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INFORMATION & COMMUNICATIONS TECHNOLOGY IN EDUCATION | RESEARCH ARTICLE

Integrating Information Technology's competencies into academic nursing education—An action study

Ayala Gonen^{1*}, Dganit Sharon¹ and Lilac Lev-Ari²

Abstract: Today, in the digital age, we are committed to prepare the future nurse for the information technology-rich workplace, and to help them reducing the “shock reality” upon arriving at the clinical setting. The main aim of the study is to promote the knowledge of Information Competencies Technology among nurses' educators and student. The method was an action research process that started by collecting the data—by literature review, nurses' interviews and students' survey, analyzing and interpreting the data, and developing a plan of action, including curriculum change for the students and workshops for the nurse educators. Two benefits were driven from this action: updating and developing academic courses and adopting pedagogic tools for nurses' educators. In conclusion, the overarching theme of this project is the need for Information Technology to be integrated within the larger body of the nursing learning program, and its implication for educators and students.

Subjects: Curriculum; I.T. Teaching; Information Technology; Nurse Education & Management; Technology in Education

Keywords: educators; nursing students; information technology; competencies, curriculum change

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Ayala Gonen is working at Ruppin Academic Center, Israel, as the deputy director of Nursing Department, and a senior lecturer. Her dissertation was about “Registered Nurses' Attitudes towards Working with Computers.” Gonen believes that the integration of Information technology into education and the workplaces is expected to have influence on the experience and performance of learners. However, it depends on the technology acceptance of the end-user. Without acceptance of the users, it is unlikely to be fully integrated. Gonen is working toward promoting health informatics among nurses in Israel, and the main issues of research interest are: nurses' attitudes and intention to use information technology, influence of work climate, threat and challenge, curriculum change, and more. Some of the articles can be found at https://www.researchgate.net/profile/Ayala_Gonen

The value of the study is the presentation of an efficient tool that describes how to perform the process of curriculum change.

PUBLIC INTEREST STATEMENT

Information technology, which has advanced considerably over the last decade, is a powerful and valuable tool for supporting learning, and enabling learners to be more cooperative in the learning process. The integration of Information technology into academic learning and teaching is expected to have great influence on the experience and performance of learners, however, without acceptance by the users, it is unlikely to be fully integrated into more formal learning. Based on this background, the authors decided to carry out a study that will indicate how to promote the knowledge of Information Competencies Technology among educators and student. The study was performed by action research process, started by collecting the data, nurses' interviews and students' survey, analyzing and interpreting, and developing a plan of action, including curriculum change.

The authors believe that it can be adapted by every professional who would like to Integrate ITC into Education.

1. Introduction

The twenty-first century is witnessing considerable changes in health care professions, including the nursing profession, and information technology is playing an important role in this transformation (Benner, Sutphen, Leonard, & Day, 2010). Israeli scientific achievements are highly ranked worldwide, especially those in innovation and research (Florida, 2011). There are 27 general hospitals in Israel: 11 Governmental, 7 of Klalit HMO (the largest HMO in Israel), and 9 private hospitals. The MOH is the regulator of the health system in Israel but also the owner of hospitals (11 general, 9 psychiatric, and 4 geriatric). Furthermore, Israeli health services are considered to be among the most technically advanced and publicly accessible services in the developed world (Gonen, 2010) and most of them are using Electronic Patient Record (EPR) and Computer Patient Order Entry (CPOE). Economic and technological forces are driving profound changes toward the provision of low-cost, high-quality, and safety care. However, the nursing profession in Israel has not kept up with the technological changes that have infiltrated the health care system and, consequently, nursing has reached a critical junction. Integrating Nursing Informatics specialization should start from the education and it can be done by investigating the needs and reforming the nursing curriculum. In order to better prepare nursing students for the new era, the Nursing Department at one Academic Center in Israel, has taken active steps to implement Information Technology (IT) into the nursing curriculum.

This study is a sort of action research process that involved “Identifying an area of focus, Collecting data, Analyzing and interpreting the data, Developing a plan of action” (Mills, 2011, p. 5). In this study, our area of focus is enhancing the knowledge of ICT among nurses’ educators and student. We will collect the data—by literature review, interviews and survey, analyze and interpret the data, and develop a plan of action, including curriculum change for the students and workshops for the nurse educators.

1.1. Background-Identifying an area of focus

The health care system is undergoing fundamental changes in order to deliver enhanced quality and safety health care. The current health care environment is in a state of flux, rapidly changing in response to technological advances. To keep up with these changes, the nursing profession has to respond and integrate appropriate information technology. As the largest of the health care professional groups, nurses spend the most direct time with patients: conducting bedside monitoring, assisting and teaching patients, providing primary care, and consequently they are the sector which most needs to change and integrate relevant information technology skills (Benner et al., 2010). In order to meet the new expectations of the nursing workforce, nursing education must be upgraded in parallel with integration of information technology. It is no longer an additional option, but an essential element of job performance (Cheeseman, 2011). Informatics and information competency must be incorporated throughout the nursing curriculum in order to prepare nursing graduates to meet the ever-changing technological needs of health care consumers (Gardner & Jones, 2012), and to prepare nurses for “high-touch, high-technology” patient care for the twenty-first century (Hebda & Calderone, 2010). This will ensure that tomorrow’s nurses are comfortable using informatics throughout their education and careers (Edwards & O’Connor, 2011).

The National League for Nursing (NLN) has also called for reform in nursing education. They claim that nurses cannot afford to be isolated from this transformation and emphasize that all nurses must take an active role in ensuring that it is used in service of nurses’ profession values (National League for Nursing, 2008). The NLN has established standards of accreditation: Administrative, Faculty and staff, Students, Curriculum, Resources, and Outcomes (National League for Nursing Accrediting Commission, 2008). Furthermore, in US, a national effort was performed using Quality and Safety Education for Nurses (QSEN) to enhance competency outcome performance assessment among graduates of their programs. Armstrong, Spencer, and Lenburg (2009) claim that nursing faculty whose teaching is focused in a competency-based curriculum, are well positioned to respond to the call to integrate QSEN competencies into their curriculum.

One of the key objectives of curriculum change is to increase technological competency. Competencies are a set of defined behaviors that provide a structured guide at work, and represent the skills needed for workers to be successful in their jobs. Nurses' informatics competencies are divided to four levels of practice: beginner nurse; experienced nurse; informatics specialist; and informatics innovator. These competencies should serve as a guide for nurse educators in the development of a nursing curriculum (Gardner & Jones, 2012).

The Technology Informatics Guiding Education Reform–(TIGER, 2008) defined competency standards through the TIGER Informatics Competencies Collaborative (TICC). The TICC developed a model of informatics competencies including basic computer competencies, information literacy, and information management. The informatics competencies range from basic computer skills to an advanced level in literacy competencies and expertise (Hebda & Calderone, 2010). The importance of technological competency has been demonstrated in different studies. In a survey relating to information technology competency, Fetter (2009c) notes that nursing students were looking for fair access to informatics and to a technologically rich clinical setting. In a separate post-project survey conducted by Edwards and O'Connor (2011) and relating to technological competencies in nursing students, the students gave positive feedback about the integration of technology competency into the curriculum. The importance of technological competencies should serve as a guide to nurse educators in the development of a nursing curriculum.

1.2. Barriers

Barriers to the use of Information Technology include limited knowledge by nursing faculties about its appropriate integration into the curriculum. Nurse educators are experiencing challenges with incorporation of informatics into an already burgeoning curriculum (Flood, Gasiewicz, & Delpier, 2010). Furthermore, the integration of informatics into the curriculum requires overcoming faculty resistance and receiving academic support (Edwards & O'Connor, 2011). The fact that many nursing schools across North America do not offer sufficient informatics education could be attributed to the fact that many nursing faculty members have limited Nursing Informatics knowledge themselves. Spiste Bond, Lewis, and Joy (2009) note that lecturers in nursing and their students do not consider health informatics to be a clinical skill. The source of that resistance to the integration of Nursing Informatics may be due to a misperception of the nurses' role. The opposition to implementing informatics may also stem from a lack of understanding of how informatics can contribute to the quality of nurses' work.

Other barriers include a lack of faculty computer skills and discomfort with technology (Cheeseman, 2011; Fetter, 2009a); limited funding and high costs of informatics education (Fetter, 2009b); variation in nursing curriculum; and the variety of informatics that need to be accommodated within the curriculum, including different types of electronic health records. However, it should be noted that the skills required for understanding one kind of product can usually be transferred and applied to other products, with minimal additional learning required (Meyer, Sternberger, & Toscos, 2011).

1.3. Benefits

There are numerous benefits of integrating informatics into the nursing curriculum. Examples include rapid access and easy navigation to crucial data such as patient current vital signs, medication history, and alerts to drug allergies; systematic patient assessment; and access to decision-making support tools (Johnson & Bushey, 2011; Meyer et al., 2011).

These benefits are likely to be associated with outcomes, such as high quality of nursing care, promotion of patient safety, standardized nursing language, and evidence-based practice (Ornes & Gassert, 2007). Strong leadership and good communication between nursing practice, education, and policy groups are also necessary in order to foster a positive clinical environment for learning (Fetter, 2009a). The need for integration of information technology and informatics into the nursing curriculum has received much support (Cheeseman, 2011; Hwang & Park, 2011; Pilarski, 2010). In

addition to integration of adequate informatics skills, the ethics relating to accessing private and personal information should also receive consideration (Perry & King, 2009).

The literature reviews strengthen the researchers' intention to make a change toward updating and integrating IT use into the nursing education learning plan.

The main aim of this study was to advance the information technology knowledge and competencies to the population of nursing students and educators. This target aim can be achieved properly by making changes that will encourage nurses to be able to use information technology in order to enrich their knowledge base, and to use interactive health communication resources. The main research questions for assessing the situation before planning and building a plan are: A. Is there a lack of knowledge about health IT use among nurses and student nurses? B. what are the nurses' and students' recommendation for the enrichment of the IT knowledge and use?

This study will display the whole process of integrating health informatics issues including IT use into the nursing students learning plan including enriching the knowledge of the nurses' educators. It is a sort of action research that is an interactive inquiry process that identifies a problem, assess the situation using research tools like questionnaire and interview, build integrating solutions, and implement them along with evaluation through the whole process.

2. Assessing the learning needs by questionnaire and reviews

2.1. Type of the research

It is a sort of action research that is an interactive inquiry process that identifies a problem, assess the situation using research tools like questionnaire and interview, build integrating solutions, and implement and evaluate these solving actions.

In order to develop an advanced curriculum, the initial step was to assess the level of knowledge among nursing educators and students. This study used two distinct methods: A. Interviews conducted with faculty members and hospital nurses. B. A needs and attitudes assessment survey aimed at the students.

2.2. Interviews

The nurses' educators and the academic nurses at the different health care institute are the most important factors that we have to consider, to consult and to hear their opinion before making any changes in the curriculum. We decided to conduct in depth semi-structured interviews with members from each group. Thus, three nursing educators and three fresh graduate hospital academic nurses were asked about the way they understand students' and faculty's needs.

2.3. Survey

The end user—the student must be consulted in order to make the proper curriculum change. That is why the first step was to assess the students' knowledge, competencies and attitudes toward using information technology. This information is important for the researchers for better understanding the “human factors” before planning and changing the way of teaching.

2.4. Sample

Fifty-nine, first- and second-year nursing students participated in a pencil and paper survey (this to ensure that using a computer would not pose a threat or hinder compliance).

2.5. Tools

The survey included nurses' attitudes toward using computer (Gonen, Sharon, Offir, & Lev-Ari, 2014) and questions about computer competencies for programs such as Office, Internet, and email. The main aim of the interview with faculty was to assess how comfortable they themselves were with nursing informatics, how they thought implementing it in the curriculum would be most useful, what

challenges they felt they and the students would have to deal with, how they foresaw student's difficulties, and how they thought these barriers could be overcome. Faculty is in a unique position, as they can assess their own knowledge and student's challenges and strengths, as well. The main aim of the interview with hospital nurses was to gain more perspective into their experience in school and in clinical practice. They were asked about their first year after graduation, what they felt they had gained from their nursing education and what they felt was lacking in their education. The interviews related to the skills and knowledge base needed to ensure familiarity with IT in the hospital, to facilitate the transition to working in a technologically rich health care environment and to enhance the learning process.

2.6. Data analysis

The statistical tools used in this research were chosen according to the nature of the study and the characteristics of the variables and included the following: To assess the students' attitude and their knowledge and competencies in IT, descriptive statistics was used, that is, means and standard deviations of sequential variables and frequencies of categorical variables. Content analysis was used in order to assess interview results.

2.7. Ethical considerations

The research was approved by the Ethics Committee of Ruppin Academic Center. The researchers distributed the questionnaires to the first- and second-year students of the bachelors of Science nursing students. The students who consented to participate were briefed about the study's aim and importance and were requested to fill out the questionnaire. The questionnaire forms were anonymous.

3. Results and discussion from the interviews and questionnaire

3.1. Nurses' interviews

The nurse educators highlighted the need to redesign nursing education and to provide nursing students with educational tools to improve their technological competencies. They further emphasized the importance of providing basic technological competencies to meet the demands of nursing students such as practice using EPR (anamnesis, follow-up, discharge), and COPE.

The nurses educated indicated that there is a need to change current ways of teaching and is not easy and demands a lot of time. Teachers must update their Power Point slides, and use applications for encouraging the participation of the students in the teaching process, applications like polleverywhere.com, or kahoot.com. They must also find new ways of teaching like conducting simulations, bringing up to date case studies for discussion in class, etc. The interviews with the hospital nurses highlighted the need for more knowledge and experience with health care software and with IT. The nurses stressed the challenges they had faced when starting to work on hospital wards, without the basic knowledge needed in Informatics. The hospital nurses reported that they did not feel comfortable using computers for tasks such as sending and receiving emails, surfing the Web, using computerized information bases, and various software that they had not been familiarized with. They described the information technological changes as a threat and challenge for them to engage in at work. They also mentioned a need to facilitate these changes by improving IT education related to the nursing profession, including its use in the workplace. The researchers integrated these interviews' contents analysis into the new curriculum.

The insights from the nurses' interviews in this study indicate the necessity of integrating informatics into the nursing curriculum, also in accordance with recommendations by Hwang and Park (2011) to improve nurses' competencies. Nursing faculty members had limited Nursing Informatics knowledge, as it was found by Cheeseman (2011). The nurses' interviews provided an important contribution for the understanding the real clinical environment, and using the nurses' recommendations, might prevent the student nurses from experiencing the "reality shock reality." Due to interview's data, significant consideration was given to prioritization, i.e. choosing the most important

health information technology issues relevant for the students; with appropriate design; and which met the guidelines that the whole plan should be useful, i.e. include relevant issues; user-friendly, i.e. incorporate new and accessible modes of teaching, including situated learning. These considerations applied to nursing students as well as to faculty members.

3.2. Students questionnaire

The students consisted of 49 first-year students, and 10 second-year students. All of them were younger than 30 years old. The cohort was evenly split between Jews and Muslims. Fifty-eight percent of the students had not participated in a basic computer course and 71.2% had less than 4 years of computer experience. Just over half of participants (52.5%) reported having access to a computer at home.

3.3. Information technology knowledge from the survey-results

The nursing students were asked how knowledgeable they felt they were in computer-based programs, such as Word, Power Point, Excel, Outlook, email, Facebook, Moodle, surfing the Web, using computerized information bases, and different software. Results are described in Figure 1. Overall, almost 30% of the students had little or no skills in using computerized calendars, and searching information bases. Less than 25% of the students reported having little or no knowledge in Excel and other software. Students reported having most knowledge in Word, Moodle (which is the college's information platform) and general surfing of the Web.

3.4. Information technology knowledge-discussion

Overall, almost 30% of the students had little or no skills in using computerized calendars and searching information bases. Less than 25% of the students reported having little or no knowledge in Excel and other software. A lack of faculty computer skills and discomfort with technology due to limited knowledge is also a barrier for integration (Cheeseman, 2011; Fetter, 2009a), that is why the new curriculum contains more simulation with Excel, outlook, and ect.

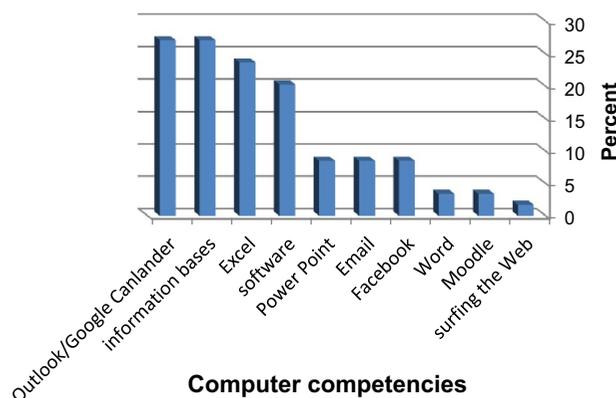
3.5. Attitudes toward computers-discussion

The findings indicate that the attitude to computer use was not positive, nor was it negative: mean (SD), 2.99 (0.73) (on a scale of 1–5). The mean that was obtained was close to 3, “difficult to decide.” A significant positive correlation emerged between nursing student's attitudes towards computers and students' reported self-efficacy ($r = 0.60, p < 0.001$). Meaning that the more positive the student's attitudes towards computers were, the more competent they felt using them.

3.6. Attitudes toward information technology-discussion

Information technology knowledge and experience can contribute to students' positive attitudes toward working with computers, expose them to the world of technology and improve their computer competencies, all of which will help in their integration in health care centers (Shoham & Gonen, 2008). In accordance with other studies, (Chow et al., 2013; Gonen et al., 2014), significant positive correlations were noted between nursing student's attitudes towards computers and students' reported self-efficacy.

Figure 1. Percent of students who reported having little knowledge in each field.



Perry and King (2009) claim that students should continue to use learned behavior such as computer competencies based on intrinsic reward, and that improving nursing competencies will enhance and build the students' self-efficacy, which will in turn facilitate their use of information technology. Consequently, it is important for educators in nursing to train a new generation of students who have high self-esteem, which could contribute greatly to the advancement of the nursing profession, with respect to information technology and other aspects of the nursing profession. As it can be found, threat is significantly associated with attitudes toward computers (Caudle, Bigness, Daniels, Gillmor-Kahn, & Knestrick, 2011; Gonen et al., 2014; Weiner, 2008). The threat factor in relation to nursing students was considered during the whole process of development of the new curriculum.

4. Building a suitable plan for the educators and students

After assessing the skills and knowledge-base of the students and evaluating faculty and hospital nurses' interviews, a nursing informatics plan was developed for all aspects of learning throughout the four-year degree. The Technology Acceptance Model (TAM) based on Davis' theory (Davis, 1989) was used as an educational platform. The TAM provides information about user acceptance of IT and specifies a causal relationship between system design features, perceived usefulness, perceived ease of use, attitudes toward use, and actual usage behavior. Consequently, the new curriculum was developed with a view toward ease of use and usefulness. The curriculum change was planned according to the student's stage of learning, from beginner to expert. The new curriculum covers new technologies in nursing education like Moodle-learning management system, You-tube and Edutube-educational videos, Annotate-using document online, and Google drive-storing and accessing files anywhere. There was also a need to acquaint the students with the technological changes in the health care clinical arena such as EPR and CPOE and this was done through expert lectures in health informatics, and by exposing the students to the technological innovations at the classroom and the clinical settings. New academic courses were developed, covering different aspects of nursing information technology like, Introduction to nursing informatics, basic computer competencies for nurses. The examples used in class came from practice, and included nursing anamnesis, case studies, lists of medications, and instruction for patient discharge, and the implementations of them using different computer software and hardware. All lessons were constructed in a way to better prepare the students for the reality of a technologically rich health care environment. These were done via expert lecturers in health informatics, and by exposing the students to the technological innovations both in the classroom and in the clinical setting.

New academic courses were developed, covering different aspects of nursing IT such as Introduction to nursing informatics, basic computer competencies for nurses.

Along the curriculum change planning, the nurses' educators participated in different seminars and workshops where they got a lot of training by experts how to use many kinds of information technology application in class like using: Kahoot, Edutube-educational videos, and more. Their participation in class was very high and their comments were that it strengthened their self-efficacy about using such tools.

The need for integration of information technology and informatics into the nursing curriculum has received much support (Cheeseman, 2011; Hwang & Park, 2011; Pilarski, 2010) Nursing educators have a responsibility to try and increase the feeling of self-esteem and challenge associated with using information technology, and to reduce threat. It can be done by strengthening their knowledge in Information Technology, using methods such as situated learning and simulation. It should be noted that new ways of learning is growing in popularity. Hood, Cant, Leech, Baulch, and Gilbee (2014) studied the nursing students' perceptions of learning about roles, identity, and teamwork in an inter professional clinical setting. They claim that this way of learning is essential for future collaboration and recommend that it should be included in senior nursing students' education. Additionally, in the future, many students will select programs of study based on the availability of online classes offered by a school. Traditional nursing education is likely to change even more with the addition of fully online or enhanced classrooms that require nursing students to have advanced computer literacy skills.

5. Implementing and evaluating

The whole process of planning and assessing the situation started in 2012. It lasted around a year to build the four years' curriculum change and to plan the contents of the workshop for the nurses' educators. The next step was to start with the workshops and the curriculum change concerning IT use. At the end of 2015, the first graduates' nurses finished their study, got their BA RN license, and started to work at the different health care institutes. It is interesting to mention that the comments that were received throughout the process, both the students and the teachers were excellent. They positively commented the IT competencies that they received, and the effective way in which the subjects were learned. It will be interesting to examine the process of the new graduate integration in work and to research if indeed this project reduced their "shock reality" and attitudes toward using ITC. We also recommend future research that will assess the effect on nursing faculty and students and their way of adopting new health technologies.

6. Conclusion

The overarching theme in this project is the need for innovation to be integrated within the larger body of the nursing curriculum, and its implication on educators and students. The use of Information Technology in the nursing education in Israel will provide appropriate and superior tools for the benefit of the nursing profession and the health customers.

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