Maisa Kivistö

Nursing students' experiences in learning with mobile technology

Literature Review

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The purpose of this thesis is to describe how undergraduate nursing students experience the usage of mobile technology in learning. The aim of this literature review is to get a better understanding of nursing students' perceptions towards mobile technology and enhance nursing students' learning with mobile technology. The research question is: How do undergraduate nursing students experience the usage of mobile technology in learning?

This is a literature review and principles of content analysis were used in the analysis phase. Articles were collected from CINAHL and MEDLINE with different search term combinations. A total of fourteen articles (n=14) were analysed.

Results were divided into positive and negative experiences and they further into smaller categories. Positive experiences dominated and it was stated mostly that mobile technology is an effective educational tool which enables fast access to evidence based knowledge. Thus, patient safety and quality of care are enhanced in clinical environment. Mobile technology was said to be a good tool in teaching and learning and works both in class and clinical settings. Games were stated to be good for repetition as well as personal digital assistants. From a video record learning is enhanced via visual feedback but also verbal. Own personal appearance can be evaluated and strengths and weaknesses can be pointed out from which one's professionality grows.

Mobile technology might cause unpleasant feelings at first but as one gets familiar with the technology the feelings mostly eased. Technical problems were internet connection issues and device's structural downsides such as small screen size and small font. Students worried about the costs and feared that the device could be stolen, unprofessional appearance in clinical practice, confidentiality issues and becoming dependent on the device. Biggest concerns related to health care professionals opinions about the students' mobile technology used in clinical settings.

Students stated that they would use the device more if they had more precise instructions and ideas how to optimize the usage in clinical environment. Therefore, sufficient support meaning acceptation and IT support should be ensured.

Keywords	Mobile technology, learning, undergraduate nursing student, experience

Tekijä(t) Otsikko Sivumäärä Aika	Maisa Kivistö Sairaanhoitajaopiskelijoiden kokemukset mobiiliteknologian käytöstä oppimisessa – Kirjallisuuskatsaus 21 sivua + 2 liitettä 20 Huhtikuu 2017
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Tämän opinnäytetyön tarkoitus on kuvata sairaanhoitajaopiskelijoiden kokemuksia mobiiliteknologian käytöstä oppimisessa. Tavoitteena on lisätä ymmärrystä sairaanhoitajaopiskelijoiden kokemuksista ja asenteista mobiiliteknologian käytöstä sekä kohentaa sairaanhoitajaopiskelijoiden oppimista mobiiliteknologian kanssa. Tutkimuskysymys on: Kuinka sairaanhoitajaopiskelijat kokevat mobiiliteknologian käytön oppimisessa?

Tämä opinnäytetyö käsittelee yhteensä neljäätoista tutkimusartikkelia (n=14), jotka valikoituivat CINAHL ja MEDLINE tietokannoista. Artikkelit esitellään kirjallisuuskatsauksen muodossa ja ne analysoitiin käyttäen sisällönanalyysin periaatteita.

Artikkelit vastasivat tutkimuskysymykseen ja niistä muodostui kahdenlaisia tuloksia. Oppilaat kokivat sekä positiivisia että negatiivisia asioita käyttäessään mobiiliteknologiaa. Positiivisia kokemuksia oli valtaosa ja oppilaiden mielestä mobiiliteknologia on opettavainen ja tehokas väline, joka mahdollistaa nopean yhteyden luotettaviin tietokantoihin. Mobiiliteknologian sanottiin toimivan hyvin sekä kliinisessä että luokkaympäristössä. Oppilaat kuvasivat mobiiliteknologian olevan hyvä mahdollisuus kerrata opittuja asioita. Simulaatiossa kuvattu video mahdollisti oppimisen visuaalisen sekä verbaalisen palautteen myötä. Erityisesti visuaalisen palautteen oppilaat kokivat hyväksi, sillä videon myötä itsetietoisuus kasvoi.

Mobiiliteknologia voi saada aikaan epämukavia tunteita, mutta ajan myötä, kun laite kävi tutuksi, nämä tuntemukset lievittyivät. Teknisiä ongelmia raportoitiin olevan muun muassa internet-yhteyden ja laitteen valmistukseen liittyvien asioiden kanssa, kuten näytön koon ja fontin epäselvyyden kanssa. Oppilailla oli huolia ja pelkoja muun muassa seuraavista asioista: mobiiliteknologian kustannuksista, laitteen varastamisesta, luottamusongelmista potilastietojen säilyvyyden kannalta, epäammatillisesta näkyvyydestä kenttätyössä sekä riippuvaiseksi tuloa laitteesta. Suurin huoli oli kuitenkin se, miten kentällä työskentelevät terveydenhuollon ammattilaiset suhtautuvat opiskelijoiden mobiiliteknologian käyttöön.

Jotta mobiiliteknologian integraatio voi onnistua, tulee oppilaille tarjota avoin ja hyväksyvä ympäristö sekä tarpeeksi tietoteknistä tukea.

Avainsanat	Mobile technology, learning, undergraduate nursing student, experience

1 Introduction

New technological innovations are constantly introduced in today's higher education institutions. The development has led to an integration of technology into nursing education as well (Skiba 2015, p. 422). Mastering technology nowadays is a key to civilization and is compared to the ability to read a hundred years ago. (Välijärvi, 2011, p. 7.) Integrating mobile technology into the curriculum increases the level of involvement and learning (Monti Fonseca et al. 2015, p. 13) and it should be integrated better into the nursing curricula since the usage of mobile technology is an important competency to learn and a matter that will enhance the quality of nursing practice (Cibulka & Crane-Wider, 2011). Mobile technology develops the learning environment as it combines real-world and the digital-world (Hwang, Wu, & Ke, 2011). Various technological innovations facilitate different types of learning compared to traditional teaching methods (Hammerling 2012, p. 318). Technological revolution has reached a point that 96% of young adults in Finland and 86% of young adults in USA were using smartphones in 2015 (Anderson 2015; Sanoma 2015). Therefore, nursing students should be taught about the possible benefits of mobile technology as it can be a tool to improve nursing practice, decrease medical errors and enhance patient satisfaction. (Cibulka & Crane-Wider, 2011.) Technology is an umbrella term and mobile technology is more precisely the term for handheld devices and its functions.

Students have differing learning styles and they should be taken in account when designing the curriculum and when planning the teaching since this promotes student learning. Therefore, individual learning styles should be recognized according to the National League for Nursing and which is why it is important to research student experiences of different learning tools. Naturally, not everyone is excited about technological learning environments. Even in the future students have differing motivation, learning strategies and abilities which must be considered. Students are in school to learn and teaching should be implemented in meaningful and interesting ways so that the learning is not perceived as old fashioned and boring. (Välijärvi, 2011, p. 4.)

Since the growth of technology is seen to be significant it is important also to research the experiences of the students who use mobile technology since there is no point in using a learning tool such as mobile technology if the students do not accept it and are

not motivated to use it. Therefore, the experiences and outcomes of the usage are important to explore to see how the integration of technology is succeeding into nursing education. In this literature review, the purpose is to describe how nursing students' experience mobile technology in learning.

2 Background

2.1 Concepts

The main concepts used in this thesis are learning, mobile technology and an undergraduate nursing student.

Learning

According to Merriam-Webster dictionary learning is a process of gaining new knowledge or skill due to practicing, studying, being taught or an experience. Learning is enhanced when it involves emotions and motivation. The process is also interactive with the student and the environment and consequently social relationships affect to it. Constructive learning theory is based on sensible assignments and solving problems. The goal is to teach the thinking process. Using technology in education is said to be constructive learning. Successful learning and learning process consists of the activity of the learner, information research, theory application and producing new knowledge. (Sampola, 2008, p. 28.)

Mobile technology

Merriam Webster Online Dictionary defines technology as ‘’a manner of accomplishing a task especially using technical processes, methods, or knowledge.’’ Mobile (cell) phone is defined as something that is “capable of moving or can be moved”. The term ‘’mobile technology’’ is commonly understood as technology that is related to mobile phones. However, since the lack of research concerning mobile technology in nursing education, the term “mobile technology” in this review will include all technology based hand held tools that can be used to learn. Terms personal digital assistant, handheld device and device are used as well to refer to mobile technology. This means, for example, aids in

simulations, mobile phones or hand-held devices and applications and games that can be operated on them. This thesis does not include computer software or platforms nor social media.

Undergraduate nursing student

An undergraduate is a person who is studying their first college or university level degree. The aim of the bachelor degree of nursing and in other degrees is that the one has in the graduating phase a certain knowledge level. This includes broad practical skills and theoretical knowledge to be able to work as a professional, readiness to follow up and enhance one's field development, skill to develop own professional skills and lifelong learning, sufficient communication and language skills to one's duties, international functions and cooperation. (Valtioneuvoston asetus ammattikorkeakouluista 1129/2014, 4§.)

Per EU directive Article 31 of 2005/36/EC to graduate as a general nurse, one must attend and successfully complete nursing studies for three years and 4600 hours of study. A Half must consist of clinical studies and one-third theoretical studies. The Nursing and Midwifery Council (NMC 2010, p. 9) legislates half-and-half (2300 hours – 2300 hours) ratio for theory and practical training in UK. However, nursing students in Finland must successfully pass 105 credits, 2835 hours, of clinical studies. That means 535 hours more than the EU standard concerning clinical studies. (Eriksson, Korhonen, Merasto & Moisio 2015, p. 35; Opetusministeriö 2006, p. 17.)

2.2 Technology in nursing education

Application of technology to education has a positive effect on the development clinical competence among nursing students. Incorporation of traditional and experimental learning environments decreases the gap between theory and practice. (Rowe, Frantz & Bozalek, 2012.) Nursing profession has evolved over the last century significantly and requires nowadays proficiency in advanced technology and complex assessment skills. In addition, technology is more and more apparent in healthcare environments. (Diener & Hobbs, 2012.)

A matter which is important to consider when planning the integration of mobile technology into nursing, is students' learning styles. With the concept ''learning styles''

is meant the manners that one learns and exploring one's individual learning style is finding one's strengths. Choosing a correct teaching method according to one's learning style helps the student to attract concentration, process and retain the new information. (International Learning Styles Network 2008.) Learning styles differ between the entering nursing students and graduating ones which is why they should be taken into consideration. Especially simulation as a learning strategy is good because it involves students with different kinds of learning styles since it offers active/reflective, sensing/intuitive and visual/verbal approaches. (Gonzales et al. 2017.)

The learning needs of the students are broad so to fulfil them, there needs to be used differing teaching and learning methods. A weak combination of different methods has serious consequences which is why these should be properly considered. (Rassool & Rawaf 2007.) Mobile technological aids allow new approaches to learn and practice clinical skills more comprehensively and are proven to enhance learning (Raman 2015). Pre-clinical lessons are held in learning laboratories, in which simulations, videogames and other technological aids are increasingly used. Simulations allow nursing students to practice real-lifelike-situations and develop professional identity in a safe environment (Gaba 2005, p. 2; Kelly, Berragan, Husebø, & Orr 2016, p. 319). However, they do not give the feeling of a real caring and reciprocal relationship (Diener & Hobbs, 2012). Video games can be used to improve skills or to create new knowledge (Monti et al. 2015, p. 13). Video presentation of clinical procedures is found to be more effective learning method compared to didactic lecture (Lee, Boyd & Stuart 2007, p. 244). Other mobile technological aids are different iPods, tablets, software packages, applications and programs to handheld devices (Raman 2015).

3 Purpose, aim and study questions

The purpose of this literature review is to describe how undergraduate nursing students experience the usage of mobile technology in learning. Thus, the aim of this literature review is to get a better understanding of nursing students' perceptions towards mobile technology and enhance nursing students' learning with mobile technology.

The research question is formed as follows;
- How do undergraduate nursing students experience the usage of mobile technology in learning?

4 Methods

Literature review is a research method that takes the previous researches under analysis and composes cohesive summary concerning the topic of interest. The previous knowledge is critically evaluated and organized to reveal what is already known. Literature review does not just describe what has been done, but compares studies to each other to find out their consistencies and contradictions (Polit & Beck 2004, p. 108). A literature review offers a great basis for further qualitative or quantitative research since it builds connections between theory, practice, research and education. In-debt data reach will build a strong foundation for a research. First is searched what is known and unknown of the chosen subject and through that the research questions and or hypotheses are made. When there are used at least two different online databases the validity of the literature review is better. In addition, the validity is enhanced by using mainly primary sources and collecting a good amount of critically chosen articles that answer the research question(s). After theoretical frameworks exists suitable research design, methods and analysis are decided. Strengths and weaknesses are determined and supportive evidence for maintaining guidelines and interventions or new ways of approaches are revealed. It is important to document each stage of the process including used databases, search terms, limitations and number of articles retrieved and chosen. (LoBiondo-Wood & Haber 2014, pp. 50-51, 66, 70, 72-73.)

This thesis is a descriptive literature review where the search methods of systematic literature reviews will be applied. This cannot be a narrative review since it has undefined methods concerning the literature review process. (Aveyard 2010, p. 17.) In this work, there has been chosen a research question which guide the research and there are inclusion and exclusion criteria set.

4.1 Search strategy

Reliable databases such as CINAHL and Medline were used in data search and collection. Suitable articles from ERIC and Medic were not found. Research articles found were limited to English and Finnish language. To attain reliable amount of data, one refrained from using excessive amount of limitations. Search terms were used in different combinations to find articles linked to the subject. The Boolean connector ''OR''

gives broader results than "AND" which is needed to retrieve more material otherwise some important results might drop out. Both connectors were used.

Search terms were: mobile technology, learning, nursing students, experience, perceptions, education, nursing, personal digital assistants, PDAs, smartphone, handheld, handheld devices, mobile, learning styles, undergraduate student nurses, student nurses, video, m-learning, mobile learning.

4.2 Study selection

Inclusion and exclusion criteria were set to assist in the selection of articles (Table 1.) Articles that answer to the research question were chosen which means the article included terms such as mobile technology or technology or hand held devices/technology, learning and student experience. They were found from scientific databases and were written in a well understandable language (English, Finnish) by the researcher. Also, the research must have undergraduate nursing students from a college or university not for example practical nursing students or graduated nurses. Some articles were discarded since the sample consisted of nurse practitioner and/or medical students. There was not used any restrictions of the publication year since all information regarding students' experiences with mobile technology are useful and in addition mobile technology in education is quite a new matter.

Table 1. Inclusion and exclusion criteria

Inclusion criteria	**Exclusion criteria**
• Mobile technology, undergraduate nursing student, experience, learning • Peer-reviewed research articles • English or Finnish language	• Articles concerning lower or continued education or professional development

The selection of the material was started by reviewing the titles. If the title was not related to the research question it was discarded. Duplicates were excluded. Abstracts of those articles which title seemed appropriate to this study were read. Preliminary the articles were chosen by seeing that there has been used mobile technology in the research and there were student experiences described. Furthermore, twenty-one full articles (n=21) were carefully read and final selection was done based on the inclusion and exclusion criteria which brought a total of fourteen articles (n=14). Primary sources were strived to

be used in the literature review. The study selection process was based on Polit & Beck (2004, p. 84).

The data search table was done by presenting the different combination of terms used, the number of hits, whether there were limitations used and how many articles were reviewed and then chosen from that search result (Appendix 1.)

The chosen articles were read and a table of main points was made. There are presented the author(s), year of publication, purpose of the research, used mobile technology, study design, sample size and results of the research article (Appendix 2.)

4.3 Data analysis

The principles of inductive content analysis described by Elo & Kyngäs (2007) were applied within the process, which means that the categories were derived directly from the data (Polit & Beck 2004, p. 580). In this research, experiences of the students were collected from the final selection articles. The feelings and points were individually written on a small piece of paper which then were divided into positive and negative experiences. Further critical sorting was made and subcategories were formed. Then names of the generic categories were decided and a figure of positive and negative feelings was made to present the results more clearly. The subcategories are presented more precisely in the results.

5 Results

This thesis answers to the question regarding the experiences of undergraduate nursing students with mobile technology in learning. The research articles were published between 2007-2015 and are from Australia, Canada, Finland, Sweden, United Kingdom, Spain and the United States of America. Mobile technology used in discovered articles are such as iPods, iPads, Tetra phone, personal digital assistants, an application used in a personal digital assistant and video recording.

The researches revealed that almost in every case most the students or all students had positive experiences of mobile technology and it was stated to be an educational tool

(Brimble 2008; Cook et al. 2012; Davies 2014; De Marcos Ortega et al. 2011; Farrell & Rose 2008; Fisher & Koren 2007; George et al. 2010; Johansson et al. 2013; Lynch-Sauer et al. 2011; Mann et al. 2015; Nyström et al. 2014 & Schlairet 2012).

However, in one research students stated that mobile technology would be good to use among traditional methods (Cook et al. 2012). In another research, students had varying experiences depending on the device's orientation way. One group felt unpleasant feelings as the other group enjoyed learning with the mobile technology. (Poikela et al. 2015.)

5.1 Positive experiences

All in all, improvement in nursing practice happens as the student can use mobile technology (Schlairet 2012). As using mobile technology, the student gains self-awareness (Brimble 2008 & Nyström et al. 2014), sees the device beneficial (Farrell & Rose 2008), enjoys using the device and learning is fun (Cook et al. 2012). Mobile technology works well both in class and in clinical surroundings as a reference tool (George et al 2010). Students still prefer using mobile technology in clinical settings (Farrell & Rose 2008) and would like to use personal digital assistants in their future work but worry about other health care professionals' opinions about using a PDA in real work (Johansson et al. 2013). Most of the positive experiences and feelings aroused from the device benefits which these then together enabled learning.

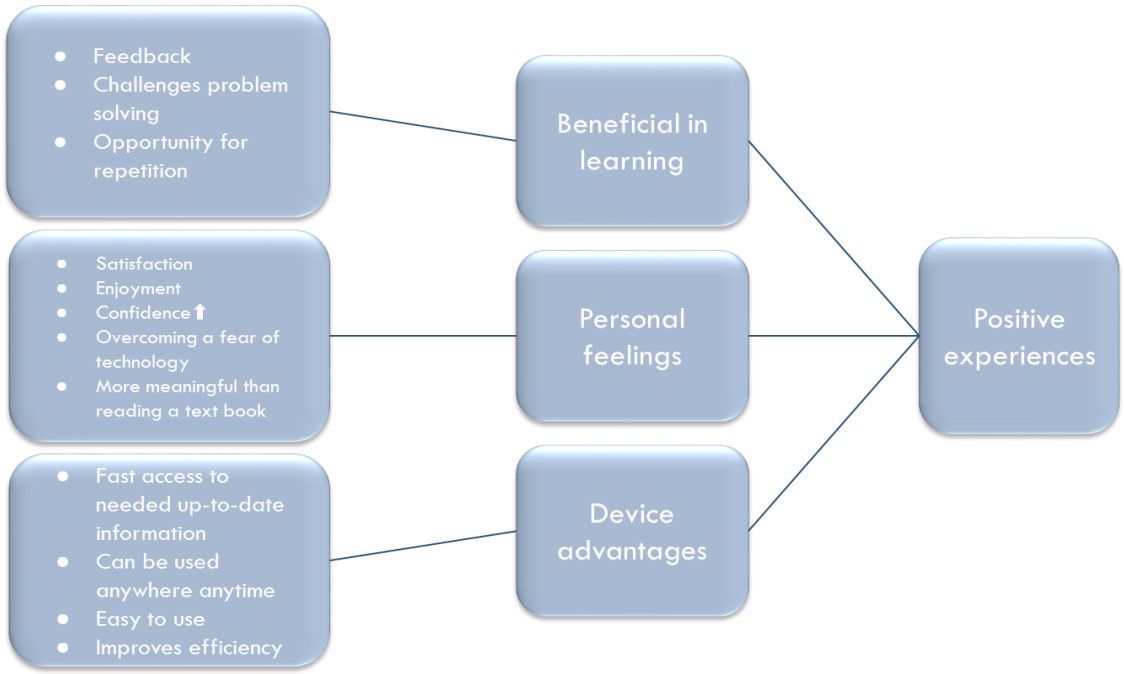

Figure 1. Positive experiences.

The positive experiences consist of three different sections which arouse from the student experiences. Consequently, the generic categories have sub-categories as seen in (Figure 1). These will be further described.

5.1.1 Beneficial in learning

This generic category includes experiences which altogether lead to learning and improvement in one's practice. Feedback is an essential part of learning and therefore students highlighted the opportunity of visual learning as seeing one's and another's performance (visual feedback) from a video record after a simulation. Through video one can analyse own practice as one observes personal actions (appearance) and points out mistakes and thus learning from mistakes occurs. This is a good way to develop skills even though this method can cause unpleasant feelings at first. (Brimble 2008 & Nyström et al. 2014.) As observing own actions, one can see own personal appearance, meaning how one reacts to different situations (stress) and does one behave professional. Meanwhile as watching the video, a dialog between the student and teacher can take place which is emphasized by the student stating own actions which gives the teacher an opportunity to focus on the positive verbal feedback.

Consequently, learning is enhanced through developing self-awareness when seeing own strengths and weaknesses and professional growth occurs. (Nyström et al. 2014.) Benefits of video recording were recognized even by those who had concerns (Brimble 2008).

The students reported that playing games offers an opportunity for repetition which is beneficial especially before an exam. In addition, problem solving skills are challenged (Cook et al. 2012.) and interpersonal skills can be developed through games which are important areas of nursing and students hope games would be integrated more into the education. From games one will most probably find out what went wrong and one learns from the mistake. The students stated that if the game helped to reach a meaningful goal, they would play it even in their free time. (Lynch-Sauer et al. 2011.) Also with the personal digital assistants the opportunity for repetition was reported since the students mostly went and checked information about a certain medication many times during the clinical practice (Fisher & Koren 2007).

5.1.2 Personal feelings

Students reported feelings of satisfaction as the nurses' knowledge could be supported with the mobile technology (Fisher & Koren 2007) and enjoyment when playing games or using a personal digital assistant (Cook et al. 2012). They felt that the mobile technology encouraged (Farrell & Rose 2008) and that one's confidence improved (Brimble 2008 & Johansson et al. 2013) whereas many reported overcoming a fear of using mobile technology (Davies 2014). Some even stated that learning with the device was more meaningful than reading a traditional textbook (Cook et al. 2012). Mobile technology was said to be a good tool (Fisher & Koren 2007) in teaching and as a learning method (Brimble 2008). Students stated a reason for playing games as being able to relax meanwhile (Lynch-Sauer et al. 2011).

5.1.3 Device benefits

Plenty of benefits were reported in the articles. Most common statement was that the device is convenient because one has fast access to up-to-date evidence based knowledge (Fisher & Koren 2007; Johansson et al. 2013 & Schlairet 2012) and it can be used anywhere anytime as there is internet access or as the content is already

downloaded (Martyn et al. 2014). Due to these qualities, student felt that patient safety and the quality of care were improved. Interaction between the nurse and patient was enhanced and the student could quickly solve a conflict with the device concerning a medicine or a patient's question at the bedside and one did not need to leave the patient alone to search information. (Fisher & Koren 2007; Johansson et al. 2013.)

Efficiency is improved as mobile technology works well as a reference tool which often means time is saved which then can be directed into other duties. Students reported that the mobile technology is mainly easy to use. (George et al. 2010.) However, it depends of the student, one might need help when another does not (Farrell & Rose 2008). It was also reported that the mobile technology is much more straightforward and faster to use than a text book and in addition to the drug guide, information about different diseases and symptoms were searched (Fisher & Koren 2007). In addition, the personal digital assistants made up for the small number of computers at the wards (Mann et al. 2015).

5.2 Negative experiences

In every study, some negative experiences were reported. They consisted mainly of issues concerning the device and lack of support using the mobile technology. Thus, negative feelings as frustration occurred when the students' technical literacy level did not meet the requirements using the device (Poikela et al. 2015). As the literacy level was not adequate the students felt it difficult to use the device (Farrell & Rose 2008) and lack of confidence was seen to be a limiting factor to the use of the device (Martyn et al. 2014). These issues are important to notice since they decrease the learning experience.

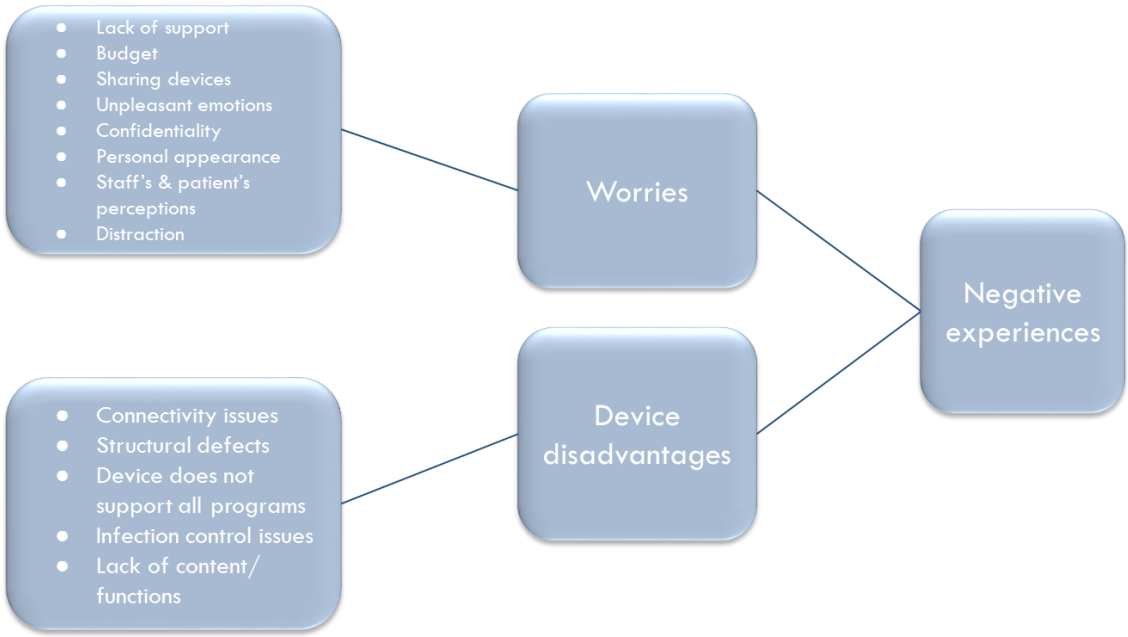

Figure 2. Negative experiences.

The negative experiences consist of two different sections. The student experiences revealed personal worries and issues concerning the device (Figure 2.). These will be further described.

5.2.1 Worries

The most reported feeling was not knowing how to use properly the mobile technology and felt that the technical support or teacher's knowledge of the mobile technology was not enough to support the usage (Farrell & Rose 2008; George et al. 2010 & Mann et al. 2015). Inadequate training sessions were also a barrier to the use of mobile technology which then caused lack of knowledge and discomfort (George et al. 2010). However, some students reported not needing support at all to use device (Farrell & Rose 2008). Discomfort using the technology and challenges of the usage appeared especially among mature students but many adjusted quite quickly to the usage of the mobile technology (Davies 2014 & George et al. 2010). Also, mature students' motivation towards using mobile technology applications is not so high compared to the younger ones' (De Marcos Ortega et al. 2011) possibly due to this feeling of discomfort. In few researches the mobile technology was used in groups. Everyone did not have a device of their own since the students did not have the money to buy one or the institute could not afford one for each individual and unfortunately everyone did not get a chance to use

the device. Yet it was discussed that when the device was used in groups, it enhanced group working (Davies 2014.)

Students had unpleasant emotions and concerns before video recording simulations which consisted of nervousness, tension and putting oneself on display. Nevertheless, those feelings tended to disappear as the examination progressed. (Nyström et al. 2014.) Afterwards as watching the videos the concerns were that one would be judged, feeling embarrassed and worries of personal appearance (Brimble 2008). In one research students played a game which included fast tests which then caused time pressure in their performance (Cook et al. 2012).

Students worried about the costs of the applications and feared that the device could be stolen, unprofessional appearance in clinical practice, confidentiality issues and becoming dependent on the device (Mann et al. 2015). One student stated not being worried about becoming dependent since relying on the device and facts found of it is better than guessing (Fisher & Koren 2007).

Student wished to have access to the patient records from their device so that they could read information and document as they were at the bedside to reduce documenting errors and loss of information. However, the matter of how will the patient data be integrated into the mobile technology needs to be discussed with the hospital and how to keep the records safe. Internet has widely information so it is sometimes difficult to know which is reliable knowledge. (Johansson et al. 2013.)

The students worried about the staff's perceptions towards mobile technology (Johansson et al. 2013 & Mann et al. 2015). Even though the students are using the devices for educational reasons some might think that it is used for personal reasons for instance playing games or chatting. As the students face negative attitudes from the staff the usage of mobile technology is decreased but when supportive attitudes are gained the usage is enhanced. (Mann et al. 2015.) In addition, the students worry about patients' attitudes towards using mobile technology in patient rooms and whether it is overall suitable to use it in such a situation. Therefore, some students did not want to use the device in front of patients and thought that the use of PDA is distraction since the time with one's patient is special. Using a device to check a matter might seem like not knowing one's field and therefore the patient might have less confidence in the nurse.

Although it is more of ensuring patient safety which is especially important in medicines management. (Fisher & Koren 2007.)

5.2.2 Device disadvantages

Internet access is sometimes very crucial in the usage of mobile technology since many functions need connection to work. Connectivity issues as internet not working or not functioning fast enough were often mentioned (Cook et al. 2012 & Martyn et al. 2014) or difficulties to access the wireless internet (Mann et al. 2015). As there is no internet access all functions of the device cannot be utilized which hinders the usage and experience (Martyn et al. 2014). Problems arising already from the devices' manufacturing were a small screen size (Farrell & Rose 2008; Martyn et al. 2014) and font being unclear or too small (Farrell & Rose 2008) but a small device means it is portable (Mann et al. 2015). In addition, all devices do not support every program which was very unfortunate and hindered the usage at times (Martyn et al. 2014). Another technical issue was that in a game the video paused by itself (Cook et al. 2012). The issue of quick battery loss was reported (Mann et al. 2015) but in another research, it was not an issue since the students were diligent and remembered to charge it after every shift (Farrell & Rose 2008). In one research, it was mentioned that students were thinking about infection control issues concerning the device, meaning how to maintain aseptic working methods and to reduce cross infection after being in an isolation room (Mann et al. 2015). A proportion of students wished for more content or functions to the device (Johansson et al. 2013). However, students stated that the mobile technology becomes useful as the resources could be accessed and problems managed (Martyn et al. 2014).

6 Discussion

6.1 Discussion of results

Millennial students state mobile phones to be very important communication tools and a huge part of their lives. Motivation towards learning enhances as they feel comfort using mobile technology. Thus, offering the students with mobile technology learning tools has a great chance to improve learning and future practice. (De Marcos Ortega et al. 2011.)

Essential is to offer adequate orientation (Poikela et al. 2015) and training sessions on the use of mobile technology and enough time to assimilate the features of the device before the students go for clinical placement (Farrell & Rose 2008). Thus, proper technology literacy level to use mobile technology needs to be ensured (Martyn et al. 2014).

Students found innovative ways to use the device as they familiarized with the it and thus, learning was enhanced (Fisher & Koren 2007). As the usage became innovative, problems were handled more easily and again the learning experience improved (Martyn et al 2014). However, important is to notice that mobile technology is expensive and therefore students should be provided adequate support to be able to maximize the use of it (George et al 2010) and student stated that they would use the device more if they had more precise instructions and ideas how to optimize the usage in clinical environment (Mann et al. 2015). Adequate support means that there is general IT support and teacher's and/or clinical staff's knowledge is sufficient to be able to support the student's usage of the device (Farrell & Rose 2008).

As the results show students used the mobile technology a lot as a reference tool to find out quickly evidence based knowledge especially among medicines management. In that area, most errors happen (via unsafe practise and medication errors) and that is worldwide the leading cause of patient safety injuries and harms (WHO 2017). Students should adopt mobile technology early in their nursing education to fasten and improve the use of mobile technology in the clinical setting (Farrell & Rose 2008). Human mind and memory are limited and therefore everything cannot be always remembered which is why a personal digital assistant is a fast way to recall the knowledge (Johansson et al. 2013) so why take a chance on patient safety? Consequently, the health care staff should be taught about mobile technology and technology should be integrated more into the field so that the benefits would be seen, perceptions of the usage would become more acceptable than prejudiced and students could have a better support system to use the technology.

All in all, the students' positive and negative experiences should be considered as the future curriculum is planned and mobile technology is integrated better into it. Emphasis on the improvement of negative experiences should be so that the greatest benefits of the mobile technology are accomplished. These would be ensuring adequate amount of support, enough nursing content on the device, a proper size device from the beginning

(portability should be maintained) and a responsive environment. The most recent is important also in video simulations. There should be a non-judging environment where mistakes are allowed since school simulations are a safe learning environment. However, there will most likely appear problems that cannot be seen beforehand nor can be prevented. Yet the technical difficulties will be the most common issues regarding mobile technology and these should be considered initially and institutions should be ready for a commitment and to plan a proper budget for mobile technology including costs of the mobile technology and technical support (George et al. 2010). Students would benefit of a grant funding but this is not always possible. Therefore, more options should be sought. (Raman 2015).

More research is needed of the students and clinical staff's experiences and attitudes and how the device should be orientated to the students. Hand held devices are good educational tools but it should be remembered that there are differing opinions and students have differing learning styles when integrating mobile technology into the curriculum. Optimal would be to offer an opportunity to the student to choose the learning style according to one's individual needs but unfortunately the resources are limited.

6.2 Validity

Databases used in this review are considered reliable and recommended by the library of Metropolia University of Applied Sciences as well as many other respectable research committees. Use of many various sources of writings to compare the results ensure validity (Burns & Grove 2001.) Integrity was ensured by self-reflecting ensuring that the interpretations are solely from the data and not researcher's subjective views (Polit & Beck 2013). The principles of the inductive content analysis were applied, since it is a commonly used data analysis method in qualitative research. Reliability is ensured when the data is simplified and categorized properly. The process is demonstrated clearly to show the link from the data to the results. Trustworthy of the work was enhanced by using legitimate sources. (Elo & Kyngäs 2008.)

Since the data was collected from various sources there is a potential for clear presentation of the topic of interest but also potential for bias and error. Each stage of the process was documented and the procedure of the methodology was followed to increase the trustworthiness of the work (Whittemore & Knafl 2005).

The results of this research might not be generalized since some of the research articles analysed in this research did not have a large sample size. In few researches the sample was taken of an implementation which included students who had chosen the course where was used mobile technology so the students already had a motivation towards using mobile technology. Therefore, a broader research with random selection of samples should be done about the experiences of undergraduate nursing students to have more diverse and reliable outcomes. Yet strength of this research is that there were many shared experiences among the students.

6.3 Ethical considerations

Research was conducted according to the Responsible Conduct of Research Guidelines (RCR guidelines) since these guidelines are considered ethically reliable and trustworthy). The core values of good ethical research, such as honesty, accuracy in every phase as well as general meticulousness were obtained. Accepted and ethically proven data collection methods and research methods were used. Work of other authors was respected and acknowledgement with references were shown properly to maintain the value of their work. (TENK 2012, pp. 30-31.) All in all, integrity and avoidance of all kind of research misconduct were adhered to achieve high standards. (Polit & Beck 2013, pp. 140-141). To ensure the absence of plagiarism, the work was checked with Turnitin (Wager & Wiffen 2011, p. 132).

7 Conclusions

Undergraduate nursing students reported positive and negative experiences when using mobile technology. The main positive aspects of mobile technology are that it is beneficial in learning, awakes positive personal feelings and the device advantages are seen. Students' worries and device disadvantages are seen to be the negative aspects of mobile technology.

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Search terms and results

Database	Search terms	Limitations	Number of hits	Articles reviewed	Chosen articles
MEDLINE 30.1.2017	''nursing'' AND ''education'' AND ''perceptions or experience'' AND ''mobile technology or handheld or personal digital assistants or PDAs or smartphone or mobile''	None	73	6	4
MEDLINE 31.1.2017	''m-learning or mobile-learning''	None	98	3	1
CINAHL 10.1.2017	''Personal Digital Assistants or handheld devices'' AND ''nursing students or student nurses or undergraduate student nurses'' AND ''experiences or perceptions''	None	13	6	4
CINAHL 10.1.2017	''Video'' AND ''nursing students'' AND ''experience'' AND ''learning''	None	47	6	5

Presentation of research articles

Author(s), year, country, title.	Purpose	Mobile technology used	Study design/ data collection	Sample size	Results
Brimble, M. 2008. United Kingdom.	To explore student perceptions and support needs before, during and after video assessment in the simulated environment.	Video assessment in simulation	Self-completion questionnaires	Nursing students in one college. Before assessment n=29, after n=24	All participants rated the tool useful and informative. The number of students with concerns were decreased by 21 per cent. Concerns were being worried about being judged, making mistakes, personal appearance worries and feeling embarrassed in front of others. Overall positive results. Benefits were recognized even by those who had concerns.
Cook, N. et al. 2012. United Kingdom	Enhance the student experience of life support education, to motivate on-going learning and engagement and to improve psychomotor skills associated with the provision of Intermediate Life Support (ILS) training.	Interactive simulation game (PULSE)	Quantitative analysis of performance and qualitative data with questionnaires which assessed the learning experience.	N=34	All participants enjoyed playing the game, stated that the game helped to understand better the importance of teamwork during critical events and in learning and understanding. PULSE was evaluated positively and said to be an educational tool (enhanced knowledge, psychomotor skills, decision making) but in addition with traditional life support training.
Davies, M. 2014. United Kingdom	Examine the efficacy of using such technology (Apple iPad) more formally in facilitating increased levels of interaction and group cohesion within a series of tutorial sessions.	Apple iPad	iPads were used for one term in seminar sessions and in the end a six-point Likert questionnaire was done by n=20	n= 24 Three groups; two conventional tutorial groups and one iPad group	Positive results were overcoming the fear of technology, engagement with content, enhanced presentation skills, opportunity to go through the material online after the session. Negative was that they had to share the device among three students but there this might have caused better team working since they could not work so independently. Fear of technology decreased.

Author(s), year, country, title.	Purpose	Mobile technology used	Study design/ data collection	Sample size	Results
De Marcos Ortega, L. et al. 2011. Spain	Aim was to build a mobile application that could be used as an aid to students' self-evaluation.	Mobile application for self-assessment	Students installed the mobile application on their phones. Filled questionnaires concerning learning objects.	n= 28	Students' attitudes were very positive of the application and the overall learning experience. There was some technical issues due to device incompatibilities.
Farrell, M. & Rose, L. 2008. Australia	Investigate whether PDAs would enhance students' pharmacological and clinical contextual knowledge and to identify issues associated with the use of PDAs in students' clinical experience.	Personal digital assistant (Hewlett Packard iPAQ Pocket PC h5500)	PDAs were given to students who went to clinical practise. Mixed-method approach	n= 76 PDA group and a control group	Impressions were positive and encouraging. PDA was founded easy to use and was seen to be beneficial to learning in the clinical area. Negative was a small screen size. Students wished for more support and training sessions about the mobile technology.
Fisher, KL. & Koren, A. 2007. USA	Explore the perceptions of students lived experience using a palm hand held technical device (personal digital assistant) (PDA) in clinical practice at the point of care in undergraduate nursing clinical education.	Palm handheld technical device (personal digital assistant)	Open-ended qualitative questions in a semi-structured interview. Qualitative analysis. Students used the PDA's medical software in clinical practise.	n=28 Four focus groups	Once the students became familiar with the tool they founded creative ways to use it which then enhanced critical thinking and learning (especially among medicine management). Overall was experienced to be a good tool to find out quickly information and to improve learning and communication skills (ability & confidence) as accurate information could be given. Two different opinions about the impact of PDA usage in front of patients; distraction or a benefit?

Author(s), year, country, title.	Purpose	Mobile technology used	Study design/ data collection	Sample size	Results
George, LE. et al. 2010. USA.	Describe the use of PDAs by undergraduate and graduate nursing students during their educational process.	Personal digital assistant.	Students used received the PDA prior clinical experiences. 18-question internet survey was sent to the PDA owners. Response rate was 54%.	n=48 which of 5 were graduated.	The device had four software applications and the drug guide was the most used and the medical dictionary the second most. Said to be easy to use and to improve efficiency. All students said that the PDA is an effective educational tool. Works well as a reference tool both in class and clinical surroundings. Barriers were reported (technical problems, lack of technical support and knowledge)
Johansson, PE. et al. 2013. Sweden	Explore nursing students' experience of using a PDA in clinical practice.	Personal digital assistant	Questionnaire preand post practice. Interview in focus groups after the post questionnaire.	n= 67 Participants used a PDA for 15 weeks in clinical practise.	Supports students in clinical practice as it increases confidence and saves time as giving the opportunity to gain quick access to information and patients do not need to wait. Participants said that the practice becomes more organized, safe, timesaving and efficient with the PDA. All in all, it can be a useful tool but the students worried about other health care professionals opinions about the usage of a PDA in real work life.
Lynch-Sauer, J. et al. 2011. USA	Elicit nursing students' experience with computer games and new media, their attitudes toward various instructional styles and methods, and the role of computer games and new media technologies in nursing education.	Videogames	Internet survey about nursing students' experiences and views about videogames and related new media technology	n= 218 which of undergraduates were 150.	Students state that it is possible to learn from mistakes when doing them in a game. Interpersonal skills, critical analysis and thinking could be developed through games which are important in nursing. Students' attitudes are positive and they wish games and related new media technology would be integrated more into nursing since they see their potential to strengthen the education.

Author(s), year, country, title.	Purpose	Mobile technology used	Study design/ data collection	Sample size	Results
Mann, EG. et al. 2015. Canada	Aim was to explore the utility of mobile technology in undergraduate nursing education.	iPod Touch (contained best practice guidelines)	Baseline n= 33 and post-implementation n=23 questionnaires. Ongoing feedback. Usage of iPod in a clinical setting.	n= 33	Device was founded useful (internet access, made up for the computer lacking) though some technical issues were recorded. The usage was enhanced as they gained supportive attitudes from the staff but decreased when faced negative attitudes. Lack of skill using the device and lack of support were the main issues. Students feared theft, unprofessional appearance, confidentiality maintenance, becoming dependent on the device and had concerns about infection control.
Martyn, J. et al. 2014. Australia.	Investigate the use of iPods by student nurses to enhance their interactions with content, instructors and peers while located at a distance from their university campus.	Apple iPod Touch (Wireless handheld device)	Students used their iPods in distance learning. Mixed method study.	n= 40. Two different universities	Stated barriers of handheld devices usage were internet issues, technology literacy level, compatibility of study resources (software limitations) with WHD and a small screen size. Via innovative users the problems could be managed. Tool is useful when resources can be accessed. As the content was downloaded to the device it can be used anywhere. Students felt that as problems were managed the learning experience was enhanced.
Nyström, A. et al. 2014. Sweden.	Aim is to describe bachelor nursing students' experiences of being video-recorded during an examination with a simulated patient in emergency care.	Video recording	Six open-ended questions one week after the last examination which was video recorded.	n= 44	Students felt nervous and tensed before the examination. The feeling disappeared as they began filming. Focused more on what they looked or sounded like rather than the tasks performed still some reported increased insight. Sometimes video recording might affect the performance negatively but still the interventions were well performed. Good way to develop skills since it gives the opportunity to learn through visualization. Gave

Author(s), year, country, title.	Purpose	Mobile technology used	Study design/ data collection	Sample size	Results
					the opportunity to discuss. Overall a good learning experience as one could observe own actions (professionality, stress level) The positive experiences dominated.
Poikela, P. et al. 2015. Finland.	Purpose is to examine how two different teaching methods presented students' meaningful learning in a simulated nursing experience.	Tetra phone	Quasi-experimental study. Questionnaires and video-recordings. Interviews and observation.	n= 40	Students reported varying feelings depending of the device's orientation way. Frustration of the usage of the device was reported after a lecture formed orientation. Another group learned to use the device through a computer-based simulation program. In that the student stated excitement and curiosity as using the device in a simulated nursing practice. Students reported it to be fun to learn that way.
Schlairet, MC. 2012. USA.	Purpose was to determine if nursing students' knowledge and attitude scores following a PDA-assisted Simulated Clinical Experience would be equivalent to textbook-assisted scores.	Hewlett-Packard iPAQ handheld personal digital assistant.	Two open-ended questions	n= 44	All students felt that this had a positive effect in Nursing practice. The PDA was reported to enhance learning and to be a fast reference tool. Some students felt frustration since they did not find information and 1 said that the PDA affected negatively.