

# Information technology competency of registered nurse undergraduates at the completion of IT preparatory course in bsc nursing degree at a selected private university in sri lanka.

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**Abstract—** Information technology (IT) has slowly been implemented in many health-care organizations (i.e. hospitals). The use of computers has advanced to home care and long-term facilities. Consequently, it is important that nurses are able to demonstrate competence and feel confident in the use of IT. This study was conducted to determine the self-satisfactory level of IT competency and to compare the relationship between self-satisfactory level and the actual performance of IT competencies of undergraduate Nursing students. A qualitative descriptive study design focused with convenience sampling technique was used. Data were collected on the starting day of the class for the pretest through a written survey distributed, and it was completed by 90 Nursing students in batch 6c and 60 Nursing students participated in the posttest after completion of the course. The final results of a set of 56 students in the final examination were collected. Data were analyzed in terms of descriptive statistics, t-test, and regression analysis. It was noticed that nursing students acquired more competence and satisfaction after the completion of IT preparatory course. Therefore, they performed well in their final examination. Finally, we concluded that Nursing students need an IT preparatory course before starting their nursing degree since it will help them to adapt to further education and nursing informatics field in the future.

**Keywords—** Nursing students, Information Technology, Competency, Nursing Informatics, IT Preparatory

## I. INTRODUCTION

Nursing is a profession within the health care sector focused on the care of individuals, families, and communities so they may attain, maintain, or recover optimal health and quality of life. The current trend of registered nurses is to follow BSc Nursing degrees at both government and private institutions in order to upgrade their professional qualifications. KIU is one of the institutions that provide Nursing degree which has an IT Preparatory course at the beginning of the course. IT Preparatory course is a 45-hour course that covers History of computing, Office packages, Internet & Email, Basics of computer networks, E-commerce, and Malware

programs like basic topics in Information Technology. There are three evaluation criteria for this course and they are scheduled for the middle of the 45 hour giving assessment and after completing 45 hours they have a Multiple Choice Question (MCQ) paper with 30 MCQ questions to evaluate the theory sessions in the course and there are three practical questions to evaluate the practical knowledge of the students. The main aim of this IT preparatory course is to achieve Nursing students' educational goals and to make them fit for nursing informatics.

Graves and Corcoran (1989) defines nursing informatics as “a combination of computer science, information science, and nursing science designed to assist in the management and processing of nursing data, information, and knowledge to support the practice of nursing and the delivery of nursing care [4].”

To date, many studies have compared the informatics competencies of nursing students. Nursing students have different educational backgrounds and nursing practice experience. Also, nurse's have different workplace experiences, so, they have different preparation levels in Information Technology. Nursing students have a higher diploma and varied background knowledge of computers and computer applications. Nurses might not have been exposed to computers from their previous nursing higher diploma and job experiences. Thus, the nursing curriculum needs to reflect this variation while advancing the students toward proficiency in informatics competencies.

The purpose of this study is to identify registered nurse undergraduates' self-reported basic computer skills before starting and after finishing their IT preparatory Course.

## II. RESEARCH QUESTION

- What is the relationship between pre and post the satisfactory levels of registered nurse undergraduate students?

- What is the relationship between post satisfactory level and the actual performance in their final examination?

### III. LITERATURE REVIEW

According to Hans Ragneskog & Linda Gerdner [1], nursing educators reported overall competency in operating computers than the students. Nursing educators also felt more competent with specific skills of word-processing, sending/receiving e-mails and attaching a file to an e-mail message. Forty-one percent of nursing students felt uncertain or inadequate in their overall competency in operating computers. This suggests a need for additional training in IT. Although nearly 80% of the students felt competent in word-processing, it is unacceptable that 13% of the students were deficient in this vital skill. However, findings must be interpreted with caution as they may reflect an overarching lack of self-confidence in these students. The nursing profession must be prepared for the demands associated with the rapid advancement of IT in health-care settings. It is important that Nursing students have basic IT skills and are familiar with e-mail, word-processing and various databases on the World Wide Web. Findings indicate that participants had a deficit in these skills, suggesting the need to integrate IT into the nursing curriculum [1].

According to Ayala Gonen<sup>1</sup>, Dganit Sharon and Lilac Lev-Ari [2], 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 of Excel and other software. The lack of faculty computer skills and discomfort with technology due to limited knowledge is also a barrier for integration [3] that is why the new curriculum contains more simulation with Excel, outlook, etc. Information technology knowledge and experience can contribute to students' positive attitudes toward working with computers, their exposure to the world of technology and to the improvement of their computer competencies, all of which will help in their integration in health care centers [4]. In accordance with other studies [5], significant positive correlations were noted between nursing students' attitudes towards computers and students' reported self-efficacy. The overarching theme in this project is the need for innovation to be integrated into the larger body of the nursing curriculum and its implication on educators and students. As an example, 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.

According to Raymond Kolbæk [6], construction of ICT-habitus amongst bachelor Nursing students displayed by four positions of attitudes that describe the ICT-habitus of the group of Nursing students included [under consideration] in the study. Quotes from the students were used to support and illustrate the findings. The methodical approach was based on Pierre Bourdieu's multi-faceted data collection approach and Steiner Kvale's technical guidelines for interviewing were used for conducting focus group interviews. In order to carry out the construction, a mapping of ICT implementation in the Danish primary and secondary education and nursing education from 1970 – 2001 was undertaken. A questionnaire concerning attitudes towards ICT in Healthcare was conducted amongst

first year students and focus group interviews were completed. A bibliography and other sources have been included. These datasets made it possible to construct the field of ICT in nursing education and to construct Nursing students' ICT habitus and ICT capital, which were categorized in four descriptive positions, called "The endorser", "The sceptic", "The adversary" and "The critical". These positions can be used for developing strategies for implementing ICT and development of e-learning in educational and clinical settings for Nursing students, thereby contributing with new knowledge and understanding of the ICT-based learning context and the processes within.

According to Prof. Vasuki R [7], Nurses and Nursing students were generally competent in informatics, but not in clinical based experience. The Informatics competency scale scores show competency in three areas, i.e. "Basic computer skills", "informatics knowledge" and "informatics skills", regardless of undergraduate students' perception there. The findings indicate that participating Nursing students were most confident in basic computer skills such as searching the Internet, word processing, systems-operations skills, as well as graphical and multimedia presentation, similar to previous reports [8]. Participants also fully recognized the value and positive impact of informatics on nurses and nursing practice, consistent with a nationwide survey of undergraduate and graduate nursing students [9]. Nursing students and Nurses were not confident in accessing or extracting information from clinical data sets (e.g., minimum data set), review of literature, electronic medical record system or as a clinician (nurse), participating in the selection process, and designing, implementing, and evaluating systems, or seeking available resources to help ethical decisions in computing. These findings are not surprising considering the undergraduate students' limited exposure to clinical nursing practice, but many of the students have been exposed to many technologies throughout primary and secondary school and were expected to be more likely to rate themselves as proficient in using wireless devices (personal digital assistants, smartphones). Establishing a baseline of informatics competencies in undergraduate Nursing students is vital to planning informatics education and adequately preparing students to promote safe, evidence-based nursing care [10]. The findings of this study indicate that Nursing students and nurses were competent in informatics, but not proficient. Significant differences in overall informatics experience recognized while comparing the students informatics experiences and that can reflect the student's experience in classroom teaching. Practical sessions in computer lab would improve the clinical experience with informatics experience. Clinical nurses, on the other hand, usually had limited access to health informatics and relied on their own expertise, colleagues, and books on the patient floors.

### IV. RESEARCH METHODOLOGY

#### A. Sample and Setting

In this study, the selected sample was KIU nursing batch 6c. In this batch, 90 students participated in the pretest and 60 students participated in the posttest. Data were collected on

students' Information Technology competencies by a survey on the starting date of the course (2018-04-01) and final date of the course (2018-05-01). A questionnaire consisting of 34 items was a self-assessment survey. Competencies were assessed through a questionnaire with 26 question items of basic computer skills. Each item is self-rated on a 5-point Likert scale. 5 'Expert', 4 'Advanced User', 3 'Average User', 2 'Struggle', 1 'Unable to use' for each question. Other 8-items were used to get general usage of IT and computer. Those question items used yes/no type and a 4-point scale. Table 1 shows the basic computer skills questions in the survey. Finally, examination results were collected from the examination office at KIU. Gathered samples consisted of 90 students who participated in the final examination in batch 6c.

TABLE I. QUESTIONNAIRE

1	Familiarity with desktop computer
2	Familiarity with a laptop computer
3	Familiarity with Operating System
4	Opening, closing and navigating through folders
5	Accessing the main file server
6	Powering on / off your computer
7	Logging on / off Launching and using an internet browser
8	Finding a file
9	Comfort renaming a file
10	Creating a folder
11	Renaming a folder
12	Opening and closing the application
13	Saving a document
14	Using Spell Check
15	Using Cut / Copy / Paste
16	Using Undo / Redo
17	Install a new software program
18	Create a document with a word processor
19	Create a new spreadsheet
20	Create charts and graphs from a spreadsheet
21	Draw simple graphical shapes and objects
22	Create a multimedia presentation
23	Send and receive e-mail messages
24	Send and receive e-mail messages with attachments
25	Download files from the Internet
26	Launching and using an internet browser

### B. Data Analysis

Data on nursing students Information Technology competencies were analyzed using descriptive statistics, t-test, and regression analysis with SPSS, version 22.0.

## V. RESULTS

In our study, the first research question is "What is the relationship between pre and post satisfactory level of registered nurse undergraduate students?" To determine students' satisfaction levels, we divided the students who answered the questionnaire into Groups (1) those who participated for the pretest and (2) those who participated in the posttest.

Table 2 provides the satisfactory level of students who participated in the pretest and posttest. Scores were also used to place them into sub groups of low, moderate and high

satisfaction. In order to divide students into sub groups, scores were converted into percentile ranks. Students in the bottom 25% were placed in the low satisfaction group. Students in the middle 50% were assigned to the moderate satisfaction group and those in the top 25% comprised the high satisfaction group.

TABLE II. LEVEL OF SATISFACTORYION, SURVEY SCORE AND NUMBER OF PARTICIPANTS IN PRETEST-POSTTEST

Satisfactory Level	Survey Score		Number of Participant	
	pretest	posttest	pretest	posttest
Low	$\leq 71$	$\leq 90.5$	16	6
Moderate	$> 71$ and $< 98$	$> 90.5$ and $< 111.75$	59	46
High	$\geq 98$	$\geq 111.75$	15	8
Total			90	60

Table 3 presents the descriptive statistics of the survey scores in pretest and posttest. It is noticed that the average score for all participants (n=90) in pretest was 82.62 of a possible 130 points and the average score for all participants (n=60) in posttest was 101.55 of a possible 130 points.

TABLE III. DESCRIPTIVE STATISTICS OF THE SURVEY SCORES IN PRETEST AND POSTTEST

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	90	28.00	130.00	82.6222	20.19432
Posttest	60	80.00	122.00	101.5500	11.56327

The above analysis shows that the satisfaction level scores in the posttest were higher than those of the pretest, and the average score of the posttest (n=101.55) was higher than that of the pretest (n=82.6222). Nursing students had a significant satisfaction after IT preparatory Course.

The 26 basic computer skill question items were grouped into six categories: Working with the operating system, word processing, spreadsheet, and presentation, using the Internet and using email. Table 4 presents the descriptive statistics with regard to 6 basic computer skills in pretest and posttest.

TABLE IV. DESCRIPTIVE STATISTICS WITH REGARD TO 6 BASIC COMPUTER SKILL CATEGORIES IN PRETEST-POSTTEST

Basic Computer Skill	pretest		posttest	
	Mean	Std. Deviation	Mean	Std. Deviation
Working with operating system	3.4550	0.774026	4.063763	0.506931
Word processing	3.2255	0.877526	3.877778	0.546231
Spreadsheet	2.7640	3.471752	3.700000	0.621946
Presentation	2.8539	1.039565	3.400000	0.847729
Using Internet	3.3409	1.027063	4.033333	0.862921
Using email	2.8165	0.900352	3.738889	0.513808

All average values of the basic computer skill categories in the posttest were higher than those in the pretest. The highest mean score was the category “Working with Operating System” in both tests. The lowest mean score in the posttest was the category “Presentation”, and that in pretest was “Spreadsheet”.

Fig 1 shows the mean of each category in the pretest and posttest. Then a student's t-test was conducted to see the differences between the satisfaction in the pretest and in the posttest.

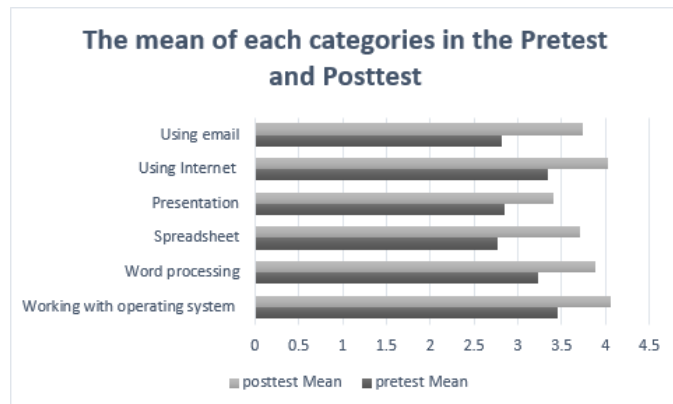


Fig. 1. The mean of each category in the pretest and posttest

15, 20, 23, and 24 (t-test,  $p < .05$ ). Low p-values are good. They indicate that data did not occur by chance.

Next, it was important to look at the strength of the actual survey instrument and basic computer skill quiz. Cronbach's alpha measures the internal consistency of the 26 questions in the survey. This basically measures how well items in the survey are related to each other and in turn, provides insight into the effectiveness of measuring a specific underlying construct. The Cronbach's alpha for the basic computer skill survey is reported next.

TABLE V. THE CRONBACH'S ALPHA ANALYSIS

Cronbach's Alpha for overall question items	Cronbach's Alpha for pretest	Cronbach's Alpha for posttest	N of Items
.961	.967	.903	26

The above table shows that the basic computer skill survey had acceptable reliability (0.961) and for the items in pretest had strong reliability (0.967). Strong reliability means the survey items were well related to each other and the survey reliably measured the motivation of student participants. But the reliability of the items in the posttest was 0.903.

In our study, the second research question is “What is the relationship between post satisfaction level and the actual performance in their final examination?” Next, we analyzed the students' performance in the final examination. Only 56 students participated in assignment, MCQ, and Spreadsheets practical, 55 in word processing practical, 50 in presentation practical. Then, we noticed that all students scored more than 50 and the average was 76.39.

TABLE VI. DESCRIPTIVE STATISTICS OF THE FINAL EXAMINATION RESULTS

	N	Minimum	Maximum	Mean	Std. Deviation
Assignment	56	12.00	38.00	32.7500	4.32014
MCQ	56	18.00	30.00	24.0536	3.00368
Word Processing	55	1.00	10.00	7.1273	2.12616
Practical					
Spread Sheet practical	56	3.00	10.00	6.5893	1.84664
Presentation Practical	50	3.00	10.00	6.7200	2.10965
Total	56	9.00	30.00	19.5893	5.52935
Practical Total	56	51.50	95.00	76.3929	8.30633

Then regression analysis was conducted to see the relationship between the post satisfaction level and the performance in the final examination. Table VII presents the summary results of the regression analysis.

TABLE VII. THE SUMMARY RESULTS OF THE REGRESSION ANALYSIS

R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig
.086 <sup>a</sup>	.007	-.011	8.35178	.528

We noticed that there were no significant differences in satisfaction level and performance of the nursing students in the final examination (less R square and high p values).

Fig 2 provides a visual representation of the correlation between post satisfaction level and examination results.

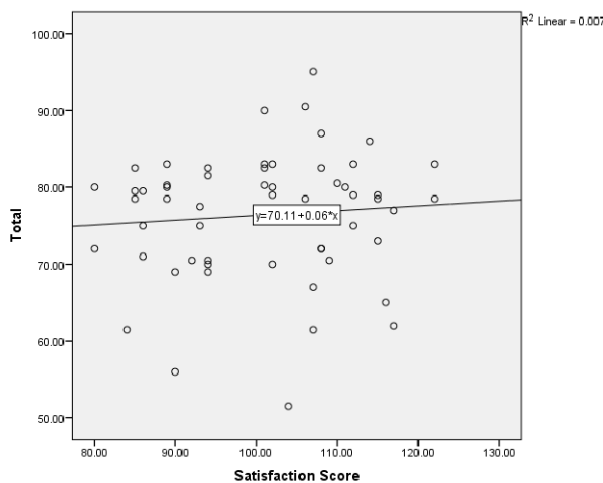


Fig. 2. Post satisfaction vs Examination Results

## VI. DISCUSSION

Fig. 1. The results showed that self-satisfaction level of nursing students in the basic computer skills was high. To investigate the satisfaction level, we conducted two surveys before starting the IT preparatory course and after finishing the course. It was brought to attention that the average score changed from 82.62 to 101.55 of a possible 130 points. The findings indicate that participants, nursing students, were confident in basic computer skill categories such as “working with operating system”, “word processing”, “using the Internet” and were less confident in “spreadsheet”, “presentation”, and in “using email”. But after the IT preparatory course, Nursing students were more confident in all basic computer skill categories. In order to obtain students’ performance, final examination results were analyzed. All students scored more than 50 and the average was 76.30 out of 100. They performed well in assignment ( $m=32.75$ ), MCQ ( $m=24$ ) and practical ( $m=19.5$ ). Next, we conducted a regression analysis to find the relationship between satisfaction level and the performance. The result reported that there was a weak relationship. We noticed that Nursing students were self-motivated during the course and performed well in the final examination. To find out the factors that influence performance, further studies are needed.

## VII. LIMITATIONS

This study had several limitations. The findings showed that Nursing students were competent in basic computer skills, but not proficient because nurses had less experience in health informatics in Sri Lanka. Another limitation was the small sample size; in this study, we utilized only one batch. Third, basic computer skills were measured by self-report. Thus, nursing students’ actual skills might be lower due to over-reporting [4].

## VIII. CONCLUSION

IT skills are essential for every individual in today’s world [5]. Therefore, it is important that Nursing students are able to demonstrate competence and feel confident in the use of IT. This study was conducted to determine a self-satisfaction level of IT competency of undergraduate Nursing students and to compare the relationship between their self-satisfaction level and their actual performance of IT competencies. It was noticed that nursing students acquired more competence and satisfaction after the completion of IT preparatory course. Therefore, they performed well in the final examination. Finally, we concluded that Nursing students need an IT preparatory course before starting their Nursing degree, which will help them to adapt themselves to further education and to the field of nursing informatics in the future.

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