

A Review of Technology Advancement (Use of Smartphones) as a Communication Tool in Supporting the Students Learning Literature: A Mini-Review Approach

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Abstract

In the modern era, technological advancement has changed our way of life more rapidly, especially in education. One form of developments in technology is smartphones. The smartphone has become an effective and efficient teaching tool and communication medium in delivering a world education course. The present study attempts to comprehend the use of technology advancement (smartphones) as a communication tool in supporting the students learning through a review of literature collected from the various relevant sources. This study designed using a qualitative approach through review literature. Reviews on technology advancement (smartphones) and students learning style were conducted by reading and analysing 30 peer-reviewed journal articles and summarised in two tables, namely article journal and publisher distribution and article category on the basis of the subject. The analysis shows that technology advancement (smartphones) and education communication significantly affect students' learning. In conclusion, this study has proved that using smartphones as an education communication tool is an excellent medium for supporting teaching and learning activities. Thus, we recommend that teachers improve their skills in mastering learning media. In this case, smartphone technology based on android as support and efforts to improve learning in schools with a more orientation towards teacher work in educating students in class and communicating with students through several approaches using smartphones can support positive learning activities.

Keywords

Educational communication, technology advancement (use of smartphones), and student learning style

1. Introduction

In education, we cannot separate the current learning process from information and communication technology. The goal is to improve learning that is more interesting, active, and creative. It is hoped that learning that uses information and communication technology can improve the quality and quality of learning. In the learning process, the existence of well-established educational communication between teachers and students has a very important role in arousing students' enthusiasm for learning. Also, to increase the students' enthusiasm for learning is the carrying capacity of the devices they have, namely smartphones. In times like this, the use of information technology continues to grow rapidly, and a student can reach various information through the hardware, one of which is a smartphone. This smartphone has more uses it. use than computers today, which all people, both rich and poor, can use it because it is more affordable (Marler, 2018)

It changes the old situation and the old view when students' reach is limited to classrooms or school buildings. Smartphones should not be used in studying, and only people who have them have smartphones, but now the reality is different. According to Rosenberg (2001), the development of ICT media has led to a shift in the learning process. Whenever, from paper to "online", from physical facilities to network facilities (Mallampali, 2021). In various concept learning activities above have begun to be widely used in several schools. Still, technology arrives there at the development stage, but technology is now gradually starting to shift the factual situation to become virtual. The emergence of distance learning using smartphones begins with the transformation (shifting) of the socio-technological value of the relationship between humans and machines. These human needs are increasingly forced to be adjusted to conditions that appear in various content applications whose function is to help humans.

Continuous education in using smartphones also needs to be held, given that this device will certainly develop every year as an effort to update the ability to use this smartphone device (Czerkawski et al., 2021; Bigema et al., 2021; Dore, 2020; Hammer, 2021). During this pandemic, almost all educational institutions have begun to close, and learning is mostly carried out online or online. Many students learn using smartphones, and online classes are also attended by all students (Ogbonnaya, 2020). At the start of this implementation, it was quite difficult to get used to it. Teachers and various education practitioners use online learning tools for their students. It requires the readiness of all teachers to do online learning. Several findings indicate that teachers are digitally literate, and most teachers access online learning using smartphones. Thus, the present study attempts to comprehend the use of technology advancement (smartphones) as a communication tool in supporting the students learning through a review of literature collected from the various relevant sources.

2. Method

This qualitative study utilises the mini-review approach, which focuses on technology advancement (smartphones) and the students' learning by reading through and analysing 31 peer-reviewed journal articles. These articles are summarised in the tables below. The first table presents the journal article's information regarding the title, authors, publishers, and publication year. The second table represents the journal articles' contents, including the study's objectives, the findings, and the recommendations.

Table 1. Journal and Publisher Distribution

No	Article Name	Author(s)	Journal	Publisher	Year
1	Structural and functional correlates of smartphone addiction	Juliane Horvatha, Christina Mundingera, Mike M. Schmitgena, Nadine D. Wolfa, Fabio Sambatarob, Dusan Hirjakc, Katharina M. Kuberaa, Julian Koenigd,e, Robert Christian Wolfa	Addictive Behaviors	Elsevier	2021
2	New technology, new role of parents: How parents' beliefs	Hammer, M., Scheiter, K., Stürmer, K.	Computers in Human Behavior	ScienceDirect	2021

	and behavior affect students' digital media self-efficacy				
3	Enhancing Second Language Listening Skills Through Smartphones: A Case Study	Mallampalli, M.S., Anumula, V.S.S., Akkara, S.	Advances in Intelligent Systems and Computing	Springer	2021
4	Pedagogical Considerations for Mobile-Based Augmented Reality Learning Environments	Czerkawski, B., Berti, M.	Advances in Intelligent Systems and Computing	Springer Nature Switzerland AG.	2021
5	Problematic smartphone use in Spanish and Italian university students	Roig-Vila, R., Prendes-Espinosa, P., Urrea-Solano, M.	Sustainability (Switzerland)	MDPI	2020
6	New generation acceptability towards durability and reparability of products: Circular economy in the era of the 4th industrial revolution	Bigerna, S., Micheli, S., Polinori, P.	Technological Forecasting and Social Change	ScienceDirect Elsevier	2021
7	A qualitative exploration of teachers' perspective on smartphones usage in higher education in developing countries	Iqbal, S., Bhatti, Z.A.	International Journal of Educational Technology in Higher Education	Springer	2020
8	Students' Attitudes Towards the Mobile App Used in English Classes	Klímová, B.	Advances in Intelligent Systems and Computing	Springer	2020
9	Technology and Media Use in Preschool Classrooms: Prevalence, Purposes, and Contexts	Dore, R.A., Dynia, J.M.	Digital Learning Innovation	Frontier	2020
10	Students' Perspective on Online Medical Education Amidst the COVID-19 Pandemic in Nepal	Nepal, S., Atreya, A., Menezes, R.G., Joshi, R.R.	Journal of Nepal Health Research Council	J Nepal Health	2020
11	The parents' tale: Why parents resist the educational use of smartphones at schools?	Hadad, S., Meishar-Tal, H., Blau, I.	Computers and Education	ScienceDirect Elsevier	2020
12	Control and liking: Examining features of interactions as relational framing cues	Delaney, A.L.	Communication Teacher	Routledge Taylor, Francise Online	2021
13	Study of communication ethnography for entrepreneurship culture in the interpersonal relations of teachers and students	Triwardhani, I.J., Trigartanti, W., Putra, R.P.	Malaysian Journal of Communication	Jurnal Komunikasi: Malaysian	2020
14	Characterisation of interpersonal communication in the teaching-learning process	Ronquillo, M.J., Martínez, R.A., López, G.B.	Revista Electronica de Investigacion Educativa	Redie	2020

15	Student teachers' perceptions of trust during the team practicum	Waber, J., Hagenauer, G., de Zordo, L.	European Journal of Teacher Education	Taylor Francis Online	2020
16	Mastering Interpersonal and Virtual Communication Skills of the Education Process Participants in E-learning	Volchenkova, K.N., Evsina, E.V., Elsakova, R.Z., Serebrennikova, E.V., Batina, E.V.	Proceedings of the 2019 IEEE International Conference Quality Management, Transport and Information Security, Information Technologies IT and QM and IS	IEEE Xplore	2019
17	Mobile phones and inequality: Findings, trends, and future directions	Marler, W	New Media and Society	Sage Journals	2018
18	Accumulating phones: Aid and adaptation in phone access for the urban poor	Marler, W.	Mobile Media and Communication	Sage Journals	
19	Move to online learning during covid-19 lockdown: Pre-service teachers' experiences in ghana	Ogbonnaya, U.I., Awoniyi, F.C., Matabane, M.E.	International Journal of Learning, Teaching and Educational Research	International Journal of Learning, Teaching and Educational Research	2020
20	A blended learning system to improve motivation, mood state, and satisfaction in undergraduate students: Randomised controlled trial	Lozano-Lozano, M., Fernández-Lao, C., Cantarero-Villanueva, I., (...), Arroyo-Morales, M., Galiano-Castillo, N.	Journal of Medical Internet Research	JMIR publication	2020
21	Mobile Learning Design Using Gamification for Teaching and Learning in Algorithms and Programming Language	Tundjungsari, V.	Advances in Intelligent Systems and Computing	Springer	2020
22	Augmented reality application to develop a learning tool for students: Transforming cellphones into flashcards	Sharmin, N., Chow, A.K.	Healthcare Informatics Research	HIR	2020
23	Virtual reality in foreign language training at higher educational institutions	Symonenko, S.V., Zaitseva, N.V., Osadchyi, V.V., Osadcha, K.P., Shmeltser, E.O.	CEUR Workshop Proceedings	CEUR Workshop Proceedings	2020
24	The usage of e-book as learning media through the sigil application in history	Imansari, A., Umamah, N., Na'Im, M.	IOP Conference Series: Earth and Environmental Science	IOPscience	2019
25	Gender Differences in Motivation to Learn Math	Fahuzan, K., Santosa, R.H.	Journal of Physics: Conference Series	IOPscience	2018

	Using Role Play Game in Smartphone				
26	To study the impact of Google Classroom as a platform of learning and collaboration at the teacher education level	Gupta, A., Pathania, P.	Education and Information Technologies	Springer	2021
27	Smartphone use in university students: An opportunity for learning	Dafonte-Gómez, A., Maina, M.F., García-Crespo, O.	Pixel-Bit, Revista de Medios y Educacion	Pixel Bit	2019
28	The development of an educational outdoor adventure mobile app	Michalakis, V.I., Vaitis, M., Klonari, A.	Education Sciences	MDPI	2021
29	Mobile Teacher Professional Development (MTPD): Delving into English Teachers' Beliefs in Indonesia	Saiful, J.A.	International Review of Research in Open and Distance Learning	IRRODL	2020
30	Am I Doing Enough?" Special Educators' Experiences with Emergency Remote Teaching in Spring 2020	Rachel K. Schuck and Rachel Lambert	Education Sciences	MDPI	2020

Table 1 above captures the summary of the journal and publisher distribution. We have reported 30 peer-review articles published in numerous journals and publishers. Further, the following table is presented to list the article's category based on the subject.

Table 2. Articles' Category Based on the Subject

No	Article Name	Objectives	Findings	Recommendations
1	Structural and functional correlates of smartphone addiction	To provide the evidence for distinct structural and functional correlates of behavioural addiction in individuals meeting psychometric criteria for SPA	This study found that widespread use and increasing popularity, the present study questions the harmlessness of smartphones, at least in individuals that may be at increased risk for developing smartphone-related addictive behaviours.	
2	New technology, new role of parents: How parents' beliefs and behavior affect students' digital media self-efficacy	To explore how digital media can be used for teaching but is largely focused on how teachers shape technology use.	Teachers in the classroom, parents at home, may also have a pivotal role in shaping students' beliefs towards digital media which are in turn an important precursor to students' use of technology for learning	Future studies can consider the home factors that influence students' digital media self-efficacy.
3	Enhancing Second Language Listening	To study the role of MALL in enhancing English	The study witnessed a positive impact on the	

	Skills Through Smartphones: A Case Study	language skills among engineering students and examines a) effectiveness and viability of smartphones for second language listening b) issues and challenges faced by learners and teachers, and c) perceptions of stakeholders	participants in enhancing participants' L2 listening skills and improved motivation towards learning L2 listening	
4	Pedagogical Considerations for Mobile-Based Augmented Reality Learning Environments	To study the accessibility, the availability of augmented reality applications for students' Smartphones, and the effective and collaborative capabilities	This paper first reviews empirical studies in learning with mobile-based augmented reality and then proposes situated cognition as a pedagogical framework for the design and use of this technology in educational contexts.	
5	Problematic smartphone uses in Spanish and Italian university students	To understand the smartphone usage profile of Spanish and Italian university students. It also aimed to identify possible problematic uses and the differences in smartphone use (or abuse) between the participating subjects	There are significant differences between the universities: the UA students exhibited more problematic use than the UNISOB students. Therefore, necessary to prepare training programmes that are designed to avert problematic behaviours related to smartphone use.	
6	New generation acceptability towards durability and repairability of products: Circular economy in the era of the 4th industrial revolution	To evaluate to what extent the market is able to sustain durability and repairability of CE characteristics of products included in the 4IR	Results reveal that some variables, such as parental education, household income, and age, positively affect both participation and willingness to pay (WTP) the stated amount.	
7	A qualitative exploration of teachers' perspective on smartphones usage in higher education in developing countries	To capture the views of faculty members regarding usage of Smartphones for promoting learning at the tertiary level.	Smartphones to be an effective medium for off-campus learning and communication with peers and students. Smartphone is suitable for explaining complex topics to their students as audio-visual content available over the internet can easily be shared.	

8	Students' Attitudes Towards the Mobile App Used in English Classes	To discuss students' attitudes towards the mobile app used for learning vocabulary and phrases in English classes at a university level.	The results showed that the positive aspects of the mobile app prevailed over the negative ones. The mobile app helped students prepare for the final achievement test. Learning was less stressful; interacting with the app helped students retain the English vocabulary better and become more confident in their learning. Also, using the app gave students confidence.	
9	Technology and Media Use in Preschool Classrooms: Prevalence, Purposes, and Contexts	To provide a picture of technology and media use in preschool classrooms.	Results indicated that tablet and computer use were most common, whereas smartphone and television use was less prevalent. Teachers reported most frequently using tablets, computers, and smartphones for instructional purposes. Television was most frequently used for entertainment.	
10	Students' Perspective on Online Medical Education Amidst the COVID-19 Pandemic in Nepal	One month into the lockdown all the medical colleges in Nepal started online classes to keep pace with the academic calendar	Most of the students used smartphones to attend online classes; broadband internet service is the internet source in 65.5%. Two-thirds of the students rated online classes to be poorer than the traditional classroom teaching and 77.8% preferred traditional classroom teaching in the future.	
11	The parents' tale: Why parents resist the educational use of smartphones at schools?	This study examined the level of parental resistance to the use of smartphones in schools, as well as the predictors and the factors underlying parental resistance	Authoritative parenting style was found to be a negative predictor of parental resistance. Implications of the findings are discussed concerning educational theory and the challenges of policymakers who cope with parental resistance towards the integration of	Future studies can discuss educational theory and the challenges of policymakers who cope with parental resistance towards the integration of smartphones in school learning

			smartphones in school learning	
12	Control and liking: Examining features of interactions as relational framing cues	To study the dominance-submission frame positions interactants to attend to attempts to control behaviour or establish status, while the affiliation-disaffiliation frame attunes a person to appreciation or esteem.	This study found the activity and their reflection through discussion, and students consider relational inferences they make daily in their interactions.	
13	Study of communication ethnography for entrepreneurship culture in the interpersonal relations of teachers and students	To study communication ethnography for entrepreneurship culture in the interpersonal relations of teachers and students.	With this activity, students apply the vocabulary and principles of RFT as they examine hypothetical interpersonal interactions. They consider distinct features of the interaction and ways those features might prompt different interpretations of messages	
14	Characterisation of interpersonal communication in the teaching-learning process	To study the shift to Emergency Remote Teaching (ERT) presented challenges to special educators of students with significant support needs who often benefit from strong interpersonal connections, modeling, and the use of physical manipulatives	The teachers reported three distinct ERT stages: making contact, establishing routines, and transitioning to academics. They also discussed the challenges they faced during this period, such as the inequity in resources amongst their students, needing to rely on at-home support to teach students meaningfully, and changes in what it meant to be a teacher while having to teach online	
15	Student teachers' perceptions of trust during the team practicum	To examine the positive and trusting relationships with the team partner and the mentor teacher are at the core of such internships and form the basis for optimal learning experiences and successful cooperation in the practicum	The results reveal that many different facets contributed to student teachers' perceptions of trust. These could be divided into two main dimensions: interpersonal and professional trust.	
16	Mastering Interpersonal and Virtual	To study online education is favourable for mastering both interpersonal and	The article gives the theoretical background of the research studying	

	Communication Skills of the Education Process Participants in E-learning	virtual communication skills of all the educational process participants	different communication methods of education process participants in the online learning environment. Identifies the specific character of their communication and provides evidence that e-learning impacts the mastering of communicative skills for both groups of participants.	
17	Mobile phones and inequality: Findings, trends, and future directions	To examine the effects of socioeconomic disparities on poor and minority communities.	Conclusions about the nature and extent of cellular effects vary across research areas, including digital inequality, social networks, and coordination and mobility.	Future studies can use the phone capabilities, user motivation and habituation, popular cell phone use, and certain adverse conditions shape outcomes for marginalised populations.
18	Accumulating phones: Aid and adaptation in phone access for the urban poor	To investigate the poor stay connected to phone service and mobile internet through the possession of multiple phones, including those subsidised by government aid.	This study identifies three functions for phone accumulation as a strategy for maintaining phone access: to back up other phones, to build up capacities across phones, and to share phones with others in need.	Future studies can adapt the policy to the needs of low-income phone users.
19	Move to online learning during covid-19 lockdown: Pre-service teachers' experiences in Ghana	To study the pre-service teachers' preparedness for online learning in terms of their digital literacy and technological devices used for online learning, their positive online learning experiences, and the challenges they encountered learning online.	The findings are pre-service teachers digitally literate and mostly accessed online learning using smartphones. Online learning enabled them to communicate and collaborate actively with their course mates and lecturers.	
20	A blended learning system to improve motivation, mood state, and satisfaction in undergraduate students: Randomised controlled trial	To examine the short-term effects of a blended learning method using traditional materials plus a mobile app—the iPOT mobile learning app—on knowledge, motivation, mood state, and satisfaction among undergraduate students enrolled in health science the first-degree program.	The blended learning method led to significant improvements in motivation, mood state, and satisfaction compared to traditional teaching and elicited subjective improvement statements in English competence.	

21	Mobile Learning Design Using Gamification for Teaching and Learning in Algorithms and Programming Language	The objective of the application is to improve the learning motivation of students in a private university majoring in computer science	The usability testing result shows that the application considered as a usable application for each usability element	Future studies can consider the application's features which are very important to enhance students' motivation for learning algorithms and programming.
22	Augmented reality application to develop a learning tool for students: Transforming cellphones into flashcards	To use the inseparable relationship between university students and their smartphones to create new options for higher education, converting their cellphones into flashcards.	This study developed an augmented reality (AR) flashcard application using Unity3D, which requires the user to identify a target image	
23	Virtual reality in foreign language training at higher educational institutions	This paper deals with the urgent problem of the application of virtual reality in foreign language training.	Virtual reality is remaining a relatively new technology in language learning.	
24	The usage of e-book as learning media through the Sigil application in history	To study the usage of the e-book as learning media through the Sigil application in history	Students are expected to be able to improve learning outcomes and help learn history and students are expected to reach a high level by using literacy after using E-book learning media through the Sigil application in learning history	
25	Gender Differences in Motivation to Learn Math Using Role Play Game in Smartphone	To determine the comparison of students' learning motivation between males and females in learning using a mobile game	As a result of this research, the males had a better score in math learning motivation based on the questionnaire before and after given treatment, but female students made fewer mistakes	
26	To study the impact of Google Classroom as a platform of learning and collaboration at the teacher education level	To assess the impact of Google Classroom Platform on learning at the teacher education level.	The study found that students could access the learning activities easily; they could communicate with other students in their subject electronically; they could decide when they wanted to learn. They could work at their own pace.	
27	Smartphone use in university students: An opportunity for learning	To investigate the habits of use of applications for communication and mobile learning of the higher education students and	The results show that students make of the smartphone, their preferences regarding the use of the device for	

		identify factors that can favour adopting m-learning tools based on the smartphone among university students.	learning and the importance of the playful dimension of m-learning.	
28	The development of an educational outdoor adventure mobile app	To create a system that would exploit all possible Outdoor Adventure Education (OAE) and treasure hunt benefits while excluding possible smartphone use negative consequences	By conducting nationwide research examining Greek secondary teachers' Information and Communication Technology (ICT). During the mobile application development process, we focused on the participatory aspect of the process, paying special attention to the teacher and student evaluation during the design and prototyping phases.	
29	Mobile Teacher Professional Development (MTPD): Delving into English Teachers' Beliefs in Indonesia.	To study the use of cell phones for teacher professional development.	Almost all teachers had very favourable and favourable beliefs about the use of smartphones for TPD, perceiving that a smartphone could facilitate the enhancement of their pedagogical knowledge, communication skills, positive characters and English proficiency	
30	Am I Doing Enough?" Special Educators' Experiences with Emergency Remote Teaching in Spring 2020	To study two elementary special education teachers' experiences as they navigated the transition to Emergency Remote Teaching (ERT).	This study discussed the challenges they faced during this period, such as the inequity in resources amongst their students, needing to rely on at-home support to teach students meaningfully, and changes in what it meant to be a teacher while having to teach online	

3. Results and discussion

Using the review literature, this study found that interpersonal communication has a significant relationship between teachers and students, using smartphones as a medium and a means of learning on student learning motivation. Educational communication has a positive and significant effect on learning motivation. Good and continuous interpersonal communication between teachers and students both virtually and face-to-face will provide students with good self-confidence increasing by learning motivation. A study of educational (interpersonal) communication on student learning motivation has conducted by Klimova (2020), Iqbal (2020), Triwardhani (2020), and Waber (2020). In online learning activities, Ronquillo et al. (2020) and Davonte (2021) stated that several things occur: lack of dialogue, group activities with fellow friends, inadequate personalisation processes, self-confidence, a sense of

inequality, no touch with smartphones, all the problems. Another factor in increasing the enthusiasm for learning comes within these students, namely, a sense of awareness that arises within oneself. The feeling of dependence or smartphone addiction, which impacts physical and mental health in previous research, states that this is inseparable from the influence of self-control and parents' role and there is a negative relationship between smartphone addiction and grey matter volume (GMV). The teacher's process in conducting learning also involves controlling students' parents; communication with parents is carried out periodically. Besides that, the iPad smartphone application provides a means of saving search and filtering to safe surfing for education (Horvatha et al., 2021; Hammer et al., 2021; Hadad, 2020)

4. Conclusion

The use of smartphones today has impacted all aspects of human life. New media such as smartphones currently are favoured by many people will be utilised in education, especially distance learning. The smartphone has become an effective and efficient teaching tool and communication medium in delivering a world education course. The analysis shows that technology advancement (smartphones) and education communication significantly affect students' learning. In conclusion, this study has proved that using smartphones as an education communication tool is an excellent medium for supporting teaching and learning activities. Thus, we recommend that teachers improve their skills in mastering learning media. In this case, smartphone technology based on android as support and efforts to improve learning in schools with a more orientation towards teacher work in educating students in class and communicating with students through several approaches using smartphones can support positive learning activities.

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