

## Factor Analysis of the 21<sup>st</sup> Century Learning and Innovation Skills of the Teaching Professional Students

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### Abstract

The purposes of this research was to analyze the factors of the 21<sup>st</sup> century learning and innovation skills of the teaching professional students. The sample group consisted of 400 students: the first to fifth year of Faculty of Education, Silpakorn University in the 2<sup>nd</sup> semester, academic year 2013 by Stratified Random Sampling. The research instrument was a questionnaire with five levels of rating. The statistical analysis employed was the exploratory factors analysis.

The results of the study were:

1. Learning and innovation skill in the 21<sup>st</sup> century student teachers were high level. (Mean= 3.845 Standard Deviation= .429)
2. The factors of 6 elements (43 Variables) to
  - 2.1) Opinion Exchange and Joint Decision (16 Variables and Factor Loading between .597 to .748)
  - 2.2) New Innovation (10 Variables and Factor Loading between .545 to .717)
  - 2.3) Idea Connection (6 Variables and Factor Loading between .542 to .663)
  - 2.4) Communication and Collaboration (5 Variables and Factor Loading between .514 to .627)
  - 2.5) Rationality (3 Variables and Factor Loading between .560 to .638)
  - 2.6) Multi-Methods of Problem Solving (3 Variables and Factor Loading between .500 to .557).

### Significance of the Study

National Education Act B.E. 2542 (1999) and Amendments (Second National Education Act .B.E. 2545 (2002) Section 6 specified that education shall aim at the full development of the Thai people in all aspects: physical and mental health, intellect, knowledge, morality, integrity, and desirable way of life so as to be able to live in harmony with other people. This section means that education is necessary for developing human's quality. There are some stakeholders to achieve the objectives of education including teachers, students, society, etc. The very important one that impels to achieve the objectives

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of education is teachers who have studied both knowledge and morality to succeed in a teaching profession. Teachers' work is to develop students based on the specified objectives of education. This is to say that teaching profession is one of the very important professions.

Regarding as the important profession, teachers have to educate students and contribute a high responsibility to generate an expected or ideal community. The more people have a respect to the teachers, the more teachers have to behave appropriately. In contrast, if the people in community only work for their own benefit themselves, those will lack sacrifice, morality, and ethics (Chaisongkram, 1999).

The Teachers Council of Thailand specified the teacher professional standards consisting of standard of knowledge, standard of job performance, and standard of conduct. These standards qualify teachers to have the expected characteristics and competency. For the standard of knowledge, it comprises 9 standards: language and technology for teachers, curriculum development, learning management, psychology for teachers, educational assessment and evaluation, classroom management, educational research, educational innovation and information technology, and being a professional teacher.

According to the characteristics and competency described in the teacher professional standards, the teachers will become highly professional if they have creative thinking, love of learning, teamwork, responsibility, awareness of information technology, and life skill. These skills can be defined as the 21<sup>st</sup> century skills.

The 21<sup>st</sup> century skills consist of three main skills which are learning and innovation skills, information, media and technology skills, and life and career skills (Wongkitrungruang and Jittaroek, 2011). Learning and innovation skills are divided into creativity and innovation, critical thinking and problem solving, and communication and collaboration. For information, media and technology skills, they consist of the introduction to information, the introduction to media, and the introduction to information and communication technology. For life and career skills, there are flexibility and adjustment, creativity and self-leading, social skills and cross-cultural learning, productivity improvement, leadership and responsibility.

These can be concluded that the teacher professional standards correspond to the 21<sup>st</sup> century skills which should be adopted to develop students especially in learning and innovation skills. It can stimulate students to practice creative thinking, solve any problems in daily life, as well as work with other people successfully.

Faculty of Education, Silpakorn University is of an acceptable standard to generate teachers and educational personnel. It specified five objectives in the strategic plan 2012 – 2015 including 1) to generate the graduates having the high quality of profession, full of morality, and high responsibility for the community 2) to encourage leadership of initiating educational knowledge, research, and innovation 3) to preserve and support Thai art, culture, and wisdom to be known in regional and international levels 4) to offer academic service of education science and other fields 5) to provide all levels of education with a high quality and acceptable international standard. According to the strategic plan, Faculty of Education, Silpakorn University is willing to generate the teaching professional students having a high quality of knowledge, competency and expected characteristics corresponding to the standard of The Teachers Council of Thailand and the 21<sup>st</sup> century skills.

As the significance of the teaching profession, the teaching professional students should have the 21<sup>st</sup> century skills especially in learning and innovation skills in order to develop students. Consequently, the researcher has an attention to analyze the factors of the 21<sup>st</sup> century learning and innovation skills of the teaching professional students to develop the learning process that supports students in Faculty of Education to gain learning and innovation skills.

### **Purposes of the Study**

The research was to analyze the factors of the 21<sup>st</sup> century learning and innovation skills of the teaching professional students.

### **Populations and samples**

The population was 999 undergraduates from Faculty of Education, Silpakorn University studying in the 2<sup>nd</sup> semester, academic year 2013, in the six majors including Thai, English, Social Studies, Early Childhood Education, Elementary Education, and Teaching Chinese as a Foreign Language.

The samples consisted of 400 undergraduates from Faculty of Education, Silpakorn University studying in the 2<sup>nd</sup> semester, academic year 2013, in the six majors including Thai, English, Social Studies, Early Childhood Education, Elementary Education, and Teaching Chinese as a Foreign Language by Stratified Random Sampling.

## Variables

The variable was the 21<sup>st</sup> century learning and innovation skills including 1) creativity and innovation, 2) critical thinking and problem solving, and 3) communication and collaboration.

## The Research Instruments

The research instrument was a questionnaire: factor analysis of the 21<sup>st</sup> century learning and innovation skills of the teaching professional students. It has 5 rating scales including excellent, good, fair, poor, and very Poor. There are 62 items covering the areas of learning and innovation skills divided into 3 parts: creativity and innovation, critical thinking and problem solving, and communication and collaboration. The content validity was carried out by the three experts examining item objective congruence or IOC (Identified as .50, IOC = 67 – 1.00). After a tryout for reliability by 30 undergraduates, who are not samples, Faculty of Education, Silpakorn University with Alpha's Coefficient, it was .95.

## Data Collection

The researcher used the questionnaire to collect data from the undergraduates of Faculty of Education, Silpakorn University studying in the 2<sup>nd</sup> semester, academic year 2013, in the six majors including Thai, English, Social Studies, Early Childhood Education, Elementary Education, and Teaching Chinese as a Foreign Language. A hundred percent or 400 questionnaires were carried out.

## Data Analysis

1. Do exploratory factor analysis to the questionnaire.
  - 1.1 Analyze descriptive statistics; use number and percentage for describing the characteristics of variables and use mean and standard deviation for analyzing question items.
  - 1.2 Analyze correlation matrix by Pearson's Product Moment.
  - 1.3 Use correlation variables to do principal component analysis and orthogonal factor rotation by varimax method
    - 1.3.1 Do factor extraction and look for the factors which eigen value was at least 1.
    - 1.3.2 Do orthogonal factor rotation by varimax method and choose the factors which were at least .50.
    - 1.3.3 Name the factors by considering the factors which Eigen value was more than 1. For explicit factors, select the factors which had factor loading at .50 and included at least 3 variables.

## Research Results

1. The 21<sup>st</sup> century learning and innovation skills of the teaching professional students in general was at good level (Mean = 3.845, S.D. = .429) and in 62 question items (Mean = 3.400 – 4.148, S.D. = .595 – .829). The samples had the 21<sup>st</sup> century learning and innovation skills at good level except in the question (The students' work is a new innovation) which was at fair level.

2. The results of factor analysis of the 21<sup>st</sup> century learning and innovation skills of the teaching professional students were as follows:

2.1 Communality analysis can be found that the communality before doing factor extraction by principal component analysis (PCA) was at 1.000 and after doing factor extraction was at .480 – .704 (more than .20) which means that the questions are appropriate for factor analysis.

2.2 Eigen value was sum of the square of factor coefficient. When considering for the factors having eigen value more than 1.00, there were 10 factors. The variance of these factors was 59.405 percent of the total variance.

2.3 The result of examining factor loading which was more than .50 and including at least 3 variables was found that there were 6 explicit factors with 43 variables as follows.

Factor 1 (16 variables, factor loading = .597 – .748, eigen value = 21.633) was “Opinion Exchange and Joint Decision.”

Factor 2 (10 variables, factor loading = .545 – .717, eigen value = 4.395) was “New Innovation.”

Factor 3 (6 variables, factor loading = .542 – .663, eigen value = 2.121) was “Idea Connection.”

Factor 4 (5 variables, factor loading = .514 – .627, eigen value = 1.614) was “Communication and Collaboration.”

Factor 5 (3 variables, factor loading = .560 – .638, eigen value = 1.321) was “Rationality.”

Factor 6 (3 variables, factor loading = .500 – .557, eigen value = 1.315) was “Multi- Methods of Problem Solving.”

## Discussion

The result of the factor analysis of the 21<sup>st</sup> century learning and innovation skills of the teaching professional students was found that there were 6 explicit factors with 43 variables. These could be described as follows.

1. Factor 1 (16 variables, factor loading = .597 - .748, eigen value = 21.633) was “Opinion Exchange and Joint Decision.” This factor can be defined as the characteristics of teaching professional students corresponding to the performance standard which The Teachers Council of Thailand (2013) specified in standard 9: to cooperate creatively with other people in school, listen to other opinions, accept other abilities, be willing to work with colleagues to achieve the school’s objectives, and be responsible for the result occurred. This also corresponded in standard 10: to cooperate creatively with other people in community, listen to other opinions, accept other abilities, be willing to develop school’s work, and be acceptable each other between community and school to willingly work together. In addition, this factor also corresponded to the standard of conduct specified by The Teachers Council of Thailand in item No. 2 that teachers must love, have faith, be honest, and be responsible, and well behave as a good member of the profession which The Teachers Council of Thailand specified the expected characteristics of this standard which are about to use variety of knowledge in working and do knowledge management in the organization. This means that if the teaching professional students are fostered to do knowledge management and brainstorming while they are studying or having seminar, these will encourage them to have the characteristic of opinion exchanges. Relating to the research of Office of the National Education Commission (2004), it was about a workshop encouraging the participants to do brainstorming and present the experience of successful ways of learning in class to other participants. This supported teachers to use a variety of teaching and have students’ participation.

2. Factor 2 (10 variables, factor loading = .545 - .717, eigen value = 4.309) was “New Innovation.” This can be defined as the characteristics of teaching professional students corresponding to the performance standard which The Teachers Council of Thailand (2013) specified in standard 4: to develop the practical lesson plans by selecting, improving, creating a lesson plan, having a note and suggesting after teaching, or preparing any kind of teaching which leads students to achieve the learning objectives. This also corresponded in standard 5: to develop the effective teaching media by creating, producing, selecting, improving materials, using printed media, or acquiring any techniques which lead students to achieve the learning objectives. In addition, this factor also corresponded to the expected behaviors specified in standard of conduct or the professional code of ethics. It is to select the appropriate lessons, creating new techniques and methods to develop the profession. In addition, the Office of Educational Reform (2001) stated about the teacher’s competency that teachers have a love of studying, doing a research, and experimenting to develop and keep themselves up-to-date.

Buripakdee et al. (1977) also stated that good teachers try to create new methods for more effective teaching. Consequently, if the teaching professional students are educated by creating new things through doing research, they will have creative thinking to develop students in the future.

3. Factor 3 (6 variables, factor loading = .542 - .663, eigen value = 2.121) was “Idea Connection.” This factor corresponded to standard of knowledge specified by The Teachers Council of Thailand (2013) in the part of classroom management. The teaching professional students have to practice systematic thinking, sense of communication, and use new innovation in classroom management. In a similar way, Bonwell and Eison (1991) stated that connecting ideas made students understand the lessons deeply and correctly, construct the sustainable knowledge and also connect existing knowledge to the new one. It can stimulate students to do the challenging activities, create ideas of what they are studying, and acquire new ideas for a problem solving. Furthermore, they can integrate their knowledge with what they are studying and have abilities of creation and working performance.

4. Factor 4 (5 variables, factor loading = .514 - .627, eigen value = 1.614) was “Communication and Collaboration.” This can be defined as the characteristics of teaching professional students corresponding to the performance standard which The Teachers Council of Thailand (2013) specified in standard 11: to find news and information to search, observe, memorize, and collect news in all aspects of situations. Especially, the information of teaching profession, it is used to rationally analyze, criticize, solve problems, and develop oneself, work, and community appropriately. This factor also corresponded to standard 9: to cooperate creatively with other people in school, listen to other opinions, accept other abilities, be willing to work with colleagues to achieve the school’s objectives, and be responsible for the result occurred. It is also in standard 10: to cooperate creatively with other people in community, listen to other opinions, accept other abilities, be willing to develop school’s work, and be acceptable each other between community and school to willingly work together. Panich (2012) stated that teachers use the skills of communication and creation for an achievement, develop themselves and find the effective ways to study, have self-directed learning through assessment and evaluation, create new things, have lateral thinking, and be both a good leader and a follower.

5. Factor 5 (3 variables, factor loading = .560 - .638, eigen value = 1.321) was “Rationality.” This can be defined as the characteristics of teaching professional students corresponding to the performance standard which The Teachers Council of Thailand (2013) specified in standard 11: to find news and information by searching, observing, memorizing,

and collecting news in all aspects of situations. Especially, for the information of teaching profession, it is used to rationally analyze, criticize, solve problems, and develop oneself, work, and society appropriately.

6. Factor 6 (3 variables, factor loading = .500 - .557, eigen value = 1.315) was “Multi- Methods of Problem Solving.” This can be defined as the characteristics of teaching professional students corresponding to the performance standard which The Teachers Council of Thailand (2013) specified in standard 12: to offer the opportunities of learning in any situations to construct learning activities based on the problems or what to be improved in class or in school to sustainably develop students. Teachers have to find out what the problems or criticisms are and change them to be good opportunities of learning for development. Therefore, teachers have to be optimistic or have a positive view in all situations and dare to solve the problems carefully without responding to them with a strong or torrid feeling. Teachers have to find out the way of students’ development in any kinds of situations. Kamted (2006) also stated that various ways of learning made students understand the concept deeply and accurately, have sustainable learning and transferring knowledge, develop communicative skills (listening, speaking, reading, and writing), develop thinking skill, and have a relationship with friends and teacher. This supports students to develop social skill and have fun while studying as a result of paying a lot of attention to study. In addition, a teacher and students have self- evaluation of teaching and learning from a beneficial feedback they have done the activities.

## Suggestion

### Suggestion for Usage

1. The research was found that the learning and innovation skills of the teaching professional students were at a good level. Consequently, the Faculty of Education should set up the ways to develop the teaching professional students for the higher levels of learning and innovation skills in the form of some activities in curriculum or some extracurricular activities.

2. From the result of this research, the Faculty of Education should set up the strategies to develop the quality of teaching professional students as a long plan process to generate the graduates having the learning and innovation skills.



### Suggestion for Further Research

1. This research is an exploratory factor analysis to acquire the primary factors of the learning and innovation skills of the teaching professional students. To further the study, a confirmatory factor analysis should be done to examine how the result and empirical data correspond to the hypotheses.

2. There should be a research about a development of generating teachers to have the 21<sup>st</sup> century skills.

3. There should be a research about a development of causal model of factors affecting to the 21<sup>st</sup> century skills covering 3 main skills of the teaching professional students.

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