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Identifying Biomedical and Health Informatics Competencies In Higher Education Curricula

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Abstract

This study describes the knowledge, skills and competencies found in bachelor's degree curricula for health and social care, engineering and business. The International Medical Informatics Association (IMIA) biomedicine and health information (BMHI) management recommendations was used as a framework to analyse bachelor's degree curricula (n=14). The results showed that the curricula contained a variety of subjects related to competencies in the IMIA's BMHI. The information technology (IT) engineering curriculum included the highest number of competencies and the business curricula the fewest. The nursing curricula included more competencies than any other health care curricula. When educating students in various professions, their diverse backgrounds and expertise must be considered. As future eHealth developers, students will learn to work as multi-disciplinary teams.

Keywords: competence; multidisciplinary; higher education curricula; informatics

1. Introduction

According to the European Commission (EC), information and communication technology (ICT) can be the most powerful tool in maintaining cost-effective, high-quality care. The cross-border challenges among health care personnel are insufficient skills and a lack of motivation to take part in the digital world [1, 2]. The European Qualifications Framework (EQF) is a general framework of vocational qualifications for competencies, at eight levels. The EQF defines competencies, skills and knowledge related to all degrees [3]. The European Computer Driving License (ECDL) [4] model is the standard for proficient ICT use and delivering certification worldwide. Several actions have focused on developing competencies for eHealth adoption in health care. The Technology Informatics Guiding Education Reform (TIGER) defines nursing informatics competencies [5]. The International Medical Informatics Association (IMIA) has issued recommendations for teaching biomedicine and health information

management (BMHI) to health care and IT professionals. The purpose was to facilitate and standardize multidisciplinary curricula in BMHI. [6]. The aim of this study is to describe the knowledge, skills and competencies in bachelor's degree curricula in health and social care, engineering and business.

2. Methods

Data was collected in the fall of 2015 by using an e-questionnaire that included the following items: background information (n=9), the ECDL [4] (n=31) and the IMIA's BMHI [6] recommendations (n=48). The total number of items was 88. The respondents represented four institutions of higher education: two from Finland and one each from Latvia and Estonia. The 14 curricula were divided into four groups: nursing, which included midwifery (n=6); other health and social care (n=5); IT (n=1); and business (n=2). The IMIA part has been recorded in Table 1 below, using descriptive quantitative analysis. The ethical guidelines encompassing all parts of the research, from design to truthful results, were incorporated as principles of the research conducted and documented. Additionally, each school granted a research permit for the study, and teachers responded to the study based on the curriculum of their program. The first author analysed the data, and data analysis focused on the IMIA's recommendations for BMHI education IT user level [6].

3. Results

Table 1 presents the quantitative results from 1) BMHI core knowledge and skills; 2) medicine, health, biosciences and health-system organization; and 3) informatics, computer science, mathematics and biometry of data analysis for IT user level. The options for answering questions were 'yes' or 'no'. The numbers for each curricula refer to the number of 'yes' answers.

4. Discussion

The content of IMIA's BMHI curriculum [6] is known worldwide and often facilitates discussions of developing better eHealth and eWelfare services. The EC eHealth Action Plan states that professionals must be competent in research, development and innovation in addition to content knowledge of eHealth [1].

The eHealth aspects of the IMIA's BMHI [6] are covered in the curricula for IT engineers, nurses and other social and health care professionals, but they are less present in the Bachelor of Business Administration (BBA) curricula. All curricula cover the use of personal application software for documentation; ethical and security issues; personal communication (including Internet access for publication); basic statistics and informatics methods; and tools to support education. However, few include knowledge management and information processing, even though these areas are identified as important by the ECDL [4].

Most curricula covered the IMIA's [6] medicine, health and biosciences and health-system organization aspects the most comprehensively. This was expected, since these

aspects are closely related to all health and social care. Interestingly, all of these aspects were included in the IT curriculum, but none of them were found in the business curricula. It is important for BBA students to have basic knowledge of anatomy, physiology, and how health professionals make decisions, because students will provide services to them.

Table 1. IMIA's BMHI recommendations in curricula

Items (n=40) Curricula (C)	Nursing C n=6	Other C n=5	Bussines C	IT C n=1	Total C N=14
BMHI core knowledge and skills Items (n=19)					
Use of information processing tools	6	2	0	1	9
Use of personal application software	6	3	1	1	11
Information systems in health care	6	3	0	1	10
Information systems to support patients and the public	6	2	0	1	9
Ethical and security issues	6	4	0	1	11
To support education	6	2	1	1	10
Information literacy	5	4	0	1	10
Evaluation and assessment	5	3	1	1	10
Health data management principles	4	2	0	1	7
The health record	4	1	0	0	5
Data representation and data analysis	4	3	1	1	9
Nomenclatures, vocabularies	4	1	0	1	6
Evolution of informatic	3	3	0	1	7
Architectures of information systems	3	0	0	1	4
Need for systematic information processing	2	1	0	1	4
Management of information systems	2	0	0	1	3
Regional networking and shared care	2	2	0	1	5
Modelling and simulation	1	2	0	1	4
Socio-organizational and socio-technical issues	0	2	1	1	4
Medicine, health and biosciences and health-system organisation knowledge and skills Items (n=7)					
Human functioning and biosciences	6	4	0	1	11
What constitutes health	6	4	0	1	11
Clinical decision making	6	4	0	1	11
Organisation of health institutions	6	3	0	1	10
Evidence-based practice	6	4	0	1	11
Health administration, health economics	6	5	0	1	12
Policy and regulatory frameworks	5	3	0	1	9
Informatics, computer science, mathematics and biometry knowledge and skills Items (n=14)					
Basic informatics terminology	6	4	1	1	12
Ability to use personal computers	6	3	1	1	11
Ability to communicate electronically	6	4	0	1	11
Biometry, epidemiology	6	3	1	1	11
Theoretical informatics	4	0	0	1	5
Project and change managemen	4	4	1	1	10
Mathematics	3	1	0	1	5
Technical informatics	2	1	1	1	5
Information system life cycle	2	2	1	1	6
Decision support	2	3	0	1	6
Interfacing and integration	1	0	0	0	1
Human-computer interaction	1	2	1	1	5
Ubiquitous computing	0	2	0	1	3
Practical informatics	0	1	1	0	2

In the IMIA's informatics, mathematics and biometry knowledge and skills [6], the item that occurred most often was basic informatics terminology. Every nursing and IT curricula included the ability to use personal computers and communicate electronically. However, this was not found in all curricula. Items related to basic computer-use skills

were better represented in curricula than items related to technical issues. Interestingly, not all curricula included practical informatics, the ability to use personal computers or the ability to communicate electronically. The largest number of items were found in the IT engineering curriculum; however, this curriculum did not cover all informatics and related subjects, including practical informatics. Project and change management are not included in all curricula, even though EQF [3] general competence levels five and six in the bachelor degree demand that students have knowledge and skills in these subjects.

The analysis identified the degree to which eHealth competencies exist in current curricula based on the IMIA's BMHI. The evaluation identified a wide range of subjects on various levels associated with competencies in digital health care and welfare. The main areas of the IMIA's BMHI are already part of the various curricula in health and social care and engineering, but BBA curricula do not contain much BMHI content. The reason is self-evident; health care is not a traditional subject in the BBA curricula.

The present study has some limitations. The results are not generalizable because of the small sample size. However, they provide perspective on various bachelor's degree curricula at EQF levels five and six [3], and can be used as baseline information when creating new multidisciplinary curricula. Despite its limitations, this evaluation showed that when educating students from various professional fields to develop digital health and welfare services, it is important to consider their diverse background knowledge. Cooperation among various professionals lends new perspectives to developmental work. It is necessary and valuable to include these items in every curricula as complementary to the health and social care sector, as well as engineering and BBA curricula, more systematically. The future should focus on multidisciplinary developmental work in the eHealth sector already during bachelor's degree studies, which would benefit students in their future working lives.

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5. References

- [1] European Union. 2012. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. eHealth Action Plan 2012–2020: Innovative Health care for the 21st Century. Retrieved from 8.1.2018: <https://ec.europa.eu/digital-agenda/en/news/ehealth-action-plan-2012-2020-innovative-health-care-21st-century>
- [2] European Commission. 2015. Digital agenda for Europe: A Europe 2020 initiative. Retrieved from 8.1.2018: <https://ec.europa.eu/digital-agenda/en/digital-europe>
- [3] European Qualifications Framework for Lifelong Learning European Commission. 2008. Education and culture lifelong learning: Education and training policies. Coordination of Lifelong Learning Policies. DOI 10.2766/14352. Retrieved from 8.1.2018: http://www.ecompetences.eu/site/objects/download/4550_EQFbroch2008en.pdf
- [4] European Computer Driving Licence Association. 2015. ECDL and qualifications frameworks worldwide Retrieved from 8.1.2018: <http://ecd.org/policy-publications/ecdl-and-qualifications-frameworks-worldwide>
- [5] Technology Informatics Guiding Education Reform Initiative. 2009. Informatics competencies for every practicing nurse: Recommendations from the TIGER Collaborative. Retrieved from 8.1.2018: http://tigercompetencies.pbworks.com/f/TICC_Final.pdf
- [6] Mantas, J., Ammenwerth, E., Dermis, G., Hasman, A., Haux, R., Hersh, W., Wright G. 2011. Recommendations of the International Medical Informatics Association (IMIA) on education in biomedical and health informatics. First revision. EuroMISE s.r.o. EJBI – 7 (2).