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Factor Analysis for Evaluation of Lifelong Learning Skills of Teaching Profession Program in Ramkhamhaeng University

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ABSTRACT

This study aimed to develop the measurement of lifelong learning skills which is defined as an ongoing process of person to learn throughout their life by using learning process, innovation, and educational technology in order to enhance person's wisdom, keep up with the ever-changing global social context and continuously acquire new knowledge all over their lifespan. Data were collected from 370 students of teaching profession program (50 males and 320 females). An exploratory factor analysis (EFA) with extraction method of principal component analysis was performed to analyze the data. The result of the EFA identified a three-factor structure for the lifelong learning skills measurement with 30 items. The three factors including (1) Information technology and communication skills, (2) Learning skills and (3) Thinking skills, together explained 54.708 % of the total variance. This measurement assesses an ability of lifelong learning skill among teaching profession to reflect their strengths and weakness so that professionals are able to suggest and give a guideline appropriate for their student individually.

Keywords

Lifelong Learning Skills, Factors Analysis, Teaching Profession Program

Introduction

Globalization and the growth of the fast-changing knowledge economy mean that people require upgrading their skills throughout their adult lives to cope with modern life, both in their work and in their private lives. Nowadays, there is an increasingly important basic skill in the ever-changing technological universe: an ability to learn and adapt to the needed new skills and training (OECD, 2007).

Knowledge is no longer handed down from above (either from specialists in design, from managers in organizations, or from teachers in courses), but is constructed collaboratively in the context of work. Learners must be able to use LLL facilities to upgrade their knowledge, skills, and competence in a discipline as required. They can also contribute to the facilities by sharing knowledge and supporting other learners (Marjan Laal, 2011).

According to Phuthong and Srisan (2002), global economy and society have been developed and focused on human expertise and proficiency. This developmental idea was adopted to Thai education in connection with a lifelong learning concept. Lifelong learning (LLL) was defined as an educational view which could be arranged by educational organizations in order to enhance students' knowledge and skills. Meanwhile, it was able to be created by students who might have a personal learning objective (Cropley, 1978). Lohittaviset (2005) supported that the lifelong learning could also be included for all age groups. Phongpaiboon et al. (2003) claimed that the lifelong learning concept could support Thai students to improve their competences. In addition, this concept could relate to an educational guidance in the 21st Century which was provided by the United Nations Educational,

Scientific and Cultural Organization (UNESCO). According to the International Committees of Education (1997), the UNESCO' educational guidance was titled as "Learning: The Treasure Within". Four educational principles for the 21st Century were also pointed out in terms of "Learning to Know, Learning to Do, Learning to Live Together and Learning to Be". These principles could be considered as a requirement for Thai students' lifelong learning skills. Candy et al. (1994) asserted that the skills were relevant for undergraduate students to regarding their academic experience and collaborative skills. Additionally, the students were able to design a learning process based on their individual propose and learning style.

In a Bachelor of Education (B.Ed.) programs, the lifelong learning skills were considered as an educational concept for students who studied in the B.Ed. programs. Not only the students were able to improve their knowledge and skills for a field experience, but they also learned about a pedagogical preparation for their future career as a teacher. Furthermore, the lifelong learning skills could be required for Thai B.Ed. students with regard to a Thai educational policy and educational standards. Due to the importance of the lifelong learning skills within a Thai context, my research project intends to study the students' lifelong learning skills in order to develop their learning outcomes in connection with Thai universities' character education and the educational standards.

Methodology

Sample and Instrumentation

The populations of the study were 616 students enrolled in the course of *Field Experience in Teaching Profession* during the second semester of the academic year 2017 at RU. The sample group, convenience sampling in which the samples of the study were 370 students who have enrolled in the Teaching Behavior course or in 4-year student and ones who have the cumulative credit not less than 106 credits. Theoretically, minimally adequate sample size for conducting Exploratory Factor Analysis (EFA) should be at least five times as many observations as the number of variables to be analyzed, and a more acceptable sample size would have a 10:1 ratio (10 observations per variable: Hair, et. al., 2006). Therefore, the adequate sample size for this study which initially consisted of 30 variables should be at least 300 or greater.

The instrument of the study was a 2-part questionnaire collecting the following data. Part I collected student's demographic data including gender, age and major. The questions were in the form of a checklist and fill in the blank. Part II, containing three sections, asked students to rate the three predictor variables in a Likert 5-point scale. Each section had 10 questions, for a total of 30 questions. The verification consists of the examination on the content validity, the determination of the appropriateness and clarity of the language used, and the determination of Index of Item Objective Congruence or Index of Concordance (IOC), evaluated by 3 experts. The attained IOCs rank more than 0.5.

Procedure and data analysis

Analysis factors for evaluation on lifelong learning skills consisted of four stages: (1) conceptual definition of the construct, (2) development of the items, (3) testing the assumptions, (4) development of the lifelong learning skills scale.

Stage 1: Conceptual definition of the construct

Defining the construct was the first step to develop the instrument and was based on a model or theoretical reference that identified the relationships among the construct and its components (Hair, et al., 2006). For this study, *lifelong learning skills* was defined as an ongoing process of stimulation and encourages people to acquire knowledge, values, skills, and understanding of what they need to know throughout their lives. This skill helps people to apply the new knowledge, create, and feel delighted with all the aspects of their life (Mckenzie. 2001: 368 ; Kearns. 1998. *Lifelong Learning : Implication for Vocational Education and Training*: unpagged). The results of this synthesis found that three main

lifelong learning skills (Subin Chaiya, 2015). The components of lifelong learning skills are describe in more details in Table 1.

Table 1 Components of Lifelong Learning Skills

Component	Definition
Thinking	Critical thinking, Problem solving, Numeracy skills and Creativity, collectively referred to as “Cognitive skills,”
Learning	Information Literacy, Self-directed learning, Team work, Human relations and Research skills
Information Technology and Communication	and Language with Communication , ICT skills and Digital literacy

Stage 2: Development of the items

For this study, items were generated from the Lifelong Learning skills definition and its components, together with previous Lifelong Learning skills addiction scales. A total of 30 items were selected after excluding duplicate or unrelated items. Then, three professionals (among them were two academic education and an academic lifelong learning) were asked to select items and scored on the Index of Item-Objective Congruence (IOC). Finally, 30 items remained for further analysis. The developed instrument utilized Likert-type response categories assessing frequency on a five-point scale.

Stage 3: Testing the assumptions of the Exploratory Factor Analysis (EFA)

Testing assumptions of EFA required both conceptual and statistical consideration. A strong conceptual foundation supported the assumption that a factor structure existed before the EFA was performed. Test of statistical assumption ensured that the variables were sufficiently intercorrelated to produce representative factors and possessed ‘factorability’. Several empirical measure were calculated to aid in assessing the factorability of the correlation matrix, including the anti-image correlation matrix, Bartlett’s test of sphericity, and the measure of sampling adequacy. The *Anti-image correlation matrix* is the negative value of the partial correlation matrix; in each case, smaller anti- image correlation coefficients (less than .70) are indicative of a data matrix suited to factor analysis. *Bartlett’s test of sphericity* is a statistical test for the presence of correlations among the variables. A statistically significant Bartlett’s test of sphericity ($p\text{-value} < .05$) indicates that sufficient correlations existed among the variables to proceed. Lastly, *Measure of sampling adequacy (MSA)* requires that MSA values must exceed .50 for both the overall test, as indicated by a value of Kaiser-Meyer-Olkin (KMO), and each individual variable. Variables with values less than .50 should be omitted from the factor analysis (Hair, et. al., 2006; Yong & Pearce, 2013). For this study, all of the conceptual and statistical assumptions were met. The conceptual assumption was conceptually based on the Concept of lifelong skills. Testing the statistical assumptions confirmed that: (1) the anti-image correlation coefficients were not greater than .70, indicating that the factors structure can be explained by the variables loading on the factors, (2) a statistically significant Bartlett’s test of sphericity ($\chi^2 = 6.382$, $df = 435$; $p\text{-value} < .000$), indicated that sufficient correlations existed among the variables, and (3) The KMO values was .960 and the MSA values for each individual variable were .3 and above, indicating that each variable was able to predict without error by the other variables. Taken all of this together supported the factorability of the correlation matrix.

Stage 4: Development of the Lifelong Learning skills scale by using an EFA

The primary purpose of EFA is to condense data by regrouping a large number of variables into a limited set of factors based on shared variance, so that relationships and patterns can be easily interpreted (Hair, et. al., 2006; Yong & Pearce, 2013). Therefore, for this study, an EFA was used to develop the Lifelong

Learning skills, by the extraction method of principle component analysis and the rotation method of Promax with Kaiser Normalization. The outcome of the EFA is reported in the results section.

Results and Discussion

The findings of the study answering the research objectives were presented in Table 2-5. Almost all of the samples were female (86.05%) with the students of them in the age range of 20-24 years old (51.10%). The most major is Social Study (26.50%) and the less major is Computer (0.80%)

Table 2: Demographic Data of the Sample Group

Demographic Category		<i>f</i>	□
Gender	Female	320	86.50
	Male	50	13.50
Age	20-24	189	51.10
	25-30	141	38.10
	30 up	40	10.80
Major	Early Childhood	71	19.20
	Elementary	65	17.60
	Thai	71	19.20
	English	12	3.20
	Chinese	6	1.60
	Social Study	98	26.50
	Mathematic	15	4.10
	Science	20	5.40
	Art Education	9	2.40
	Computer	3	0.80

Results of the EFA

The purpose of the EFA was to find a way to organize the information contained in a larger number of original variables into a smaller set of new, composite dimensions or factors with a minimum loss of information (Hair, et. al., 2006). In meeting this purpose, four steps were introduced: (1) selecting the variables (items), (2) specifying the number of factors, (3) examining extraction methods and factor loadings, and (4) examining rotation methods and interpretations.

Selecting the variables (items)

First, items were selected based on consensus among professionals and scores on the IOC. Three items (from an original pool of 30 items) that showed IOC < .06 were 30 items remained for further analysis. Second, in the EFA, it was important to determine *Communality* or the variance accounted for by the common factors. Items with low communalities (e.g. less than .20 so that 80% is unique variance) were eliminated from the analysis since the aim of factor analysis was to try and to explain the variance through the common factors (Yong & Pearce, 2013). In this study, all of the 30 items shown communality larger than .20; therefore, all of them were retained for the analysis, as described in Table 3.

Specifying the number of factors

In consideration of the number of factors to extract, eigenvalues and the scree plot are commonly used to guide decisions. Kaiser's criterion suggests retaining all factors that are above the eigenvalue of 1. The scree plot consists of eigenvalues (X-axis) and number of factors (Y-axis). The number of factors

to be retained is represented by the data points that are above the break, revealed by drawing a horizontal line and a vertical line starting from each end of the curve (Yong & Pearce, 2013). In this study, determining eigenvalues (greater than 1 per Kaiser's criterion) together with the scree plot (shown in Figure 1) lead us to extract 3 factors accounting for 54.708% of the total variance. These three factors were sufficient to meet a specified percentage of variance explained.

Table 3: Communalities for all the 30 items of the Lifelong Learning Skills Items

Items	Initial	Extraction
Item 1	1.000	.540
Item 2	1.000	.471
Item 3	1.000	.615
Item 4	1.000	.562
Item 5	1.000	.466
Item 6	1.000	.497
Item 7	1.000	.611
Item 8	1.000	.589
Item 9	1.000	.563
Item 10	1.000	.514
Item 11	1.000	.473
Item 12	1.000	.586
Item 13	1.000	.577
Item 14	1.000	.500
Item 15	1.000	.509

Items	Initial	Extraction
Item 16	1.000	.561
Item 17	1.000	.602
Item 18	1.000	.459
Item 19	1.000	.541
Item 20	1.000	.527
Item 21	1.000	.488
Item 22	1.000	.504
Item 23	1.000	.464
Item 24	1.000	.549
Item 25	1.000	.587
Item 26	1.000	.532
Item 27	1.000	.706
Item 28	1.000	.722
Item 29	1.000	.575
Item 30	1.000	.526

Scree Plot

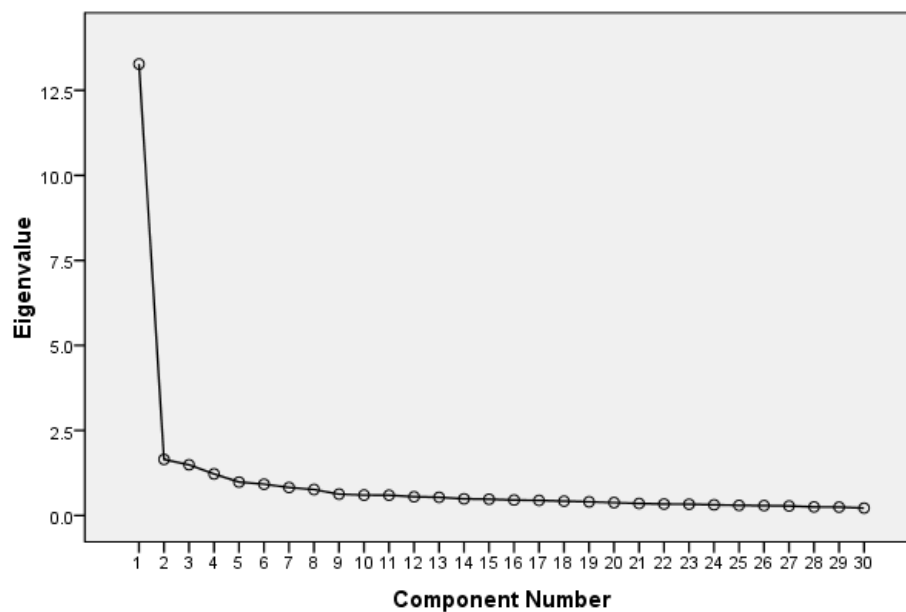


Figure 1: The scree plot generated in EFA for 30 items

Examining extraction methods and factor loadings

The extraction method of *principal component analysis* is used to extract the maximum variance from the data set with each component thus reducing a large number of variables into smaller number of components (Tabachnick & Fidell, 2007 as cited in Yong & Pearce, 2013). The results from our

principal component analysis revealed that one items (item 20) had factor loadings $< .30$. These low factor loadings indicated that perhaps the items did not represent a sign of lifelong learning skills and should be excluded from the analysis. After discarding these one items, data were subjected to a final EFA with all factor loadings $< .30$ suppressed. Though the final EFA run, a three-factor structure of the lifelong learning with 29 items was identified.

Examining rotation methods and interpretations

Factors are rotated for better interpretation since unrotated factors are ambiguous. The goal of rotation is to attain an optimal simple structure which attempts to have each variable load on as few factors as possible, but maximizes the number of high loadings on each variable (Rummel, 1970 as cited in Yong & Pearce, 2013). In this study, an oblique rotation method *-Promax with Kaiser Normalization-* was employed in eight iterations, explaining together 54.708% of the total variance. Factor 1 consisted of ten items ; factor 2 consisted of nine items ; factor 3 consisted of ten items, as described in Table 4.

Table 4: Rotated factor matrix for a reduced set of Lifelong Learning skills items (discarded item 20)

Item No.	Item in brief	factor		
		1	2	3
29	Can use English language to Introduce yourself.	.870	-.325	
27	Have a clear point when answer the questions.	.853		
28	Summarize the reading contents correctly.	.834		
26	Use speaking skills in Thai language to respond and suitable conversation circumstance.	.678		
21	Have Information Technology (ICT) skills.	.664		
30	Understand what is the others want.	.642		
25	Your writing skills in Thai language can understandable.	.600		
22	Search many learning resources.	.503	.320	
24	Use Information Technology in classroom management.	.432	.320	
17	Have an idea and open mind. Listen to the opinions of the others.		.880	
18	Teamwork Without conflict.		.773	
12	Like to learn new things		.745	
13	Interest in learning to improve knowledge and skills.		.698	
15	To Know what you need to improve knowledge and skills.		.638	
11	Other than reading in the library and lectures in the class, you have the other ways to learn.		.601	
16	Use multiple data to make decisions.		.554	
10	When experiencing bad things, look for opportunities to improve, rather than being inactive.		.497	.430
14	Follow up the information, news and knowledge.	.309	.487	
23	Use internet to search for the reporting purposes.	.399	.426	
19	Have a working plans that appropriate in the objective.		.411	
7	Interpretation of information that show as numbers, graphs, charts, diagrams, tables or text.			.773
3	To know what does information say and also describe the relationship of information			.768
8	Use statistics data to explain the issues.			.756
1	Can use the knowledge in various fields to explain the situation.			.733
2	Compare the results Effects between two or many situations.			.712
4	Adapt the ideas to suit the changing situations.			.708
9	Identify the problems that you are facing.			.629
5	When data from different sources is found to be inaccurate, Then select the data from officially accredited sources.			.617
6	Create new work that different from the original.			.489

N = 370; Factor loadings $< .30$ were suppressed

Extraction Method: *Principal Component Analysis*/ Rotation Method: *Promax with Kaiser Normalization*

Before interpretation and naming of the factors, two items cross-loading between the factors (item 23) needed to be identified. Specifically, item 23 (*Use internet to search for the reporting purposes*) was cross-loaded on both Factor 1 and Factor 2 with loadings of .399 and .426 respectively. Item 10 (*When experiencing bad things, look for opportunities to improve, rather than being inactive.*) on both Factor 2 and Factor 3 with loadings of .497 and .430 respectively. We regrouped item 23 to be under Factor 1 and item 10 to be under Factor 3 for the best conceptual fit, even though the factor loadings were slightly smaller. Thus, the resulting interpretation and naming of the factors in the final lifelong learning skills is shown in Table 5.

Table 5: Interpretation and naming of the factors in the final Lifelong Learning skills.

Factor	Naming	Definition	Item No.	Item in brief
1	Information technology and communication skills	Language with Communication, ICT skills and Digital literacy	29	Can use English language to Introduce yourself.
			27	Have a clear point when answer the questions.
			28	Summarize the reading contents correctly.
			26	Use speaking skills in Thai language to respond and suitable conversation circumstance.
			21	Have Information Technology (ICT) skills.
			30	Understand what is the others want.
			25	Your writing skills in Thai language can understandable.
			22	Search many learning resources.
			24	Use Information Technology in classroom management.
			23	Use internet to search for the reporting purposes.
2	Learning skills	Information Literacy, Self-directed learning, Teamwork, Human relations and Research skills	17	Have an idea and open mind, Listen to the opinions of the others.
			18	Teamwork Without conflict.
			12	Like to learn new things
			13	Interest in learning to improve knowledge and skills.
			15	To Know what you need to improve knowledge and skills.
			11	Other than reading in the library and lectures in the class, you have the other ways to learn.
			16	Use multiple data to make decisions.
			14	Follow up the information, news and knowledge.
			19	Have a working plans that appropriate in the objective.
3	Thinking skills	Critical thinking, Problem solving, Numeracy skills and Creativity, collectively referred to as "Cognitive	7	Interpretation of information that show as numbers, graphs, charts, diagrams, tables or text.
			3	To know what does information say and also describe the relationship of information
			8	Use statistics data to explain the issues.
			1	Can use the knowledge in various fields to explain the situation.

		skills,”	2	Compare the results Effects between two or many situations.
			4	Adapt the ideas to suit the changing situations.
			9	Identify the problems that you are facing.
			5	When data from different sources is found to be inaccurate, Then select the data from officially accredited sources.
			6	Create new work that different from the original.
			10	When experiencing bad things, look for opportunities to improve, rather than being inactive.

Conclusion and Recommendations

The objective of this review article was to study the theoretical framework of lifelong learning skills of university students by synthesizing data which related to lifelong learning skills from concepts, theories, and researches. The results of this synthesis found that three main lifelong learning skills are Thinking skills consist of ten items : Critical thinking, Problem solving, Numeracy skills and Creativity, collectively referred to as “Cognitive skills”. In accordance with the standard framework of higher education in the country, qualifications under the bachelor's degree include an ability to acquire new knowledge and skills in the profession, develop higher cognition abilities such as synthesizing, analyzing, planning and creativity, develop an ability to communicate with other efficiently, able to apply advance technology with new project, as well as the ability to improve self-competency, increase morality and develop teamwork skill.

Learning skills consist of nine items : Information Literacy, Self-directed learning, Team work, Human relations and Research skills. Lifelong Learning Skills is defined as an ongoing process of person to learn throughout their life by using learning process, innovation and educational technology in order to enhance person’s wisdom, keep up with the ever-changing global social context and continuously acquire new knowledge all over their life span (Lohitwisas Snong, 2005).

And 3) Information technology and communication skills : Language with Communication , ICT skills and Digital literacy conform to As Walters S. (2010) claims; our planet won’t survive, if it is not a learning planet, and sustainable development will be achieved by learning through life. And Michael W. McGarrah.(2015). Lifelong Learning Skills (LLS) provide the foundation for learning and working. They broadly support student thinking, self-management, and social interaction, enabling the pursuit of education and career goals. Collectively, LLS are the means by which students master academic content and translate knowledge into action.

This research result provides a guideline to identify the best learning outcome and desirable performance of a teaching profession. These knowledge should be well-defined in the Bachelor of Education program, as it is an important competency to be fully functioning person and to be a qualified teacher in the development of students and Thai society later on.

REFERENCES

- Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate Data Analysis*. Seventh Edition. Prentice Hall, Upper Saddle River, New Jersey.
- Knowles, M. S. (1985). Lifelong Learning : Changes in Social Skills. In *The International Encyclopedia of Education Research and Studies*, V.5 pp. 3081 –3082. Husen, Torsten ; & Postlethwaite, T. Neville. Oxford: Pergamon.
- Lohitwisas Snong.(2005). *Lifelong learning*. Bangkok : Srinakharinwirot University.
- Marjan Laal (2011). *Lifelong learning: What does it mean?*.Procedia - Social and Behavioral Sciences 28 (2011) 470 – 474Retrieved May 2018 from:
https://www.researchgate.net/profile/Marjan_Laal/publication/224767020_Lifelong_Learning_What_does_it_Mean/links/0912f4fba440488c32000000
- Michael W. McGarrah.(2015). *Lifelong Learning Skills for College and Career Readiness: Considerations for Education Policy*. at American Institutes for Research.
- OECD (2007, April). *Qualifications and Lifelong Learning* (p.1), Organization for Economic Co-operation and Development, Policy brief. Retrieved 15 June 2018 from:
www.oecd.org/dataoecd/10/2/38500491.pdf.
- Walters S. (2010). The planet will not survive if it's not a learning planet: sustainable development within learning through life. *International journal of lifelong education*, 29(4), 427-436.