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## A Needs Assessment for Enhancing Creative Problem Solving of Undergraduate Students(การศึกษาสภาพปัญหาและความคิดเห็นเพื่อส่งเสริมการแก้ปัญหาเชิงสร้างสรรค์ของนิสิตนักศึกษาระดับปริญญาบัณฑิต)

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การศึกษาสภาพปัญหาและความคิดเห็นเพื่อส่งเสริมการแก้ปัญหาเชิงสร้างสรรค์  
ของนิสิตนักศึกษาระดับปริญญาบัณฑิต

A Needs Assessment for Enhancing Creative Problem Solving of Undergraduate  
Students

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อศึกษาสภาพปัญหาและความคิดเห็นเพื่อพัฒนาทักษะการแก้ปัญหาเชิงสร้างสรรค์ของนิสิตนักศึกษาระดับปริญญาบัณฑิต ตัวอย่าง คือ อาจารย์ระดับปริญญาบัณฑิตจำนวน 55 คน และนิสิต/ นักศึกษา ระดับปริญญาบัณฑิต จำนวน 478 คน เครื่องมือที่ใช้ในการวิจัย ได้แก่ แบบสอบถามแบบมาตราประมาณค่า วิเคราะห์ข้อมูลโดยการหาความถี่ ร้อยละ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และการใช้เทคนิค Modified Priority Needs Index (PNI<sub>modified</sub>) ในการจัดลำดับความสำคัญของความต้องการจำเป็น

ผลการวิจัย พบว่า 1) อาจารย์ระดับปริญญาบัณฑิตเห็นว่า ความสามารถของนิสิตนักศึกษาที่มีความต้องการจำเป็นสูงสุด คือ ความสามารถของนิสิต/ นักศึกษา ในการแก้ไขปัญหาที่มีความแปลกใหม่ (PNI<sub>modified</sub> = 0.32) รองลงมาคือ ความสามารถของนิสิต/ นักศึกษา ในการค้นหาความคิดที่หลากหลายในการแก้ปัญหา (PNI<sub>modified</sub> = 0.31) 2) ผลการวิเคราะห์ความต้องการจำเป็นสูงสุดของนิสิตนักศึกษาสอดคล้องกับอาจารย์ คือ การแก้ปัญหาด้วยวิธีการที่มีความแปลกใหม่ และเมื่อเผชิญปัญหา ท่านสามารถแก้ปัญหาได้ภายในเวลาที่กำหนดที่ระบุไว้ (PNI<sub>modified</sub> = 0.08) 3) ผลการวิเคราะห์ความต้องการจำเป็นของอาจารย์ระดับปริญญาบัณฑิตเกี่ยวกับคาดหวังด้านการจัดการเรียนการสอนเพื่อส่งเสริมการแก้ปัญหาเชิงสร้างสรรค์ พบว่า ความต้องการจำเป็นสูงสุด คือ อาจารย์มีการจัดกิจกรรมการเรียนการสอนที่กระตุ้นให้นิสิต/ นักศึกษาได้คิดอย่างหลากหลายรอบด้าน (PNI<sub>modified</sub> = 0.15)

คำสำคัญ: ความต้องการจำเป็น, การแก้ปัญหาเชิงสร้างสรรค์, นิสิตนักศึกษาระดับปริญญาบัณฑิต

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### Abstract

The objective of the study was to study the state of problems and opinions in order to develop creative problem-solving skills of undergraduate students. The sample of this study consisted of 55 instructors and 478 undergraduate students. The research instruments consisted of questionnaires. Quantitative data was analyzed by means of descriptive statistics to acquire frequency, percentage, mean and standard deviation, and the use of a Modified Priority Needs Index (PNI<sub>modified</sub>) technique to prioritize the needs.

The results of this research were as follows: 1) the priority needs results of instructors showed that the highest index was the ability of students to solve problems in new ways (PNI<sub>modified</sub> = 0.32), followed by the ability of students to find a variety of ideas to solve problems (PNI<sub>modified</sub> = 0.31); 2) the priority needs result of undergraduate students showed that the highest index related to instructors was that students could solve problems in new ways and the students could solve problems within a specified time when problems occur (PNI<sub>modified</sub> = 0.08); 3) regarding the requirements necessary for instructors of teaching to enhance creative problem solving, the results found that instructors were required to organize activities which motivated students to have many perspectives on many different things (PNI<sub>modified</sub> = 0.15).

*Keywords:* needs assessment, creative problem solving, undergraduate students

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### Introduction

Problem solving and creativity are important for thinking skills in 21<sup>th</sup> century. Recently many universities specify it for their students aiming to provide major development skills for students by Thailand Education Development Plan. The desired characteristics by Thailand Qualifications Framework (TQF) assign the standard of learning outcomes of undergraduate students in intellectual property is that they can study complex problems and suggest creative solutions. They can find new ways to solve problems appropriately and the relationship between interpersonal skills and responsibility is identified as contributing to and facilitating the solution of problems in the group. They can use new innovations to solve problems, and they should have an initiative to analyze the problem appropriately. It defines the characteristics of the desirable bachelor's degree

that it is capable of examining complex problems and developing solutions for problem solving, and the initiative to solve the problem is needed too (Office of the Education Council, 2001).

However, the study found that the problem solving behavior of Thai children is also worrisome. Many of the youths lack the problem solving skills. That leads to stress and mental health especially in higher education and child development, from 22.60 percent in 2013 to 29.98 in 2014. Data from the Rajanagarindra Children and Young People's Institute indicate that many Thai youths seek mental health services in 2011. By 2013, the numbers of teenagers seeking help and support increased by 63 percent from 7,359 to 10,014. Including in the creative skills, most courses and instructional systems emphasize memorization rather than practice. Students lack creative thinking skills and imagination, which will affect the progress of the nation. In addition, it was found that the characteristics of Thai workers in the workplace of the year 2556 were 62.2% and 57.4%, respectively, in terms of initiative and problem-solving ability. The graduates should be trained in creative problem solving skills to continue to work (Alshammari, 2016; Guilford, 1967; Malakul Na Ayudhaya, 1994; Mitchell & Kowalik, 1999; National Statistical Office, 2013; Office of the National Economic and Social Development Board, 2016; Parnskul, 2002; Thai Health Promotion Foundation, 2015; Torrance, 1972; UNICEF 2015). Therefore, creative problem solving skills are important for the youths to be able to think and find the right answer. It's a different way of doing things differently by thinking of alternatives. Decide how to solve the problem. Create ideas to solve new problems that are effective and creative.

### **Research Objectives**

To study the existing conditions, the desirable condition, the instructions,

and the ability to use technology for enhancing creative problem solving of undergraduate students in Thailand.

### Research Methodology

This research was conducted by survey research using questionnaire. The sample consisted of:

1) Undergraduate students studying in the institutes of higher education in the academic year of 2017, the number of 1,669,361,478 persons, based on the size of the sample using Krejcie and Morgan formula.

1.1) A Stratified Random: There are 2 groups of institutions divided into 1) National University or Autonomy University and 2) Private University, Rajamangala University or Rajabhat University.

1.2) A Simple Random sample of undergraduate students at the university from the first stage. The quota for the selection of the convenience sample is 200 students based on the size of the sample using Krejcie and Morgan formula. (Krejcie & Morgan, 1970)

2) 50 instructors at the graduate level had the following procedures.

1.1) A Stratified Random: The higher education institutions are divided into 2 groups: 1) National University or Autonomy University and 2) Private University, Rajamangala University or Rajabhat University.

1.2) A Simple Random sample of the graduates: The first stage of the course will be assigned a quota for the selection of the convenience sample of at least 20 students.

### Research Findings

The results of the study are presented in two parts: Part 1 The result of the existing and the desirable condition and opinions of graduate instructors

and Part 2 The result of the existing and the desirable condition and opinions of undergraduate students as follows:

**Part 1 The result of the existing and the desirable condition and opinions of graduate instructors** are divided into 3 parts:

**Section 1 General information of the respondents.**

The analysis of data on the status of the respondents found that the majority of respondents were 35 women (63.6%) aged 30-39 years (54.4%), followed by 40-49 (27.4%) in the fields of humanities and social sciences (76.4%) and in the fields of science health and science and technology (23.6%). 34 instructors (61.8%) belonged to National University or Autonomy University, and 21 instructors (38.2%) of Private University, Rajamangala University or Rajabhat University. Most of the instructors had experience teaching over 10 years (23 instructors or 41.8%), followed by 4-6 years (14 instructors or 25.5%). 42 instructors (76.4%) has an experienced in using online tools for teaching and learning.

Analyze data on web-based learning experience for teaching and learning. The tools and resources for learning in the cloud are divided into 5 categories: 1) Collaborative tools. Collaboration has found that most of the online documents (Google Document or Office 365 (87.5%). 2) Data Gathering tools found that the majority of Google Forms (86.8%). 3) Content Creation tools found that most of them used Google Document (76.3%). 4) Presentation tools found that most of them use YouTube (74.4%) and 5) Communication tools found that the most commonly used line (93.3%).

The reasons to choose an online tool for teaching and learning are easy to access (41 instructors or 91.9%), it also offers a variety of contents (38 instructors or 84.8%). The technique or method used for the instructional management was mostly used in the case study method (44 instructors or 80%),

followed by brainstorming method (42 instructors or 76.4%). Online teaching will choose to use the existing teaching media that correspond to the instructional management (52 instructors or 94.5%).

**Section 2 The existing and the desirable condition for enhancing creative problem solving of undergraduate students in the instructor’s opinions.**

**Table 1**

*The results of the existing and the desirable condition for enhancing creative problem solving of undergraduate students in the instructor’s opinions*

Category	The Existing Condition		The Desirable Condition		Needs	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	PNI <sub>modified</sub>	Rank
1. Ability of student to identify the case of the problem by identifying issues related to the cause of the problem.	3.07	.77	4.16	.74	0.26	6
2. Ability of student to identify what the problems are.	3.20	.80	4.25	.75	0.25	7
3. Ability of student to prioritize the problems and solve the most important one first.	3.05	.82	4.31	.77	0.29	4
4. Ability of student to find a variety of ideas to solve problems.	2.96	.81	4.29	.71	0.31	2
5. Ability of student to solve problems in new ways.	2.84	.91	4.18	.72	0.32	1
6. Ability of student to find many different ways as they can to solve problems.	3.02	.85	4.25	.73	0.29	4

**Table 1 (Cont.)**

*The results of the existing and the desirable condition for enhancing creative problem solving of undergraduate students in the instructor's opinions*

Category	The Existing Condition		The Desirable Condition		Needs	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	$PNI_{\text{modified}}$	Rank
7. Ability of student to solve problems within the specified time when problems occur.	2.96	.84	4.18	.67	0.29	4
8. Ability of student to choose the most appropriate and possible way to solve problems.	3.04	.79	4.25	.67	0.28	5
9. Ability of student to plan a sequence and identify trouble-shooting steps.	2.87	.82	4.13	.77	0.30	3

From Table 1, considering the differences in the mean of current condition and the expectation of creative problem solving of students in the opinions of the undergraduate instructors. Priority is given to the need to be able to solve creative problems. The results indicated that the ability of student to solve problems in new ways had the highest  $PNI_{\text{modified}}$  value following with the ability of student to find a variety of ideas to solve problems.

**Section 3 The existing and the desirable condition of instructional for enhancing creative problem solving of undergraduate students**



**Table 2**

*The result of the existing and the desirable condition of instructional for enhancing creative problem solving skill of undergraduate students*

Category	The Existing Condition		The Desirable Condition		Needs	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	PNI <sub>modified</sub>	Rank
1. You have organized learning activities focusing on the practice of problem solving for students.	3.78	.69	4.40	.65	0.14	2
2. You have organized activities that encourage students to be creative.	3.84	.74	4.45	.57	0.14	2
3. You have organized activities that motivate students to have many perspectives on many different things.	3.80	.73	4.47	.57	0.15	1
4. You have organized activities focusing on giving and sharing opinions reasonably, listening to others' opinions and criticism.	3.98	.68	4.53	.60	0.12	3
5. You have organized activities that motivate students to analyzed and exchange opinions among them.	4.07	.74	4.61	.60	0.12	3
6. You have organized activities that promote students to bring the knowledge to use in different situations.	4.05	.62	4.55	.57	0.11	4

Table 2 (Cont.)

*The result of the existing and the desirable condition of instructional for enhancing creative problem solving skill of undergraduate students*

Category	The Existing Condition		The Desirable Condition		Needs	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	PNI <sub>modified</sub>	Rank
7. You have organized learning activities, taking into account the interests, aptitude and knowledge of the students.	3.91	.65	4.53	.57	0.14	2
8. You have organized learning activities that encourage students.	3.87	.77	4.49	.63	0.14	2

From Table 2, considering the differences in the mean of the current condition and the expectation of teaching and learning to promote the creative problem solving of the undergraduate instructors. Priority is given to the need to be able to solve creative problems. The requirement for the highest PNI value is of the first importance: You have organized activities that motivate students to have many perspectives on many different things. The following are you have organized learning activities focusing on the practice of problem solving for students, you have organized activities that encourage students to be creative, you have organized learning activities, taking into account the interests, aptitude and knowledge of the students, and you have organized learning activities that encourage students to create their own knowledge.

**Part 2 The result of the existing and the desirable condition and opinions of undergraduate students** are divided into 3 parts:

### **Section 1 General information of the respondents**

The analysis of data on the status of the respondents found that the

majority of respondents were 324 females (67.8%). The average cumulative grades were in the range of 3.01-4.00 (53.1%). Most students are second year students (39.9%) and belong to the group of science, technology and technology (347%). Most of them are belonged National University or Autonomy University (53.21%) and followed by belonged of Private University, Rajamangala University or Rajabhat University (46.9%).

Most students use a smartphone to connect to the internet (96.4%), followed by laptop (66.1%) and PC computer (32.0%). The average number of students using the internet 21 times up per day (35.8%), taking each time is not certain (40.0%), and most of students has online learning experience (72.4%).

### **Section 2 Ability to use technology**

Analysis of data depended on the ability to use tools and resources to learn. The tools and resources for learning in the cloud are divided into 5 categories: 1) Collaborative tools, 2) Data gathering tools, 3) Content creation tools, 4) Presentation Tools, and 5) Communication tools.

Ability to use collaboration tools has found that most students have the skills to use discussion board was at a high level (20.9%), ability to use sticky note in sticky of 20.0%, ability to use mind map of 23.6%, and ability to use online documentation (Google Document or Office 365) of 23.6%.

The ability to use data gathering tools found that most students have the expertise or the use of Google Form at a high level (20.5%), following with the expert skills or use of Survey Monkey 17.7%, and Microsoft Forms at the high level of 19.8%.

The ability to use content creation tools found that most students have skills to use blogs of 19.3%, following with the ability to use Wikis of 18.9%, and ability to use online documentation (Google Document) of 22.1%.

The ability to use presentation tools showed that most of the students

had the highest level of expertise or use of YouTube for 21.2%, ability to use Prezi of 18.1%, ability to use Google Presentation of 17.0%, and ability to use Slide Share of 18.7%.

Ability to use communication tools has found that most students have the skills to use line of 36.3%, ability to use of 36.3%, ability to use Skype of 16.8%, ability to use Twitter of 13.5%, and ability to use e-mail of 15.4%.

### Section 3 The existing and the desirable condition for enhancing creative problem solving of undergraduate students

Table 3

*The result of the existing and the desirable condition for enhancing creative problem solving of undergraduate students*

Category	The Existing Condition		The Desirable Condition		Needs	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	PNI <sub>modified</sub>	Rank
1. You can identify the case of the problem by identifying issues related to the cause of the problem.	3.71	.65	3.93	.70	0.06	3
2. You can identify what the problems are.	3.72	.69	3.89	.75	0.04	5
3. You can prioritize the problems and solve the most important one first.	3.78	.73	3.98	.78	0.05	4
4. You can find a variety of ideas to solve problems.	3.66	.75	3.94	.74	0.07	2
5. You can solve the problem in a new way.	3.51	.75	3.82	.77	0.08	1
6. You can find many ways as you can to solve problems.	3.70	.74	3.95	.75	0.06	3

**Table 3 (Cont.)**

*The result of the existing and the desirable condition for enhancing creative problem solving of undergraduate students*

Category	The Existing Condition		The Desirable Condition		Needs	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	PNI <sub>modified</sub>	Rank
7. You can solve problems within the specified time when problems occur.	3.59	.74	3.90	.77	0.08	1
8. You can choose the most appropriate and possible way to solve problems.	3.70	.71	3.97	.74	0.07	2
9. You can plan a sequence and identify troubleshooting steps.	3.71	.72	3.99	.77	0.07	2

Table 3 shows the difference in mean of current condition and expectation of creative problem solving ability of undergraduate students. Priority is given to the need to be able to solve creative problems. The requirement list that has the highest PNI<sub>modified</sub> value is one of the most important ones is ability to solve the problem in a new way, and students can solve problems within the specified time when problems occur. The following are students can find a variety of ideas to solve problems, students can choose the most appropriate and possible solution, students are planning a sequence and identify troubleshooting steps.

**Conclusions and Discussion**

The study of the existing conditions, the desirable condition, the instructions, and the ability to use technology for enhancing creative problem

solving of undergraduate students in Thailand can be concluded according to the research objectives as follows:

1) A study of the existing and the desirable condition for enhancing creative problem solving of undergraduate students.

The bachelor's degree instructor noted that the highest requirement for PNI<sub>modified</sub> items was the number one priority that was, the ability of students to solve new problems following with the ability of students to find a variety of ideas to solve problems. And the ability of students to plan in sequence. The problem solving process, in turn, corresponds to the needs surveyed by graduate students who find that the highest PNI<sub>modified</sub> values are of equal importance are ability to find new solution to solve problems and when confronted with a problem, you can solve the problem within the specified time. The PNI<sub>modified</sub> value is the same when the problem occurs. You are thinking of a diverse solution. You can choose the most appropriate and possible solution. And you are planning a sequence. Can identify troubleshooting steps.

Two of the most commonly measured components are fluency, which refers to the quantity of ideas that a participant is able to generate, and originality, which refers to the comparative novelty of each of those generated ideas. (Dumas et al., 2016) correspond with Torrance (1996, 1999 as cited in Cropley, 2000) that evaluated the creative problem solving in 3 dimensions are Fluency, Flexibility and Originality.

2) The study of the existing and the desirable condition of instructional for enhancing creative problem solving skill of undergraduate students.

Establishing and implementing the best strategies for improving the creativity of students must be a priority for educators (Hajiyakhchali, 2013). From the PNI<sub>modified</sub> survey, the highest priority is the number one priority. The instructor provides instructional activities that motivate students to think

about the various aspects. PNI modified values are the same. The instructors provide instructional activities focusing on problem solving for students. The instructor has organized teaching activities that motivate students to be creative. Instructors provide instructional activities focusing on the students' interests, aptitude, and prior knowledge. The instructors are provided with teaching and learning activities that encourage students to self-study. To encourage creative problem solving, the instructor has to encourage students to think. There are several techniques to stimulate thinking, such as brainstorming techniques and making questions (Office of the Education Council, 2011). With a growing emphasis in education upon authenticity, the most powerful application of creative problem solving for students is that it allows them to deal with real opportunities to develop real solutions (Treffinger, 1995). Moreover, Curriculum and administrative arrangements designed to create favorable conditions for learning and practicing creative thinking (Torrance, 1972) including the strategies for facilitating creativity in the higher education curriculum to better prepare graduates for the challenges of an uncertain future and develop their abilities to solve complex problems in the networked information era (Wood et al., 2017).

3) A study of the ability to use technology for enhancing creative problem solving.

Creative problem solving is widely used in classroom settings (Wu & Hsiao, 2004). However, based on the opinions of instructors and graduate students, most instructors have experience in using the tools and resources in their studies. Most of instructor use Line, Online Document, Google Form, Google Document, and YouTube (93.3%, 87.5%, 86.8%, 76.3% and 74.4% respectively) because it is easy to use (91.9%). In the case of using the online learning media, instructors will choose to use the existing teaching media that is consistent with the instructional management (94.5%).

Most of the students used Internet access (96.4%). Most of them used the Internet 21 times per day (35.8%), they had online learning experience (72.4%), and the ability to use Facebook and Line is the most (4.63%).

Therefore, the use of technology for teaching and learning is likely to be suitable for enhancing the ability to solve problems. Modern technology also leads to expanding horizons for research and development on the role of technology in effective process instruction, and to the creation and testing of new resources that enable individuals and teams to learn and apply creative problem solving autonomously (Treffinger, 2007). Very few researchers have focused on how to use multimedia or web-based technology to fully realize the empirical potential of the model. It is proven that the web-based technology did have positive influence on the students using the creative problem solving learning model. In the sense of the three dimensions of information: location, time, and format, students are able to be freed from the traditional constraints of classroom settings that limited where, when, and how they can access the course material and the scope of their coursework (Wu & Hsiao, 2004).

### **Recommendations**

Educational institutions and instructors should teach and encourage creative problem solving by bringing technology to support. However, education technology is constantly changing. Therefore, the needs survey should be conducted continuously to develop the learner by the requirements. In this research is to study the solution of creative problem solving by cloud technology. Cloud is a tool that can be accessed from anywhere, anytime and also has a flexible feature based on user experience. Instructors can choose the tools that already have in place to match their instructional activities. The opportunity to customize the environment as needed. Allow students to use their existing



resources flexibly to provide students with a variety of learning opportunities and respond to the needs of different students.

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