

M-LEARNING: USER PERCEPTION AND CHALLENGES IN HIGHER EDUCATION

Dr. DINESH BANSWAL

Assistant Professor, School of Business, Dr. Vishwanath Karad MIT World Peace University, Pune, India.
Email: banswal_dm@yahoo.co.in

Dr. SHUBHANGI V. URKUDE

Assistant Professor, Department of Operations & IT, IBS Hyderabad, IFHE, India.
Email:shubhangi@ibsindia.com

PUNAM CHAUDHARI

Assistant Professor, Department of Computer Science & Applications, WPU School of Computer Science & Engineering Dr. Vishwanath Karad MIT World Peace University, Pune, India.
Email: chaudhari.punam14@gmail.com

Abstract

M-learning, i.e., learning through a mobile device, has become a fad since the early 2000s. Since then, it has removed the time and distance barrier and brought learning to millions of users' fingertips. During the COVID pandemic, M-learning was the only possible solution for learning. With approximately 58% of the population between the age group (10-35), information and communication technology (ICT) has a wide range of users in India. Adaptation and adoption of technology are significant challenges for most learners, especially with the widespread use of ICT. Due to that, learners face many technical, financial, geographical, and learning challenges. The main impact of M-learning and its adaptation to the ICTs is visible in teachers and learners. The teachers have changed their teaching structure and pedagogy, improving their capabilities and bringing out new ways to make learning more comprehensive. The learners have realized that mobile devices are not only communication media but also used as learning aids. Hence, this paper aims to study the challenges and perceptions of users towards M-learning and its use in the teaching-learning process using the survey data collected.

Index Terms: ICT application, M-Learning, Geographical Areas, Financial, Technology adoption.

1. INTRODUCTION

Accessing educational materials using mobile devices is called mobile learning, or M-Learning. With this approach, users can access content whenever and wherever it suits them, empowering learning at the moment of need.

The most crucial component of mobile learning is its emphasis on the learner's mobility; by allowing them to select when and where they want to access learning, they may proceed at their speed, which boosts engagement and information retention.

M-learning became society's building block due to pandemics and gained popularity [1]. Many countries now regard understanding M-learning and mastering the basic skills and concepts of M-learning as part of the core education, alongside reading, writing, and numeracy. M-learning is the application of mobile devices such as smartphones, palmtops, notebooks, and Laptops to enhance teaching-learning. However, there seems to be a misconception that ICTs generally refer to 'computers & computing-related

actions. M-learning is an extension of e-learning through handheld devices such as mobile devices, which are readily available to use by a person of any age group; includes attributes including simplicity, less expensive context switching between applications, on-demand services, high content quality, and accessibility. The application's user-friendliness enhances the flexibility of education delivery, enabling students to access information at any time and from any location. As the process is now learner-driven and not teacher-driven, it may impact how students are taught and how they learn.

Consequently, this would enhance the quality of learning and better equip the students for lifetime learning. Along with allowing for greater flexibility in terms of location, technology-enabled educational programs also eliminate many of the time limitations that affect students with special needs [2]. Students are gaining the competence to undertake education anywhere, anytime, and anywhere.

It is imperative to investigate every available option to assist education, including mobile learning, given the numerous educational issues that nations worldwide face and the effects of the global recession that have further strained the already constrained educational and human resources. The ability of mobile learning to deliver, enhance, and support EFA must be critically assessed, as well as its numerous evolving forms and how many new participants use it. In the development, commercial, and academic arenas, practice, dialogue, and research must all be free from bias and reflective of oneself. Only after that, even as the priorities and values surrounding it are tested, all parties thoroughly investigate and take advantage of the benefits that mobile learning offers.

Student learning can occur inside and outside the classroom through connected learning. It may enable these possibilities for learning or augmented by technology, people, and experiences. To create an individualized yet complete educational experience, our educators are responsible for assisting students in connecting all of these varied learning opportunities. The combined learning model is one pedagogical foundation for using mobile devices in learning.

Even though mobile learning is not a new area, in recent years, it has attracted significantly more interest from both established mobile learning academics and practitioners and newcomers to the field. The vastly increased availability of mobile technology, the growing body of research demonstrating the educational effectiveness of mobile learning, and, for industry, the possibility of financial gain are all likely contributing factors to the spike in interest. Many relatively recent entrants, including UNESCO, have historically been more generally active in ICT in education and are now focusing on the promise of mobile learning to supplement their current initiatives.

1.1 What Distinguishes M-Learning from E-Learning?

There are further differences between mobile learning and eLearning outside the usage of mobile devices for content learning. A more diminutive, more portable form of eLearning is not all that mobile learning is. Instead, it exhibits many remarkably diverse traits. The following are the two groups' main distinctions:

Different Goals: While mobile learning is suitable for refresher training or methodically collecting knowledge, e-learning is more suited for in-depth core understanding. Mobile learning enhances support for and variety in learning. The students can immediately access brief, stand-alone chunks of knowledge they may study on the road.

One of the topics that has sparked a great deal of debate among educators is the usage of mobile devices in the classroom. We present a discussion of this topic in this article so that readers will clearly understand it through the qualitative method of bibliographical revision. We aim to contribute to a more in-depth discussion about using this device as a pedagogical tool in teaching-learning. A priori, the results support this use in the classroom, with the caveat that it is the teacher's responsibility to ensure that students have the proper ethical awareness regarding using the device in class and include the school to gain the required institutional support.

Lesson durations might vary from 15 to 90 minutes for traditional online courses on PCs or laptops. Compared to mobile learning content, they are longer. The information created for mobile devices was divided into shorter segments, typically 3 to 5 minutes long. They make learning more straightforward for the students and let them continue their usual schedules while still learning.

Different Results: No extra software is required since eLearning operates directly via a browser. In contrast, m-Learning requires an app available in at least two versions: iOS and Android. Mobile applications are designed specifically for mobile devices, and students can browse eLearning courses on them. These apps employ cameras, audio, barcode scanning, and internal sensors to improve the user experience.

1.2 Mobile Learning Pedagogy

Online learning on a smaller screen is not the only type of mobile learning. Smartphones have some restrictions compared to PCs, but they also offer unique affordances that can open up new possibilities for learning. Clark Quinn has defined these affordances as the five "C's" of mobile learning:

Content: Offering educational resources that students may use at any time or in certain circumstances (such as teacher commentary during a museum visit).

Capture: Using mobile devices, you can "capture" things like pictures, videos, sounds, GPS locations, and thoughts (as notes).

Communicate: Being able to contact peers at any time or when participating in certain field activities.

Compute: Using tools to make calculations, translate languages, and perform other computational activities.

Combine: Combining the aforementioned four features in novel ways, such as augmented reality applications that record GPS data

1.3 The use of mobile Technologies in M-learning

Mobile technologies are incredibly appealing, user-friendly, and convenient for accessing information. They are affordable and readily distributed, so they have a great chance of getting to marginalized communities and giving them access to further education and development [3]. Examples of mobile devices and technologies that support mobile learning are e-books, handheld game consoles, new gaming consoles, tablets, PDAs for use in classrooms and outdoors, handheld audio and multimedia guides for use in museums and galleries, and smartphones. Figure 1 shows the educational development components.

1.4 Characteristics of M-Learning

E-learning Materials

It is standard procedure to deliver micro-learning content—two to five-minute bursts of relevant information meant to maintain learners' attention and enhance knowledge retention—through mobile learning. Microlearning material replicates the content we frequently consume via social media feeds using short-form video, animation, Gamification, quizzes, and other interactive formats to engage the modern workforce better.

Societal Education

Mobile learning frequently combines social learning with online behavior replication to increase interest. This can contain a discussion board, newsfeed, or chat feature so that students can communicate with one another, share thoughts, and ask questions of one another.

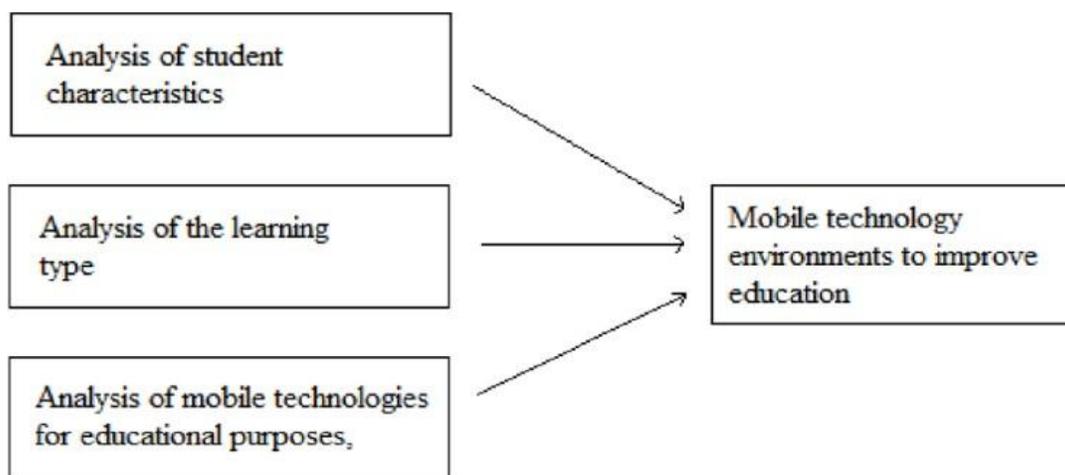


Figure 1: Educational Development Components [4]

Effortless Access

Although effortless access was unavailable in all M-Learning systems, seamless access quickly became a key feature of mobile-based training solutions. Reducing this friction—

whether it is by integrating content into your native app or by doing away with the login process with seamless links—dramatically increases engagement and makes training even more accessible for learners on the go.

1.5 The benefits

Millennials Adore Mobile Devices

80% of people in the globe currently use cell phones. Over half of the global workforce comprises millennials, whose mobile phone usage has increased to 97%. Millennials don't only use their cell phones; they are addicted to them. Ninety percent of individuals are never far from their smartphones. It makes sense that you can reach modern students the quickest by utilizing the device they rely on and utilize the most.

More Productive

Research indicates that mobile learning can expedite course completion by up to 45% and enhance productivity by up to 43%. Learning may be integrated into existing workflows with short-form, mobile content, empowering your team rather than getting in the way. Additionally, mobile learning is created and distributed more effectively. Managers can allocate their important time more effectively by updating and providing their dispersed workers with minute courses.

Ease to Access

Having bite-sized mobile training courses available on their preferred device around the clock is essential, especially for remote professionals. By incorporating learning into an already-existing worker app, you can make learning even more accessible for your dispersed staff members, saving them the trouble of remembering their login credentials and ensuring they always have access to the information they need.

More Exciting

When a lot of information is divided into digestible portions, learning is quick and easy, and including interactive elements like leaderboards and quizzes keeps students engaged and inspired. In two to three minutes, students may pick up their phones, complete a little lesson on them, and then go back to what they were doing. Employee motivation will increase if learning is incorporated into their present workflow and users immediately notice its advantages.

Realistically Priced

Using in-person training techniques is costly for businesses since it involves hiring a space, paying an instructor, printing training materials, covering travel and lunch expenses, and even factoring in lost productivity from time spent in the classroom. Making the move to mobile learning eliminates these expenses. Additional outcomes of the improved engagement with mobile training include excellent completion rates and a higher return on investment.

Promotes Continued Usage

Unlike in-person or desktop LMS training methods, which make it difficult for learners to repeat courses and retain information over time, m-learning ensures that training is embedded in your worker culture. Employees are more likely to continue studying and gain from your training course if they can start and stop lessons quickly. Encouraging continuous learning is essential to fostering a highly productive, engaged, and motivated staff that is prepared to perform at their best.

Increases Employee Loyalty

Mobile learning may also have benefits for the business sector. More than half of business owners claim enhanced expansion after implementing m-learning because it improves staff training and worker productivity and retention.94% of employees would stay with their company longer if it supported their professional development, according to a study by LinkedIn. By providing training via a mobile learning platform, you may raise employee awareness of your learning and development initiatives and improve the likelihood that they will utilize and benefit from them.

Wherever and wherever you want, learn

With mobile learning, students can keep their instructional materials with them. Your customers or employees have no obligation to study equally or at a single location. They have got access to their instructional resources in their pockets. The time invested in waiting, such as while entering an aircraft or waiting for a flight, could have been better used to learning something new. Let's go! When you're in bed, you may take a course online or do a survey.

1.6 The Disadvantages

It might serve as a diversion

If done incorrectly, bringing a mobile device to work might be distracting. If learners are distracted by text messages, notifications, and the temptation of Twitter and Facebook feeds, mobile learning may hinder rather than increase productivity. Users must select a platform that makes training as engaging and dynamic as possible to maintain their learners' interest.

Technology barriers

Lack of access to mobile devices or the Internet may be a significant barrier for businesses looking to benefit from m-learning. It's important to consider how your teams already work, the technology they access, and what training would have the most significant impact before choosing any form of learning solution. The labor without a desk is noticeably underrepresented in terms of technology. Investing in providing them with the right mobile technology to meet their needs and progress may boost their productivity and save significant money and effort.

Competence

A training course is only as good as its content, regardless of how user-friendly the software is or how captivating the gamification features are. You cannot benefit from mobile learning if the material is incorrect. Make sure the instructional materials you provide are suited to the requirements of your personnel. What kind of experience will they need to accomplish their jobs well? Which format works best for their workflow? If your team lacks this experience, you might want to consider hiring a learning consultant to ensure you get the most out of your m-learning software and provide measurable business outcomes.

1.7 Effectiveness of Mobile Learning Make Starting Simple

People will assess the usefulness of the mobile educational application in 4-5 clicks. We lower friction at every stage of the onboarding process and simplify the learning experience once logged in using seamless learning, which gives learners instant access to learning content without the need to log in.

Develop your mobile learning using mobile in mind

Learning via mobile devices requires more than simply scaling down existing desktop e-learning to fit a smartphone screen. To develop an efficient and captivating mobile learning experience, examine how you and your students employ mobile devices. You can create an interface that is simple to use plus intuitive by replicating the tasks they are used to from their preferred apps.

Employ Video Material

There's a good reason we choose YouTube lessons over books: information provided in video format is 95% easier for our brains to comprehend. Incorporate films with an in-person greeting from the firm's CEO, a safety demonstration, or a 'day in the life' to put a ride-along into your mobile teaching content if you want to mimic the bite-sized videos we're used to seeing on social media.

Try using Gamification

Using game features such as leaderboards, points, and 'level up' possibilities improves user experience and encourages recurring use; this is why we become addicted to gaming applications on our phones and why it will increase training completion rates. Businesses that use gamification components in their training see a 50% improvement in productivity and a 60% increase in employee participation.

Use a fun, Conversational Voice

For most people, hearing the term "corporate training" raises concerns. Use a conversational, lighthearted tone in your educational mobile program to debunk this myth since it is more engaging, presents training as an activity rather than a "task," and is more appropriate for a laid-back platform.

Encourage Lifelong Learning

The greatest thing about mobile learning is that it does not have to conclude with onboarding and provides end users 24/7 access to instruction that they can do at their convenience. Encourage people to keep learning by providing new possibilities to improve their abilities and performance. To accomplish this, set up triggered and relevant notifications to direct users to the right educational course.

1.8 Mobile Learning Applications

As the technology is growing steadily, m-learning applications are becoming more and more adaptive according to the needs of the users, and now, the applications have introduced the functions of cameras and live chat; along with it we have the option of downloading the lectures that were previously not available. Earlier applications were not platform-independent, and this has gradually changed in recent years. Now, the learners are even awarded at completion, which encourages them to learn further. After interviewing numerous people across the campus, we discovered that ICT applications have affected how we learn as many fail to answer basic questions. For example, we asked a couple of 1st years engineering students what inertia is & frequency & wavelength is, and they failed to answer. This may be because they did not pay attention or the applications were not that interactive [5]. Many also faced technical issues with the proper hardware, and some also failed to know how to use the hardware device. M-learning has become a new emerging era in the teaching-learning process. There are numerous advantages of using m-learning in the learning process like: concurrent learning, independent learning, learning upon the condition and situation, lifelong learning, etc. Some of the M-learning applications in India is listed in Table 1 shows, top 10 education mobile apps.

Table 1: Top 10 Education Mobile Apps [6]

Company name	Specialized area
Byju's	Education
Vedantu	Class 6-12, Kids learning platform for different education board
Meritnation	Class 1-12, Kids learning platform for different education board
Unfold u	Education
Topper	Class 5-12, Kids learning platform for different education board
Unacademy	For competitive exams
Udemy	For professional courses
Duolingo	To learn different languages
Khan Academy	Education
Learning Radius	UPSC exam-related, administrative exams

Objectives of the Study

- To study the perception of m-Learning, i.e., learning through mobile applications and its impact on teaching-learning.
- To study the impact of financial challenges to adopting m-learning.
- To study the impact of the geographical location of a learner in the m-learning process.

2. LITERATURE SURVEY

Bünyamin et al [7] discussed the need for mobile learning technology and available opportunities. They suggested new ideas for using m-learning effectively, such as augmented reality and virtual reality, to bridge the gap between the applications of concepts in the real world using simulation. Díez et al. [8] discussed the agent-based technology acceptance model for mobile learning. This model was tested with 15 experienced teachers and showed that it encourages using mobile learning platforms in higher education. Ironsi & Bostancı [9] explained the implementation of mobile learning in Spain by collecting 1544 samples from 59 universities. They found that 73% of the surveyed population shows the feasibility of implementation in the learning process. Some factors such as teacher status, type of technology used, and pedagogical innovations show that mobile devices are efficient for expanding the learning process. Sophonhiranrak et al [10] focused on the features, barriers, and influencing factors of mobile learning in higher education. He explained how mobile devices have become an essential part of the learning process for students and teachers. Tondeur et al [11] explained the link between the teacher and the different types of computer devices used in the learning process. Learners can opt for any mobile device or computer, such as a laptop or desktop computer, according to their financial condition. However, due to the advancement of technology and the availability of the Internet, many people use smartphones to learn. Bindu et al. [12] discussed the impact of ICT on the teaching and learning process. Due to technological advancements, the learning process has become more student-centric and helps develop focused and collaborative learning [13]. ICT also elevates traditional educational practices such as assessment, monitoring, and evaluation. It helps motivate learners through various simulation tools available in the education sector.

In an essay titled "Mobile Learning," which was released in 2010, the UNESCO Institute for Information Technologies in Education highlighted the significant role that mobile devices play in the daily lives of contemporary students. The circumstances of modern life are such that very few students utilize conventional sources on paper for training, such as textbooks, study guides, and dictionaries, and they obtain practically their entire material straight from the Internet using a computer or mobile device. Hwang et al [14] noted that a high impact of studies included Higher Education students, followed by elementary school students and K–12 students. Oddly (or maybe not, as we shall argue later), only a select amount of studies included in each meta-analysis were concerned with m-learning from the perspective of professors or teachers. When the educational contexts of m-learning research are exposed, informal learning contexts predominate, followed by formal contexts and a combination of the two. This outcome is in line with findings presented by other writers, most notably [15].

In addition to the prevalence of informal educational contexts in published m-learning research, most studies do not concentrate on a specific learning domain, presenting results related to students' motivation, perceptions, and attitudes towards m-learning [13]. Again, it's uncommon to find instructor perspectives and attitudes. These findings are

consistent with those found in a more recent investigation. Cheever et al [16] explained that our reliance negatively impacts user's emotional "mood" states on smartphones, which has been connected to a type of psychological dependency. For instance, anxiousness can impair one's capacity to pay attention to information while away from their smartphones. The author found that even 10 minutes into the experiment, heavy and moderate mobile phone users experienced significant anxiety when their phone was taken away. Al-Rahmi et al [17] explored the acceptance of M-learning by university students using structure equation modeling. They found that perceived mobile value (PMV), academic relevance (AR), and self-management of M-learning (SML) were the major influencing factors for student's acceptance. They also found the behavioral intention to use mobile devices for education purposes. Marunevich et al [18] discussed a case study in Russia based on M-learning and E-learning as a tool for higher education.

3. RESEARCH METHODOLOGY

3.1 Data collection

The analysis was performed by collecting data using a questionnaire to study the impact of ICTs on the field of education among students. Through the random sampling technique, 80 samples were tested, and the hypothesis was drawn to test using a one-sample T-test in the SPSS statistical tool. Based on the P-value, the impact of M-learning on students and teachers was stated. The questionnaire consisted of a series of questions, and the respondents needed to provide answers in the form of agreeing or disagreeing to express their attitude towards m-Learning. Responses are collected on a Likert scale of 1-5, where 1 means "Strongly assent", 2 means "Assent", 3 means "Neutral", 4 means "Dissent", and 5 means "Strongly dissent," respectively.

3.2 Scope of the Study

This study proposes the following hypotheses:

Hypothesis 1: Technical challenges in the usage of m-learning for ICT applications are affected by the user's geographic location.

Hypothesis 2: Financial challenges in adaptation m-learning for the ICT application are affected by the scale of the organization or the individual user.

Hypothesis 3: M-learning with the use of ICT applications significantly affects the learner's learning capability.

4. ANALYSIS OF DATA

Hypothesis 1:

H0: Technical challenges in the usage of m-learning for ICT applications are not affected by the user's geographic location.

H1: Technical challenges in the usage of m-learning for ICT applications are affected by the user's geographic location.

Table 2: One Sample Test for Geographical Areas and M-Learning Applications

	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval (Lower)	95% Confidence Interval (Upper)
Geographical area	29.359	79	.000	1.138	1.06	1.21
Usage of M-learning application	33.077	79	.000	1.328	1.25	1.41

Since $\text{sig}=0.000 < 0.05$, we reject the null hypothesis; hence, the user's geographical location brings technical challenges to M-learning-enabled ICT applications.

Since the network coverage is different in different geographical locations, restrictions on using mobile phones for learning are brought about. A few users shared the experience of having difficulty accessing information due to internet speed.

Hypothesis 2:

H0: Financial challenges in adaptation m-learning for the ICT application are not affected by the scale of the organization or the individual user

H1: Financial challenges in adaptation m-learning for the ICT application was affected by the scale of the organization or the individual user

Since $\text{sig}=0.000 < 0.05$, we reject the null hypothesis; hence, the usage of ICT applications is affected by the financial situation of the organization or the individual user.

Financial conditions play a significant role in ICTs as the applications are costly, and some require modern hardware and software. They also need some training to understand the applications better. So, the training cost is an extra burden on the organization or an individual.

Table 3: One Sample Test for Organization/ Individual and Financial Estimates

	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval (Lower)	95% Confidence Interval (Upper)
Organization/ Individual	29.359	79	.000	1.138	1.06	1.21
Financial estimate	62.982	79	.000	1.062	1.03	1.10

Hypothesis 3:

H0: M-learning with the use of ICT applications doesn't have a significant impact on the learner's learning capability.

H1: M-learning using ICT applications significantly impacts the learner's learning capability.

Table 4: One Sample Test for Learning Capabilities and Acceptance of M-Learning

	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval (Lower)	95% Confidence Interval (Upper)
Learners Learning Capability	25.157	79	.000	1.350	1.24	1.46
Acceptance of M-Learning	62.982	79	.000	1.062	1.03	1.10

Since $\text{sig}=0.000 < 0.05$, we reject the null hypothesis; hence, M-learning impacts the learning capability of the learners.

Since ICTs are widely used these days, one of the drawbacks of the ICT application is its distractions. That will affect the learning capabilities of the learners; one might be using an ICT application for some time but may redirect oneself to another application and be away from one's learning path. Which is something every individual is responsible for him or herself.

5. CONCLUSION

Technology is a versatile and valuable tool for teaching, becoming a way of life. The study proposed insight into problems faced by different individuals in different geographical locations and economic sectors. It also pinpoints the learners' problems and their impact in each phase, such as location, finance, and the learner's capabilities. All of these are also affected by the policies made by the central government or the state government, as well as the private sector and one's capacity. Everyone needs to work together to resolve such problems and cope with the growing technology globally, and we should be ready to face the pandemic. During the pandemic, many users and organizations missed the preparedness to adopt m-learning for the teaching-learning process. M-learning plays a significant role in the country's advancement as it helps achieve economic growth and substantially contributes to GDP growth. The more important benefits of M-learning are to be completed in a more structured way using skilled employees. Human resources should be trained to use all mobile technologies to handle the pandemic situation, where only the availability of mobile devices for the teaching-learning process. ICT allows the learner to think of all the resources available around the globe. It also benefits students because they have more choices and opportunities to explore and share information to a greater extent than in a traditional classroom. Thus, M-learning is not a replacement but emerges as a helping hand to teachers practicing the traditional teaching process with advancements in technology and ICT application. A logical extension of what we do is mobile technology. As a result, it may turn out to be a simple way to give engaging training. Don't give up the chance of going above and beyond for your students.

Mobile learning serves everyone, from educational institutions to international organizations and leaders across many industries. For instance, you may have found that pupils aren't interested in your training initiatives. This is where mobile learning may be helpful. Engagement will surely rise on platforms that allow teams to learn at their own speed (on any device).

Identify the function of mobile learning in your educational approach before giving it a goal. You might think about your key priorities and assess the available resources. Don't forget to evaluate and improve your material continuously.

Generally speaking, your mobile app should complement alternative methods rather than replace eLearning and conventional classroom teaching. Thus, make sure you understand how mobile contributes to their learning process. There should be no

restrictions placed on instructors and students at universities in the future by being able to study at a designated place and time. Both indoor and outdoor learning spaces will soon be equipped with wireless technology and mobile devices—lecture space. Since most modern students are both technically and psychologically equipped to use mobile technology in the classroom, it's critical to consider innovative ways to maximize the potential of mobile learning. The heads of education must make organizational efforts to integrate mobile learning methods, formats, and techniques into their institutions' educational processes.

To summarize the above, we can state that the introduction of mobile technologies in education has allowed people with disabilities to learn; it has expanded the educational process outside of the school; it is economically viable because it eliminates the need to purchase a personal computer and paper textbooks; and it has made it easier to distribute educational materials between Organizational, scientific, and methodological work are obviously needed to fully realize the educational process's newfound potential for mobile learning.

6. SUGGESTIONS

Mobile devices are an integral aspect of ICT and potent tools for improving learning. Mobile learning will quickly take on significant importance if existing ICT policies for education start to include mobile devices, digital learning resources, support for instructors, and recommendations on best practices.

Learners experienced a variety of issues while using m-learning due to several obstacles and restrictions, including the small screens of mobile phones that made it difficult to view course materials and video recordings, connecting to the Internet in locations with spotty signal strength, and the high cost of mobile wireless connections. These difficulties and restrictions were seen in the mobile learning application design process. It has been determined that mobile learning should be utilized in conjunction with e-learning since it will not suffice for remote learning.

For further education, it is advised that m-learning and e-learning apps be combined. Additionally, it is recommended that information be created for mobile learning and added to a database while developing e-learning material. By linking to an e-learning database with an m-learning application, online services of GSM carriers must be made available in order to send SMS to students in the database about the recorded academic matters. Collecting students' phone numbers is also thought to notify all pupils by SMS instantly.

References

- 1) Shubhangi V. Urkude & D. Saravanan (2022). Deterioration of Daily Life in COVID-19. Computer Communication, Networking and IoT, Lecture Notes in Networks and Systems book series (LNNS), 459, 117-125.
- 2) Moore M.G.& Kearsley G. (1996). Distance education:A systems view. Boston, MA: Wadsworth Publishing.

- 3) Al-Emran, M., Elsherif, H.M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human behavior*, 56, 93-102.
- 4) Dickersen J. & Browning, J. B. (2009). Selecting Appropriate Technologies for Mobile Teaching and Learning. In R. Guy (Ed). *The Evolution of Mobile Teaching and Learning*. California, USA: Informing Science Press.
- 5) Mobile Learning and Education in the Digital Age. (n.d). Retrieved from <https://elearningindustry.com/mobile-learning-education-digital-age>
- 6) Ayana Reji, 2020, Top 10 E-learning Mobile Applications in India, <https://lilacinfotech.com/blog/54/top-10-elearning-mobile-applications-in-india>
- 7) I.GÖKSU Bünyamin ATICI (2013). Need For Mobile Learning: Technologies and Opportunities. 13th International Educational Technology Conference. Turkey. *Socialand Behavioural Sciences* 103. 685–694.
- 8) L.F.Díez A.Valenciaand J.Bermudez. (2017). Agent-based Model for the Analysis of Technological Acceptance of Mobile Learning. *IEEE Latin America Transactions* 15(6), 1121-1127.
- 9) Ironsi,C.S.,& Bostancı,H.B. (2022). Utilizing mobile-learning and CAP (E) lesson frame work in improving the productive skills of learners in a hybrid environment. *Education+Training*, 65(2), 232-252.
- 10) Samoekan Sophonhiranrak (2021). Features, barriers, and influencing factors of mobile learning in higher education: A systematic review. *Heliyon*, 4(7).
- 11) Tondeur J.Hermans R.van Braak J.&ValckeM. (2008). Exploring the link between teachers' educational belief profiles and different types of computer use in the classroom. *Computers in Human Behaviour*, 24(6), 2541-2553.
- 12) BinduCN. (2016). Impact of ICT on Teaching and Learning: A Literature Review *International Journal of Management and Commerce Innovations*. 4 (1),21-31.
- 13) Lakshmi Devasena C & Shubhangi V Urkude (2024). Students' Perception towards Online Learning across Multiple Disciplinary Courses in India—A Qualitative Analysis. *International journal of Interactive Mobile technology*,18,4-19.<https://doi.org/10.3991/ijim.v18i01.46381>
- 14) Hwang, Gwo-Jen, and Chin-Chung Tsai (2011). Research trends in mobile and ubiquitous learning: A review of publications in selected journals from 2001 to 2010. *British Journal of Educational Technology* 42(4), E65-E70.
- 15) Hemabala.J & Suresh.E.S.M. (2013). Mobile Learning for Undergraduate Engineering Students. *International Journal of Computer and Information Technology*, 2(6), 1175-1180.
- 16) Cheever,N.A., Rosen, L.D.,Carrier, L.M., & Chavez, A. (2014). Out of sight is not out of mind: The impact of restricting wireless mobile device use on anxiety levels among low, moderate and high users. *Computers in Human Behavior*, 37, 290-297.
- 17) Al-Rahmi, A.M., Al-Rahmi, W.M., Alturki, U., Aldraiweesh, A., Almutairy, S., & Al-Adwan, A.S. (2022). Acceptance of mobile technologies and M-learning by university students: An empirical investigation in higher education. *Education and Information Technologies*, 27(6), 7805-7826.
- 18) Marunovich,O., Kolmakova,V., Odaruyk,I., & Shalkov,D. (2021). E-learning and M-learning as tools for enhancing teaching and learning in higher education: a case study of Russia. In *SHS Web of Conferences* (Vol.110, p.03007). EDP Sciences.