

ICT & Nursing Informatics Skills in Cyprus' Universities Undergraduate Nursing Curricula

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Abstract—Information and Communication Technology (ICT) skills for university nursing students is a well researched area; however there are different opinions as to whether ICT skills related courses should be taught in undergraduate nursing programmes. On one hand, authors suggest that the pervasive use of ICTs in secondary education makes the teaching of ICT skills at university level unnecessary as students do have the required ICT skills to cope at university level. On the other hand, considering the digital divide and that underprivileged student may not have had equal access to use computers and the fact that students are mostly using computers for entertainment and socializing, it raises doubts as to whether new university students actually do have the ICT skills required to cope with their students. This paper will present the findings of an exploratory study that examined the content of nursing curricula of undergraduate programs in one public and three private universities in Cyprus in terms of the ICT skills and competencies included and taught in these programs. The study found that only the public university combines both ICT and nursing informatics skills in the curriculum and that private universities' content is limited to ICT skills only. The qualitative data was derived through unstructured interviews with representatives of the four universities and indicate that they do not consider ICT courses as an important component of their nursing curricula. The study recommends that university nursing curricula are upgraded to meet the ICT needs and competences that will be required for the effective implementation of the national health system in Cyprus in 2017.

Index Terms—competences, curriculum, Cyprus, ICT, informatics nursing, skills

I. INTRODUCTION

The Government of Cyprus considers the health sector as an important component for the development of the economy of Cyprus. The executive summary of the Cyprus Digital Strategy [1] states that "it is being recognized that the use of Information and Communication Technologies (ICT) plays a key enabling role to achieve smart, sustainable and inclusive economy and society. The use of ICT in all vital sectors of the economy of Cyprus like education, health, tourism, transport and generally in the exercise of every business activity is of paramount importance to the development

of Cyprus into a regional service centre and to the attraction of foreign investments".

In view of the introduction of the General Health System (GHS), the Government of Cyprus has included specific actions under the "Measure 9 – e-Health" Strategy [1] that provide for the implementation of an electronic health record system to support the provision of quality care facilitated by a web-based infrastructure that will allow easy access to patient records and communication among physicians.

The nursing population is expected to play an important role in the implementation of the GHS and new nurses are expected to have adequate skills for this purpose. To this end, the question pertinent to the Cyprus' Universities Nursing Departments (CUNDS) is whether their curricula include such courses that cover the required ICT skills and informatics competencies relevant and required to address the ambitious actions under the "Measure 9 – e-Health" strand.

II. BACKGROUND

The above question can be addressed within the wider context of ICT skills courses offerings in universities. As referenced by [2] and cited by [3] "Most universities do not require a computer literacy course in the core curriculum. Critical information technology competencies are often taken for granted, to the detriment of students who lack basic computer and Internet skills." This may be due to the fact that curriculum of secondary education has in the recent years been enriched with courses introducing students to computer literacy concepts in the form of teaching and using common software applications which were previously, to a lesser or greater degree, only taught at the college or university level as an introductory course [4]. On the other hand, [5] references a list of US based universities which include a computer literacy course in their requirements.

Taking into consideration the daily experience of students with technology in the form of playing games and navigating the internet as part of their new types of digital social networking and living, students are now considered to be "born digital" [6] and are considered "digital natives" [7] may also lead universities to decisions not to offer any computer literacy courses as they consider the new generation of students as computer literate who do not have to learn computer skills ICT but simply live it and experience it [8].

All in all, the gap that usually exists between the expectations or requirements of universities as to the level of computer skills of their freshman students, on one hand, and their reported computer self-efficacy levels which are usually, unjustifiably, overrated compared to their objective performance results, on the other hand, [9] enlarges and extends the misconception that freshmen students can perform well in college without an introductory course on computer literacy.

The answer to the above question merely depends on the policy and regulations of the University itself. So, for example, the [10] offers two computer literacy courses, one elementary and one more advanced course while the University of [11], apart from offering a required computer literacy course offers the option to students to waive the taking of the exam required by passing one of the two courses offered.

To answer the same question for Cyprus Universities an explorative study was undertaken complemented by interviews with key personnel of the four CUNDS.

III. DESIGN AND METHODS

For this study an exploratory investigation was undertaken. [12] highlight the purpose of the exploratory research as general that generates an understanding insights about a situation; in this case the curriculum content of Cyprus' university nursing programs in relation to the component of ICT skills in these programs. To investigate the situation, a literature review was conducted on the topic of nursing ICT skills.

The search strategy was formulated so that it is open and versatile enough to produce considerable number of results and consisted of two components; one specific and in relation to the Cyprus education system and one without the Cyprus constraint.

The search was carried out on the CINAHL Plus with Full Text, PUBMED, ProQUEST Central, and MEDLINE with Full Text databases and through the Google Scholar search engine. The search criteria included the following keywords: ICT, computer, nursing, skills.

The inclusion criteria set before the literature were a) to include description of ICT related skills c) the study and the skills to be related to university nursing students c) the language to be English.

IV. FINDINGS

A. ICT Skills in Nursing Curricula Internationally

As early as in 1981, [13] through his work using semi-structured interviews with experts and a random sample of educators in department of nursing in two and four years higher education institutions, identified a set of objectives required by nursing students in order to be considered computer literate..

In their proposal for a nursing informatics curriculum at the undergraduate level shown in Table I, [14] identify computer literacy skills recommended by National Advisory Council on Nurse Education and Practice (NACNEP) as an integral part of such curriculum. As

depicted in Table II, [15] are very explicit as to their recommendation of the elements to be covered early in the undergraduate curriculum.

TABLE I. NURSING ICT CURRICULUM DOMAINS OF [14]

Curriculum Component	
Theoretical	ICT Skills
<ul style="list-style-type: none"> • Programming and algorithm skills • Skills in computer usage • Hardware and software principle • Major uses and applications principles • Limitations of computers • Personal and social aspects • Relevant values and attitudes 	<ul style="list-style-type: none"> • Word processing, • Library bibliographic searches • Statistical applications • Database applications • Computerized patient monitoring equipment • HIS to retrieve patient data • Spreadsheet application as a management tool

TABLE II. NURSING ICT CURRICULUM RECOMMENDATION [15]

Curriculum Component	
Theoretical (summary)	ICT Skills
<ul style="list-style-type: none"> • Informatics • Computer technology • Information processing • General & Systems Theory • Information systems: practice, education, administration and research • Life cycle of information systems • Telehealth • Careers/roles in health informatics • Ethical use of information systems • Privacy, Confidentiality, Security • Professional health informatics groups 	<ul style="list-style-type: none"> • Word processing • e-mail • Spreadsheets • Databases • Bibliographic retrieval • Internet & WWW • Presentations & Graphics

TABLE III. COMPUTER SKILLS IN TAUGHT NURSING PROGRAMS IN US UNIVERSITIES [16]

Undergraduate Nursing Programs	
↑	Access to electronic resources
↑	Ethical use of information systems
↑	Computer based patient records
↑	Evidence based practice
↑	IT nursing competencies
↓	Information Systems Standards
↓	HL7
	Nursing Information and Data Set Evaluation Center
Skills required for entry	
↑	Word processing skills
↑	Use of e-mail applications
↑	Proficiency in accessing the Internet
↓	Spreadsheet application
↓	Presentation and graphics applications
↓	Database applications
Skills required for exit	
↓	Word processing skills
↓	Use of e-mail applications
↓	Proficiency in accessing the Internet
↓	Information literacy skills for bibliographical retrieval
↑	: Indicate a high percentage among survey respondents
↓	: Indicate low percentage among survey respondents

Ref. [16], reporting the findings of a national survey performed among universities in the United States offering Nursing Education programs, highlight the emphasis given on the taught components of nursing programs and the skills and competencies expected of students entering and exiting a nursing program in relation to information technology. The results of the survey are summarized in Table III below indicating a relatively common set of skills required for entering and exiting from both undergraduate and graduate programs. Universities also seem to pay the same level of attention to a similar common taught component with variations as to the level they teach a number of other elements unique to each institution.

Ref [17], in their university-wide inter-departmental study they investigated the various information technology related topics that should be included in the curriculum so as to ensure that graduates were fully equipped in terms of skills and competences so as to participate fully in the information society both socially and professionally. The study reveals that the survey items on Information Research and Retrieval which covered “Access needed information effectively and efficiently using library, Internet, and professional organization databases and search engines “ and the Information Communication which covered the “Presenting digital information in a useful and understandable format using commercially available packages” [17] were the highest-valued aspects by academics. The study identified additional topics to be included in the curriculum common to all students that relate to the common good practices in the use of information technology such as “ethics, security and privacy, and how to validate the relevance and usefulness of data and highlights the need for discipline-specific topics to be embedded in subject-knowledge courses” which are unique for each department [17].

B. ICT Skills in Cyprus’ Universities Nursing Curricula

It was disappointing to notice that the search results did not produce any significant results relating to ICT skills in curricula of CUNDS. Only two studies seemed to be relevant because they covered the issue of nurse’s competences and their attitudes respectively. The first study identified related to the development of an instrument for determining the competencies of Intensive Care Unit postgraduate [18] which unfortunately, however, did not identify or cover any IT related skills.

The second study, although titled “Validation of the Evaluation Scale of Cypriot Nurses’ Attitudes towards the use of Information Technology” [19] did not actually cover their attitudes towards their own use of the Information Technology” but rather their attitudes towards the introduction and the effect of computerization in a hospital setting as described by [20].

The limited and irrelevant number of articles may be explained by the fact that nursing education at the university level (see Table IV) has been offered in Cyprus

only since 2007 with the establishment and operation of the Department of Nursing at the Cyprus University of Technology. It is evident that no research activity relating to ICT in nursing, and particularly in the area of ICT skills and competences, is taking place in Cyprus.

TABLE IV. NURSING EDUCATION SYSTEM IN CYPRUS

Duration Years	Degree Awarded			REGISTERED NURSE
	3-5	Doctoral Programmes		
1-2	Master Programmes			
4	Cyprus Public Universities	Cyprus Private Universities	Foreign Public and Private Universities	REGISTERED NURSE
	Bachelor of Science			
1	Emulation Programme			
3	Old School of Nursing (operated until 2007)			

Nursing education is offered in Cyprus by four universities, one public (The Cyprus University of Technology - CUT) and three private (European University of Cyprus - EUC, Frederic University (FU) and University of Nicosia - UNIC).

To identify the content of CUND curricula the researcher relied on the information available on the universities’ websites, their published degree programmes and on unstructured and informal discussions that were arranged with personnel from the four universities.

A summary on the ICT skills content of CUNDS is shown in the Table V overleaf. In comparison to the university curriculum of foreign universities which value the importance of information skills and the ability of the students to formulate information strategies, locate reliable resources, perform information searches and evaluate information [13], [14], [16], [18], none of the curriculum of the Cyprus universities include a course on this important for students topic. A related course on “Research Methodologies in Nursing” offered by CUT [21], EUC [22] and FU [23] and “Evidenced based Nursing Practice offered by CUT [21] they are considered advanced and are offered in the third or fourth year of study.

C. Unstructured Interviews

Meetings with representatives of the four universities were arranged during April 2015 to discuss informally the content of their ICT related courses.

Only the CUT offers two courses relevant to ICT, both with a theoretical and practical component. According to the CUT academic this is due to the fact that at the time of the creation of the department the Acting Coordinator/Head had an extensive background and specialization in Nursing Informatics.

TABLE V. ICT CONTENT IN CYPRUS' UNIVERSITIES NURSING DEPARTMENTS

University	Course Id	Theoretical Component	Practical Component
[20]	EPL 141 – Introduction to Information Technology	<ul style="list-style-type: none"> • Information technology in the society • Computer architecture • Operating systems concepts • Computer software • Legal and ethical issues in computing • Computer security • Information systems principles • Programming concepts • Telecoms, Networks & the Internet 	<ol style="list-style-type: none"> 1. Word Processing 2. Library services, Information and Bibliographical searches 3. Presentations 4. Operating Systems* 5. e-mail application* 6. Internet* <p>*:considered prerequisite</p>
[20]	EPL 241 – Introduction to Nursing Informatics	<ul style="list-style-type: none"> • Introduction to Health Informatics • Health Databases • Hospital Information Systems • Electronic Health Records • Imaging Systems • Signal and Image Processing • Telemedicine Systems 	<ol style="list-style-type: none"> 1. Spreadsheets 2. Demo of health applications 3. Databases
[21]	CSC 190 - Computer Fundamentals and Applications	<ul style="list-style-type: none"> • Hardware , Storage & Software • Information networks • Computer in Everyday life • IT and society • Security, copyright and the law 	<ol style="list-style-type: none"> 1. Operating systems 2. Word processing 3. Spreadsheets
[22]	NUR102 Information Systems in Health	<ul style="list-style-type: none"> • Hardware & Software • Digital Representation of Data, Multimedia • Information Systems • Information Systems in Health • Evaluation of Information Systems in Health 	<ol style="list-style-type: none"> 1. Internet searching 2. e-mail client application
[23]	COMP 150 Microcomputer Applications	<ul style="list-style-type: none"> • Hardware • Software • Peopleware • Data procedures 	<ol style="list-style-type: none"> [1] Word processing [2] Spreadsheets [3] Presentations [4] Operating Systems

A similarity amongst representatives of the private universities is the fact that none of them addresses the inclusion of ICT related courses in their curricula as important for their students/graduates and as strategic for the development of the department. Representatives of all three private universities mentioned that they still have other important nursing subjects to cover and the related course was included in the curriculum following an instruction from the Ministry of Education and Culture that approves all university programs implying that they would not include the course in their program if they had the choice. The representative of FU also indicated that “the nursing students are not going to use computers after they graduate; they will have to take care of the patients”. This attitude may be merely justified by the fact that the person’s educational and professional background did not include any such element or due to his limited knowledge on the role of ICT in modern healthcare provision and quality. On the other hand, the CUT representative highlighted the fact that the department offers two related courses in the degree program and also an advanced course in their MSc program and attributed this fact to the importance given by the department to the increasing role of technology in the healthcare sector. However, he

recognized the fact that the content of the first year’ course is “purely informatics and quite technical” and requires revision and emphasized the fact that the department is currently in the process of reviewing the curriculum in which substantial changes will be applied. As part of this process changes in the content of all courses are to be expected.

All interviewees justified the fact that their ICT related courses are taught by computer science graduates and not by either a nursing informaticians or a nurse academic with extensive experience in ICT or a graduate from an informatics related discipline with a nursing qualification due to the lack of such academic which combines these qualifications and attributes. They all agreed that such a profile would be preferable to a pure computer science academic. It is also noted that only the course offered by CUT [21] and FU [23] are offered by academics of the nursing department while the courses of EUC [22] and UNIC [24] are designed and offered by academics of the computer science departments of the universities.

Although all universities offer other degree programs via distance education and/or online, they all offer their nursing programs in standard instructor-led mode. All university representatives agreed that the theoretical

components of their nursing program could be offered online.

The discussion around the question “how could ICT enrich the learning process and engage students” revealed some contradictions on the private universities interviewees’ opinions in relation to their position that they do not consider ICT skills as important. While they all concurred that the clinical practice part, which requires students to attend hospitals and clinics, could be enriched and enhanced with the inclusion of computer-based training, educational simulations where patient cases and scenarios are presented. The FU representative also proposed that virtual environments like Second Life could also be exploited in the education process and recommended that appropriate training and support should be provided to interested academics for the development of such content.

V. LIMITATION

Although the number of ICT professionals in Cyprus exceeds 3000 the researcher could not identify one with specialization in nursing informatics. Similarly, among the nursing population which exceeds 5000 no nurse or health professional specializing in nursing informatics could be identified.

The persons interviewed are nursing academics and their interest in ICT and informatics in general may be considered as limited to the “basic skills”. For the above reasons, it may be thought that the study does not effectively consider the views of nursing informaticians. However, it must be noted that a similar situation may occur in countries where the healthcare system is not as mature and considerably technology enabled as the system in Cyprus.

VI. CONCLUSION

The above findings have a strong relevance to the clinical practice and should ring a warning bell to the CUNDS. In view of the current discussions of for the introduction of the General Health System in Cyprus, it is highly recommended that CUNDS take into serious consideration the upcoming technological revolution in the healthcare sector and prepare accordingly to review their curriculum so that it is fully aligned with the technological changes so that they ensure that their nursing graduate can effectively respond to the needs of the health sector and remain current and competitive in the increasingly competitive health job market. As NACNEP recommends, it is significant that the nursing curricula content “reflects emerging information technologies” [15]. Consequently, the minimum that should be expected is that their curriculum is upgraded to reflect the actions included under the “Measure 9 – e-Health” of the Digital Strategy of Cyprus which envisages for the introduction and implementation of modern and emerging information technologies [1].

Considering the deficiency that Cyprus does not have a formal set of ICT skills required for new nursing students and/or professionals it is highly recommended that

CUNDS delve into the process of establishing such set of ICT skills which can be part of a common component in the wider nursing curriculum. A mechanism for the continuous monitoring and update of these skills set based on the latest technological trends, developments and standards in the healthcare sector is also recommended.

Another notable deficiency of the curricula of all CUND stems to the fact that they do not offer any course that will address the common requirement of students for valid information retrieval via the universities’ extensive library resources and databases which will facilitate their effective response to the preparation of course assignments and projects. It is highly recommended that students are introduced to the INFINITY Learning model [25] that provides for a unique, structured and easily implementable process that introduces students to the concept of literature review that requires extensive information skills for its successful completion.

At the wider European level, such an alignment of the curricula will facilitate and enable further the mobility of students [26] among national universities but also across borders with Europe and internationally.

It is noted that the Digital Strategy of Cyprus does not include any specific measures or actions as to the developed of a standardized set of ICT skills specifically for health professionals. It remains to be seen whether this deficit will hinder the effective implementation of the NHS in Cyprus. However, the Strategy document includes the statement, as part of “Measure 14 – Promote digital literacy Action 14.1” to “Implement a co-financed project entitled “e-skills for all” based on the 7 sessions of the ECDL” [1]. A recommendation that could be forward is to, at least, include the health professionals as critical participants in this project so as to ensure that they, at least, receive the appropriate baseline ICT training and plan their career to advance their ICT skills.

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