The effect of e-health contents on health science students’ attitude toward the efficiency of health ICT in care provision

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Abstract. Objective: This study aimed to examine the effects of e-health education content on the attitude of undergraduate health science students towards the efficiency of health ICT in healthcare provision. Methods: A cross-sectional survey design was used. Participants were Health Sciences students attending The University of Sydney. Students were divided into three groups: junior students enrolled in a subject with non e-health content; senior students enrolled in a subject with non e-health content; and students enrolled in a subject with e-health content. Students’ attitude towards the efficiency of ICT in healthcare provision was measured by a modified version of the Information Technology Attitude Scales for Health (ITASH). Results: Students enrolled in the subject with e-health content had a significantly higher average baseline attitude score than the other two groups (T₁ = -3.47, p = 0.001; T₂ = -2.43, p = 0.017). The repeat measures analysis yielded a result with significant interaction between survey time and student group (F = 4.99, p = 0.007) suggesting that changes of score was dependent on student group status. Conclusion: Subjects rich in e-health content significantly enhanced student attitudes, even with a group of students with a rather positive initial attitude. To facilitate the uptake and utilisation of health ICT by the future health workforce, it is important for tertiary educational institutes to provide students with sufficient exposure to specific health-related ICT training, via specifically designed subjects delivering both generic and specific e-health content.

Keywords. health workforce, e-health, health technology, health education, attitude

Introduction

With the advancement of information and computer technology (ICT), health ICT is now an essential component in the delivery and operation of modern day healthcare. However the implementation of such systems is still encountering considerable resistance from many healthcare staff. Many factors may have contributed to such resistance. These include the burden of change and concerns about increased workload, and lack of confidence and training in using health ICT. In addition, staff attitude towards the efficiency of such systems in the provision of patient care also plays an important role in influencing the uptake of the new technologies in the workplace. Research found that although most health professionals do not hold negative views about ICT in healthcare, certain key issues affect their willingness to adopt health ICT. These include: flexibility and usability of these technologies,
practical software design suited to real life use\textsuperscript{11}, and sufficient education and training to support the implementation of the new system(s)\textsuperscript{13,14}. This prior research has been conducted on the current generation of health professionals who are practitioners likely to have been trained in the pre-Internet era, or at the early stage of global information technology development. As such, these findings may not reflect the attitudes of the next generation of health professionals. Current health students have grown up in an ICT enriched environment and may be more amenable to health ICT and expecting the efficiency of technology to be carried into their workplace. However, apart from research into nursing students’ confidence and perception of the relevance of health ICT in clinical practice\textsuperscript{7}, there is a notable absence of research in the attitudes of other health science students, who will also be part of the future health workforce, towards ICT in healthcare. Given the importance of attitudes in the acceptance of, and compliance with health ICT, research is required to examine the effectiveness of e-health education at the university level in enhancing student views towards ICT in healthcare. This study aims to fill this knowledge gap and will examine whether participating in a subject that is enriched with e-health content will lead to more positive attitudes towards health ICT.

The aims of this study are twofold. Firstly, it aims to investigate the attitudes of future health professionals towards health ICT in health care provision. Secondly, it aims to evaluate whether e-health content studied at university will cultivate positive attitudes towards health ICT. It is hypothesised that, as a consequence of their environment, these students will show a positive attitude to health ICT in general. Additionally, students who are exposed to course content rich in health ICT will show a more positive attitude change towards the efficiency of health ICT than students who are exposed to general health science content.

1. Methods

1.1. Study Design and Participants

This study utilised a cross-sectional survey design with repeated measures. Participants were undergraduate students who enrolled in a general health science subject (Human Development) and an e-health enriched subject (Cyberpsychology and E-Health) in the Faculty of Health Sciences, The University of Sydney. All health sciences students enrolled in these units of study were invited to participate in the study for 5% course credit. For students who did not wish to participate, an alternative 5% assessment was offered so as not to disadvantage or adversely motivate them to participate in the study. There was no exclusion criterion.

1.2. Exposure and Outcome Measures

The exposure variable of the study was the e-health educational content of the subject. Two subjects were included: Human Development and Cyberpsychology and E-Health, with the former without ICT and e-health content. These two subjects are electives for the Bachelor of Health Sciences degree, and are open to both first year (junior) and non first year (senior) students. Participants of the study fell into three groups by design: 1) junior students enrolled in Human Development; 2) senior students enrolled in Human Development; 3) students enrolled in Cyberpsychology and E-Health.
The outcome of the study was student attitudes towards efficiency of health ICT in patient care. It was assessed using a modified version of the “efficiency of ICT in care” subscale of the Information Technology Attitude Scales for Health (ITASH), designed and validated by Ward and colleagues15. The original subscale had 17 items and was designed to assess healthcare workers’ attitudes towards efficiency of ICT in patient care using a 4 point Likert scale15. There were 16 items in the modified subscale with a possible score ranging from a minimum of 16 to a maximum of 64. A low score represented an attitude that health ICT was inefficient in patient care, whereas a high score suggested a positive attitude towards health ICT in patient care. The outcome was assessed twice, one at the beginning of the semester and another at the end of the semester to test for any changes due to engagement with e-health teaching content.

1.3. Materials

An online survey was set up on SurveyMonkey.com. The survey contained 75 survey items, comprising of demographics, semester completed at the university, subject and degree enrolment, personal ICT use and proficiency, and attitudes towards the efficiency of health ICT in healthcare provision as measured by a modified version of the ITASH “Efficiency of Care” subscale15.

1.4. Procedure

Recruitment: an advertisement was posted on the eLearning site as well as the unit of study outline and assessment guidelines for each subject.

Study protocol: participating students were instructed to visit the Survey Monkey website. Participants read the information statement, checked the consent box and provided their student ID for course credit before completing the survey. Surveys were completed at the beginning and then at the end of the semester.

1.5. Data Analysis

Data were analysed using SPSS V.19. Any differences between groups in terms of demographics and outcome measure were examined using Chi-squared test for categorical variables and One-way analysis of variance (ANOVA) for continuous variables. For changes in attitudinal scores a General Linear Model with repeated measures was applied with student groups as the between subject factor, and time of survey as the within subject factor.

2. Results

A total of 270 students completed both surveys, 175 (65%) were junior students enrolled in the general health content subject, 70 (26%) were senior students enrolled in the general health content subject, and 25 (9%) were students enrolled in the subject with e-health content. Of these, 33% were males (n=88) and 67% were aged below 20 years. Table 1 summarises the results on the descriptive information on students’ demographics with a comparison across groups. As shown, there were statistically
significant differences in terms of age ($\chi^2 = 128.50, p<0.001$), but not sex ($\chi^2 = 1.53, p=0.486$) across the three comparison groups.

**Table 1.** Demographics of students by groups and results on comparisons (N=270)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Junior, General Health Contents (n=175)</th>
<th>Senior, General Health Contents (n=70)</th>
<th>Senior, E-Health Contents (n=25)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Below 20</td>
<td>159 (91%)</td>
<td>18 (26%)</td>
<td>4(16%)</td>
<td>$\chi^2 = 128.50, p&lt;0.001$</td>
</tr>
<tr>
<td>20 or older</td>
<td>16 (9%)</td>
<td>52 (74%)</td>
<td>21 (84%)</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>56 (32%)</td>
<td>26 (37%)</td>
<td>6 (24%)</td>
<td>$\chi^2 = 1.53, p=0.486$</td>
</tr>
<tr>
<td>Female</td>
<td>119 (68%)</td>
<td>44 (63%)</td>
<td>19 (76%)</td>
<td></td>
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</tbody>
</table>

A comparison of the baseline mean attitude scores revealed a statistically significant difference ($F_{2, 267}=4.75, p=0.009$). Students enrolled in the subject with e-health content (*Cyberpsychology and e-Health*) had a significantly higher average baseline attitude score than the other two groups ($T_{198}=-3.47, p=0.001; T_{93}=-2.43, p=0.017$). The repeat measures analysis yielded a result with a significant interaction between survey time and student group ($F_{2, 267}=4.99, p=0.007$) suggesting that changes of score was dependent on student group status (Figure 1).

![Figure 1](image.png)

**Figure 1.** Plot of mean attitude scores by student groups and survey times

Results from pair wise comparisons among student groups of the changes in score before and after the study of the subject suggested that the change in score of the e-health content group was significantly higher than that of the other two groups (Table 2). Students who had attended the e-health subject scored significantly higher in the second survey in comparison to the first survey ($T_{24}=3.71, p=0.001$) with a mean difference of 2.9. However, there were no significant differences in the other two groups.
The current study aimed to investigate the attitude of future health professionals towards the efficiency of health ICT in health care provision. It also examined whether studying e-health would cultivate more positive attitudes towards the efficiency of health ICT in healthcare delivery. The results obtained indicated that, on average, students held positive attitudes towards the efficiency of health ICT in health care provision. This was demonstrated by the overall mean attitudinal score of all groups being higher than 32, the medium value of possible scores for the full scale. In terms of the effect of studying e-health, the results showed that subjects rich in e-health content would significantly enhance student attitudes, even with a group of students with a rather positive initial attitude. This is the first attempt to investigate the ICT attitude among health sciences students. As such, comparisons of results are difficult.

The results obtained from this study have significant implications on the training of future health professionals, particularly in the acceptance and utilisation of ICT in healthcare provision. The results have demonstrated that the study of a subject that is rich in e-health content enhances the attitude of students towards the use of ICT in their healthcare careers. This holds true even with senior health science students who have previously been exposed to concepts and practices in health-related ICT in other subjects. These students may have already understood the importance of health ICT (hence, their enrolment in this subject) evidenced by higher baseline attitudinal score in the e-health group in the study. A subject designed with an enriched e-health focus serves to further improve their positive attitude, in comparison to no significant increases in attitudinal scores for similar senior students attending a non e-health subject.

The finding suggests that in the preparation of a career in the health industry, it is important that students are exposed to concepts as well as practices of health ICT. To facilitate the uptake and utilisation of health ICT by the future health workforce, it is important for tertiary educational institutes to provide students with sufficient exposure to health–related ICT training. The content of e-health training could include both generic and discipline-specific materials. For example, an introduction to the Electronic Medical Record system can be included in all general studies in Health Sciences. Additionally, discipline-specific information systems and focused technologies can be included for profession-based education. Interactive and hands-on approaches such as role-playing and virtual simulations could be considered for the delivery of e-health content.

Some limitations of the study have been identified. First, the sample size across three groups in the study was unbalanced with a small sample of 25 students in the e-health group. Given that the study design was a repeated measures design, within subject variability has been reduced to the minimum and thus the sample size could be sufficient in providing enough power to detect a true difference. However, to ensure
sufficient power for the study, a larger sample size, particularly for the e-health content enriched group should be used in future studies. Second, a repeated measures design may not be able to provide the rigour of evidence that equates to a randomised controlled trial. Given the current setting of the university and its course structure, there could be some difficulty in conducting a randomised controlled trial. Given this, the current study worked within the parameters of the curriculum and evaluation structures of The University of Sydney and could be used as a starting point for comparison across institutions.

Future research could build on and extend this study by comparing the attitudes towards health ICT use between existing and future health professionals. The area of e-health is expanding and for increases in acceptance and compliance, higher education and healthcare organisations need to provide adequate training and support for the health workforce. This study provides an initial step in this endeavour.

References