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RESEARCH ARTICLE

CONTENT VALIDITY OF TECHNOLOGY INFORMATICS GUIDING EDUCATION REFORM (TIGER) ASSESSMENT INSTRUMENT FOR INFORMATICS COMPETENCIES OF GRADUATING NURSING STUDENT.

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Abstract

Informatics competencies assessment instrument developed by Technology Informatics Guiding Education Reform (TIGER) is an essential tool for appraising the graduating student nurses' competencies in nursing informatics. The TIGER recommended informatics competencies developed through collaborative effort of expert health care professionals abroad, validation of its content was not appraised in the Philippine setting. A need for further validation supports universal practical application of the tool despite variations in the age of technology country-by-country. Hence, this paper aims to examine the content validity of TIGER assessment instrument for informatics competencies in the context of graduating student nurses. Methods employed are literature review and 4-point scale content validity questionnaire rating each item for relevance, ambiguity, clarity, and simplicity. The assessment tool as divided into three domain – computer competencies with eleven main items and 211 sub-items, information literacy competencies with five main items and 39 sub-items, and information management competencies with five main items and 70 sub-items has been evaluated through Content Validity Ratio (CVR), Content Validity Index (CVI) and Modified Kappa Coefficient (K*). The result for CVR scores revealed that 308 out of 320 items are considered critical by the content experts. Then, CVI and K* revealed that still 308 items under the three domains of informatics competencies are appropriate and excellent while the remaining 12 were reasonably deleted. Thus, the instrument is a valid and excellent instrument to address informatics competencies of graduating student nurses in the country.

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Introduction:-

Clinical milieu around the globe has integrated sophisticated technologies expected to exponentially rise in the future requiring healthcare workers who are technologically competent. TIGER (Technology Informatics Guiding Education Reform) Informatics Competencies Collaborative (TICC) team recommended Nursing Informatics (NI) Competencies to appraise the minimum NI competencies of every practicing and graduating student nurses to meet

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the standards of a safe, quality, and efficient healthcare services. IT has three dimensions of competency namely basic computer competencies, information literacy competencies, and information management competencies [1].

NI has been integrated in the Philippine nursing curriculum [2] in acknowledgment for the need to develop nurses who are competent in the use of technology particularly in the clinical milieu locally and internationally. Part of the 11 Key Areas of Responsibility framed by Philippine Board of Nursing (BON), as based on benchmarking in other countries, expects that the graduating student nurses should demonstrate competence in record management and communication [3] which are scope of NI competencies.

However, there is a dearth of studies about NI competencies in the local setting particularly in the context of graduating student nurses. Thus, the aim of this inquiry is to contextualize a content validity of NI competencies assessment instrument developed and recommended by TIGER with the hope of standardizing the application of the instrument in the Philippine setting. Content validity is imperative [5] and serve as foreground basis for construct validity and reliability measures as robust process of instrument development. In the long-end, the instrument may implement to assess the actual NI competencies of graduating student nurse in a large-scale population.

Problem Statement

NI in the Philippines nursing curriculum [2,3] is not a guarantee that the molded soon to be professional nurse is equipped with basic NI competencies needed in the high-end clinical settings. International recommendations of NI competencies by TIGER is relevant but not have been applied in the context of graduating student nurses in the Philippines. Since there is a varying edge and adaptation in technology country-by-country which are both observed among digital immigrants and digital natives coming from academe to clinical area which gap has identified. Seemingly, there is an absence of instrument that would address gap in knowing and gauging the informatics competencies of graduating nursing students that would soon fill-in work place of clinical technologies. As an initial step prior to actual data collection and construct validity is content validity addressed through crucial intellectual judgement of experts to the instrument. Therefore, this paper aims to examine the content validity of NI competencies assessment instrument through Validity Ratio (CVR), Content Validity Index (CVI) and Modified Kappa Coefficient (K*).

Methodology: -

The research technique employed in this inquiry is quantitative through itemized questionnaire with four-point rating scale based on the literature suggested criteria for measuring content validity [5]. It has been circulated to pooled content experts. The purpose was to identify the content validity of NI competencies assessment instrument to facilitate construct validity and reliability for actual administration to a large number of populations in the context of graduating student nurses. Results has been assessed through Content Validity Ratio (CVR), Content Validity Index (CVI) two approaches (i.e. Item Level Content Validity Index [I-CVI's] and Scale Level Content Validity Index [S-CVI's]) with Modified Kappa Coefficient (K*) discussed below.

Literature Review

The researcher primarily conducted literature review of NI competencies [1,2,3,4] in order to explore important components of NI competencies in the context of graduating student nurses. This is to develop a standard NI competencies instrument in the form of a checklist type questionnaire. Review on different content validity studies has conducted to determine appropriate methods of validating an instrument [5,6,7].

Questionnaire survey

The NI competencies assessment instrument developed and recommended by TIGER was the subject of this research after appraisal of literature [1] from reputable databases. Based on review of other sources showed that items or statements deemed important for identifying NI competencies are reflected in the TIGER NI competencies assessment instrument [1-4]. It is composed of three dimensions or constructs - basic computer competency with 18-items and 211-sub-items; information literacy competency with 5-items and 39-sub-items; and information management competency having 9-items and 70-sub-items.

Classification of respondents.

There were fifteen respondents as context expert validators considered by the researcher but only nine returned the instrument after giving ample time. They were approached and contacted by the researcher based on their available time physically and virtually to discuss the purpose and aim of the study. The decision in choosing the number of

experts were based on literature in consideration to use both the Content Validity Ratio (CVR) and the Item Level Content Validity Index (I-CVI) [6, 8]. Other authors have suggested at least five number of experts for validation [6, 9-10]. But in this study, it deduced to nine number of experts who participated which deemed to be acceptable compared to the set norms [12]. Table 1 shows the number of respondents, expertise, area of designation and length of experience in years. Notably, all of the nine respondents have more than 10 years of experience in which postulated by Benner’s as experts in her Novice to Expert Theory.

Table 1: -Sample and respondents of the content validity

No	Respondents	Expertise	Academe/ Hospital	Length of experience (years)
1	Dean	Health Science	Academe	22
2	Dean	Information and Technology	Academe	17
3	Research Coordinator	Health Science	Academe	26
4	Assoc. Prof (researcher)	Health Science	Academe	18
5	Assoc. Prof (researcher)	Health Science	Academe	19
6	Chief Nurse	Clinical Science	Tertiary Hospital	28
7	Chief Nurse	Clinical Science	Tertiary Hospital	29
8	Head nurse	Clinical Science	Tertiary Hospital	18
9	Research Coordinator	Clinical Science	Tertiary Hospital	16

Content Validity Ratio (CVR).

According to Yaghmaie [5], content validity is not highly regarded as important process by researchers may not actually measures what it intends to measure. CVR is employed in this study through expert’s proportional level of agreement in evaluating an item as essential. A 3-point scale has been applied in rating each item; (3) essential; (2) useful but not essential; and (1) not necessary [7, 11]. The CVR mean score of each item were then compared to CVR critical table of Ayre and Scally [12] in deducing item as very important. Table 2 shows the CVR critical table [12].

$$\text{Content Validity Ratio (CVR)} = \frac{(ne - (N / 2))}{(N / 2)} \{+1\}$$

where,

ne: number of expert’s panel members indicating an item ‘essential’

N: number of expert’s panel members

Table 2: -Simplified Table of CVRcritical Including the Number of Experts Required to Agree an Item Essential

Panel Size	Ncritical (Minimum Number of Experts Required to Agree an Item Essential for Inclusion)	Proportion Agreeing Essential	CVRcritical
5	5	1	1.00
6	6	1	1.00
7	7	1	1.00
8	7	.875	.750
9	8	.889	.778
10	9	.900	.800
11	9	.818	.636
12	10	.833	.667
13	10	.769	.538
14	11	.786	.571
15	12	.800	.600
.	.	.	.
.	.	.	.
.	.	.	.
40	26	.650	.300

Source: Ayre and Scally [12]

Content Validity Index (CVI).

While CVR measures the essentiality of an item, CVI then is for the relevance of each item to the construct using a 4-point scale; (4) extremely relevant; (3) relevant; (2) somewhat relevant; and (1) irrelevant. CVI has been applied to take the mean of all retained or remaining items. The Item Level Content Validity Index (I-CVI's) and Scale Level Content Validity Index (S-CVI's) as two approaches suggested by Polit and Beck [6] has been considered in this research. The former deals with computing the relevancy of an items based on the number of experts who gave a relevance rating of 3 or 4 over the total number of experts. While the latter then deals with the proportion of total items on an instrument that had achieved a rating of 3 or 4.

Modified Kappa Coefficient (K*).

Modified Kappa Coefficient is used in this study to address possible inflated values as a result of chance agreement. The combination of CVI and K* are used to provide computable methods for appraising the level of agreement between content experts. Formula below shows that Probability of Chane agreement (Pc) has been computed first using the value of I-CVI followed by computing the K*

$$\text{Probability of Chance agreement (Pc)} = \frac{(N!)}{(A!(N-A)!)} \times 0.5^N \quad [13]$$

$$\text{Modified Kappa Coefficient (K*)} = \frac{(I-CVI-Pc)}{(1/Pc)} \quad [13]$$

where,

N: number of expert's panel members

A: number of expert's panel members indicating an item 'relevant'

Findings and Discussion: -

The presentation and discussion of findings were arranged based on the analysis of CVR, CVI, and K*.

Analysis of the Content Validity

Table 3 shows the name and the number of constructs (i.e., Basic Computer Competency; Information Literacy Competencies; and Information Management Competencies) together with the title of items and the number of sub-items. The NI competencies comprised of 320 items rooted from the three constructs. The items with the number of sub-items under Basic Computer Competency are hardware-13, software-5, networks-9, ICT in everyday life-19, security-8, law-7, operating system-17, file management-26, utilities-6, print management-5, using the application-5, the internet-5, using the browser-19, using the web-6, web outputs-6, electronic communication-14, using e-mail-19, and e-mail management-10. Then Information Literacy competencies is comprised of items namely as knowledge-3, access-9, evaluates information and its sources critically-11, use information effectively to accomplish a specific purpose-8, and evaluate outcomes of the use of information-8. Lastly, information management competencies have demographic/ patient info-9, consents and authorizations-3, medications management-7, planning care-6, order/results management-6, care documentation-4, decision support-21, notifications-8, and facilitating communications-6.

Thus, the developed content of NI competencies questionnaire after careful content validation infers qualification to construct validity through Exploratory Factor Analysis (EFA) complemented with Confirmatory Factor Analysis (CFA). Reliability test may also follow to finally arrive into conclusion that NI competencies instrument is valid and reliable.

Table 3: -Components of Nursing Informatics Competencies Instruments.

No	Constructs	Items	No. of Sub-items
1	Basic Computer Competency	Hardware	13
		Software	5
		Networks	9

		ICT in Everyday Life	19
		Security	8
		Law	7
		Operating System	17
		File Management	26
		Utilities	6
		Print Management	5
		Using the Application	5
		The Internet	17
		Using the Browser	19
		Using the Web	6
		Web Outputs	6
		Electronic Communication	14
		Using e-mail	19
		e-mail Management	10
2	Information Literacy Competencies	Knowledge	3
		Access	9
		Evaluates information and its sources critically	11
		Use information effectively to accomplish a specific purpose	8
		Evaluate Outcomes of the use of information	8
3	Information Management Competencies	Demographic/ patient info	9
		Consents and Authorizations	3
		Medication Management	7
		Planning Care	6
		Order/ Results Management	6
		Care Documentation	4
		Decision Support	21
		Notifications	8
		Facilitating Communications	6
TOTAL			320

Content Validity Ratio (CVR)

The data responses of the respondents' content experts were encoded in the IBM-SPSS application to compute for the CVR. Table 4 shows that the utmost critical items were 308 out of 320 based on the judgment of content experts. The 308 items deemed critical (210 items in computer literacy competencies; 33 in information literacy competencies; and 65 in information management competencies) based on comparison with CVR critical table which requires that for an item to be critical with panel size of 9 (N=9) is 8 (Ncritical), 0.889 (proportion agreeing essential), and 0.788 (CVR critical) [12].

Table 4: -CVR critical items in Nursing Informatics Competencies Instrument.

Construct No	Items	No. of Sub-items
1	Basic Computer Competency	210
2	Information Literacy Competencies	33
3	Information Management Competencies	65
TOTAL		308

Moreover, these 308 items were deemed critical to be retained and included in NI competencies instrument as a probable tool to be used in the context of graduating student nurses. The remaining 12 items has been considered for further content evaluation using CVI and K* testing.

Content Validity Index (CVI) and Modified Kappa Coefficient (K*)

Table 5 below shows that Item Content Validity Index (I-CVI), number of items, score together with range value of K*, number of items, and score. Based on the scores in the I-CVI, 308 items ranged from 0.899 to 1.000 are classified as appropriate (greater than 0.79 I-CVI); 4 items need revision (within range of 0.70 – 0.79 I-CVI); and 8 items are reasonable to be eliminated (less than 0.70 I-CVI).

Table 5:-Evaluation criteria for I-CVI and K*

I-CVI classification	No. of items	Score	Modified Kappa Coefficient (K*)	No. of items	Score
>0.79	308	Appropriate	>0.74	308	Excellent
0.70 – 0.79	4	Needs revision	0.60 – 0.74	0	Good
< 0.70	8	Eliminate	0.40 – 0.59	4	Fair
			<0.40	8	Poor

Source: Davis [14], Cicchetti and Sparrow [15] and Polit&Beck [6]

Moreover, apart from I-CVI, all items (320) has been evaluated based on K* scores. It shows that 308 items are excellent (greater than 0.74 K*), 0 good (within range of 0.60 – 0.74 K*), 4 fair (within range of 0.40 – 0.59 K*), and 8 poor (less than 0.40 K*). Hence, it is also reasonable to eliminate the 12 items. This means that the total no of items based on the combination of I-CVI and K* is 308 items.

Conclusion: -

After CVR appraisal by content experts to the NI competencies instrument revealed that only 308 out of 320 items are regarded as the most critical based on comparison in the table of CVR critical table. Items of each construct has trimmed down as follows: basic computer competency – 210 items; information literacy competencies – 33 items; and information management competencies – 65 items. Nonetheless, the remaining 12 items were tested for CVI and K* revealed that these items are reasonable to eliminate (I-CVI = < 0.70) because is either fair (K* = 0.40-0.59) or poor (K* = < 0.40).

The process of content validity in this research is considered robust as the method applied is systematic and subjected to three stages: CVR, CVI, and K*. Thus, this research has better basis and foundation of content validity particularly the NI competencies instrument. It means it could be administered for actual data gathering among graduating nursing students and be further validated using EFA and CFA which in the long end result to a very valid instrument.

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