

The Assessment of Needs in Readiness Preparation for Using Computer-Supported Collaborative Learning Model Using Problem-Based Learning and the Synectics Technique

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Abstract

The purposes of this study were to assess the needs required in readiness preparation for undergraduate students before using the Computer-Supported Collaborative Learning (CSCL) model and using problem-based learning and the synectics technique to enhance undergraduate students' innovative capability. A questionnaire was used to collect the data. The participants were 400 undergraduate students from private and public universities, using a cluster random sampling technique. The study indicated that most of the undergraduate students spent most of their time on computers and internet usage on entertainment, communication, searching data, education, and downloading data respectively. The highest need was the use of new problem-solving techniques in teaching and learning, followed by the use of brainstorming and learning from the authentic problems, and the use of participation in understanding problems altogether.

Keywords The Assessment of need, computer-supported collaborative learning, problem-based learning, synectics technique, innovative capability

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การประเมินความต้องการจำเป็นในการเตรียมความพร้อมสำหรับการใช้รูปแบบคอมพิวเตอร์สนับสนุนการเรียนรู้ร่วมกัน โดยใช้การเรียนรู้ด้วยปัญหาและเทคนิคซินเนคติกส์

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาสภาพและความต้องการจำเป็นเพื่อเตรียมความพร้อมให้แก่ นักศึกษาปริญญาบัณฑิตก่อนการใช้รูปแบบคอมพิวเตอร์สนับสนุนการเรียนรู้ร่วมกันโดยใช้การเรียนรู้ด้วยปัญหาเป็นฐาน และเทคนิคซินเนคติกส์เพื่อเสริมสร้างความสามารถทางนวัตกรรม เป็นการวิจัยเชิงสำรวจโดยใช้แบบสอบถามกลุ่มตัวอย่างมีจำนวน 400 คน ใช้วิธีการสุ่มตัวอย่างแบบแบ่งชั้น ผลการศึกษา พบว่าปัจจุบันนักศึกษาระดับปริญญาบัณฑิตส่วนใหญ่ใช้เวลาส่วนมากไปกับการใช้คอมพิวเตอร์กับอินเทอร์เน็ตสำหรับเพื่อความบันเทิง การติดต่อสื่อสาร การค้นหาข้อมูล การศึกษา และการดาวน์โหลดข้อมูลตามลำดับ รายการความต้องการจำเป็นที่มีความสำคัญเป็นลำดับที่หนึ่ง คือ การนำเทคนิคการแก้ปัญหาแบบใหม่มาใช้ในการเรียนการสอน รองลงมาคือ การระดมสมองด้วยการเรียนจากปัญหาจริง และการให้ทุกคนได้มีส่วนร่วมในการเข้าใจปัญหาร่วมกัน

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Introduction

At present, the advancement of technology has enhanced the effective communication between senders and receivers. In the view of education and technology, instructors can use technology as the media to support their teaching (Dockter, 2012). Blending technology into traditional teaching is very interesting in the classroom. Technology can be used as a medium to communicate with each other while using digital technology such as the computer, communication and networking tools, or social networks, allows students to access, manage, integrate, evaluate, and create information. Computers, smartphones, and tablets are highly efficient and inexpensive; these are easy to use and are very accessible to undergraduate students. When such tools are connected to the internet network provided by internet service providers, students can communicate with others at any time and enhance their collaborative learning as individuals and in groups (Lipponen, 2002; Goggins & Jahnke, 2013). Therefore, university instructors must be concerned about their readiness preparation and prepare their undergraduate students to know the pace of technological change.

Conforming to the framework for 21st-century learning, students should have the essential skills for thriving in the global economy. Students need to have the following three skills: first, learning and innovation skills, e.g., creativity, critical thinking, communication, and collaboration; second, information, media, and technology skills, e.g., information literacy, media literacy, and technology literacy.; and last, life and career skills, e.g., flexibility, adaptability, initiating, self-direction, leadership, and responsibility. Therefore, learning and innovation skills are a part of the students' priority needs while getting along well with media, information, communication, and technology literacy are important. Meanwhile, promoting learners with innovative abilities can help them to generate and conceptualize the ideas, think laterally, and detect opportunities by creating works which are different from others (Basadur & Gelade, 2006; Momeni, Nielsen, & Kafash, 2015; Department of Education, Employment and Workplace Relation, 2009). Hence, with the blend of synectics technique and problem-based learning, students will diversify their ideas and creative imagination to analyze and solve the problems concurrently.

Objectives

The purposes of the study were to study undergraduate students' computer and internet skills and to assess the needs in readiness preparation for undergraduate students before using the invented model.

Literature Review

A. The Assessment of Needs

Needs assessment is the measured discrepancy or gap analysis between the "what is" and the desired conditions, which is the process of identifying, prioritizing needs, allocating resources, and solving the problems underlying priority needs (Altschuld, 2004; Wongwanich, 2015). Azimi & Rahmani (2013) stated that the importance of needs assessment before the implementation of e-learning would provide information to the instructor to prepare for the readiness and facilitate the supported services and technology needed for students. In addition, the analysis of needs would let the instructor know the gap between the current and desired level of students' computer skills and their knowledge. Then the instructor could use the obtained information to make needs-based decisions. The well-conducted need assessment would lead to changes in learners' behaviors (Guide to Conducting, 2009).

B. Computer-Supported Collaborative Learning (CSCL)

The digital media that blends the collaborative learning process with Information Communication Technology (ICT) enhances students' interaction with others individually and/or in groups. Students can learn and share experiences anywhere and anytime on the online environment in both synchronous ways through chatrooms, video conferences, and live broadcasts and asynchronous ways, such as WebBoards, E-mails, Weblogs, and Twitter (Balakrishnan, 2014; Tresin, 2012; Cress, Wodzicki, Bientzle & Lingnau, 2011). The provision of suitable environment will help students to attend collaborative activities in remote areas. The instructor must be concerned about students' skills related to the content and the problem-solving techniques defining the kinds of mediational tools that are best suited for the students (Stahl, Koschmann, & Suthers, 2006; Verdejo, Barros, Read & Rodriguez-Artacho, 2007). In this study, CSCL demonstrates how students can study altogether with the help of computers (Stahl, Koschmann, & Suthers, 2006).

C. Problem-Based Learning (PBL)

PBL can help students to acquire knowledge, increase communication skills, problem-solving skills, self-directed learning, and share information with others in a team (Bergstrom, Pugh, Phillips, & Machlev, 2016; Wood, 2003). This process will enhance the

students' learning in authentic scenarios with conceptualizing and activating creative thinking skills. Students will communicate and work collaboratively in the team, evaluate learning resources, and become lifelong learners (Hansen, 2005). There are six steps for the PBL process: (1) Understanding problems and recognizing the situation, (2) Managing the learning environment in which students face the problem, (3) Students analyze the problem and find out the causes of the problem, (4) Students find out the solutions, (5) Students search and seek for knowledge by themselves while the instructor is the facilitator; and (6) Students solve the problem, collect and analyze the data, summarize, and make an evaluation.

D. Synectics

Synectics is the creative process that uses analogies to create more ideas in problem solving. The technique will bring out students' creativity affecting individual differences. Meanwhile, analogies will increase the fluency, originality, flexibility, and elaboration of thinking. The form includes personal analogies, direct analogies, and compressed conflict (Joyce, 2000; Seligmann, 2007; Tajari & Tajari, 2011). Students can overcome mental blocks and increase their divergent thinking and problem-solving abilities (Hummell, 2006). There are six steps for the synectics process: (1) Define problems and recognize the situation, (2) Develop the first direct analogy

and compare problems in similar words, (3) Define personal analogy, (4) Create compressed conflict and match opposite words, (5) Develop the second direct analogy to find strange words, and (6) Re-examine the original idea and put the new creative idea or solution instead of the original one.

E. Innovative Capability

The innovative capability is how a person applies technology, skills, and knowledge to initiate the creative idea and lateral thinking or new procedure, which are different from the origin and will lead to superior performance. Capabilities and attributes identify as necessary for innovation, including idea generation, conceptualization, critical thinking dealing with ambiguity, knowledge sharing, problem-solving ability, lateral thinking, thinking across disciplines, and opportunity detection (Basadur & Gelade, 2006; Momeni, Nielsen, & Kafash, 2015; Department of Education, Employment and Workplace Relations, 2009).

F. Computer-Supported Collaborative Learning Model Using Problem-Based Learning and the Synectics Technique to Enhance Undergraduate Students' Innovative Capability

The developed model will enhance undergraduate students' innovative capability. There are six core components, as follows: (1) CSCL tools and media, (2) Content, (3) Instruction, (4) Facilitator, (5)

Learning resources, and (6) Authentic assessment. During the experiment, students have to join eight activities gradually: (1) Identify and define, (2) Analyze, (3) Discuss, (4) Formulate, (5) Collect, (6) Solve, (7) Share, and (8) Evaluate. Strategic pedagogies based on the mixtures of problem-based learning are the synectics technique and online computer-supported collaborative learning.

Methodological Design

The research methodology is described below:

Research Sample

The participants in this study were 400 students who were public and private undergraduate students selected by cluster random sampling technique.

Instrument

The instrument used for data collection was the questionnaire. The questionnaire was divided into three parts:

Part 1: Collecting students' demographic data about their gender, college year, and type of university.

Part 2: Collecting data about the characteristics of learners, their skills, and experience on the use of the computer and the internet. There are four checklists and 5 rating scales (from "very low=1" to "very high=5").

Part 3: Survey the learners' priority needs on 5 rating scales (from "very low=1" to "very high=5").

The instrument was tested for its validity using the index of congruence (IOC) through opinions of three experts in the field of study, and it piloted its reliability by using 30 trying-out samples using Cronbach's alpha. The validity and reliability of the questionnaire were .73 and .80, respectively, which were suited to conduct the survey.

Data Collection

A questionnaire with closed-ended questions was used for interview for collecting the primary data from the undergraduate students from the faculty of Business Administration's in both public and private universities.

Research Results

There were 188 students from the public university or 47 percent, and there were 212 students from the private university or 53 percent.

Results on the utilization of computer and the internet by the undergraduate students indicated that 81.3 percent spent most of their time on entertainment, 80.0 percent on communication, 75.5 percent on searching data, 70.8 percent on education, and 68.3 percent on downloading data, as shown in Figure 1. Students' use of the computers and the internet for their entertainment was very high, but very low for education and downloading data. Before entering into the model, students practiced through the assignments, such as downloading articles from any websites,

summarizing the abstracts, and sending them through e-mails to the instructor. From the needs analysis, the results showed that this would enhance the students' learning experience in the use of electronic technologies, which complied with Azimi & Rahmani (2013). They stated that the identified needs assessment would provide the information and direction where the training should be applied. Meanwhile, Wongwanich (2015) stated that the need

assessment was not only the survey but also finding facts that ones might not know their real needs.

As for the internet time usage spent by the undergraduate students, it was found that 22 percent spent less than one hour, 21 percent for a duration of 1 - 3 hours, 20 percent for a duration of 4 - 6 hours, and 18 percent for more than 6 hours, as shown in Figure 2.

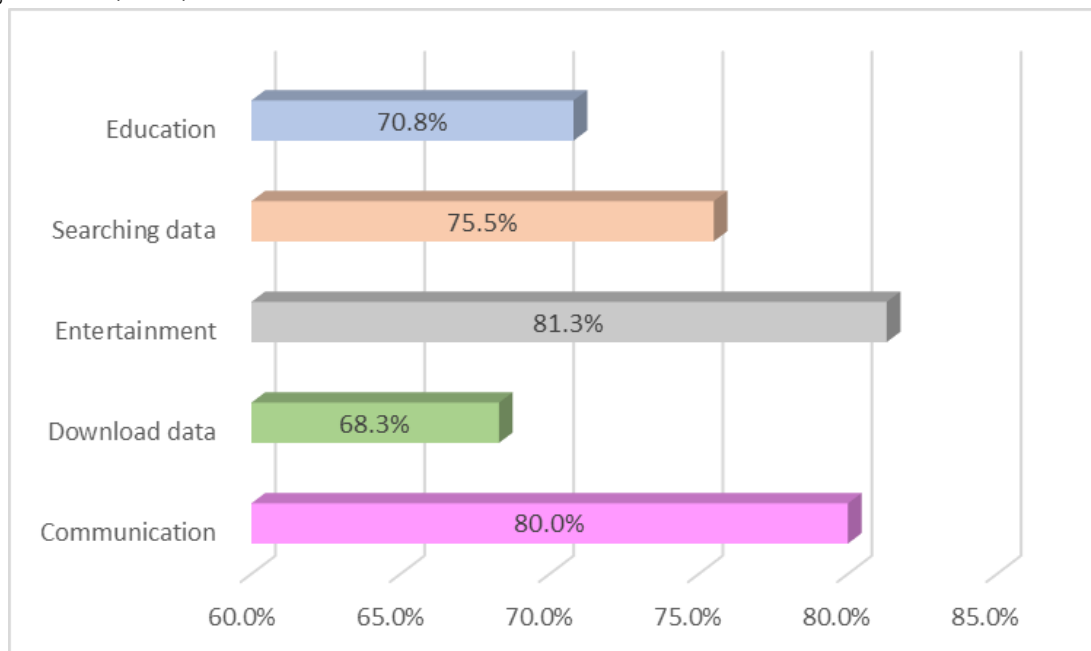


Figure 1 Frequency of Computer and Internet Usage by Undergraduate Students

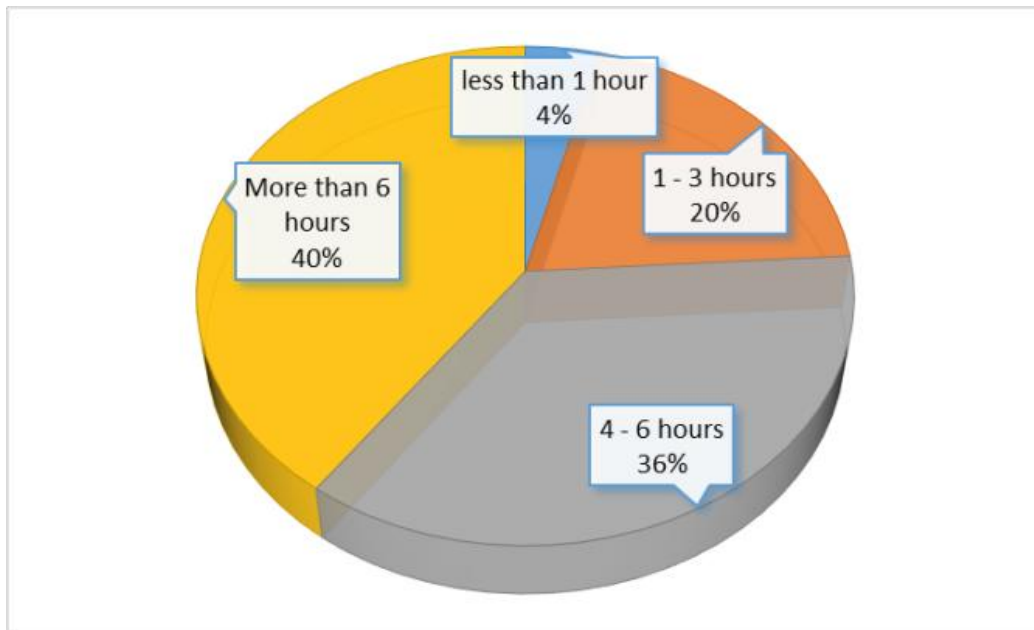


Figure 2 Undergraduate Students' Internet Usage Time

The places where the undergraduate students mostly used a computer were their homes (83.0%), universities (44.5%), apartments (41.3%), and internet cafés (17.3%), as shown in Figure 3. Meanwhile,

the places where the undergraduate students mostly used the internet were their homes (83.3%), universities (69.5%), apartments (44.8%), and internet cafés (24.3%), as shown in Figure 4.

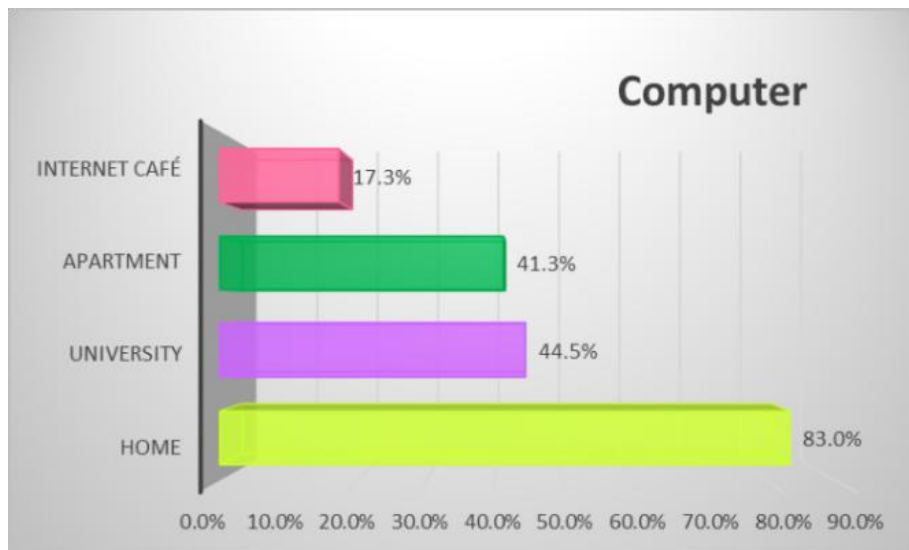


Figure 3 Frequency Use of Places of Undergraduate Students for Computer

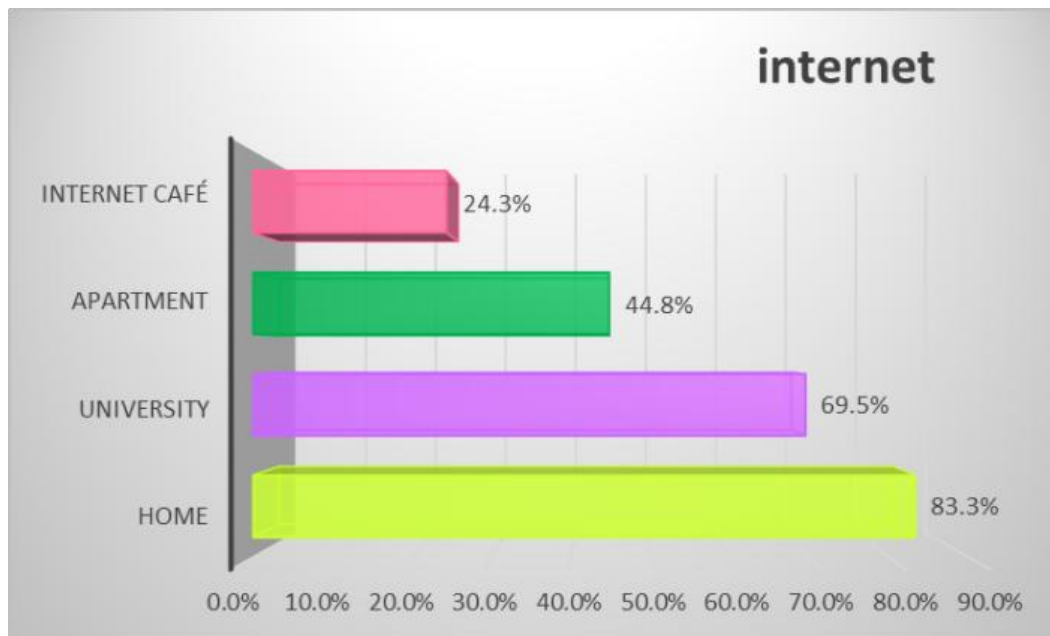


Figure 4 Frequency Use of Places of Undergraduate Students for the Internet

Based on the data in Table 1, the results showed that the undergraduate students' levels of skill and experience in using computer and the internet were the following. Their skill and experience in using smartphones, tablet, and PDA was very high (mean = 4.56, SD = 0.62); in searching data was very high (mean = 4.53, SD = 0.67); in presentation programs was high (mean = 4.01, SD = 0.81); in using e-mail was high (mean = 3.72, SD = 0.88); in using chat program was high (mean = 4.20, SD = 0.91); in using social networks was high (mean = 4.43, SD = 0.72); and in downloading data was high (mean = 4.03, SD = 0.86). Finally, their levels of skill and experience were

moderate in using Web Boards (mean = 3.01, SD = 1.14); online meetings (mean = 3.04, SD = 1.13); and mind mapping programs (mean = 3.18, SD = 1.10). Before letting students enter into the training program, the instructor taught them how to use WebBoards, online meetings and mind mapping programs because they had to express their ideas, share information, and communicate to others through the computer and the internet. Students expressed their questions, shared task concepts, taught each other, and saw how others were learning, both synchronously and asynchronously.

Table 1 Skills and Experience of Undergraduate Students in Computer and the Internet

Usage	mean	SD	Level of skill and experience
Computer, Smartphones, Tablet, Personal Digital Assistant (PDA)	4.56	0.62	Very high
Presentation program	4.01	0.81	High
E-mail	3.72	0.88	High
WebBoards	3.01	1.14	Medium
Online meetings	3.04	1.13	Medium
Chat programs	4.20	0.91	High
Mind mapping programs	3.18	1.10	Medium
Social network programs	4.43	0.72	High
Downloading data	4.03	0.86	High
Searching data	4.53	0.67	Very high

Table 2 Modified Priority Needs Index of Undergraduate Students

Needs	Current conditions Mean (A)	Desired conditions Mean (B)	Modified PNI _{factor} ((B) – (A))/(A)	Ranking
- The student should organize activities to solve problems by thinking diversely to get a variety of new ideas, create concepts, and find opportunities to solve problems with the introduction of new problem-solving techniques used in teaching and learning.	3.31	4.55	0.374	1
- The student should brainstorm with others and study from the authentic problem.	3.27	4.37	0.338	2
- The student should participate in understanding problems and sharing with others.	3.35	4.18	0.246	3
- The students should set goals and objectives with others.	3.49	4.02	0.151	4
- The student should analyze and	3.42	3.88	0.134	5

Needs	Current conditions Mean (A)	Desired conditions Mean (B)	Modified PNI _{factor} ((B) – (A))/(A)	Ranking
search for the root causes of the problem with others.				
- The student should evaluate authentically.	3.50	3.95	0.127	6
- The student should search and seek knowledge from various sources by themselves.	3.52	3.95	0.120	7
- The student could summarize, discuss, and evaluate the performance.	3.48	3.85	0.105	8

In ranking the first three priority needs for readiness preparation before learning with the model, the undergraduate students' needs were prioritized by ranking the highest discrepancy gap between current and desired conditions to the lowest one by considering from modified priority needs index factors, as shown in table 2. As a result, the priority needs were as follows.

In the first place was “students should organize activities to solve problems by thinking diversely to get a variety of new ideas, creating concepts, and finding opportunities to solve problems with the introduction of new problem-solving techniques used in teaching and learning (PNI = 0.374).” Consequently, a metaphor or analogy was the technique that would apply to enhance students’ thinking creatively and invent new ways of seeing

things (Joyce, et al, 2000; Tajari & Tajari, 2011).

In the second place was “students should organize activities to brainstorm with others and study from the authentic problem (PNI = 0.338).” As shown in Table 2, students should be arranged in a collaborative group, and they should apply the knowledge into real situational problems, which can enhance their capability. This conforms to the earlier studies by Schmidt, Rotgans, & Yew (2011) and Hansen (2005). Assigning the authentic problems can motivate students to identify, communicate, and research information that they need to know to solve the problem.

In the third place was “students should participate in understanding problems and sharing with others (PNI = 0.246).” Hansen (2005) stated that students needed to work cooperatively in the team

with complex, real-world problems, think critically, acquire many learning resources, integrate information, and solve complex problems.

Conclusions and Discussions

1. The students mostly used computers and the internet for their entertainment at the highest level (81.3%), whereas they used computers and the internet for education and downloading data at the lowest level (68.3%). Moreover, their skill and experience in using smartphones, tablets, and PDAs was very high (mean = 4.56, SD = 0.62). The results complied with Balakrishnan (2014), Tresin (2012), and Cress, Wodzicki, Bientzle & Lingnau (2011).

2. The study of needs for readiness preparation of the undergraduate students, revealed that the first priority was to organize activities to solve problems by thinking diversely to get a variety of new ideas, creating concepts, and finding opportunities to solve problems with the introduction of new problem-solving techniques used in teaching and learning (PNI = 0.374); the second priority was organizing activities to brainstorm with others and study from the authentic problem (PNI = 0.338); and the third priority was participating in understanding problems and sharing with others (PNI = 0.246).

The assessment of needs is the preliminary process in determining how to

prepare the readiness of the students. The measurement of discrepancy would regard the gap between “what is it?” and “what should it be?” for the students’ current study conditions. Consequently, the importance of needs assessment before the implementation of e-learning would provide information to the instructor to prepare the readiness and to facilitate the supported services and technology needed for their students (Rahmani, 2013).

Recommendations

It is appropriate to assess the needs in readiness preparation for undergraduate students before using the Computer-Supported Collaborative Learning (CSCL) model and problem-based learning with the synectics technique. These techniques could enhance undergraduate students’ innovative capability. Furthermore, the instructor should analyze the students’ needs because a needs analysis would help the instructor to know the priorities to train the students before using any teaching models.

The students should be assigned assignments, such as downloading articles from any websites, summarizing the abstracts, and sending them through e-mails to the instructor.

The instructor should provide the training program to the students so that they can learn and share their experiences

anywhere and anytime by using both the synchronous and asynchronous ways.

However, The participants in this research were mainly undergraduate students from the faculty of Business Administration. For

further studies, researchers should conduct the study with different groups of participants and re-interview them to get their viewpoints on computer and the internet usage and to assess their priority needs.

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