ORIGINAL ARTICLE

Mobile e-portfolio as a Personal Digital Assistant in Nursing Education

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ABSTRACT

Background: In view of the recent interest in the use of mobile technologies for assessing people's work and career, tools such as personal digital assistants (PDAs) and cell phones can not only make data collection possible at anytime and anywhere, but also improve this process by allowing for the collection of multimedia data. This study was conducted to design and develop a mobile portfolio and evaluate its efficacy in assessing the performance of nursing students in clinical wards.

Methods: The graduate nursing students of Jahrom University of Medical Sciences were recommended to draft a clinical portfolio of their clinical experience in written, audio and video formats in various media. Mobile e-portfolios have been developed to synchronize wirelessly with the user's personal web page over Wi-Fi and cellular networks. Data on the students' duration and type of training, time, learning opportunities, work performance, resources and clinical experiences were recorded on the ward's website. The teachers were also able to access the students' portfolios for adding notes and comments. The teachers' assessments were both qualitative and quantitative.

Results: Mobile e-portfolios are a user-friendly, accessible and attractive method for the objective assessment of students that enable the careful assessment of the students by encouraging their Improving information literacyand feedback. This tool satisfied 70% of the students.

Conclusion: Smartphone-based e-portfolios can facilitate the continuity of work and create uniform frameworks for the students to display their performance and learning efficiency, invite others to interpret and evaluate their work and selectively publish online documents of their clinical achievements.

Keywords: Electronic portfolio, mobile-based learning, clinical performance, student assessment

INTRODUCTION

Portfolio is a specific software for supporting collection, selection, reflection and communication and can be used for many purposes, including assessing the students' progress, career development and promotion, thinking skills, school communications, long-term or lifelong learning, recruitment and acceptance, accreditation, integration and consolidation of data and receiving reports[1,2,3,4].

The advantages of portfolio include creating a link between theory and clinical practice through a process of reflection on theoretical subjects in clinical settings. It makes the students aware of their strengths, weaknesses and limitations and helps create a sense of responsibility in then toward learning and increases their self-esteem and confidence. Furthermore, it encourages the active participation of the teachers in providing feedback and increases student-teacher interactions[1]. Other important advantages of this method are that it enables the students to learn to think about solutions, strive for personal development, adopt a model of self-oriented learning, acquire reflection skills and respect professionalism. These outcomes can be best achieved through a portfolio[5-9].

Evidence suggests that students and teachers are not quite satisfied with the current clinical education and assessment methods[6]. Some believe that the quality of clinical education is generally poor and appropriate measures should be taken to change the design of curricula and the students' assessment[5,10-12]. Solving these problems requires decisive organizational leadership by 2020, when organizational leadership is intended to be professionally adopted in universities[13,14]. Clinical education is a key part of learning for health professionals[15]. Portfolios offer an integrated education and assessment tool[16-19].

E-portfolios can provide immediate feedback and create many links for the organization of content. For example, they can link content and educational goals, enhance learning by providing a structural flexibility of ideas and providing links to other resources[20]. E-portfolios can obtain and present learning evidence and documents from resources such as literature, presentations, illustrations, photos and videos[21] .In addition, by enabling constructive assessment, e-portfolios help assess the possibility of displaying the numerical indicators of automatic progress and improvements in the acquiring of skills[22-25].

The limitations in the first versions of e-portfolio included a focus on achieving skill targets rather than the comprehensive assessment of competence involving communication, knowledge acquisition, technical, clinical decision-making, emotional and monitoring skills and value, which benefit the community and the patients[26, 27]. In recent years, the use of mobile technology (including PDAs and cell phones) for assessment purposes has become widely popular [28]. Cell phones are currently being used to collect photos, audios, videos and text materials and they can help archive, store and share information through social

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networking and stimulate student feedback and reflection[29]. Mobile devices can be used as effective student response systems for receiving feedback on their progress[30].

The present study aims to develop mobile portfolios as a tool for the assessment of clinical performance in medical science education. A pilot study was designed and the portfolios of undergraduate nursing students were assessed.

MATERIALS AND METHODS

A clinical electronic portfolio (e-portfolio) was developed for the undergraduate nursing students of Jahrom University of Medical Sciences in Iran in order to enable them to quickly register their clinical experiences in text, audio and video formats.

Study design: The PDA e-portfolio tool has been developed to show the potentials of using mobile phone technology for supporting and improving clinical learning, integrating learning and reflection in the learning environment, interacting with students in the knowledge translation process, helping conceptualize and internalize clinical knowledge in the workplace and helping prevent the isolation of students in clinical supervision.

Mobile e-portfolios have been developed to synchronize users' personal web pages with their portfolio whenever cellular network or Wi-Fi are available. Wi-Fi systems, cell phones and PDA devices were selected and developed to offer an electronic platform for clinical e-portfolio. IOS, Android and Windows were the mobile platforms selected as wireless devices with multimedia capabilities. This software was developed to facilitate access to the students' clinical information (frequency of data input to the e-portfolio, commencement and termination of courses, communication with the professors, contact data, learning opportunities, resources and clinical experiences, including a list of nursing care activities obtained by nursing students' reflection on the structure of clinical practice). A PDA and other devices working on a safe web server based on the portfolio were provided for recording the live activities of the students at improving information literacy [Fig. 1-2].

This software was developed to facilitate access to the students' clinical practice data, including the duration and type of training, time, learning opportunities, work performance, resources and clinical experiences such as conference participation, publications, care experience and reports such as self-assessment questionnaires and teacher assessment [Fig.3-4].This network was designed based on a hierarchical system to enable the organization of all the stages of the registration of teachers and students, the duration of training and the confirmation of registration by the network manager as shown inFig.1-2.The students were able to access their web-based portfolio and edit it. The teachers were also able to access the students' portfolios and give them their feedback and carry out a qualitative and quantitative assessments of their performance [Fig. 5].

Data analysis: The quantitative questionnaire contained 20 items scored based on a 3-point Likert scale (good, moderate and poor) with a total score of 60. The qualitative part described the students' clinical performance as good, moderate and poor. All the students who entered the pilot program uploaded and categorized their clinical performance in the form of text, image or PDF. On average, these students were engaged in clinical practice for four weeks (five days/week). The sample size was small due to the limited number of students who had a proper cell phone that could be used in this study. Each student was given a PDA or clinical software to use for three weeks during a clinical period, and also one to two hours of basic training on the application of these tools. Over these three weeks, they prepared a report on their performance in the ward using the PDA or smart phone-based software. Then, the students were interviewed on their understanding and views about the potentials of e-portfolios and PDA clinical tools. They also participated in focus group discussion (four students in each group) to delve deeper into the advantages and disadvantages of this software.

RESULTS

A total of 30 students taking a psychiatric course were included in this study. The reports received showed that the students had made a significantly good use of the software in the last three weeks. Five students with old phones (java-script operating systems) were excluded. As another means of analysis, the surveys of the 30 students whose e portfolios were examined were considered. With respect to the efficacy of the e-portfolios for evaluating student completion of learning goals, e portfolio evaluation questionnaire results are presented in Table 1.

Item	M
1. Capable of creating a learning community	2.23
2 Authentic learning .when it is linked to real world experiences	2.29
3 Experiential learning	2.10
4 Competency-based education (using electronic portfolios as part of student learning outcomes based performance assessment)	2.57
5 Promote higher order skills	1.76
6 Lifelong learning where (learning guided by the individual's interests)	1.98
7 Learning is self-taught and self motivated(interensic motivation)	2.97
8 Students' assessment is objective	2.45
9 Active learning(students set goals for learning)	2.14
10 Engage self reflections	2.11
11 Assume responsibility for their own learning	2.89
12 Ability to foster cooperative learning	2.87
13 Stimulating student strengths	2.35
14 Exposing them to areas needing development	2.45
15 Capable of growth as students' progress	1.26
16 Fostering deep learning	2.54
17Constructivist (learners construct knowledge through problem solving)	2.22
18 Capable of encouraging information and media literacy	2.87
19 Supporting of guided inquiry (involves initiation, selection, exploration, formulation, collection, presentation, and assessment)	2.56
20 Increasing students' self directed learning	2.12

The mean value for this questionnaire using found to be 2.33, showing a high level of students' satisfaction

.moreover, the mean score are between good (3) and moderate (2). Students also reported the e portfolio produce successful results for their own learning.

On the other hand, students also expressed their ideas on the benefit of using portfolio and challenges .The students reported that the program was user-friendly, accessible and attractive and helped them extract information about their assessment. In contrast to traditional assessment methods, the application of mobile software and the students' participation in their own assessment were novel for the participants. Self-assessment and getting immediate feedback from the teachers were among the strengths of this software. The students believed that this method provides a more objective assessment of

Table 2: Students' satisfaction from using e portfolio

User friendly	25 (83.3%)
Accessible	28(93.3%)
Attractive method	25(83.3%)
Novelty	15(50%)
Immediate feedback and self evaluation	22(73.3%)
Objective assessment	21(43%)
25(83.3%)	8(26.6%)
Enrich learning experiences	6 (20%)
Student associated with their existing need	4(13.3%)

The rubric data analyzed from data showed that students completing these early e portfolios exceeded the expectations of the instructors.

Using mobile technology in assessment thus delighted the students, and those with good IT literacy experienced greater joy when using it for assessment. By transferring software knowledge to their peers and sharing information, these students further developed their self-expression in using the capabilities of smart phones. They occasionally shared various software and suggested uploading information to their peers. Given the availability of Wi-Fi networks in clinical settings and outpatient clinics, the students attempted to send their assessment reports in these environments and exchanged views with their teachers about some articles for their inter-departmental presentations and searched for topics related to their assignments.

This accessibility made education in outpatient settings particularly attractive. A number of the students searched for irrelevant articles and were unable to work with digital libraries to obtain reliable information, which provided a perfect opportunity for training, and the teacher used this opportunity to teach the students how to use digital libraries and enhanced their knowledge of the subject. The students thus learnt how to use the main page of digital libraries, such as up to date and clinical key. They also learned to add it to their default internet search and signed up for using the website.

E-portfolio is less frequently used as a reference tool and is generally used once or twice per week or sometimes once a day in order to record the clinical activities of students. Generally, the students used this software to enter a series of data, including the patients' diagnosis, the care measures taken and other necessary information such as medications and the care and patient training provided during the administration of medications, and other information, including procedures performed for the patients, articles and presentations and their own activities in textual and multimedia formats. Although the students showed great interest in using this software, its use was restricted by their small display screens. The reports showed that the students had significant interest in using the multimedia capabilities of the PDA interface, especially its camera capabilities. Using touch keyboards showed that the students' reaction speed had also increased, but those with limited technical skills experienced greater limitations in using the software and required their peers' help. Generally, the students were interested in multimedia uploads, entering selected text and deleting files from the e-portfolio. There was relationship between wireless and wired communication and the smart application of these devices for synchronizing and updating the student assessment data, which suggested the students' satisfaction with this software –occasionally even reaching 70%.The capability of peer reflection had been anticipated in another part and in the initial design platform, but it was not used in the pilot study, and will be presented in later research and development stages.

This design was registered in Iran Patent Center (Code: 139450140003014239) and was approved by the Inventions Committee of Jahrom University of Medical Sciences.

Fig. 1

Fig. 2

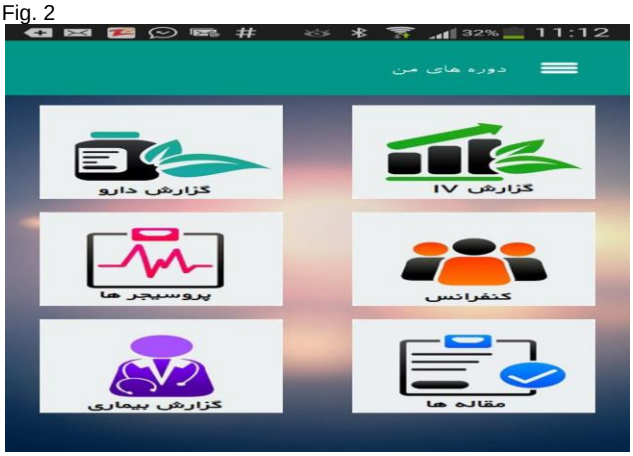
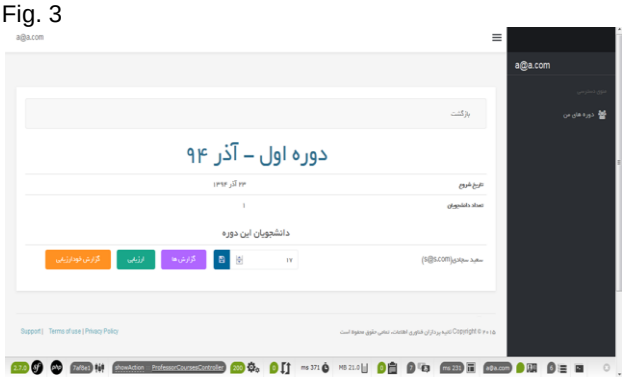


Fig. 3



+

Fig. 4

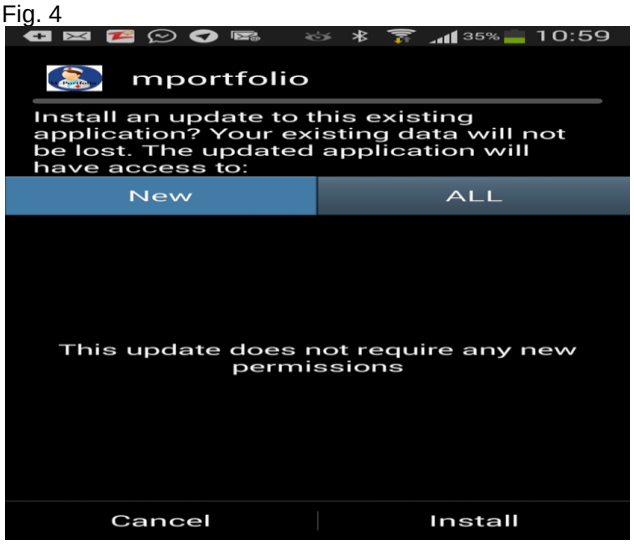


Fig. 5:

Fig. 6:

DISCUSSION

Smartphone-based e-portfolios can facilitate the continuity of work and create integrated frameworks for the students to display the results of their performance and learning efficiency, invite others to interpret and evaluate their work and selectively publish online documents of their clinical achievements (through careful planning and support). It is nonetheless clear that recording professional reactions can be difficult, even with appropriate and efficient tools. Furthermore, wireless PDA networks can help prevent knowledge isolation and encourage the students to report their clinical activities.

Garrett and Jackson assessed a wireless PDA for clinical e-portfolio in nurse practitioners and medical students and reported positive attitudes to the use of PDA-based tools and portfolios, which was confirmed by other studies too[32]. In another study, the students reported positive effects for mobile teaching and learning strategies and devices and found that they could better engage with course materials, have a deeper learning experience and improve their retention of learned materials[33]. Cell phones can help students develop higher-order thinking and critical thinking skills[34-35]. They can also help support their learning of information management, communication and time management[36-37]. In another study on students' perceptions of the aspects of the e-portfolio, mobile devices were found to be a convenient and easy to use application for the better management of information. They can also facilitate communication and help the mastery of concepts. These results confirm the present findings[33]. Using this software also helps with the targeted assessment of the students' performance. The students' own involvement in their assessment helps them better reflect on subjects and supports clinical learning.

Limitations: The limitations of this experimental study include the limitations of mobile phone applications for student assessment and the use of the tool and accessible resources for supporting student performance.

Further studies on these issues can help better understand teacher-student interactions. A similar study with a larger sample size is required for fully understanding the advantages and disadvantages of the software. The simultaneous use of wireless devices whose efficiency was limited by the PDA user interface was a limitation of this study. Despite the access to clinical guidelines on PDA, their use was limited by the size of the screens and working with online systems.

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