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Development and Psychometric Testing of the Faculty Training Needs Inventory

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Educational institutions are steered by philosophical orientations that place importance on the pursuit and development of knowledge, skills, values and attitudes essential for instruction, research and extension services. Therefore, the primary aim of this research is to develop and assess the psychometric properties of the Faculty Training Needs Inventory (FTNI). The researcher utilises the methodological design. To estimate the scale's reliability and construct validity, items were run using Cronbach's alpha and exploratory factor analysis. Principal axis factoring and Promax rotation are used in extracting the factors. Results yield that the combined eigenvalue analysis and scree plot inspection led the researcher to consider a three-factor solution, which accounts for 61.661% of the variance. Overall, the FTNI is a reliable and valid instrument that can provide meaningful training needs assessments for educational settings in the areas of research, instruction and community extension.

Key words: *Psychometric testing, Faculty Training Needs Inventory (FTNI), Training needs analysis (TNA), College of Nursing, University of Ha'il, Kingdom of Saudi Arabia.*

Introduction

As nursing institutions attempt to compete in the global community, differentiation on the basis of the technical skills and abilities, practical know-how, and motivation of faculty members take on a magnifying primacy. Educational institutions, especially in colleges of nursing, are steered by philosophical orientations that place importance on the pursuit and development of knowledge, skills, values and attitudes essential for instruction, research and extension services. These are known as the tripartite functions of the HEIs and are geared towards quality nursing education. The fast-changing certainties spurred by globalisation emphasise the shift in contemporary discourse from education to lifelong learning and to building the competencies of the learners. More so, this intensely persuades higher education

institutions (HEIs) to emphasise the quality of faculty members, and to provide them with proper opportunities for professional development through proper training.

Ancient and medieval societies had a scarcity of institutions offering training of the principles and practices of teaching. Nurses who intended to become educators were only required to exhibit mastery of the professional nursing subjects they wanted to teach. On the one hand, actions were taken to facilitate the provision of teacher training in HEIs during the rise of democratic principles in the 17th and 18th centuries (Teacher Training, 2017). Today, modern institutions of higher learning highlight the need for well-trained teaching personnel and, implicitly, for a culture of quality teaching. However, to achieve the goals and objectives related to the enrichment of the quality of teaching in higher education, there is a need for individual or institutional initiatives focused on the holistic faculty of improvement.

HEIs play an essential role in influencing the development of countries in a globally-competitive realm. Teaching, research and service comprise the fundamental aspects of faculty work. As institutions of higher learning, colleges and universities are mandated not only to teach (instruction) but also to produce knowledge (research) and apply the fruits of the intellect to benefit the greater community (extension). Therefore, the need for highly-competitive and technically-trained graduates makes countries develop and execute thoughtful plans to improve the quality of teaching in higher education. Nurses-turned-educators in colleges of nursing come to the field of teaching with little, if any, formal professional training in teaching other than the content of their discipline. Little, Locke, Parker and Richardson (2007) report that "in pursuit of [a] national strategy of excellence, we are convinced that the enhancement and promotion of learning and teaching must be a priority for all of higher education".

According to Armstrong (2009), "training is the systematic modification of behaviour through learning, which occurs as a result of education, instruction, development and planned experience". He also points out that successful training can reduce learning expenditures, enhance individual, team and mutual functioning in terms of productivity, value, and overall output, and increase work flexibility.

Training must be methodical and unswerving; otherwise, it turns out to be undervalued and diminutively used, particularly if the ideals necessitated are not being met in daily activities. Go et al. as cited in Cassidy (2012) affirms that certain fundamental models should always be utilised in organisational training preparation. Most of the well-arranged training proposals are devised according to the model of systematic training, described by Armstrong (2009) as a "training which is designed to meet a set of defined needs". The principle of this specific model is the logical series of assessment (determining what is necessary by whom so that the training objectives can be identified), activity (choosing the training approaches and learning

philosophies to be used), and evaluation (quantifying how well the endeavour achieved the training objectives) (Stone, 2008). The content of professional development programs and the competencies they address depend on several factors, such as the specific needs of the teaching staff, the needs of the students, the educational paradigm, and the mission and orientation of the university.

Menges and Austin (2001) list five types of programs implemented in institutions of higher learning that contribute to the development of faculty members: individual developmental strategies; strategies which involve regular feedback from students, interpretation and management of the results; strategies involving fellow academic staff; institution coordinated programs; and programs promoted by external qualified persons. According to the researchers, individual developmental strategies include critical reflection upon self-performance, portfolio preparation, the teaching diary method, and conducting research. Strategies involving fellow academic staff include mentoring programs and peer-reviews; while institution coordinated programs include experience exchange, workshops, seminars, sabbatical years, and centres for teaching and learning. Lastly, programs promoted by externally qualified persons include activities or projects by teaching associations or organisations.

In order to assess these needs, there has to be a thorough understanding of training needs analysis (TNA). According to the Business Dictionary (2012), TNA is an appraisal of the training necessities of a particular set of individuals in terms of the number of learners, their educational attainment and career background, their current competence level, and the desired behaviour or skill level to be obtained at the end of the training.

After the identification of training needs, the next step is the identification of training priorities and objectives which are the quantifiable, envisioned aftermath of a specific training program, communicated in terms of the anticipated behaviour or skill level. After the training needs and objectives have been recognised, the next step is to design the milieu to achieve the objectives "which involves a consideration of both content and process, including selecting the training and development methods and learning principles that are to be employed" (Arthur, Tubre, Paul, & Edens, 2003). Once the planning phase of a training program is complete, it is time to implement the program. This phase is the process of putting a training program into operation and involves different supportive activities, e.g., publicity, organisation, transportation. However, training, as an instrument for change and improvement, often does not provide expected results (Saner & Yiu, 2007). Often, investments in training are not successful and intended objectives are not met, leading to disappointment and unhelpful attribution of blame. In order to judge whether training has been successful or not, evaluation of the results is necessary. Evaluation is a process used to determine the relevance, effectiveness, and impact of activities in light of their objectives.

Evaluation enables us to empirically demonstrate whether the training was effective (Bramley, 2003; Goldstein & Ford, 2002; D. Kirkpatrick & J. Kirkpatrick, 2006).

Berge (2008) argues that training sometimes lacks the systematic approach consisting of planning, training needs analysis, and evaluation, or is done for the wrong reasons. He additionally points out that in almost all of the cases the lack of performance in employees is only partially caused by the need for training. Conducting needs assessment is essential in the realisation of a training program. Often, newly-established organisations design and implement training activities without first conducting a needs assessment. As a consequence, these organisations risk overdoing training, doing too little training, or missing the point completely. Ideally, the assessment of training needs is an unending activity of collecting information to identify what training needs exist so that appropriate interventions can be established to assist the institution to achieve its goals and objectives (Brown, 2001). Specifically, a methodical needs assessment can guide and serve as the foundation for the design, development, implementation, and evaluation of the training program. Further, it can be used to specify a number of key features for the implementation (input) and evaluation (outcomes) of training programs (Arthur et al., 2003). More so, such assessment captures information spanning where and why training is needed (organisation focus), who needs to be trained (person focus), and what must be incorporated as program content (task focus) (Dierdorff & Surface, 2008).

Although the usefulness and criticality of training needs assessment is generally recognised, empirical work on the topic has been quite inadequate (Dierdorff & Surface, 2008). For instance, Arthur et al. (2003) report that studies conducting needs assessments represented only 6% of the data in their meta-analysis of training effectiveness. Further, Salas and Cannon-Bowers (2001) highlight this scarcity of empirical data in their review of the field of training. Considering the substantial role TNA plays in the overall success of training and the sheer amount of financial resources dedicated to training and development efforts in modern organisations (billions of dollars annually) (Noe, 2010), this lack of systematic research is potentially problematic to both training practitioners and researchers.

On the one hand, Loucks-Horsley (2010) report that though there have been modifications in the degree to which professional development is propelled by the learning needs of students, there has not been parallel improvement in focusing those learning experiences on what teachers do in their classrooms. Teachers have been engaged in meaningful exploration of their teaching practices, but too often, this is not prevalent in schools. For example, teachers report that much of the professional development available to them is not useful (Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009), implying that their learning is disconnected from their practice.

However, after a thorough search of published literature, the researchers were not able to find any psychometrically-sound inventory that would assess college faculty members' training needs in terms of instruction, research and community extension. Therefore, the primary aim of the researchers in this study is to develop and assess the psychometric properties of the Faculty Training Needs Inventory.

Methodology

Research Design

Since the objective of this study is to develop and assess the psychometric properties of the Faculty Training Needs Inventory, the researchers utilise the methodological research design. The methodological design is the most appropriate research design for this research undertaking since methodological studies are concerned with the development, testing and evaluation of research instruments and methods (Polit & Beck, 2010). Methodological design is a research design used to develop the validity and reliability of instruments to measure constructs used as variables in research. This design is concerned with the development, testing and evaluation of research instruments and methods. More so, it is also known as research and development (R&D).

Respondents

Through purposive sampling, the researchers were able to invite nurses-turned-educators from the different HEIs in Central Luzon, Philippines based on the following criteria: the respondents are currently employed as faculty members in colleges of nursing at the time of data collection and are holders of academic rank (instructor, assistant professor, associate professor or professor). The respondents' employment status (whether under permanent or contractual status), current teaching loads and length of service were not considered in the selection process. Tabachnick and Fidell (2007) suggest that, in reality, about 150 respondents should be sufficient in such undertaking. Therefore, the researchers invited a total of 180 respondents (20% more than the required number of cases) who voluntarily participated in this study. Table 1 presents the respondents of the study.

Table 1: Respondents of the Study

Indicator	
Age	
(Mean=35.10; SD=11.2)	
20-29	36.54%
30-39	34.62%
40-49	16.67%
3.85%	8.33%
60 and above	3.85%
Sex at Birth	
Male	52.6%
Female	47.4%
Civil Status	
Single	46.3%
Married	53.7%
Educational Attainment	
Baccalaureate degree holder	39.6%
Masters degree holder	41.4%
Doctorate degree holder	18.9%
Rank	
Instructor	69.6%
Assistant Professor	20.5%
Associate Professor	8.7%
Professor	1.2%

Development and Validation Procedure

The researchers made use of the following steps in the development and validation process of the Faculty Training Needs Inventory. The researchers:

1. Determined the purpose, specific objectives, and the target group
The researchers aimed to develop a psychometrically-sound instrument that would measure the training needs of faculty members in the following areas: instruction, research, and extension. The instrument serves as a diagnostic tool in determining what training needs should be addressed by the concerned HEIs. This inventory gathers data to identify what training should be developed to help faculty members and the HEIs accomplish their goals and objectives.

2. Reviewed the literature and related studies

The researchers reviewed relevant, substantive, methodologic, and practical, substantive, methodologic, and practical literature and studies. Articles were included in the review if they discussed conceptually and/or empirically the training needs of faculty members and if they were published in peer-reviewed journals. Grey literature such as dissertations, unpublished reports, and non-refereed journal articles were excluded from the review. The following online databases were searched: EBSCO Host databases, Education Resources Information Center (ERIC), Google Scholar, and ProQuest®. Examples of search items include training needs, training needs analysis, training needs assessment, faculty members, university lecturers, university professors, and the like.

3. Generated the items of the instrument (which results in the creation of Draft 1)

Initially, there were 45 items in the Faculty Training Needs Inventory. Since the researchers are guided with a priori assumption which proposed a three-dimensional model, 15 items each for training needs for instruction, training needs for research and training needs for community extension were developed, based on the reviewed literature as well as from the researchers' objective point of view.

4. Conducted content validation of Draft 1 (which then results in the creation of Draft 2)

Three validators per dimension reviewed the items and provided useful opinions on certain aspects that needed to be improved. These validators assessed and commented on the representativeness/relevance of each item to the areas of investigation. They were asked to indicate whether each item is highly relevant, quite relevant, somewhat relevant, or not relevant in the list by checking the appropriate space provided in Draft 1. Further, they indicated their comments and/or suggestions in the remarks section, should they think a particular item needed more structural enhancement. The numeric value of content validity ratio is determined by the Lawshe Table. For nine validators, if CVR is bigger than 0.56, the item in the instrument with an acceptable level of significance are accepted (Lawshe, 1975).

5. Pilot tested Draft 2 and tested the reliability of the instrument (which then results in the creation of Draft 3)

A pilot study was conducted after the development of the Draft 2 of the Faculty Training Needs Inventory. The researchers analysed the reliability of the proposed instrument after distributing the inventory to 30 randomly-selected faculty members. Internal consistency of each dimension of the inventory was examined through the calculation of the Cronbach's alpha. Results range from .932 to .965, which indicates high reliability of the inventory. Meaning, the scale is free from random error and that it measures the same underlying attribute or construct.

After completing Step 5, Draft 3 was then distributed to the actual respondents during their most available and most convenient time. Each respondent was given one set of the proposed inventory to be filled out completely and as honestly as possible. The explanation of the entire nature of the study, distribution of questionnaire and answering of the inventory took 5-6 minutes. The researcher then followed the steps suggested by Hooper (2012) in the conduct of construct validation (using exploratory factor analysis) resulting in the Final Faculty Training Needs Inventory.

Data Collection

A letter of request to conduct the study was secured from the respective HEI Officials. After the approval, the researchers secured an individual informed consent from the respondents. However, before securing the consent, the researchers explained the entire nature of the study, possible risks and benefits that may arise, and the respondents' rights in research undertakings. Further, the researchers assured the respondents that no identifying respondent-information will be reported in this manuscript.

Statistical Treatment of Data

The data collected were coded and entered into a digital spreadsheet. Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS) version 22. To determine the internal consistency of the proposed inventory, Cronbach's alpha was utilised. Prior to the conduct of exploratory factor analysis, the researchers first evaluated whether the sample is adequate enough to execute a satisfactory factor analysis by determining the Kaiser-Meyer-Olkin (KMO) quantity of sampling sufficiency and Bartlett's Test. A KMO value greater than 0.6 was used as a criterion for sample size adequacy (Hooper, 2012). Then, to estimate the scale's construct validity, items were run using exploratory factor analysis. Principal axis factoring as well as Promax rotation were used in extracting the factors. In doing this, the researchers set the following parameters to achieve best-fitting structure and correct number of factors: eigenvalues greater than 1.0 and factor loadings greater than .40 (Hooper, 2012). Items with values lower than these pre-set values were automatically removed.

Results and Discussion

Content Validity Ratio

The numeric value of content validity ratio is determined by Lawshe Table. For nine validators, if CVR is bigger than 0.56, the item in the instrument with an acceptable level of significance is accepted (Lawshe, 1975). The instruction dimension of the proposed inventory

has had 15 items; however, only 14 items yielded a CVR value of more than 0.56 (CVR=1.00). Thus, one item was deleted from the dimension (which had CVR value of 0.33). The research dimension of the proposed inventory has had 15 items; all items yielded a CVR value of more than 0.56 (CVR=1.00). The community extension dimension of the proposed inventory had 15 items; however, only 13 items yielded a CVR value of more than 0.56 (CVR=1.00). Thus, two items were deleted from the dimension (which had CVR value of 0.33).

Testing the Assumptions

The researchers checked the values of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and the Bartlett's Test of Sphericity to determine whether the sample is adequate enough to execute a satisfactory exploratory factor analysis. Table 2 shows the results of the KMO Measure of Sampling Adequacy and Bartlett's Test. It can be gleaned from the table that the KMO value is above the acceptable limit (either .6 or above) and that the Bartlett's Test of Sphericity is significant (less than .05). With the results of KMO and Bartlett's Test, factor analysis is appropriate to use in the validation process of the proposed inventory.

Table 2: Results of the KMO measure of sampling adequacy and Bartlett's Test

Test		Value
KMO Measure of Sampling Adequacy	Approx. Chi-Square	.915
Bartlett's Test of Sphericity	Df	8978.508
	Df	1485
	Sig.	Sig.

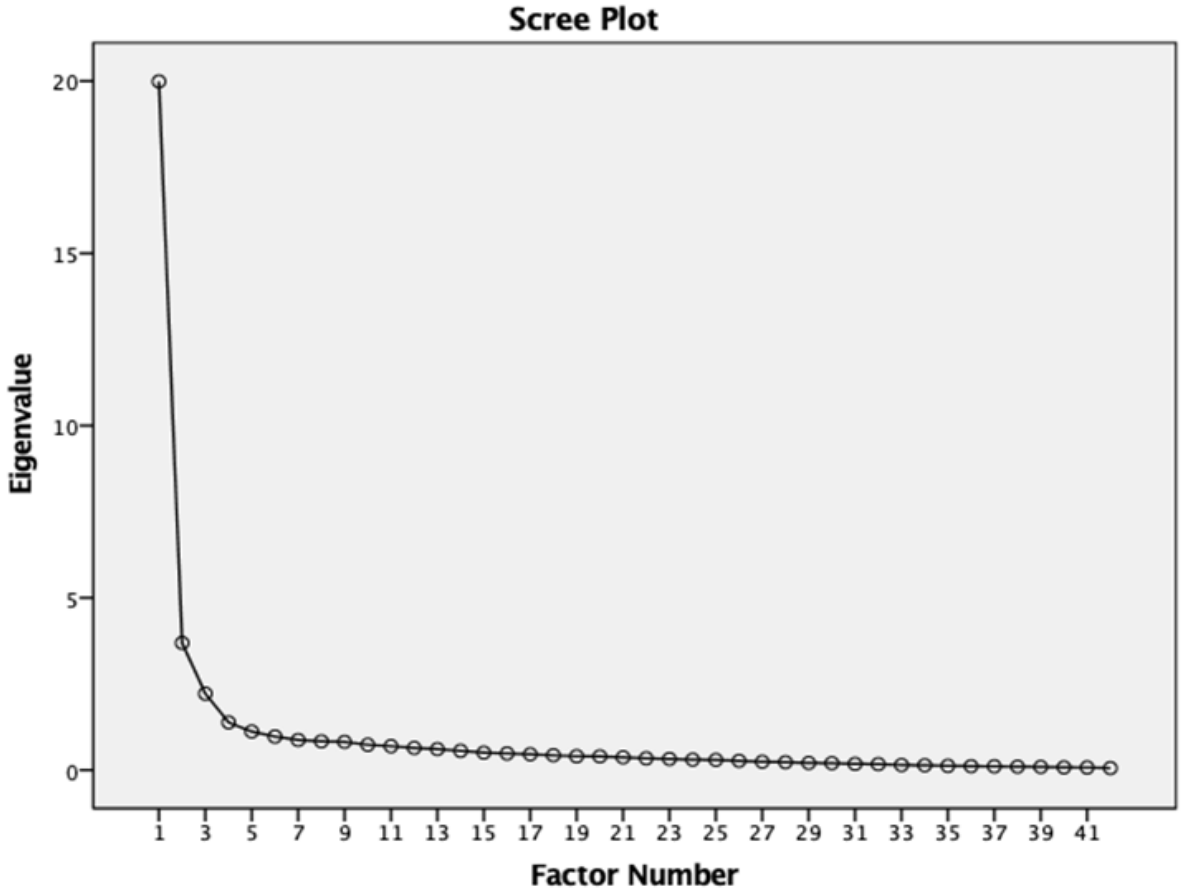
Deciding on the Number of Factors to Extract

The researchers made use of the most popular method for deciding on the retention of factors – the Kaiser's eigenvalue greater than 1 criterion (Fabrigar, MacCallum, Wegener, & Strahan, 1999). In this method, all factors greater than one are retained for interpretation. Further, the researchers utilised the Cattell's Scree Test, which graphically presented the eigenvalues in descending order linked with a line. The researchers scrutinised the graph to determine whether there is a noticeable change in its shape – known as the 'elbow' or point of inflexion.

Results of the analysis suggest that the researcher can extract five factors from the dataset. However, the researcher also considered the result of the scree plot. It can be seen in Figure 1 that the most obvious break (point of inflexion) in the scree plot is at Factor 2, suggesting a multi-dimensional solution is appropriate. However, a second (albeit much smaller) drop in eigenvalues seems to occur between Factors 2 and 3, which may indicate a three-factor

solution is appropriate. Should the researcher consider the three-factor solution, this captures 61.661% of the variance. Thus, the combined eigenvalue analysis and scree plot inspection led the researcher to consider a three-factor solution. Coupled with these results, the researcher is guided with a priori which proposed a three -factor solution. Therefore, the researcher re-ran the analysis, specifying a three-factor solution.

Figure 1. Scree Plot for Exploratory Factor Analysis



New output was generated after the researchers re-ran the analysis. The correlation matrix, KMO and Bartlett's Test of Sphericity were all the same as the original specification. On the one hand, the output in Table 3 presents a three-dimensional solution. In this output, there are three lines of data rather than five and this reflected the fact that the researcher constrained the solution to three dimensions. This captures 61.661% of the variance.

Table 3: Re-specified solution of the total variance explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Total				Total	% of Variance	Cumulative %	Total
1	19.988	47.590	47.590	19.599	46.664	46.664	9.596
2	3.691	8.788	56.378	3.255	7.751	54.414	7.911
3	2.219	5.283	61.661	1.834	4.368	58.782	7.182
4	1.385	3.299	64.960				
5	1.119	2.664	67.624				
6	.974	2.318	69.942				
7	.874	2.081	72.023				
8	.836	1.989	74.013				
9	.819	1.949	75.962				
10	.735	1.751	77.713				
11	.694	1.653	79.365				
12	.643	1.530	80.895				
13	.609	1.450	82.345				
14	.559	1.331	83.676				
15	.507	1.207	84.883				
16	.484	1.152	86.035				
17	.458	1.091	87.125				
18	.430	1.025	88.150				
19	.402	.958	89.108				
20	.398	.947	90.055				
21	.370	.881	90.936				
22	.341	.813	91.749				
23	.325	.774	92.523				
24	.304	.723	93.246				
25	.294	.701	93.947				
26	.271	.645	94.592				
27	.242	.576	95.168				
28	.230	.547	95.715				
29	.206	.492	96.207				
30	.202	.482	96.688				
31	.180	.428	97.116				

32	.173	.411	97.527				
33	.148	.352	97.879				
34	.141	.336	98.215				
35	.122	.290	98.505				
36	.115	.273	98.778				
37	.109	.258	99.037				
38	.101	.240	99.277				
39	.091	.217	99.494				
40	.081	.192	99.686				
41	.075	.178	99.864				
42	.135	.246	98.202				

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Factor Rotation and Interpretation

Prior to interpretation of the factors, the researcher first checked for cross-loadings. A cross-loading is an item with coefficients greater than .4 on more than one dimension. It can be seen in Table 4 that the dataset is free from cross-loadings as all items load on only one dimension. More so, all items were loaded on one of the factors. Therefore, this dataset provides a nice clean solution to interpret.

Factor 1 described 47.590% of the variation. It has 15 items with loadings exceeding the criterion 0.40. This factor appeared to capture the training needs of faculty members in regards to research. The item "I need to participate in trainings that would formulate testable hypotheses and/or assumptions", was the clear-cut marker variable for Factor 1, which is named Training Needs for Research, because of its high loading (.834).

Factor 2, represents 8.788% of the total variance, and has 14 items with loadings exceeding the criterion 0.40. The theme of this factor involves the training needs of faculty members in regards to instruction. The marker variable for this factor is "I need to participate in trainings that would help me align with lesson objectives the teaching methods, strategies and instructional materials or resources appropriate to learners" which has a loading of .820; hence, it is named Training Needs for Instruction.

Factor 3 describes 5.283% of the variation. It has 13 items with loadings exceeding the criterion 0.40. This factor appeared to capture the training needs of faculty members in regards to community extension. The item "I need to participate in trainings that would help

me understand and describe the target community", was the clear-cut marker variable for Factor 3, which is named Training Needs for Community Extension because of its high loading (.868).

Table 4: Pattern matrix of items and factor loadings

I need to participate in trainings		Factor	
That would help me…	1	2	3
Research Item 04	.834		
Research Item 02	.826		
Research Item 11	.818		
Research Item 12	.813		
Research Item 14	.803		
Research Item 07	.802		
Research Item 01	.799		
Research Item 10	.796		
Research Item 06	.793		
Research Item 03	.780		
Research Item 09	.776		
Research Item 08	.717		
Research Item 15	.714		
Research Item 05	.713		
Research Item 13	.705		
Instruction Item 11		.820	
Instruction Item 09		.805	
Instruction Item 05		.774	
Instruction Item 13		.760	
Instruction Item 12		.755	
Instruction Item 07		.744	
Instruction Item 08		.723	
Instruction Item 10		.710	
Instruction Item 06		.691	
Instruction Item 14		.638	
Instruction Item 01		.589	
Instruction Item 03		.555	
Instruction Item 02		.505	
Instruction Item 04		.498	
Community Extension Item 02			.868
Community Extension Item 10			.855
Community Extension Item 03			.827

Community Extension Item 11			.808
Community Extension Item 04			.737
Community Extension Item 01			.715
Community Extension Item 05			.681
Community Extension Item 06			.655
Community Extension Item 09			.590
Community Extension Item 08			.559
Community Extension Item 12			.480
Community Extension Item 13			.478
Community Extension Item 07			.404

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalisation.
a. Rotation converged in six iterations.

Conclusions

The Faculty Training Needs Inventory is free from random error and it measures the same underlying attribute or construct. Internal consistency of each dimension of the inventory was examined through the calculation of the Cronbach's alpha. Factor analysis is appropriate to use in the validation process of the Faculty Training Needs Inventory. The combined eigenvalue analysis and scree plot inspection led the researcher to consider a three-factor solution, which accounts to 61.661% of the variance. Coupled with these results, the researcher is guided with a priori which proposed a three-factor solution. Factor 1 is named Training Needs for Research, Factor 2 is named Training Needs for Instruction, while Factor 3 is named Training Needs for Community Extension.

Limitations and Directions for Future Research

The present study did not include other colleges of nursing outside Central Luzon, Philippines, which may possibly contribute to the further development and validation of the said inventory. Therefore, future researchers may want to venture on toward involving a larger sample size to represent the entire target population. Second, the researcher only assessed the reliability of the Faculty Training Needs Inventory by means of using Cronbach's alpha. Further psychometric testing needs to be done in the national level to objectively set the constructs and indicators of the training needs of faculty members. Future researchers may want to conduct test-retest reliability and/or interrater reliability to further test the consistency of the inventory. Third, the researcher only assessed the content and construct validity of the Faculty Training Needs Inventory. Future researchers may want to conduct more validation procedures such as criterion validation, concurrent validation, predictive validation, and/or discriminant validation to measure the extent to which the scores

from the Faculty Training Needs Inventory represent the variable/s they are intended to. Lastly, future researchers may want to further explore other dimensions of the Faculty Training Needs Inventory since the results showed that the constructs represent 61.661% of the total variance.

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