The Smart Phone in Education: A Review of Current and Potential Use Among Students.

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Abstract

Background: Technology advancement had an impact in almost all the sectors and education sector is also among one of them. These days' students are also using smart phone for academic purpose. Now it is possible to perform many functions using smart phone like communicating via email, performing internet searches and using specific applications. In technology industry smart phone is one of the fastest growing sectors and popularity of smart phone has gone tremendously. **Objective:** The objective of this paper is to describe the role of smart phone in education. The aim here is to highlight the ways in which Smartphone can enhance academic performance, lifelong learning and communication. And also what evidences are there of smart phone increasing engagement of students with their studies? **Methods:** A review was conducted on all published papers on the uses of the Smart phone that could be applicable to the field of education. **Results:** We have identified 20 studies and found many uses of Smartphone for the academic purpose; also we found very high quality papers that can help us to understand how to make best use of this technology for academic purpose. **Conclusions:** The role of Smartphone is very promising and exciting in education, although more studies are needed to better understand the role of it in this field. As nearly billions of people are using Smartphone, it has certainly vast potential to create right kind of learning. Although this study supports digital learning, higher educational institutions in developing countries are yet to exploit its full advantage.

Keywords: Smartphone; technology; education; Android; iPhone; BlackBerry; mobile phone

1. Introduction

The advancement in smart phone is conti-nuously growing. It has dramatically changed the way we work and communicate. It has become one of the most prevalent ICT devices. Smart phone is capable of advanced functions there by affecting our personal life as well as our work environments. Like any other sector educational sector is also experiencing the resounding effects of the Smartphone. In fact, it may be among that sector where the impact of smart phone is so intense. As these days Smartphone is very common among students. (Smith, 2013) people use smart phone for wide range of purposes and they are found everywhere. Smart phone has become important part of everybody life irrespective age, gender, income or place of living. People prefer smart phone over computer and laptops and in some cases over radio and television too. Like people use smart phone to watch news or sports highlights. Uses of Smartphone are many like search for information, online shopping, online banking, entertainment, preparing homework and learning. The purpose of this paper is to study the academic use, advantages and impact of smart phone among the students. Although there are studies which talks about the positive impact as well as negative impact of smart phone on academic performance. But in this paper the focus is only on the positive impact of smart phone on academic performance of students. Finally, it was concluded that if one use smart phone efficiently then it may prove to be very beneficial and can enhance the academic performance of the students.

2. Methods

Database Search

We searched the following databases Scopus, Web of science; Science direct, Emerald, Taylor and Francis, Google scholar search engine was also used for the literature review. Following key words were used to search for the related articles - Smartphone*, smart phone*, mobile phone, academic performance, students, and educational technology. Boolean operator OR and AND were used to combine all the terms. Our Scopus search used the following keywords: Smartphone*, smart phone*, academic performance, and was combined with education to narrow our results. We limited our search to journals written in English in both databases. Studies conducted during the last five years are included. These searches
were conducted over a period of 6 month, from February 2019 to August 2019.

Search Criteria

In search criteria only those articles were included that either demonstrate particular role of Smartphone for academic purpose or discussed its implications. For the purpose of this paper Smartphone is defined as- "Smart phone is a kind of

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mobile phone that connects to the internet and can be used as a small computer". It has advanced features like WiFi connectivity, high resolution touch screen display, web browsing capabilities, and downloaded applications. Theses smart phones run on popular mobile operating systems: iOS, Android, Symbian, and Windows Mobile. A search criterion includes any article or review that discuss the role of smart phone in the field of education. These roles included social networking, lifelong learning or continuing education with the help of Smart phone. Additionally, those papers are not included that demonstrate the negative impact of smart phone on academic purpose.

3. Results

Search Results

From the database search, 300 articles were retrieved (Figure1).On the basis of the review conducted of a title and abstract, 50 articles were identified for detailed review. Out of these 50 articles only 20 articles meet the eligibility criteria. These articles were further subdivided into the following categories: (1) Augmented reality on mobile device, (2) Networked Learning, (3) Power of gaming to increase student understanding, (4) Student reference app.

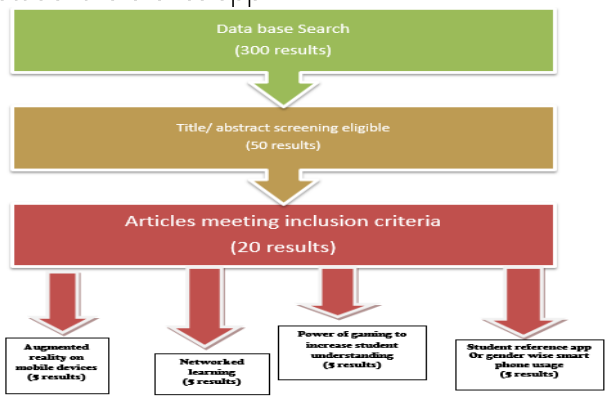

Figure1. Flow diagram of the process of article selection and results

Augmented reality on mobile devices

Our literature search found several examples of the use of mobile augmented reality. Augmented reality is related to the concept of virtual reality (VR). VR attempts to create an artificial world that a person can experience and explore interactively, predominantly through his or her sense of vision, but also via audio, tactile, and other forms of feedback

((Iftene and Trandabăț, 2018) developed four AR applications for different types of children- children with autism, Kindergarten children, middle-aged children, high school children. The purpose was to see the impact of AR applications on children as well as on teachers and also how it is accepted by children. It was concluded from the discus-sion with teachers and students that use of images, 3D models, sound and animations attracts more students than classical teaching methods. Students retain new information more easily, and it also contributes to stress free testing environment.

In another study-the author assess whether it is feasible or not to use to use AR on mobile devices for academic purpose (Fonseca et al., 2014). And also analyze is there any change in academic performance and student participation after using AR. Case study method was followed in this study. It was concluded that use of mobile device was highly correlated with motivation but signify-cantly correlated with academic achieve-ments.

(Cieza and Lujan, 2018) conducted study on children over 4 years old. And the purpose was to improve the level of learning through the use of educational mobile application of augmented reality. It was concluded in this study that implementation of mobile educa-tional applications has improved the learning level and academic performance.

Another comparative study was conducted between augmented reality (AR) environment and in class environment to see the impact of learning performance among engineering students(Guo, 2018). Augmented reality (AR) environment has proved to be beneficial for engineering education and training and there have been improvements in academic performance of engineering students.

AR technologies offer opportunities to present information in an effective way as it has become great necessity for educators. AR helps to concretize abstract concepts, and enhances the sense of reality, which in turn is a huge contribution to learning. By finding empirical studies from the literature, limita-tions and advantages of AR were presented in this chapter (Kurubacak & Altinpulluk, 2017).

Networked learning

For nearly a century a wise saying "It's not what you know, but who you know" has been considered true for professional success. During this time social networking was considered important for professional success (Rajagopal et al., 2012). It was argued by Castells that the adoption of modern information and communication technologies (ICTs) would lead to a new form of "network society" based on affordances for decentralized and interactive communication (Castells, 2010). The relationship between social networks and learning has dramatically changed. In our current era every activity, every knowledge artifact, and every worker may be connected with every other (Spinuzzi, 2007). Organizations have become flatter, less hierarchical, and individuals have increased autonomy and greater responsibility for highly situated problem solving that leverages informal social networks (Cross et al., 2002) Hence, in order to get your work done it has become important for contemporary professionals to create, maintain, and active on social networks (Nardi et al., 2002). Recent studies have shown that it is advantageous to have structu-ral position in networks for professional success

because it enhances opportunities for learning ,the advantage result as a by-product of processing diverse information (Burt et al., 2013).

We find numerous studies, on social media usage among students. (Anders, 2018) it is a case study, in which network learning strategies were used to promote self efficacy for social networking and professional development among undergraduate students of business communication. It was found in this study that networked learning promote self efficacy among students. Social networ-king with professionals contacts offer learning opportunities and enhance academic learning and lifelong learning for professional development.

This study differentiate between task related and non task related compulsive internet use and also analyze how social media activity effect academic performance of the students (Chang et al., 2019). The findings of this study revealed that academic type social media activity and task related compulsive internet use has positive effect on student's academic performance. If students use social media to access educational sources, material and contents then it will help them in gaining academic skills and knowledge. It was also highlighted in this study that student with low academic grades can also improves if they use internet properly.

(Ooi et al., 2018) conducted study on the use of mobile social networks such as Face book and You Tube for learning purpose. It was assumed in this study that smart mobile devices are used to access these platforms. Findings of this study revealed that once the learner discovered that MSLP are useful and easy to use in learning they will develop high level of satisfaction and will continue to use it for academic purpose.

(Whelan et al., 2020) use SOBC (Situation Organism Behavior consequence) model w to analyze the effect of social media overload on academic performance of university students. Both qualitative and qualitative data was used for this study. Qualitative data was collected through interview, and quantitative data was collected through online survey. Data was analyzed using partial least square (PLS) approach using the Smart PLS software. The study suggests that social media overload decrease self-regulation, which is vitally important for high academic performance.

(Giunchiglia et al., 2018) measure social media usage and academic performance. Academic performance was measured using GPA (Grade point average) and CFU (Credito Formativo Universitario). Time diaries were employed in this study to acquire information on average amount of time spent on different activities during a day. The findings of the study show that Mobile social media usage negatively affects academic performance if students are not managing their time effectively.

Power of gaming to increase student understanding.

Across diverse societies games have captured human motivation for thousands of years. In modern times, it has converted into addiction. According to ((McGonigal, 2011) Angry Birds has been downloaded more than 1 billion times and more than 10 million subscribers have spent more than 50 billion hours playing World of Warcraft. The typical gamer, comprising some 40% of the population, is now 20–34 years old and nearly half are women (Johnson et al., 2013). This increase in the gaming population has led to a culture of college students who may be more readily prepared to engage in game-based activities for serious learning. This has led to the gamification of educational materials and courses.

The study was conducted to check how gamified mobile learning app affect student's academic performance and increase their engagement in the subject (Pechenkina et al., 2017).App was created to effectively engage students in lecture content, multiple choice content base quizzes were directly sent to students' personal mobile devices. It was found that with the introduction of app there was increase in student retention rate and academic performance and positive correla-tion was found between students' scoring highly on app and achieving higher academic grades. (Chapman and Rich, 2018)- The study was conducted on undergraduate students of organizational behavior to find answers of the following important questions- Does educational gamification increase student motivation in learning if yes to what extent? It was concluded in this study that as compared to the traditional course students find gamified course more motivatating. Gender, age and student status does not affect the motivation level for the gamified course among students. (Atwood-Blaine and Huffman, 2017) the purpose of this study was to analyze the impact of mobile game, on students' interaction in science center. To encourage the engagement in science the game used QR scan codes and a challenge-based game structure. In this study iPad based mobile game was created using ARIS (Augmented Reality and Interactive Storytelling).Gender differences in game play behavior was also compared. Findings of the study revealed that female students outperformed the male students. (Seow and Wong, 2016) presented the first mobile gaming app for learning accounting. The purpose of the app was to motivate and to generate interest of the students to learn accounting in a fun way, outside of the classroom. This app is freely available in Android and iPhone/iPad version. The survey revealed that students were satisfied with the app and there was positive feedback for the app. (Bartel and Hagel, 2014) presented game based learning concept on mobile devices. The purpose was to promote student engagement using gamification approach.

Mobile app for educational use

Increased engagement with mobile apps is an

emerging trend with people today. The term 'app' is a shortening of the term 'application software.' An app is typically a small, specialized program downloaded onto mobile devices (Briz-Ponce and Juanes-Méndez, 2015). An app can operate on Smartphone, tablet computers, and other mobile devices. With the ability to be selective regarding which apps to install, apps have contributed to the process of customizing and personalizing mobile devices.

(Wai et al., 2018) conducted study in Hong Kong on undergraduate students. The purpose was to examine the usage of mobile apps for learning purposes. It further analyze the relationship between students' perceived usefulness (PU), perceived ease of use (PEOU), and overall attitude (OA) towards the use of mobile apps along with their learning behavior, with reference to the technology acceptance model (TAM)(Davis, 1993). It was found that there is frequent use of mobile app by undergraduate students of business, education and engineering. They use mobile app for learning activities related to their academic studies. While using mobile app student's manly focuses on communi-cation and collaborative working, assessing academic resources, and checking a dictionary.

(Linnhoff and Smith, 2017) The study was conducted to evaluate the usage of mobile app by college students; at the same time the aim of this study was also to analyze the relationship between app usage and one's satisfaction with life. According to study person's level of mobile app usage and his/her level of satisfaction with life are correlated with each other. It was also found that usage of mobile app by females is more as compare to males. (Fakokunde, 2017) examine awareness of the students on educational use of mobile phone. It was found that majority of students were aware of educational use of mobile phone. It was suggested that mobile phone should be incorporated in the curriculum planning, at the same time appropriate rules and regulation should also be placed to guide the use of mobile phone within the school environment. (Zakaria et al., 2019) design Economics mobile app for learning economics terminology. The purpose of this app design is to build student understanding and knowledge of the economics termino-logies, process the information for long term retention and increase their interest in the subject. The details of the app were explained in this study. (the Foreign Language Center, Feng-Chia University, Taiwan and Wang, 2017) develop a mobile app to improve college students' English vocabulary learning. Twenty-four vocabulary learning units for students were design to be use in one academic year. Thirty words every week were expected to learn from students. Pilot study was conducted to know the student opinion towards the app. It was concluded that student motivation for learning and self- Study habits can be built using mobile app.

4. Discussion

Data base search were summarize identifying how the Smartphone is being used in education. Focus was on the data that shows that smart phone positively affect academic performance. With respect to augmented reality on mobile devices various ways were found of it for using it for educational purposes. We identified research attempting to provide evidence that the smart phone has advantages in this area; however much of this is still in the preliminary phase in developing countries. Augmented reality is used in various different field of education - engineering, medical and management etc. AR system provide engaging environment conducive for learning. It motivates the students and creates interest in the subject. With respect to augmented reality on mobile devices, we found various studies of learning through augmented reality. AR has been gaining widespread use in education. We found various studies that provide evidence that Smart phone have advantage in this area. Although Augmented Reality technology is not new, it's potential in education is just beginning to be explored. Educators should work with researchers in the field to explore how these characteristics can best be applied in a school environment. There are few challenges also while using augmented reality like cost and health issues. Because of the cost associated with it, AR may be out of reach for many students. Students may suffer from some health issues also like nausea, anxiety, eye strain etc.

We found wide range of studies on networked learning which speaks about improvement in academic performance of students through networked learning. Although, there are studies which give evidence of negative effect on academic performance if students use social media excessively and do not manage their time effectively.

Wide range of studies was found of networked learning by students and it makes students self-sufficient. It can also be concluded from these studies that, student perceived networked learning is relevant for lifelong learning and for their professional development. However, higher educational institutions in developing countries are yet to exploit its full advantage for better student engagement.

Not surprisingly, we found a larger number of articles that discussed ways in which the mobile gaming is improving the way students take the concept of the topic. These results suggest that teachers play an important role in the use of mobile gaming for learning; however, drawbacks such as mobile addiction may produce new issues. Students of all ages, races, income levels, and educational levels love virtual reality and teachers are finding that students who were previously disengaged from learning are becoming engaged and sharing their enthusiasm and excitement with others in their

classes and want to learn more. Students love playing with their Sony PlayStations and other gaming equipment. They are fun, engaging, and interactive. Virtual and augmented reality combines fun, learning, and entertainment. With the power of VR, students can visit places and cultures all over the world from the comfort of their VR headsets and other equipment. They can visit the ruins in Maya, the great pyramids of Egypt, the opera house in Sydney, and climb Mount Kilimanjaro all without leaving their classroom. With the richness of VR, students are more motivated, engaged, and excited about learning. Rather than learning about history, students are now living, learning, and loving it! We found it interesting that many people are looking into using the Smartphone for remote regions where students do not have access to proper resources. It is easy to imagine the huge benefits that could be reaped in resource-poor regions of the world.

In the future, Students may not need to see their teachers or mentors in person as often. Many examples of Smartphone's use in education were found. For example, at Stanford University's medical school all students are given an iPad to use in place of text books. Online resources are easily accessed. As the role of the Smartphone continues to grow, we can only expect that its role in education will expand with more institutions incorporating it into their curriculums. However, we need to have better evidence to support both its use and methods of how best to use it.

5. Conclusion

Smart phones gain a significant place among the students and working group. There are many applications freely available online. Such Apps can be easily downloaded and stored on any handy device. This paper has emphasized that students could use smart phones for academic purposes extensively from simple reading, browsing and downloading academic materials. It has wide impact on their academic performance which will boost their interest through class participation, enhancement of learning skills, preparation and submission of assignments on time. In future empirical studies may be conducted to investigate the academic use of smart phones and its effect on academic performance.

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