

# Nursing Informatics Competency and Attitudes toward Internet-Based Distance Education among Nursing Students

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**Abstract Background:** Increase the attention to distance learning and increase the popularity by time and led to far-reaching impact on the education scene. **Aim:** Examine the relationship of nursing informatics competency and attitudes toward internet-based distance education among nursing students. **Sample:** A stratified random sample (n=315) of nursing students from different academic levels, encountering in baccalaureate science of nursing program during the academic year 2018-2019 constituted this study. **Tools of data collection:** A questionnaire sheet was used for data collection that was included three parts: 1) Personal characteristics of the nursing students, 2) Competence in information technology 3) Students' attitude toward internet based education scale. **Results:** The results revealed that the highest percentage of nursing students received previous training in computer and internet skills, have computer and internet access, reside rural areas, and have positive attitude toward internet based distance education. **Conclusion:** The present study concluded that the highest percentages of nursing students received previous training in computer and internet skills, have computer and internet access, reside rural areas, and have positive attitude toward internet based distance education. As well, there were statistically significant correlations between total score of the nursing students' attitude toward internet based distance education and all personal characteristics except place of residence, and there was a statistically significant positive correlation between total informatics competency score and readiness of nursing students to implement internet based distance education. **Recommendations:** Training and mentoring should be used to increase students' acceptance and skills in developing distance education, support Faculties of Nursing with resources and funding to build infrastructure necessary to promote students' knowledge in nursing informatics and new technologies in education.

**Keywords:** *competence, information technology, internet-based distance education*

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## 1. Introduction

Advances in healthcare have created a nursing workforce increasingly base on technology to deliver innovative therapies and quality-related outcomes data. Setup data base for students become vital to plan an informatics curriculum and adequately preparing [1]. Nursing informatics is integrates nursing science such computer, and information and communication [2,3].

Informatics competencies are increasingly considered a basic skill for every nurse and have been delineated by several investigators and organizations. Additionally, a number of instruments have been developed to measure some aspects of computer-related competencies in nursing [4].

Basic computer literacy (competency) is defined as "the use of personal computers, including the use of software

tools such as word processing, spreadsheets, databases, presentation graphics, and e-mail" [5]. Today's education is faced with more demands than before; distance learning is used to fulfill these requirements. More information technology is distance learning could offered and students more require being aware of these formats. Such distance learning give a significant help to education spread out [6].

Distance education is formal learning activity by geography, time or both for the majority of the instructional time. Teachers support distance learners through communication technologies. Where distance learning is an area of education, it has described teaching as creating and providing access to learning when knowledge and learners are separated by time and distance, or both [7]. Examples of optimized delivery are the correspondence coursework, recorded lectures, and a website that could be posted for the student to read. This is provided by conference and lives video or training center [8].

## 1.1. Significance of the Study

Learners in high education learn through innovation, comprehensive and advanced methods of teaching. One of the challenges that are facing today's education is the raised costs of educational buildings, labs and classrooms, which can be easily overcome through extensive use of distance learning. Therefore, this study conducted to examine the relation between nursing informatics competency and attitudes toward internet-based distance education among nursing students.

## 1.2. Aim of the Study

Examine the relation between nursing informatics competency and attitudes toward internet-based distance education among nursing students.

## 1.3. Research Questions

1. What is the level of informatics competency among nursing students?
2. What are attitudes toward internet-based distance education among nursing students?
3. Is there a relation between nursing informatics competency and attitude toward internet-based distance education among nursing students?

## 2. Subjects and Methods

### 2.1. Research Design

A Descriptive correlation design was used.

### 2.2. Study Setting

The investigation done in Faculty of Nursing, Zagazig University, Egypt.

### 2.3. Subjects

A stratified random sample was used. Required of nursing students from each academic year was calculated with the following formula: Number of students in each academic year  $\times$  required sample size / total number of nursing students in the faculty. Accordingly 315 nursing students were chosen randomly as follows; First academic year (74 nursing students), second academic year (82 nursing students), third academic year (88 nursing students), and fourth academic year (71) nursing students.

### 2.4. Sample Size

Ideal sample size estimated at confidence interval 95%, margin of errors 5.0%, a total population size of 1743 nursing students, and by using following formula  $[n = N / 1 + N (e)^2]$  [9] sample size was 315 students.

*Tools of data collection:*

Questionnaire sheet composed of three parts as follow:

Part (1): Personal characteristics of nursing students developed by the researchers: Age, gender, academic year,

previous training in computer and internet, internet access, and place of residence.

Part (2): Competence in information technology was developed by Ragneskog and Gerdner [10] to assess students' competencies in information technology. It consisted of 25 items. Nursing students' responses were measured on a five-point Likert scale ranged from strongly agree (5) to strongly disagree (1). The reliability of the instrument was estimated using Cronbach's alpha, it was (0.9).

### 2.5. Scoring System

The scores were categorized into expert level of informatics competencies who scored  $\geq 75\%$ , competent level (participants who scored  $60 < 75\%$ , and advanced beginner level (participants who scored  $< 60\%$ ) [10].

Part 3: internet based education scale: Developed by Panda and Mishra [11] to assess students' attitudes toward internet based education. The inventory included 20 items. The nursing students' answers were evaluated on a five-point Likert scale ranged from 1 (Strongly Disagree) to 5 (Strongly Agree). The internal consistency of this inventory was assessed by using Cronbach's alpha coefficient and it was (0.84).

### 2.6. Scoring System

The scores were categorized into positive attitude toward internet-based distance education (participants scored on  $\geq 75\%$ ) and negative attitude toward internet-based distance education (participants scored on  $< 75\%$ ) [11].

*Pilot study:*

The pilot study was conducted in order to establish clarity, understanding, and applicability of instrument before beginning the actual data collection and estimate required time for each questionnaire sheet to be completed. 33 nursing students were randomly selected, and excluded from the main study.

### 2.7. Field Work

Data collection took one month from mid-March till mid-April, 2018. Aim of study was clarified to each student either individually or through group meetings and took the questionnaires at break time between lectures according to their lectures time schedules. Time required for each questionnaire sheet about 15-20 minutes.

### 2.8. Administrative and Ethical considerations

Ethics Committee and Dean of the Faculty of Nursing, Zagazig University. Verbal and written explanations of the aim and nature of the study have been presented to students included in the study sample. Confidentiality was confirmed by not writing their names. Researchers assured to participants their participation is absolutely voluntary.

### 2.9. Statistical Design

Data entry and statistical analysis using (SPSS), version 20 and cleaned to guarantee and no missing or inadequate information existed. ANOVA F test and t-test used to

detect the relation between the variables. Correlation analysis between total scale scores was done.

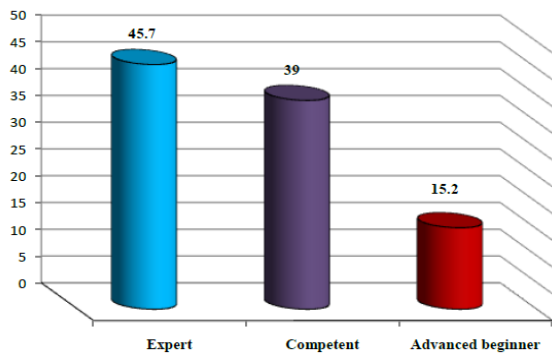
### 3. Results

**Table 1:** Presents the personal characteristics of the nursing students. As shown in this table; 31.7% of nursing students are within the age group 20 to <21 years. As well, the highest percentage of them were female, in the third academic year, received previous training in computer and internet skills, and have computer and internet access(70.8%, 34.6%, 84.8%, 77.7%, respectively).

**Table 1. Distribution of Personal Characteristics of Nursing Students (n=315)**

Items	No	%
<b>Age (in years)</b>		
• <18	72	22.9
• 18 :<20	82	26.0
• 20 :21	100	31.7
• ≥21 years	61	19.4
<b>Gender</b>		
• Male	92	29.2
• Female	223	70.8
<b>Academic year</b>		
• First year	72	22.9
• Second year	82	26.0
• Third year	109	34.6
• Fourth year	52	16.5
<b>Previous training in computer and internet skills</b>		
• Yes	267	84.8
• No	48	15.2
<b>You have computer and internet access</b>		
• Yes	245	77.7
• No	70	22.2
<b>Place of residence</b>		
• Rural	191	60.6
• Urban	124	39.4

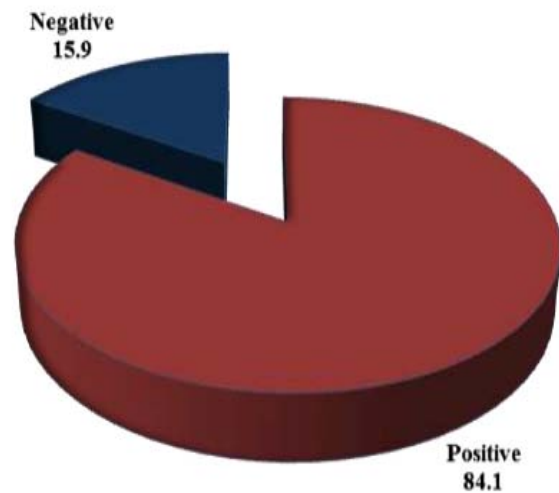
**Figure 1:** Illustrates the percentage distribution of total nursing informatics competency level among the nursing students. According to this figure 45.7% of the students have expert level of nursing informatics competency, followed by competent level (39%), while advanced beginner level has the lowest percentage score (15.2%).



**Figure 1.**

**Figure 2:** Demonstrates the percentage distribution of nursing students' total attitude score of internet based distance education. According to this figure, 84.2% of the students have positive attitude toward internet based distance education, while the rest have negative attitude (15.9%).

**Table 2:** Shows the relationship between nursing informatics competency score and personal characteristics of nursing students. According to this table there are highly statistically significant correlations between total score of the nursing students' informatics competency and their personal characteristics related to age, gender, academic years, previous training in computer and internet skills, and computer and internet access (p value< 0.001).



**Figure 2.**

**Table 3:** presents the relationship between nursing students' attitude regarding internet based distance education and their personal characteristics. According to this table, there are statistically significant relationships between total score of the nursing student's attitude toward internet based distance education and their personal characteristics related to age, gender, academic year, previous training in computer and internet skills, and computer and internet access(p value< 0.001).

**Table 4:** Demonstrates the correlation between nursing students' informatics competency and attitude toward internet based distance education. According to this table, there is a statistically significant positive correlation between total informatics competency score and attitudes toward internet based distance education among nursing students (r= 0.74 & p value= .0001).

**Table 5:** Shows the linear regression model for prediction readiness of nursing students to implement internet based distance education from total score of nursing informatics competency. According to this table, there is a statistically significant positive correlation between total informatics competency score and readiness of nursing students to implement internet based distance education (R<sup>2</sup>= 4%; p = .0001), which reveals that nursing informatics competency is a predictor of nursing student's readiness to implement internet based distance education.

Table 2. Relationships between Nursing Informatics Competency Score and Personal Characteristics of Nursing Students (n=315)

Items	Total nursing informatics competency level						total	$\chi^2$	P
	Expert n=144		Competent n=123		Advanced beginner n=48				
	No	%	No	%	No	%			
<b>Age (in years)</b>									
• <18	3	4.2	52	72	17	23.8	72	77	<0.0001(S)
• 18 :<20	51	62	16	19.5	15	18.5	82		
• 20 :21	52	52	33	33	15	15	100		
• $\geq$ 21	38	62.3	22	36.1	1	1.6	61		
<b>Gender</b>									
• Male	37	40	22	24	33	36	92	44.8	<0.0001(S)
• Female	107	48	101	45.3	15	6.7	223		
<b>Academic year</b>									
• First year	3	4.2	52	72	17	23.8	72	75.7	<0.0001(S)
• Second year	51	62	16	19.5	15	18.5	82		
• Third year	58	53.2	36	33	15	13.8	109		
• Fourth year	32	62	19	36.1	1	1.9	52		
<b>Previous training in computer and internet skills.</b>									
• Yes	130	48.7	91	34.1	46	17.2	267	19	<0.0001(S)
• No	14	29.1	32	66.7	2	4.2	48		
<b>You have computer and internet access :</b>									
• Yes	192	72	43	16	32	12	267	29.5	<0.0001
• No	18	37.5	10	20.8	20	41.7	48		
<b>Place of residence</b>									
• Rural	52	27.2	109	57.6	30	15.7	191	5.6	0.8(NS)
• Urban	71	57.2	35	28.2	18	14.5	124		

\* Statistically significant at  $P < 0.05$ , \*\* highly statistically significant at  $P < 0.01$ .

Table 3. Relationship between Nursing Students' Attitude Regarding Internet - Based Distance Education and their personal Characteristics (n=315).

Items	Total attitude score of student's internet based distance education.				Total	$\chi^2$	P
	Positive N=265		Negative N=50				
	No	%	No	%			
<b>Age (in years)</b>							
• <18	51	70.8	21	29.2	72	82.7	<0.0001(S)
• 18 :<20	82	100	0	0	82		
• 20 :21	88	88	12	12	100		
• $\geq$ 21 years	44	72.1	17	27.9	61		
<b>Gender</b>							
• Male	88	95.7	4	4.3	92	13	0.002(S)
• Female	177	79.4	46	20.6	223		
<b>Academic year</b>							
• First year	51	70.8	21	29.2	72	83.6	<0.0001(S)
• Second year	82	100	0	0	82		
• Third year	97	89	12	11	109		
• Fourth year	35	67.3	17	32.7	52		
<b>previous training in computer and internet skills</b>							
• Yes	305	90.6	25	9.4	267	55.6	<0.0001(S)
• No	23	47.9	25	52.1	48		
<b>You have computer and internet access:</b>							
• Yes	235	88	32	12	267	29.5	<0.0001(S)
• No	28	58.3	20	41.7	48		
<b>Place of residence</b>							
• Rural	179	93.7	12	6.2	191	0.04	0.5 (NS)
• Urban	86	69.3	38	30.6	124		

**Table 4. Correlation between Nursing Informatics Competency and Nursing Students' Attitude toward Internet -Based Distance Education(n=315)**

Items	Nursing student's attitude toward internet -based distance education.	
	(r)	p
Nursing informatics competency	0.74	0.0001

\* Statistically significant at  $P < 0.05$ , \*\* highly statistically significant at  $P < 0.01$ .

**Table 5. Linear Regression Model for Prediction Readiness of Nursing Students to Internet - Based Distance Education (n=315)**

Items	R	R <sup>2</sup>	Unstandardized Coefficients		t	Sig.
			B	Std. Error		
Total nursing informatics competency score	0.2	0.04	.292	.081	3.582	0.0001**

\* Statistically significant at  $P < 0.05$ , \*\* Highly statistically significant at  $P < 0.01$ .

In accordance, in Egypt a study done by Taher and Ahmed [13], Sukums et al [14] and Buabbas et al. [15] who found that the majority of the students were computer literate. In the same line with the present study findings as Mohammed et al. [16] emphasized that the majority of the study sample had incongruent with the present and several previous study findings are those of AlBarrak et al [17] Haefeli et al. [18] Irinoye et al [19] and Elewa and El Guindy [20] as they declared that the majority of respondents had no previous computer training.

Majority of nursing students had access to computer and internet at faculty and home. In the same line, Deltidou et al. [21], Shahi [22], Taher and Ahmed [13] and Elewa and El Guindy [20] as they found that most of the nursing students had access to computer at homes. Moreover, a study in Malaysia by Chong et al. [23] admitted that most of the nurses had a computer at home and at work. In disagreement with the present study results Irinoye et al. [19] admitted that respondents don't have access to a computer and do not have personal computer. However, Singh [24] found that the majority of the respondents had access to the Internet. The previous results concurred with that of Akman et al. [25] and Chipps et al [26]. Also, Hay et al [27] reported in Australian undergraduate nursing students used at least one IT device similar to observation of Zayim and Ozel [28].

Regarding percentage distribution of total nursing informatics competency level among the nursing students, the result of the current study showed that, the highest percentages of nursing students have competency level ranged from expert to competent levels indicating a high competency level in nursing informatics among the students. This result may be due to that, most of students have a smart phone and computer access at home and faculty which helped them in acquiring more knowledge and competence in information technologies.

In addition, some of the nursing curriculums such as Public Health Administration was modified and included new topics about nursing informatics which affected nursing education. As well, the academic staff at all levels of nursing education are concerned with nursing informatics both practically and theoretically through transforming parts of nursing curriculums to on line courses on the university web site. These results are in the same line with that of, Shahi [22] and Taher and Ahmed [13] who examined the extent of computer literacy concluded that most of the study subjects mentioned that they had expert skills in using computers.

Contradicting the present study, Mohammed et al [16] declared that respondents rated themselves as using computers inadequately. As well, Sukums et al [14] reported that most of the study sample was computer illiterate or beginner users.

Regarding the percentage distribution of nursing students' total attitude score of internet based distance education, the findings of the present study showed that the majority of the students have positive attitude toward internet based distance education. It was noticed that the highest percentage of the student nurses in this study were strongly agree that distance education provides an opportunity to study outside the place of residence.

Additionally, choose the way of learning methods by determine the degree of interaction Stanković et al [29] In the same line Mahmoud [30] and Collins, [31] who's found perceptions of students towards use of distance learning and perceptions of distance learning were positive.

In agreement with the previous studies' results Mumcu et al [32] and Saroha [33] who studied the attitude and perceptions of the learners towards the use of distance education concluded that, both male and female have positive attitude towards distance education. As well, Bhartiya and Borah [34] who tested attitude of college students of Assam towards open and distance learning, found that more number of students of urban area have positive attitude towards open and distance learning in comparison to the students of rural area. All these results are in disagreement with those of GOK -Tolga [35] who evaluated the college students' perceptions on distance education, found that the majority of the students were not pleased with the distance education courses from the point of the technical and educational interaction factors.

The findings of the current study showed that there was highly statistically significant correlation between total score of the nursing students' informatics competency and their age. This result coincide with that of Niyomkar [12] who examined computer competency of nursing students at a university in Thailand, and emphasized that, respondent age correlates positively with their informatics competency. In the same line, Haefeli et al. [18] and Fehr, [36] who revealed that age is a significant factor in nursing informatics competency.

Considering gender, the present study results showed that there is a statistically significant difference between gender and total score of the nursing students' informatics competency. The researchers could interpret this as

nowadays both male and female have the access to smart phones and computers and they have a similarity of previous teaching background. This finding is in agreement with a study done in Egypt, on medical students at the faculty of medicine-Cairo University by Taher and Ahmed, [13] who found that there was a significant difference between gender and nursing students' informatics competency.

Incongruent with the previous study findings Elewa and El Guindy [20] who found that there was no statistically significant difference between gender and perception of nursing students regarding nursing informatics.

The present study result showed that there was a statistically significant difference between nursing students' total score of informatics competency by their academic year. This could be attributed to lack of standardized curriculum and different background knowledge about information technology between students. As well, this may be due to differences in personal preference, interests and previous background.

In congruence with the present study findings, Rhema and Miliszewska [37] emphasized that there was a difference between nursing students in relation to knowledge and, skill level, and on how information technology influences clinical practice. Furthermore, Yang et al. [38] found that education level had a significant impact on informatics competencies.

The findings of the current study showed that there was a highly statistically significant difference between total score of the nursing students' informatics competency in relation to computer and internet access, and previous training in computer and internet skills. This result is in the same line with that of Alwan et al [39] and SINGH [24] who found that there was a significant difference between competence in informatics and previous training in computer among nursing students compared to those who did not.

The present study results showed that there was no statistically significant difference between total score of the nursing students' informatics competency and place of residence (rural & urban). This may be due to that, nowadays there was internet access in rural areas similar to urban areas, and that both of students in rural and urban areas had advanced skills in using technologies. This finding is in agreement with that of Rhema and Miliszewska, [37] who study analysis of student attitudes towards e-learning in the case of engineering students in Libya and revealed that there was no significant difference in the level of attitudes towards ICT and e-learning between the urban and regional groups.

In disagreement with Chipps et al [26] who found a significant relation between learners in rural and urban areas of South Africa and ICT, where IT access and network connections were often a challenge.

Concerning the relationships between nursing students' attitudes regarding internet - based distance education and their personal characteristics, the findings of the present study revealed that there were statistically significant relationships between total score of the nursing students' attitudes toward internet - based distance education and their personal characteristics related to age, gender, academic years, previous training in computer and internet skills, and computer and internet access. This may be due to that most of students have smart phones, taps,

computers, and access to internet. And that both gender males and females, at all academic levels prepared assignments through computers and internet. As well; students are taking computers training courses which became important requirements for learning.

On the same line, Xing et al [40] who conducted a study, in China, to evaluate Chinese nurses' attitudes toward, and needs for online learning, and to explore the differences in attitudes and needs between nurses mentioned that, there were positive statistically significant differences between nurses' attitudes toward internet- based education and computer use and internet access at home and in their workplace and age while there was no significant difference with gender.

In consistence with the findings of Ben-Jacob et al. [41] which showed that most adult distance learners are more dedicated and tenacious; they are willing to learn new technologies or use different distance learning models because experience has taught them that education is the key to success. Regarding the correlation between nursing students' informatics competency and attitude toward internet based distance education, there was positive correlation between total informatics competency score and attitudes toward internet- based distance education among nursing students. This finding matches the regression analysis in that when there was a competent level in nursing informatics of a student, this will increase nursing student's readiness to implement internet - based distance education.

This finding may be due to the successful implementation of distance-learning programs based on availability of electronic technology and access of internet devices and competent level of students to use these devices.

In agreement with Darvish et al [42] who conducted a study in Tehran to assess the role of nursing informatics on promoting quality of health care and the need for appropriate education, and mentioned that, students denoted that the electronic course is enriched with distance education which develops through the targeted set to improve the power, speed, and accessibility of instructional technologies.

In the same line, Conde et al. [43] and Shannon and Rice [44] revealed that almost all the students (95.6%) have positively assessed the effectiveness of using distance e-courses. They highlighted that the advantage of such training is that there is a wide opportunity to learn the material and perform assignments in any place and at any free time. In addition, Ulusoy et al [45] stated that computer technologies allow exchanging information meaningfully at any distance within the framework of the student-teacher system.

## 5. Conclusion

The present study findings concluded that, there was a statistically significant positive correlation between total informatics competency score and nursing students' attitudes towards internet - based distance education. In addition, there were statistically significant correlations between total score of the nursing students' attitudes toward internet - based distance education and all personal characteristics except for place of residence.

## 6. Recommendations

- Training and mentoring should be used to increase nursing students' acceptance and skills in developing distance education.
- Designing appropriate training programs to help nursing students maintaining familiarity with the use of new information technologies.
- Supporting faculties of nursing with resources and funding to build infrastructure necessary to promote students' competence in nursing informatics and new technologies in education.
- Providing faculty staff with opportunities to learn and develop skills about nursing informatics in order to prepare them to integrate this course within the faculty curriculum and courses they teach.
- Encouraging faculty staff in transforming books of nursing courses to on-line courses through the university web site.

## 7. Further Researches

Required to be carried out in Egyptian universities to determine and evaluate barriers, incentives, and factors affecting the implementation of internet-based education.

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