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Use of smartphones in learning and techno-pedagogical integration of artificial intelligence tools as a prospect for intelligent learning: Case of Moroccan students from Hassan II University of Casablanca

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ABSTRACT

This study aims to measure the degree of use of smartphones in learning by Moroccan students, Using some techniques of artificial intelligence. This is an exploratory descriptive study in which a sample of the student population of The Ben Msick Faculty of Sciences and the Higher Normal School of Casablanca- Morocco was subjected to a questionnaire during the 2019- 2020 academic year. the results were favorable, the results of this study show an average rate of use of smartphones for learning purposes by these students. They also show no statistically significant differences in this respect regarding the three variables treated, namely: sex, institution, and level of education. since students often use their smartphones for educational purposes, they will use artificial intelligence-assisted applications on their university campus.

Key words : Smartphones, Learning, Artificial Intelligence, Students, University

1. INTRODUCTION

Our current way of life is undergoing an unprecedented metamorphosis: Information and communication technologies have been radically transforming our pattern of thought and lifestyle. The forms of our institutions starting with our schools are in the process of changing. The very notion of teaching and learning is impacted.

Thus, technological innovations following one another at a dizzying pace overturn individuals' lifestyle and their social relations, as well as socio-economic-political systems of whole societies, so the systematic integration of artificial intelligence (AI) into university education has the potential to meet some of the biggest challenges in this area today. The very nature of their communication changes [1]: From a style that favors intimate face-to-face and creates a climate of human warmth, we are in the process of moving to another which places interactivity at the head of priorities; interactivity which becomes a paradigm of post-modern society. It is in this regard that the smartphone has come to overturn the whole way of living and thinking of humanity as a whole. In addition to the classic acts of communication such as phone calls and texts, it is a whole range of so-called "social" activities that smartphones allows the user: Storage in mode Cloud of ever-increasing volumes of data in a wide variety of formats, increasingly fast downloads, interaction and orientation via satellite, etc. Thus, making it possible to create and develop certain applications of intelligent simulators of different scientific phenomena thanks to the technologies of artificial intelligence.

It, therefore, becomes obvious that the number of smartphone users is constantly increasing in all socio-economic and even educational sectors. Like the so-called generation Z born in the era of mobile technology, the so-called generation Y which had preceded it in time is also required to update itself in order to be able to constantly accompany and use new computer-technical innovations [2].

As a result, new methods of researching, processing, sharing and exploiting information are emerging and renewing themselves day by day. Learning also begins to change approaches and methods. Information media, formerly stationary and localized, are now starting to invade the learning field; first by completing the classic models; and why not replacing them later. The opportunities they offer in this regard at ridiculous prices make them unbeatable, particularly because of the space-time freedom enjoyed by their users.

Also, the very philosophy of learning-teaching is shifting towards valuing flexibility and interactivity between teachers and learners as well as between learners themselves. From a learner dependent on the teacher who owns the knowledge and is essential to the process, we are witnessing the resurgence of a completely different learner, this time independent, who continues to learn according to his preferences and speed of learning. A new era has therefore begun with mobile learning, by looking at emerging technologies of artificial intelligence. The services, options are constantly increasing for learners as well as for teachers and supervisors of the process. Thanks to "smart" mobile phones, students can consult, practice, accomplish and interact with content at any time and in any space, as well as with the teacher who has become a mediator.

Motivation and research needs: However, some studies point out that the use of smartphones by university students is far from having an academic aspect or being intended for learning. The absence of coaching to which this activity should be subject would make them dependent

on the excesses that these leads. Of course, smartphones, with the constantly innovating or created options that they offer, have many benefits for this young population, but the risks of deviation that they present are undeniable too. And if most of the current studies have focused on social networks and their use by students, the use of smartphones also requires more attention in this regard. Some researchers [3] have defined mobile learning as a mode that uses portable or remote communication devices. Others [4] have identified it in any form where learners use mobile devices at anytime and anywhere. Also, we could say that this kind of learning involves three key dimensions: The ubiquity designating the omnipresence of the devices everywhere, the focus signifying the point of their presence and the personalization which manifests a degree of motivation spurring the learner to adhere to the learning process.

Research objectives: Therefore, we propose in this article to measure the rate of use of Smartphones for learning purposes by Moroccan students. A study whose interest will lie in the contribution it will have in mobile learning in the university environment, thanks to the avenues of improvement it would open up and the remediation points it would find [9].

The objective of our research will be to define the degree of use by students of the Moroccan University of Smartphones in their learning process and to know if there are statistical differences in this regard depending on their level, their gender, and their university affiliation [10].

Different researches were to examine through the students' perceptions of the game elements used in gamification applications. ClassDojo, as a case study in [27], has been implemented class-wide in an EFL class in the Moroccan high school. In their article [28] proposed three machine learning algorithms supporting the vector machine (SVM), decision trees (DT) and Naive Bayes (NB) to classify the feelings of the data in twitters, however a huge amount of data is generated synchronously and asynchronously for social networks and sharing of content which can be in the form of structured, unstructured or semi-structured data. A summary research has been developed by Arif Ullah et al. at [29] which presents a comprehensive study on load balancing in cloud computing using the ABC algorithm. It also defines a basic concept on the smart swarm and its property.

2. METHODOLOGY

2.1. Context: advantages of smartphones and usage constraints

More and more smartphones are endowed with artificial intelligence (AI). Artificial intelligence resides in the implementation of a set of techniques aimed at allowing machines (an automatic system capable of processing information) to imitate a form of real intelligence, according to Jean-Claude Heudin, director from the research laboratory of the Internet and Multimedia Institute.

There are currently several important application areas for artificial intelligence on smartphones:

- Recognition of images, sounds and videos
- Linguistic detection and translation
- Storage and navigation of massive and big data
- Simulation of three-dimensional objects using virtual reality headsets
- …

A. Advantages of smartphones in education

That being said, using smartphones to learn is justified by its permanent accessibility, the increasingly low cost of its services and the ever-widening and diversified range of options. Also, it allows to each learner very close and almost instantaneous management of the learning process. It also facilitates teamwork without requiring the physical meeting of the people concerned [11]. Finally, the Smartphone allows the almost unlimited archiving and storage of data and resources as it makes learning very pleasant thanks to the countless possibilities it offers (games [21], simulations, quizzes, audio-video files, animations, etc.) [14].

B. Limits of smartphones

This does not however preclude mentioning certain defects of the Smartphone[5] such as the size of the screen, the difficulty of input which still do not succeed in making it boring for students because of the multiple services that " it makes available to them, in particular the wap for transferring and exchanging data, the web for access to the Internet, SMS to send and receive short messages, Bluetooth to connect to other smartphones, especially those of teachers for educational purposes, MIS for exchanging files in multiple formats, etc.

C. Use and educational constraints

The negative impacts of the use of smartphones on young people have attracted the interest of several researchers who have carried out studies on the subject. Thus, Walsh, White and Young[6] in 2007 noted the multiple risks that arise in this regard [12]. They all emphasize the predominantly entertaining nature and therefore the constantly increasing time that they consume. Ditto for the near impossibility of controlling the user, the very negative impact on his linguistic level, the inviolability of confidential data increasingly threatened.

The study carried out by Suki[7] in 2011 concluded that learners were not interested in the Smartphone in terms of learning since they consider, with the teachers, that its use is far from adding value to the process.

In the same vein, Cagan, Unsal, and Celik [8] studied in 2014 the level of addiction to smartphones among university students and concluded that the phenomenon is blatant and that this dependence increases with that of the rate of use. A negative correlation has been noted by researchers between the rate of use and academic success. Another, positive, is evident between this dependence and the rate of depression among them. These conclusions reinforce the relevance of this study that we plan to carry within the Moroccan university [13].

2.2. Type of study

The study we conducted is exploratory descriptive. It was to lead to the evaluation of the use of smartphones in their learning by Moroccan students, considering the variables of gender, level of education and university affiliation.

The following figure shows the educational use and interaction of students with the smartpohone for educational purposes, presenting an educational system that provides a set of digital tools (Games, Simulations, Quizzes, Audio-video files, Animations) [15], that serve to motivate students to communicate with each other and with their teacher [16].

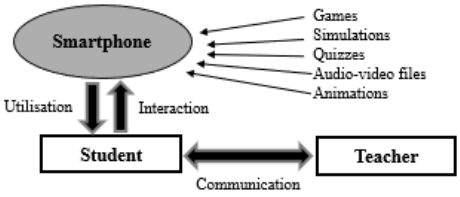

Figure 1: Student-smartphone and student-teacher relationships

2.3. Population

The population studied is made up of 200 students distributed between two establishments of the Hassan II University of Casablanca-Morocco; The Ben M'sik Faculty of Science and the École Normale Supérieure. The population was designated by random choice.

The sampling method used in this study is simple random sampling which consists in that each member of a population (students) has an equal chance of being included in the sample. Each combination of participants who belong to the population thus has an equal chance of composing the sample. These two characteristics are what define simple random sampling. We have compiled a list of students who are included in the survey population to select a simple random sample [17].

Table 1: Distribution of students by institution and gender

Institution	Number of male students	Number of female students	Total
Faculty of Sciences Ben Msik	30	80	110
Ecole Normale Supérieure	44	46	90
Total	74	126	200

Table 2: Distribution of the population by variables

Variable	Class	Number	Rate
Sex	Males	74	37%
	Females	126	63%
Level	1st	50	25%
	2cd	44	22%
	3th	46	23%
	1st Master	60	30%
Institution	FSBM	110	55%
	ENS	90	45%

2.4. Instruments

To measure the rate of smartphone, use by Moroccan university students, we have developed a 20-item survey comprising demographic variables first and then others relating to the objective of the study. This survey has have been validated by experts and the answers are given in relation to the Likert scale.

The study includes the independent variables of sex, university level and institution of affiliation as it includes only one independent variable which is the rate of use of smartphones in the learning process.

The responses of the individuals in the sample having been collected, they were processed on SPSS before processing the data output on t-test for the variables on sex and establishment. Those relating to the university level were submitted to One-way ANOVA; for the data relating to the rate of use, we treated them with the arithmetic means, the standard deviations and the order [18].

2.5. type of technical results

Our article does not consist in carrying out a synthesis study, but to apply a research algorithm which combines both the use of smartphones (technical component) in university education (educational component) which allows an evaluation of performance: obtained by analyzes, simulations or measurements.

3. RESULTS AND DISCUSSION

3.1. Data collection and interpretation

Concerning the question relating to the rate of use of smartphones by Moroccan university students in learning, the results were presented as follows:

Table 3: Arithmetic means, standard deviations of the rate of use by Moroccan students in learning classified in descending order

Number	Item	Arithmetic average	Standard deviation	order	Utilization rate
11	I consult the university announcements relating to the university	4,01	0,58	1	High

	portal				
2	use the Smartphone to exchange emails	3,96	0,55	2	High
3	Smartphone use rate to access social networks	3,90	0,69	3	High
20	Learning by smartphone is more effective than the traditional method	3,86	0.67	4	High
19	the use of Smartphones to ensure the permanence of the interactivity between the actors of the learning process	3.77	0.75	5	High
18	Use of Smartphone guarantees freedom to learn outside the university	3,69	0.91	6	High
1	I use the smartphone to access learning resources like search engines and libraries	3.14	0.84	7	Medium
12	Using the smartphone consolidates the learning process and takes into account the differences between learners	3.39	0.88	8	Medium
7	I use the smartphone to exchange text messages with my classmates for learning purposes	3.37	0.85	9	Medium
16	I use the smartphone to record the conferences in audio or audiovisual format	3.32	0.88	10	Medium
4	I use the smartphone to access blogs, forums and personal websites for learning purposes	3.28	0.97	11	Medium
10	I store the information I need for my learning on my smartphone	3.27	0.97	12	Medium
15	I use the smartphone to record my lessons	3.26	0.94	13	Medium
14	I use the smartphone to coordinate calendars for lectures, tests and homework	3.24	0.84	14	Medium
6	I use the smartphone to take photos and videos related to the learning process	3.23	0.87	15	Medium
8	I use the smartphone	3.17	0.74	16	Medium

	to consult books and studies in PDF or WORD format				
17	The smartphone makes it easier for the learner to access information	3.04	0.68	17	Medium
9	I use the smartphone to deliver urgent announcements and news to classmates	2.84	0.93	18	Medium
13	I use the smartphone to send homework and follow up on feedbacks	2.52	0.59	19	Medium
5	I use the smartphone in lectures and educational films	2.31	0.76	20	Low
	Overall rate	3.34	0.28		Medium

In order to study the rate of estimates of Moroccan students using their smartphones in learning compared to the real learning environment, we used the values of the standard deviations to determine the dispersion of the data compared to the arithmetic means for each Item, the objective of which is to show a certain comparison value between arithmetic means and standard deviations, while the more the distribution is less dispersed i.e. the values are concentrated around the mean, the more l standard deviation will be reduced. Generally speaking, for a normal distribution, about 68% of the values fall within one standard deviation of the mean, 95% of the values fall within two standard deviations, and 99.7% of the values fall within three standard deviations. In our case the values of the standard deviations are close to 0, this means that the values are very little dispersed around their arithmetic means. If we take for example Items with a high usage rate "use the smartphone to exchange e-mails" whose number is 2 (average = 3.96 and standard deviation = 0.55), "I consult the relative university announcements at the university portal "whose number is 11 (average = 4.01 and standard deviation = 0.58) and" Smartphone learning is more efficient than the traditional method "whose number is 20 (average = 3.86 and standard deviation = 0.67), we can conclude that according to the values of the data collected during the survey it turns out that the rate of use of smartphones for learning purposes is high, since the values of the standard deviations are reduced (close to from 0). So for the "average" usage rates for Items including the numbers 1, 12, 7, 16, 4, 10, 15, 14, 6, 8, 17, 9 and 13, we notice that the values of the deviations -types are between 0.59 and 0.97 on the other hand for "I use the smartphone in conferences and educational films" (mean = 2.31, standard deviation = 0.76 and number = 5) the rate of use is low.

It turns out that the rate of use of smartphones by Moroccan students for learning purposes compared to the real learning environment is average because for the overall rate the average value is equal to 3.34 and the difference -type is equal to 0.28. The rate of this use calculated based on the variable "sex" was organized as follows:

Table 4: Arithmetic means and standard deviations of the estimates by Moroccan students of their use of the smartphone in learning according to the variable Sex

Sex	**Number**	**Arithmetic mean**	**Standard deviation**	**T-value**	**Level of meaning**
Males	74	3.32	0.30		
Females	126	3.36	0.27	-0.818	0.415

Therefore, the results do not indicate differences of statistical significance in the estimates of Moroccan students relating to their use of smartphone in their learning, and this compared to the variable Sex and according to the calculated value T. As for the arithmetic means and standard deviations of estimates of Moroccan students use of smartphone in learning according to the variable of university establishment, the results were presented as follows:

Table 5: Arithmetic means and standard deviations of the estimates of Moroccan students use of smartphone in learning according to the variable of the university establishment

Establishment	**Number**	**Arithmetic mean**	**Standard deviation**	**T - Value**	**Level of meaning**
FSBM	110	3.34	0.30		
ENS	90	3.34	0.260	0.100	0.920

The results show that there is no difference with the statistical significance of the estimates of the use of smartphones by Moroccan students in learning according to the variable Establishment compared to the calculated value T.

We always notice that the values of the standard deviations are close to 0 (0.30 and 0.27) for the sex variable compared to the arithmetic means (3.32 and 3.36), and likewise for the establishment variable whose values of the arithmetic means and deviations -types are mentioned in Table 5.

For the Arithmetic means and standard deviations of the estimates of Moroccan students use of their smartphone in learning according to the variable of Level of study, here are the results:

Table 6: Arithmetic means and standard deviations of the estimates of Moroccan students use of their smartphone in learning according to the variable of Level of study

Educational level	Number	Arithmetic mean	Standard deviation
3rd year license	40	3.39	0.21
2nd year license	61	3.34	0.28
1st year master	70	3.33	0.27
1st year license	29	3.32	0.36
Total	200	3.34	0.28

We notice that "3rd year license" has the lowest value of the standard deviation compared to "1st year license" which has the highest value, by comparing the values of the arithmetic means against the values of the deviations. types we can conclude that these results show at first glance differences between the arithmetic means of the estimates of the students with respect to the variable of their level of education. According to the statistics calculated in Table 3, Table 4, Table 5 and Table 6 the threshold value between high and medium is defined at 3.5

This required the application of unidirectional ANOVA, which gave us results invalidating the first observation and made it possible to conclude that there were no such significant differences.

3.2. Improvement of the artificial intelligence of the proposed solution using smartphones

The use of smartphones as part of a university intelligence and one of the pedagogies that have been based on artificial intelligence as one of the advanced sciences and technologies of the 21st century, it has a profound effect and crucial on school and university education. Li Geng [22] in his recent research has used artificial intelligence technologies in the visualization application for almost 12 years. Based on this principle, this work adopts automatic teaching-learning techniques based on smartphones such as inductive logic programming, connectionist learning technology and the theory of statistical learning are constantly evolving [22]. Mahesh G et al. [23] have shown in their research the usefulness of integrating smartphones into smart classes thanks to a project which involves surveys to identify how the use of mobile phones in higher education establishments can be made under the control of the authorities and how many hours of lessons and training can be saved in a year using this device.

In order to make eLearning or adaptive traditional teaching Richa Bajaj and Vidushi Sharma [24] have proposed a tool framework which takes into account a set of learning models and artificial intelligence techniques to determine different learning styles among students. Maud Chassignol et al. [25] in their contributions in trends in artificial intelligence in education presented a possible image of how artificial intelligence will rethink the educational landscape, by identifying the prospective impact of artificial technologies on the study process and on any changes.

Smartphones and various techno-educational devices aim to increase the quality of the teaching-learning process in the context of computer-assisted training, so with the development of communications via the internet, it has become much easier to access digital resources that circulate on different educational devices using new technologies such as those based on artificial intelligence [25]. Mehmet Korkmaz [26] proposed virtual classes with cloud architecture using augmented reality applications is considered. In addition, mobile applications providing virtual reality will enrich the course material. With this application the quality of teaching will be improved and it will be beneficial for the development of learning.

3.3. Comparisons with recent results : novelty by smartphones and artificial intelligence in educational research

The results obtained in this work are similar to those of Mahesh G et al. [23] who have shown that during their experiences traditional classes have become more improved by different technologies, while a new learning style could be introduced based on artificial intelligence, virtual reality, 3D multimedia technologies, ...

The results of using smartphones for artificial intelligence and big data for educational purposes were favorable as they favored the development and progress of research in artificial intelligence, as Li Geng [22] showed. From another point of view Richa Bajaj and Vidushi

Sharma [24] demonstrated that the framework developed in their research for intelligent education helped to make education adaptive (personalized learning was provided) according to classification techniques based on artificial intelligence, based on the performance of a set of dynamically developed models, thus on the basis of cloud hosting a framework which consists of the construction of a virtual teacher who was able to interact with the learners in an evolutionary way in order to dynamically determine their learning styles [24].

Maud Chassignol et al. [25] also explain how artificial intelligence can help decipher students' difficulties and improve their imagination, based on different solutions and possibilities developed in their research. Artificial intelligence should be added to the teaching-learning process as well as the use of multimedia teaching devices such as smart phones which can help with homework assessment and the detection of learning gaps.

Artificial intelligence is present in smartphones for educational purposes in different modes and ways of use, knowing the artificial intelligence by the processor including the graphics processor using the full computing power, artificial intelligence by the Cloud (using Ok Google) in order to use the computing power of the servers and artificial intelligence by Neural Processing Unit (NPU) technology to boost the processor to run faster and optimize current applications .

Artificial intelligence will go towards major improvements and transformations in education at the level of voice and facial recognition systems, image recognition and translation systems, in particular Google has launched a " Google Lens " application available on Android which allows explore the content of a photo using artificial intelligence techniques, and other operations using smartphones allow people to move in space and interpret the environment in a multisensory manner, using machine learning techniques that use massive labeled training data (texts, images, video, audio).

Thus several studies are interested in different strategies, means and intelligent paradigms concerning university education, in particular a study which concerns the process of design and implementation of an innovative dynamic adaptive hypermedia system (DAHS) called " CleverUniversity "in [30]. And researchers who are interested in learning strategies online and using connected smartphones, such as in [31], the authors have made improvements to the user-centered design method and they have carried out a test on an online learning website.

4. CONCLUSION

Regarding the question of Moroccan students' use of smartphones for learning purposes, the overall rate was medium. The classification of the recorded scores gives priority to the consultation of university announcements on the university portal, and thus reflects their interest because the latter provides them with essential information, in particular about evaluation, exam dates, etc. In second place come scores relating to the item dealing with the use of smartphones to exchange texts and emails [19]. This allows us to conclude that they are skilled and independent in the exchange of data and information.

Respondents scored medium scores on the homework transfer item and followed up on related feedback. The reason could be the low interest they give to the use of smartphones for this purpose and the preference they have for conventional channels [20].

The item on the use of smartphones to give presentations and broadcast educational films came last with lower scores. The cause could be the size of Smartphones.

On the other hand, the results of our research are conclusive as to the contribution of the variables Sex and Establishment in the responses to the related items. They note that there are no differences of statistical significance in the estimation that these same students make of their use of Smartphones, whether they are males or females, whether they study at the FSBM or the ENS. However, given the variable Level of education, we note differences of statistical significance. Juniors come in first position, followed by sophomores then by those of the 1st year Master and finally those of freshmen. This could be explained by the fact that student becomes progressively aware of the importance of Smartphone use in his learning as he progresses in the university curriculum.

Consequently, it would be in our opinion conclusive to initiate measures aimed at supervising and optimizing the use made by Moroccan students of their Smartphones, in particular: by launching awareness campaigns to this effect, by organizing training sessions for students and teachers alike, by accompanying pilot classes adopting this learning style.

This work aims to measure the degree of use of smartphones in learning by Moroccan students in order to demonstrate that since university students usually use their smartphones for learning, teachers can use applications assisted by the artificial intelligence often relating to the personalization of distance education via robots in tutoring and conversational agents capable of assessing the progress of students and accompanying them. Different applications assisted by artificial intelligence in smartphones are appearing, whether for learning or teaching:

- Applications of language processing (translation, content mining, meaning extraction, etc.);
- Applications of three-dimensional modeling of scientific phenomena (chemistry, physics, etc.);
- Applications of automated reasoning (calculation algorithms, machine learning, etc.);
- Digital simulation applications on smartphones for practical work;
- Virtual classroom applications;
- Applications that use augmented reality.

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