks, the students could contact support accounts which provided them with a quick response or professional help in less than half an hour. The study was not focused on collaborative learning, but collaboration was encouraged; it arose spontaneously as discussions and student requests to each other.

The control group and the experimental group had access to the same educational materials and available opportunities. However, the experimental group was guided by the teacher and the participants had to do the exercises and use the proposed digital materials to complete the course. The control group could use these opportunities on their own.
Before the beginning of the experiment, the participants were surveyed about the social media they use. Based on previous studies [22], [23], 4 key uses of social networks by schoolchildren were identified: entertaining, cognitive, communicative (for communication) and informative (obtaining socially useful information). The study was conducted by analyzing the history of browsing and accessing social networks from personal electronic devices of participants. The data was transmitted anonymously and encrypted so that the source of the data could not be determined. Thus, the study is based on objective information rather than subjectively expressed opinions. There was a similar study that took place a day later after the end of the research cycle.

The participants used a specific tag to access the educational resources; the tag was used to count the number of references to various sources. The analysis of this information reflected the development of the cognitive skills of the participants. Based on the available studies on cognitive processes in social networks [24], the key factors that transform social networks into cognitive tools are the independent use of the possibilities of finding educational materials and going beyond the course. The search and independent use of social networks for identifying, processing and utilizing information directly demonstrate an increase in the digital literacy of participants.

An objective study of the academic performance of students was conducted based on the experiment results. In order to make the assessment as realistic as possible, the study was based on a 12-point scale that is traditionally used in school education. The mean grade and the assessment variance (average deviation) were calculated in each group; the correlation between the grades of each group obtained before and after the experimental course, as well as between the final grades of both groups, was examined. The analysis of the correlation allowed the researchers to evaluate the change in personal assessments of each participant in the correlation groups.

The hypothesis of this study is that there should be a strong correlation between the grades within the group and between the experimental and control groups if the use of social media in the learning process and the increase in digital literacy really affect the quality of education.

The hypothesis of our study is that the accentuated use of social networks in education under the supervision of teachers and based on appropriate pedagogical methods (encouragement, comparison of achievements with other students, support and respect from peers) should contribute communicative activities on social media platforms, improve academic performance and change preferences by making learners use social media as a cognitive tool. The latter should be evidenced by the change in the percentage ratio of the number of requests for network resources intended for entertainment and resources for communication, knowledge improvement, and information search.

The study has certain limitations, in particular, it does not consider the gender analysis of personal characteristics of the participants and the dependence of their success in using social media on the socio-economic status of the family, as well as the level of education in the family. According to the number of studies, these are the key factors predicting success in learning and using social media. There is also a need for further research on digital literacy of both high school students and teachers. In the present study, the problem was addressed through coaching and expert support. In our opinion, all these research aspects should be carefully studied in the future.
3 Results

An objective study of the academic performance of the participants (Table 1) showed a strong correlation between the mean grades in both groups before and after the experiment (0.81 and 0.97 in the experimental and the control groups, respectively). Thus, it should be assumed that the increase in the mean grade of the experimental group (from 7.77 to 8.76 out of 12 points) is relevant and correlates with the teaching method being discussed. There is also a strong correlation between the performance of the control and experimental groups (0.8). Therefore, teacher supervision and the subsequent check of student tasks, as well as student encouragement greatly affect academic performance in the social media learning environment. In the control group, there were no changes in the academic performance of students (the mean grade increased from 7.63 to 7.76 after the experiment; the change is within the statistical error and may be discarded).

| Table 1. An objective assessment of the participants (on a 12-point scale) |
|-------------------------------------------------|----------------|----------------|
|                                                 | Experimental group | Control group |
| Mean grade                                      | before the study  | after the study | before the study | after the study |
| Mean grade                                      | 7.7727273         | 8.76515152      | 7.639705882      | 7.76470588     |
| Average deviation                               | 1.8965252         | 1.29508671      | 1.828494984      | 1.85486465     |
| Correlation                                     | 0.8079206         | 0.975122        |
| Correlation between the final grades             | **0.807552**      |                |

Figure 1 shows the distribution of the number of social media logins made by the study participants for educational purposes. The students were asked to use a special tag when they used the network specifically for the purpose of solving educational problems. The margin of error limits are also indicated in Figure 1. The graph shows that all data is relevant and the comparable values are beyond the mutual margin of error.

Obviously, it can be concluded that the experimental group uses social media much more actively compared to the control group, where the indicators are 2.5–3 times lower. The activity of the control group is due to the fact that the participants could also receive the same services as the experimental group participants, but only at their own request and as an extracurricular activity. Regular declines in social media activity were observed on Saturday and Sunday when school classes were not conducted. It should be noted that at the weekend the activity of the experimental group also decreased, but it still remained noticeable.
Fig. 1. The use of social media distributed by time

Table 2 shows the total number of references to educational materials throughout the study period in both groups and their distribution by characteristics. In the experimental group, the largest number of social media logins was made in order to access and process educational materials, as well as to complete the tasks set by the teachers (a total of 9,452 references to various resources). The figure is also due to the fact that some of these tasks were related to the development of digital literacy skills, and not only the work with educational materials. The total number of social media logins in the control group is only 15.16% of the number of the experimental group. The use of independently found sources and extracurricular materials is of critical importance for the research purposes. In the control group, these indicators are 8.51% and 9.52% of the number of social media logins made by the experimental group, respectively. Thus, in the experimental group, the increase in digital literacy and the possibilities of using social media as cognitive tools exceeded the control group indicator by more than 10 times.

At the same time, in the control group, social media were mainly accessed for educational purposes to contact teachers and other students. Based on the experience of the MOOC and other sources [25], most students studying without external control tend to skip exercises and have insufficient motivation to complete the course.

Table 2. The way educational materials are used

|                  | Request for the help of users/the teacher | The use of available sources | Independently found sources | The use of extra curricular materials | Total |
|------------------|------------------------------------------|------------------------------|-----------------------------|---------------------------------------|-------|
| Experimental group | 1247                                     | 9452                         | 329                         | 126                                   | 11154 |
| Control group    | 1552                                     | 1214                         | 28                          | 12                                    | 2806  |

Figure 2 shows the use of social media for educational purposes according to the characteristics described above. The graph clearly confirms that social networks are not
commonly used as cognitive tools; however, special training programs greatly contribute to the process.

**Fig. 2.** The use of social media (experimental group)

According to Figure 3, it can be concluded that the control group scarcely uses social media as cognitive tools; thus, this indicator remains within the statistical error. At the same time, most logins (55.31%) were made for communicative purposes as evidenced by many other studies on the use of social networks as a tool means or basis for education.

**Fig. 3.** The use of social media (control group)
The results of the objective study of the purposes of students in using social media before and after the experiment are presented in Figure 4 and Figure 5. The data is expressed as a percentage of the number of references to a particular resource for a specific purpose. In this case, the time of using a particular resource is not considered; however, it can be a very important and relevant indicator that is not in the scope of the present study and requires further research.

A close correlation between the results in the control and experimental groups is observed before the experiment. The largest number of references to resources is associated with entertainment (71.16% in the control group and 70.23% in the experimental group). The use of social media for communication is also noticeable (22.76% and 21.22%, respectively). The data generally agrees with similar data described in other studies [26], [25].

![The purpose of the social media use (before the experiment)](http://www.i-jet.org)

**Fig. 4.** The purpose of the use of social media (before the experiment) (%)

After the one-month course, there were completely different results. At the same time, the use of social media for entertainment decreased in the control group (up to 65.55%) while there was a very interesting phenomenon in the experimental group: the use of social media for entertainment, cognition, and communication was 30.11%, 36.15% and 31.01%, respectively.

It should be recognized that the result is largely determined by the active influence of the curriculum and the regular daily experience of using social media to complete the school curriculum. Based on the findings of our study, we cannot conclude whether these results will be stable and fixed in the behavior of the experimental group participants for long. This is a limitation of our research, and the aspects of fixing changes in the use of cognitive tools in social media require further careful study.
The purpose of the use of social media (after the experiment)

![Bar chart showing the purpose of the use of social media (after the experiment)](chart)

**Fig. 5.** The purpose of the use of social media (before the experiment) (%)

It is obvious that the use of social media for obtaining information has not changed much, which may be due to the participants belonging to a certain social and age group. Adolescents of this age are usually little involved in social life, political choice, social and economic activities, and housekeeping; therefore, they do not need this kind of information. This aspect of the research also requires further study.

### 4 Discussion

The studies on the use of social media in education are mainly focused on either their negative effects on academic performance and well-being of students [8], [18], [27], or the use of social networks in integrated e-learning and mobile learning processes [17], [28]. In the latter case, social media are used as a “vehicle” to ensure the exchange of educational information. Over the last five years, there have been a number of studies considering the features of using social media and the ways they can be used for pedagogical purposes. Most studies rely on constructivism, which allows investigating the construction of the reality model as it occurs in the exchange of information in the network [25].

In particular, it has been found that there are some gender differences in the use of social networks. On average, women spend more time on social networks, create more independent content, and share it more often [14], [29], [25]. This feature can be observed in the early school years if children at this age already have access to communication technologies [30]. Three key factors in the use of social networks have been identified: the consumption of content (including content determination, search and selection), content sharing and content creation. At the same time, researchers believe that content sharing is the most positive factor in influencing adolescent users. The actions
of the vast majority of users are reduced to this activity [31], [32]. There are dramatically different strategies of the content use at school, in the classroom, and outside of the classroom curriculum. The consumption of content outside of the classroom is characterized by a decrease in social activity, a decrease in creativity (content creation processes); however, it is generally more intensive. Most of this activity relates to the consumption of entertainment content. It has been noted that when social media are used in the learning process, most users aged 6-16 prefer to distinguish their own social life in the network and the learning processes. A lot of students have difficulties associated with the need to keep teachers “close” or identify, select, and like educational information that does not match their socialized personality, which they promote on social media [4], [10].

It has been revealed that there are different groups of social network behavior predictors that determine involvement in social media inside and outside the classroom. Moreover, in the school context, there are more of them and the creative component of user activity is much higher. The research has also revealed two most important contextual factors that dramatically affect user behavior in social media: the level of education and socio-economic status of the family. The latter factor is still relevant from the perspective of the availability of personal electronic devices that provide children and adolescents with the access to social media. At the same time, it has been found that users coming from low socio-economic households were prone to blog and generate their own content compared to those from wealthier families who tend to consume or share the content.

The studies on the digital literacy phenomenon are also closely related to the integration of social media into the life of society. Researchers acknowledge the fact that today there is no clear or universally accepted definition of digital literacy. A number of researchers define it as the ability to use electronic devices, programs, the Internet and various communication protocols between them. This definition is close to “computer literacy”, which is the term used for a long time in Russia. According to other scientists, it is the use of information mechanisms, primarily blogs, information exchange and search, communication with other participants in social networks, etc. [2], [20].

It is very important to understand the essence of motivation in order to use social media in education. The study of the adequacy of self-esteem of young schoolchildren provided interesting findings. Self-esteem implies a high level of self-awareness; it has been concluded that the creation of special conditions, including the lack of competition between participants, the development of simple articulation tasks and the absence of the need to make up complex sentences allow children to perform an adequate and accurate assessment of their knowledge and skills [33]. A number of studies also confirm that the use of social media, in particular blogging and micro-blogging, improve writing skills, lengthen the sentences used, and enlarge the vocabulary of users [19], [12]. In addition, there is an improvement in the cognitive processes of those who actively use social media under teacher supervision or in the context of their conscious goals [27]. The present study relies on this data. The fact most users who do not have external motivation and are not supervised by the teacher use social media as a means of entertainment or communication has been confirmed.
5 Conclusion

The research hypothesis that the use of social media as part of a school curriculum under the supervision of teachers and based on the use of appropriate pedagogical methods to encourage independent information search increases communicative activities on social networks, improves academic performance and changes the preferences of the experimental group participants by making them use social media as a cognitive tool has been fully confirmed. In the experimental group, the use of social media for entertainment, cognition and communication is balanced (30.11%, 36.15% and 31.01%, respectively). We can consider it as an indicator of achieving a certain level of digital literacy and self-control when using social media. The academic performance in the experimental group has increased (from 7.77 to 8.76 points on a 12-point scale), while in the control group, which did not actively use social media, the mean grade has not changed. The experimental group also showed the ability to independently use social networks as a means of cognition for the search and use of extracurricular materials. At the same time, in the experimental group, this indicator was 10 times higher than that of the control one. The present research should be expanded through a more careful study of the socio-economic and gender aspects of the use of social networks. The research findings can be used to study and integrate social media into traditional classrooms. Social media can help students increase digital literacy and master the skills of the 21st century, including the use of social media as one of the tools of cognition.

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