


# Navigating the Mobile Learning Landscape in Moroccan Nursing Education: A Descriptive Study with a Focus on Clinical Learning



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## Abstract:

**Background:** Nursing education is increasingly relying on technological innovations, including mobile learning (m-learning). However, there is limited research available on the utilization and impact of m-learning among undergraduate nursing students in Morocco. Gaining an understanding of their perspectives can contribute to the development of effective educational strategies on a global scale.

**Objective:** This study aimed to explore the utilization of m-learning among undergraduate nursing students in Morocco, specifically in the context of clinical education. This exploration included investigating usage patterns, perceptions, challenges, and opportunities.

**Methods:** A descriptive study based with quantitative design was conducted at the Higher Institute of Nursing Professions and Health Techniques of Casablanca. Data were collected through an online questionnaire distributed between October 2023 and January 2024. A total of 405 participants took part in the study, with the majority being female (77.8%).

**Results:** The results revealed that a significant number of participants owned mobile devices, with smartphones being the most commonly used device (89.4%). Furthermore, almost all participants (99.3%) reported using mobile devices for educational purposes, primarily for theoretical learning (50.4%) and accessing educational videos (94.0%). While the majority of participants (91.1%) viewed m-learning as highly useful, they also encountered challenges such as technical issues and distractions.

**Conclusion:** Moroccan nursing students perceive m-learning as valuable for enhancing clinical education despite facing challenges. By addressing these challenges and aligning m-learning with students' needs and clinical practice, its potential to improve nursing education can be optimized.

**Keywords:** Mobile learning, Clinical learning, Nursing students, Smartphones, Descriptive study, Morocco.

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## 1. INTRODUCTION

Nursing education involves a combination of classroom instruction and practical experience in hospital settings [1]. Practical experience, also known as clinical learning, constitutes a significant portion of the educational journey for nursing students [2-5]. In complex healthcare environments, nursing students often struggle to apply the knowledge and skills they've learned in school to real-life patients [2, 6-8]. They encounter various obstacles during their clinical placements, including the theory-practice gap, inadequate supervision, scheduling difficulties, and unsupportive clinical environments [3-18]. Additionally, the current focus on patient safety and rights has limited the opportunities for students to practice their nursing expertise directly with patients [7, 8, 19, 20]. This predicament has the potential to limit training opportunities and hinder optimal learning outcomes for the students [1, 19, 21].

In response, several innovative strategies have been developed to support students' learning in diverse clinical settings [9, 21-25]. One of the key elements in modern pedagogical strategies is the incorporation of information technologies as essential components of training programs, aiming to enhance clinical [24-27]. The integration of technology into clinical education has transformed nursing training [25]. Initially, technology in nursing education was limited to audio-visual aids, such as slides and overhead projectors, used as supplementary tools in traditional classrooms [24]. However, nursing education has embraced more interactive methods and simulations as technology has advanced [28, 29]. Notably, computer-based learning programs and simulators have allowed students to practice clinical skills in safe environments, minimizing risks [30]. These platforms also offer interactive tutorials and assessments to reinforce comprehension of medical concepts. Virtual Reality (VR) and Augmented Reality (AR) technologies have also enhanced immersive learning [31]. The internet has further expanded technology in nursing education, with online learning platforms and virtual classrooms providing flexibility in studies [32]. Social media platforms have also become valuable for collaboration and knowledge exchange among nursing peers and professionals [26].

Within the last few years, nursing education has experienced a notable transformation due to the rise of mobile learning, which provides dynamic and engaging learning experiences [9, 22, 24, 33-35]. Mobile learning, referred to as m-learning, is an educational methodology whereby individuals engage in independent or collaborative learning to acquire knowledge and develop experiential insights [36]. It is a widely used term that refers to the educational process occurring in diverse environments through interactive social engagement and personal electronic devices [37]. This is accomplished through active involvement in tasks such as accessing, generating, and organizing information, all facilitated by digital interactions made feasible by portable devices [38]. Essentially, these definitions emphasize the utilization of mobile devices to participate in educational activities

within various contexts [39]. Mobile devices are handheld information technology encompassing hardware, software, and communication capabilities [9]. They have transformed basic messaging systems into sophisticated wireless-enabled Smartphones [1]. Indeed, Mobile technology has seamlessly integrated itself into modern nursing programs across various settings, including clinical, classroom, and hospital environments [29]. Nurse educators need to ensure that the utilization of this technology is maximized [1]. The incorporation of mobile technology into nursing training aims to enhance students' clinical practice and exposure [34]. This approach enables students to overcome the limitations of time and space in their learning journey [36], equipping them with essential skills and knowledge for contemporary healthcare practice [35].

The use of mobile devices enables nursing students to have continuous access to information, regardless of time and location [40]. This has led to a rise in the adoption of innovative methods by educators, clinicians, and students, integrating mobile devices to access clinical resources in both classroom and clinical settings [22]. By leveraging mobile devices, individuals can enhance their limited cognitive capacity by efficiently recalling and analyzing large amounts of relevant data. This, in turn, facilitates information management, overall administration, and clinical practice in the nursing setting [29]. Over the past few years, the use of mobile devices in nursing education, including personal digital assistants, smartphones, and tablets, has experienced a significant increase, and students have responded positively to this trend [41]. These devices have proven to be valuable tools in assisting nursing students with decision-making, providing access to relevant information, and enhancing the learning process during clinical placements [42].

Initially, researchers focused on Personal Digital Assistants (PDAs) but later shifted their attention to smartphones [43]. Smartphones offer a plethora of features that can be utilized for educational purposes in the field of nursing. For instance, the video player can be employed to stream educational content, a measurement app can assist students in evaluating lesions, and music playback can grant access to relevant podcasts and channels. Furthermore, SMS can also prove advantageous in a clinical setting, enabling students to contact their instructors for guidance or to arrange meetings [44]. Instructors can utilize social networks to swiftly communicate with students, streamlining the time spent in the clinic and facilitating access to assistance. Moreover, mobile applications, commonly referred to as "apps," represent another valuable resource in nursing education, with a diverse range of programs available, including flashcard applications and health-specific applications [45]. These apps permit students to access a multitude of resources, such as information on medications or rapid calculations of health indices [46]. The availability of up-to-date resources is of utmost importance in providing evidence-based care, particularly within a fast-paced clinical environment [44]. Smartphones enable students to

have access to these resources, even in locations without an Internet connection, such as hospitals or health centers [29]

Despite the advantages of mobile learning offered to nursing students, there is limited international research on the utilization of modern mobile devices, like smartphones and tablets, in the clinical learning field [1]. Therefore, it's crucial to take into account the viewpoints of all participants involved in nursing education to guarantee the appropriate design, development, and deployment of mobile devices and their related software applications [43]. Collecting students' perspectives regarding the utilization of mobile devices as educational tools is crucial for the advancement, evaluation, and deployment of appropriate technology into nursing training [1].

In Morocco, there is a limited body of research examining the viewpoints of nursing students regarding the application of mobile learning in the context of clinical training. The objective of this study is to gain insight into students' perspectives on mobile learning in clinical education. It seeks to examine the role of mobile learning for nursing students and analyze their usage patterns, comfort levels, and perceptions. Additionally, it aims to identify challenges and opportunities in the implementation of mobile learning in nursing education. Through student feedback, the study aims to present recommendations for enhancing the integration of mobile learning into the nursing curriculum. The findings have the potential to enhance nursing education by providing valuable insights into clinical learning.

## 2. MATERIALS AND METHODS

### 2.1. Design

This is a cross-sectional study with a quantitative design, using a self-reported questionnaire to collect data from participants. The cross-sectional method allows researchers to describe and compare naturally occurring cohorts, such as those defined by gender, education levels, or age group [47].

### 2.2. Setting And Participants

This study was conducted at the Higher Institute of Nursing Professions and Health Techniques from October 2023 to January 2024 (Arrival N 060/2024). Using an online Raosoft calculator [48, 49], we have calculated the sample size to be 405. This calculation was conducted with a 5% margin of error and a 95% confidence level. The hypothesis stated that the response rate would approximate 80%. Convenience sampling was employed to recruit nursing students in their third and fifth semesters. Following the participants' informed consent, an electronic self-administered survey was distributed to each of them.

The inclusion criteria for this study were as follows: current undergraduate nursing students attending classes, those who voluntarily agreed to participate, and students who had completed at least one internship module. On the

other hand, the exclusion criteria encompassed students with no clinical practicum experience, individuals under the age of 18, and those who did not complete the data collection forms adequately.

### 2.3. Data Collection

Data was collected between December 2023 and January 2024 through an online self-administered survey using the Google Forms platform. The principal author distributed the survey to all students through email, accompanied by a clear explanation of the study's methodology and objectives. Prior to their participation, students were requested to provide their consent. The response rate was 90%, indicating that all students completed and submitted the questionnaire as requested. Participants were provided with the assurance that involvement in the research is entirely voluntary, and they were explicitly informed that they retained the right to opt out, with no negative consequences in terms of their standing within the nursing education program. Consent was obtained from students who willingly agreed to participate after being adequately informed about the study. On average, students spent approximately 15 minutes to complete the questionnaires. Lastly, the participants were sincerely thanked for their valuable contributions to the study.

The questionnaire was developed based on existing literature on the use of mobile learning (m-learning) by nursing students. The survey items were generated by drawing inspiration from similar studies [1, 49-51]. Questions were developed to assess the utilization of mobile devices for educational purposes with the aim of enhancing clinical learning. The survey consisted of 27 items, categorized into three parts. The initial part comprised four items delineating four items describing the participants' characteristics. The second part consisted of questions regarding the use of mobile devices by nursing students for learning purposes, such as their habits, frequency of usage, types of activities they engage in, and trends. The third section aimed to describe the students' perception of m-learning, its usefulness and effectiveness, and the factors influencing its integration into the nursing curriculum. It also included questions regarding the participants' experiences, challenges, and recommendations related to m-learning. The types of questions included Likert-style (5-point scale), closed-ended (binary questions: yes/no and multiple choice), and three open-ended text boxes for obtaining qualitative information about the students' perception of mobile learning. The final version of the questionnaire was revised by an expert panel, which included two professors. Each item was assessed for relevance and clarity. Based on the feedback received, the survey was revised to eliminate redundant queries and simplify certain questions/items. To evaluate reliability, the questionnaire underwent a pretest with 35 participants, revealing an acceptable level of internal consistency (Cronbach's alpha: 0,71).

## 2.4. Data Analysis

Data obtained from Google Forms was automatically transferred to Microsoft Excel. Surveys that were incomplete, with less than 50% of the forms filled out, were excluded. Additionally, partial responses that were deemed insignificant were deleted. The final dataset comprised responses from 405 participants. These responses were analyzed using SPSS version 25 for Windows. We utilized descriptive statistics to analyze the quantitative data, including percentages and frequencies. Moreover, we calculated the mean and standard deviation to describe the age of the participants. This analysis aimed to provide a description of the participants and their utilization of mobile devices for learning. Furthermore, it sought to investigate the role of mobile learning for nursing students by examining their usage patterns, comfort levels, and perceptions. Out of a total of 420 questionnaires, 405 were deemed suitable for analysis, while 15 were excluded due to incomplete responses. Specifically, 7 questionnaires did not provide data on variable 1: The use of mobile devices for learning purposes, and 5 did not contain information regarding variable 2: The perception of the role of m-learning in students' learning. Additionally, 3 questionnaires lacked data from responses to open-ended questions. Questionnaires that were not fully completed were not taken into consideration for incompletely filling out were excluded from the analysis of the results. Qualitative data obtained from open-ended questions underwent thematic analysis based on Braun and Clarke's (2006) model [52]. Student responses were iteratively examined, initial concepts were identified, and preliminary codes were developed. These codes were subsequently organized into overarching themes.

## 3. RESULTS

### 3.1. Participant Characteristics

The study included a total of 405 participants. The majority of participants were female (77.8%), while males made up a smaller proportion (22.2%). The age range of the participants varied, with the highest percentage (74.1%) falling between 18 and 24 years old, followed by smaller proportions in the age groups of 25-29 (23.0%) and 30-34 (0.7%). In terms of education level, a slight majority of participants were in their third semester (56.0%) compared to those in the fifth semester (44.0%). Participants represented various nursing fields, with the largest groups being general nurses (30.4%), followed by emergency and intensive care nurses (17.8%), anaesthesia and resuscitation nurses (9.4%), mental health nurses

(20.5%), neonatal pediatric nurses (7.2%), and family and community health nurses (14.8%). Table 1 provides further details on the characteristics of the participants.

### 3.2. Use Of Mobile Devices For Learning Purposes

All participants reported owning mobile devices, indicating that ownership was universal among the sample. Among the various types of mobile devices used, smartphones were the most prevalent (89.4%), followed by tablets (7.4%) and laptops (3.2%). When it came to using mobile devices for learning during training, the overwhelming majority of students (99.3%) reported using them for educational purposes. Only a small percentage (0.7%) indicated that they did not use mobile devices for learning. Regarding integrating mobile applications to support learning in clinical practice, 85.2% of participants reported utilizing such applications, while the remaining 14.8% did not. Comfort levels with using mobile devices varied among the respondents. While a significant number (56.3%) expressed comfort or high comfort levels, a smaller proportion reported feeling very uncomfortable (0.7%), uncomfortable (17.0%), or neutral (3.0%).

When examining the frequency of mobile device use for learning, the data revealed that the majority of participants (56.3%) reported using them daily. Smaller proportions were reported using them weekly (15.6%), occasionally (20.0%), monthly (6.7%), or rarely (1.5%). In terms of the frequency of M-learning utilization during clinical placements, the majority of respondents (41%) indicated that they use M-learning on a weekly basis, followed by daily usage (43%). A smaller proportion reported engaging in M-learning on a monthly basis (7%), while some admitted to using it occasionally (4%), or rarely (4%). Regarding the areas of use for M-learning, the majority of participants used it for theoretical learning (50.4%), while a significant proportion engaged in both theoretical and clinical learning (40.7%), and a smaller fraction focused solely on clinical learning (8.9%). The primary reasons for utilizing M-learning included easy access to information (39.0%), the availability of diverse resources (31.0%), and the adaptability of the tool to individual needs (30.0%). Regarding specific M-learning activities, watching educational videos was the most commonly reported activity (94.0%), followed by using mobile applications for nursing training (91.0%), consulting course materials (66.0%), accessing e-books or digital manuals (39.0%), taking quizzes or assessments (14.0%), and participating in virtual simulations or scenarios (4.0%). Table 2 presents the usage patterns of smartphones among undergraduate nursing students.

**Table 1. Overview of participants and their characteristics.**

Characteristics	N= 402 (%) Or M±SD
Consent of participants	405 (100)
Gender	
Female	315 (77,8)
Male	90 (22,2)

(Table 3) contd....

Characteristics	N= 402 (%) Or M±SD
<b>Age</b>	20,55 ±1,78
18-20	300 (74,1)
21-24	93 (23,0)
25-29	9 (2,2)
30-34	3 (,7)
<b>Level of education</b>	
Third semester	227 (56,0)
Fifth semester	178 (44,0)
<b>Specialty</b>	
Anesthesia and Resuscitation Nurse	38 (9,4)
Neonatal-pediatric nurse	29 (7,2)
General nurse	123 (30,4)
Family and Community health nurse	60 (14,8)
Mental health nurse	83 (20,5)
Emergency and intensive care nurse	72 (17,8)

Table 2. Use of mobile devices for learning purposes.

Variables	N = 405 (%)
<b>Mobile device disposal by students</b>	405 (100)
Yes	0
No	
<b>Types of mobile devices used</b>	
Laptop	13 (3,2)
Smartphone	362(89,4)
Tablet	30 (7,4)
<b>Use of mobile devices for learning purposes</b>	402(99,3)
Yes	3 (,7)
NO	
<b>Using mobile applications to support clinical</b>	345(85,2)
Yes	60 (14,8)
No	
<b>Comfort level with mobile devices use</b>	
Very uncomfortable	3 (,7)
Uncomfortable	69 (17,0)
Neutral	12 (3,0)
Comfortable	228(56,3)
Very comfortable	93 (23,0)
<b>Frequency of use of mobile devices for learning</b>	
Rarely	6 (1,5)
Occasionally	81 (20)
Monthly	27 (6,7)
Weekly	63 (15,6)
Daily	228(56,3)
<b>Frequency of use of M-Learning during clinical placements</b>	
Rarely	18 (4)
Occasionally	18 (4)
Monthly	27 (7)
Weekly	168 (41)
Daily	174 (43)
<b>Areas of use for M-Learning</b>	
Clinical learning	36 (8,9)
Theoretical learning	204(50,4)
Theoretical and Clinical learning	165(40,7)
<b>Reasons for using M-learning</b>	
Easy access to information	156 (39)
Diversity of resources	124 (31)
Possibility of adapting the tool to your needs	123 (30)
<b>Types of M-Learning activities</b>	
Watch educational videos	381 (94)
Accessing e-books or digital manuals	156 (39)
Use mobile applications for nursing training	370 (91)
Take quizzes or assessments	56 (14)
Participate in virtual simulations or scenarios	18 (4)
Consult the course materials	269 (66)

### 3.3. Perception Of The Role Of M-Learning In Students' Learning

This section of the results focuses on the perceptions of nursing students regarding the effectiveness and role of mobile learning (M-learning) in the context of clinical education. To begin with, the data reveals a strong consensus among participants regarding the usefulness of M-learning in their educational endeavors. An overwhelming majority of respondents (91.1%) considered M-learning to be either very useful (45.2%) or extremely useful (45.9%), underscoring its perceived value in enhancing learning experiences.

Furthermore, the study examines the effectiveness of M-learning in both theoretical and clinical learning processes. The findings indicate that a majority of respondents viewed M-learning as effective in theoretical learning (61.5%) and clinical training (60%). Importantly, a notable proportion of students perceived M-learning to be very effective or extremely effective in facilitating both theoretical (61.5%) and clinical (59.5%) learning objectives. The study also assesses the integration of M-learning into the nursing curriculum. The results demonstrate a favorable stance among participants, with a significant majority (71.9%) expressing agreement or strong agreement with its inclusion in educational programs. Regarding information-seeking behaviour, the study reveals that nursing students primarily rely on various sources, with health professionals (64%) and smartphone applications/websites (91%) being the most commonly used resources. Students expressed a perceived necessity for communication with their teachers during clinical placements; the study found that 364 participants (90%) preferred using WhatsApp as their primary means of communication with teachers. In contrast, 11 participants (3%) prefer email, and 30 participants (7%) prefer text messages. Interestingly, none of the respondents favor phone calls for communicating with their teachers. These findings emphasize the significant preference for digital communication platforms, particularly WhatsApp, among nursing students when interacting with their teachers during clinical placements.

Despite the apparent benefits of M-learning, the analysis identifies notable challenges. A significant proportion of students (66.7%) acknowledge facing barriers to using mobile devices for learning in clinical settings, indicating potential obstacles to effective integration. Lastly, the study examines the perspectives of educators and clinical supervisors on smartphone use for student learning. The data on teachers' perspectives regarding the use of smart phones for student learning revealed diverse viewpoints. A significant number of teachers (49%) expressed strong support for the use of mobile devices for educational purposes, while a notable 20% strongly opposed it. The distribution of viewpoints on the incorporation of smartphones for educational purposes in clinical settings varied among clinical supervisors. A lesser percentage (17%) expressed strong opposition compared to teachers, while a larger percentage (27.4%) maintained a neutral stance. These results underscore the

diverging perspectives among educators and clinical supervisors regarding the integration of smartphones into student education in clinical environments.

In conclusion, the findings highlight the perceived effectiveness of M-learning among nursing students while also emphasizing challenges and variations in attitudes among educators and supervisors regarding its integration into clinical education. Addressing these challenges and promoting positive attitudes may be crucial for maximizing the benefits of M-learning in nursing education.

### 3.4. Open-ended Question Results

Open-ended questions are designed to explore the perspectives of nursing students regarding the use of m-learning in a more in-depth manner. The main focus is to identify the challenges, advantages, expectations, and needs that nursing students have in relation to this area. This study utilizes Braun and Clarke's (2006) model for thematic analysis to delve into the detailed insights provided by nursing students concerning the integration of mobile technology into their clinical learning experiences.

Nursing students have identified several challenges associated with the adoption of m-learning in clinical education. Technical issues, such as problems with connectivity and device compatibility, were frequently mentioned. The intermittent availability of network coverage and the lack of compatibility between educational applications and students' devices emerged as significant barriers to achieving seamless m-learning experiences. Students also highlighted distractions caused by mobile devices, such as notifications from social media platforms, which hindered their focus during the study sessions. Additionally, some students perceived m-learning as less effective than traditional methods, expressing a preference for hands-on learning experiences and dissatisfaction with the lack of face-to-face interactions with peers and instructors in virtual environments.

Despite these challenges, nursing students recognized several advantages of m-learning in clinical education. Flexibility was cited as a key benefit, enabling students to access learning materials at their convenience and review them during busy clinical rotations. The ability to access study materials anytime and anywhere was particularly valued, highlighting the convenience offered by mobile devices. Moreover, students found the interactive nature of m-learning engaging, mentioning features such as interactive videos and quizzes that enhance the learning experience. Real-time feedback provided through m-learning platforms was also praised for its usefulness in identifying areas that require further study (Tables 3 and 4).

When expressing their expectations and needs concerning m-learning, nursing students emphasized the importance of integration with clinical practice. They expressed a desire for m-learning resources to be directly relevant to the challenges they face in clinical settings, highlighting the need for practical applicability. Additionally, students emphasized that m-learning should complement, rather than replace, hands-on clinical skills

training. Furthermore, they highlighted the need for adequate support and guidance in using m-learning effectively, including access to technical support for any issues encountered during m-learning sessions, as well as guidance on maximizing the benefits of m-learning in their studies.

In conclusion, the thematic analysis of nursing

students' perceptions of m-learning in clinical education reveals a complex landscape characterized by challenges, advantages, expectations, and needs. While technical issues and distractions present obstacles to the effective implementation of m-learning, the flexibility and interactivity offered by mobile technology provide significant benefits.

**Table 3. Perception of the role of M-learning in students' learning.**

Variable	N = 405 (%)
<b>Perceived usefulness of M-learning in learning</b>	
Not at all useful	0
Not very useful	0
Useful	36 (8,9)
Very useful	183(45,2)
Extremely useful	186(45,9)
<b>M-learning effective in improving theoretical learning</b>	
Not at all effective	0
Not very effective	18 (4,4)
Effective	138(34,1)
Very effective	156(38,5)
Extremely effective	93 (23,0)
<b>Effective M-learning to improve your clinical training</b>	
Not at all effective	3 (,7)
Not very effective	36 (8,9)
Effective	123(30,4)
Very effective	156(38,5)
Extremely effective	87 (21,5)
<b>Perception of the integration of M-learning into the training curriculum</b>	
Strongly disagree	0
Strongly disagree	0
Neutral	114(28,1)
Strongly agree	171(42,2)
Strongly agree	120(29,7)
<b>Information sources consulted during training</b>	
Classmates	150 (37)
Health professionals	260 (64)
Smartphone applications/websites	370 (91)
Online databases and journals	90 (22)
Teachers	86 (21)
<b>Perceived need to communicate with your teachers during the clinical placement</b>	405(100)
Yes	0
No	0
<b>Preferred means of communication</b>	
Mail	11 (3)
Text message	30 (7)
WhatsApp	364 (90)
phone call	0
<b>Perceived barriers to using mobile devices for learning in clinical settings</b>	
Yes	270(66,7)
No	135(33,3)
<b>Teachers' opinions on the use of smart phones for student learning</b>	
Strongly disagree	200 (49)
Strongly disagree	80 (20)
Neutral	120 (30)
Strongly agree	5 (1)
Strongly agree	0
<b>Clinical supervisors' opinion on the use of smart phones for learning in clinical settings</b>	
Strongly disagree	69 (17)
Strongly disagree	141(34,8)
Neutral	111(27,4)
Strongly agree	66 (16,3)
Strongly agree	18 (4 ,4)

**Table 4. Presentation of open-ended question data.**

Themes	Subthemes	Codes
<b>Advantages of M-Learning</b>	Ease of Information Access Improvement of Learning	Access to vast, relevant information Diversity of Resources Enhanced understanding and retention Learning at own pace, anytime, anywhere Availability of various educational materials Autonomy and Flexibility
<b>Challenges-Learning</b>	Technical Issues Distractions and Dependency Reliability of Information Institutional Restriction	Internet connectivity problems Easily distracted by social media Concerns about accuracy of information Prohibitions on mobile device use Resistance of instructors about the use of smart phones in classes Some clinical settings doesn't allow the use of Smartphone's
<b>Students' expectations</b>	Contributions from Educators Incorporating M-learning into the curriculum Interactive Content Development	Provision of Resources and Support Promoting student participation Encouragement of Active Engagement Collaborating with students to create tailored content Enhanced Connectivity Integration of Wi-Fi Access Creating more interactive learning materials Teaching students effective M-learning strategies Student Training and Guidance

#### 4. DISCUSSION

The findings of this study highlight the significant role of mobile technology in supporting learning initiatives among undergraduate nursing students. The widespread adoption, high utilization, and positive perception of mobile learning underscore its potential to transform clinical education and improve learning outcomes in nursing programs. However,

To ensure effective integration, it is crucial to address concerns, promote inclusivity, and provide adequate support. On the whole, the prevalence of smartphone ownership among nursing students emphasizes the importance of leveraging mobile devices for educational purposes. It is evident that mobile device ownership is nearly universal among the sample of nursing students, with all participants reporting ownership. Smartphones emerge as the most popular type of mobile device, with the overwhelming majority of students utilizing them for educational purposes. This widespread ownership highlights the potential of mobile technology to support learning initiatives in clinical education settings. These findings are consistent with previous research studies [49, 53-55] and align with broader trends observed in educational technology, emphasizing the significance of utilizing mobile technology to address the evolving needs of learners in the healthcare field [56, 57].

The results indicate a widespread perception among students that mobile learning is an appealing educational tool due to its flexibility, enabling learning at any time and location. They recognize the value of mobility in mobile learning, appreciating its ability to offer diverse learning methods and facilitate easy tracking of students' progress and grades. Moreover, there is a favorable view of mobile devices as tools for social learning, as they facilitate collaboration among instructors and students through various social media applications. Overall, students hold positive attitudes toward mobile learning, recognizing its

potential benefits for educational engagement and interaction. They utilize their smartphones due to their ability to quickly access answers to specific questions in less than five minutes. Similarly, previous studies revealed favourable perceptions of mobile learning among nursing students and emphasized its potential to enhance learning experiences in clinical education in nursing, citing its capacity to provide access to more information and facilitate collaborative learning [1, 58, 59]. Previous studies by Cho and Lee [53], Willemse *et al.* [54], and Beauregard *et al.* [55] have provided supporting evidence of the positive effects of m-learning and the integration of m-learning into educational programs. While nursing students generally feel comfortable using mobile devices, other studies have raised concerns about their utilization. Uzunçakmak *et al.* [56] reported concerns about Smartphone addiction and sleep quality, and Zarandona *et al.* [51] identified institutional restrictions as a barrier to the implementation of m-learning.

In terms of information sources utilized during training, smartphones, applications and websites are the primary resources, followed by health professionals and classmates. This heavy reliance on mobile applications and websites can be seen as indicative of the increasing digitalization of healthcare education. Other studies have also highlighted that students are gradually turning to technology as a means of accessing information [51, 57]. Students frequently use these mobile applications for accessing drug information, practice guidelines, and conducting clinical calculations. This observation is consistent with previous studies that have demonstrated nursing students utilizing drug reference guides and other mobile applications to verify unfamiliar medications, dosages, contraindications, and side effects [1, 22, 58, 59]. This practice holds the potential to enhance students' understanding of pharmacology and skills in medication management, thereby contributing to patient safety. Additionally, Haffery *et al.* [57] discovered that nursing



students frequently employed medical dictionary applications to facilitate the learning of crucial clinical concepts and terminology. However, the perceptions of clinical supervisors and patients regarding M-learning in nursing education vary. This is because the use of mobile devices in clinical interactions involves a complex three-way process between students, teachers, and patients. Clinical supervisors and patients may have concerns about the potential disruption of social interaction and the impact on the quality of patient care.

However, despite students' favourable attitudes towards the use of mobile devices, the internet connection speed in the hospital often fails to meet expectations, leading to frustration among learners. This issue of connectivity is a common problem, as indicated in previous research, and acts as a significant barrier to mobile learning [1, 22, 53, 60]. Conversely, the perceptions of clinical supervisors and patients vary. Given that social interaction in clinical training involves a three-way process among students, teachers, and patients, the complexity of using mobile devices is amplified [22]. These findings emphasize the necessity of addressing these challenges in order to facilitate the effective integration of mobile learning into nursing education [60, 61]. Nevertheless, despite the overall positive perceptions, this study also uncovers challenges and differing viewpoints among educators and clinical supervisors regarding the incorporation of smartphones into student learning in clinical settings. These findings differ from studies that have reported more consistent acceptance and support for mobile learning among educators [22, 55, 56]. Resolving these discrepancies and fostering consensus among stakeholders may be critical for the successful implementation of mobile learning in nursing education.

In conclusion, M-learning has been found to be effective in educating nursing students. However, it is necessary to address the challenges and discrepancies in attitudes among educators and supervisors. By capitalizing on the advantages of M-learning and addressing concerns, nursing education programs can create more dynamic and efficient learning environments that prepare students for successful careers. Further research and collaboration are needed to fully optimize M-learning and seamlessly integrate it into nursing curricula. Despite the numerous challenges, nursing students find potential benefits in integrating mobile learning (M-learning) into their clinical education. The effectiveness of M-learning in nursing education can be enhanced by addressing technical issues and aligning M-learning resources with clinical learning requirements. These challenges include technical glitches, institutional limitations, and concerns regarding the attitudes of educators and supervisors towards using smartphones for learning purposes. Despite the numerous benefits of mobile devices in nursing education, further research is needed to assess their effectiveness in different contexts. Understanding the factors that influence usage behaviour, such as job relevance, can aid educators and institutions

in seamlessly integrating mobile learning technologies into nursing curricula, thereby improving learning outcomes. Additionally, ongoing clinical trials are expected to provide more insight into the efficacy of mobile apps in enhancing nursing education outcomes.

## **CONCLUSION**

Integrating mobile learning (m-learning) into nursing education presents challenges and opportunities. Nursing students face technical obstacles such as connectivity and device compatibility, as well as distractions from mobile devices that hinder their learning experiences. However, they also recognize the benefits of m-learning, such as flexibility and accessibility to educational resources. To maximize the potential of m-learning in nursing education, it is essential to address these barriers and leverage the opportunities it offers. Educators and institutions should prioritize providing technical support and guidance to students, ensuring that m-learning resources are relevant and tailored to clinical challenges. Collaboration between educators and clinical supervisors is crucial in integrating m-learning into nursing curricula.

## **LIMITATIONS**

Some of the primary limitations of the research included the employment of a descriptive design, thus necessitating future explanatory studies to verify the correlation between mobile learning and student performance. The study was carried out at a single nursing school in Morocco, hence lacking generalizability. The convenience sampling method may have introduced bias into the results.

## **AUTHORS' CONTRIBUTION**

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

## **LIST OF ABBREVIATIONS**

- VR = Virtual Reality
- PDA = Personal Digital Assistants

## **ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

The study was approved by the head of the Higher Institute of Nursing Professions and Health Techniques of Casablanca (ISPITSC) (Arrival N 060/2024).

## **HUMAN AND ANIMAL RIGHTS**

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

## **CONSENT FOR PUBLICATION**

Informed consent was obtained from all participants of this study. (Participation in the research was completely

voluntary, and students were explicitly informed that they have the right to opt-out without facing any negative consequences in their nursing education program. We obtained consent from students who willingly agreed to participate after providing them with sufficient information about the study.

To conduct the study, we followed the established protocol of informing the research department at the institution and obtaining consent from participants who voluntarily agreed to take part.)

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of this study will be made available by the corresponding author [H.E] upon special request. Researchers who are interested in accessing the data may do so by making a special request via email, as indicated in the article.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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