

Assessing Critical Thinking Skills and Creativity Skills of Higher Education Students by Using ASSURE Models

Iston Dwija Utama
Bina Nusantara University

Ivan Diryana Sudirman
Bina Nusantara University

Rachmi Kumala Widyasari
Bina Nusantara University

Mila Andria Savitri
Bina Nusantara University

Doni Morika
Bina Nusantara University

This study aims to assess the students critical thinking skills and creative thinking skills progress by using the ASSURE learning model to implement problem-based learning for second-grade college students. The method of this study is an action research model that identifies the learning process activities start from planning, acting, observing, and reflecting process. This study supports the previous research that ASSURE Models can increase critical and creative thinking skills. Results showed that 53% of critical thinking skills students in the category had satisfactory and outstanding results. For creative thinking, 46% of students in the category had satisfactory and outstanding results.

Keywords: critical thinking skills, creative thinking skills, action research method, ASSURE learning model

INTRODUCTION

A report from the World Economy Forum in October 2019 showed that The Global Competitiveness Index of Indonesia took place at 50th rank from 140 countries, and this new position dropped fifth place compared to the last year (Schwab, 2019). The aspect that showed a minimum score are skills and innovation capability. This result must be considered a serious concern for not just the government but also every stakeholder. A report from the Ministry of National Development Planning of Indonesia in 2017 also showed a gap between skills and industries requirements. The industries view that job seekers do not have or lack the skills and competencies required by industries (Iryanti, 2017).

The emergence of the global knowledge-based economy demands that higher education graduates have both hard and soft skills. Students are encouraged to have excellent academic performance and perform other skills such as creative thinking skills, problem-solving skills, critical thinking, teamwork, and communication skills that fit the industrial requirement (Egan, 2016). In addition, higher education needs to develop both hard skills and soft skills for students such as developing the curriculum, teaching method, and learning process that appropriate and relevant with the industry 4.0 needed such as technical competencies, personal competencies, social competencies, and methodological competencies (Hecklau et al., 2016).

The teaching and learning process compulsory presents the supportive interaction between students and lecturers. A teacher also must perform several teaching and learning strategies to interact and develop the students skills to meet the learning objective of the courses. The learning objective should represent the essential methodological competencies students need, such as critical thinking and creative thinking (Grigorenko, 2019). Furthermore, there are around thirty-six of the following competencies that students should master in that field. Creative thinking and critical thinking are highlighted as critical components of the transformative competencies in 2030 by the Organization for Economic Cooperation and Development (OECD) since 2018. Other studies also showed there are four main aspects of 21st-century skills that people need to develop and learn which are (1) Ways of thinking, such as creativity and innovation; critical thinking, problem-solving, decision-making; knowledge about the cognitive process), (2) Ways of working, such as communication and teamwork or collaboration, (3) Tools for working, such as information and ICT literacy, (4) Ways of living in the world, such as citizenship-global and local; life and career; and personal and social responsibility-including cultural awareness and competence (Care et al., 2018).

One of the teaching and learning processes that can stimulate students critical thinking is by conducting the project-based learning approach during lecturing both in-class and off-class, commonly called mentoring or assistance sessions. Critical thinking positively correlates with academic performance, particularly in the analysis, evaluation, and cognitive synthesis process (Adams, 2015; R. Assaly & M. Smadi, 2015; Safitri et al., 2018). Critical thinking should encourage cognitive processes of students toward higher rates of thought, so the student can learn and implement what they get in that course in real projects or works (Adams, 2015; Saïdo et al., 2015).

Furthermore, it is essential to develop several elements to increase the Global Competitiveness Index of Indonesia. Improving the learning process in higher education might also improve students skills and innovation capabilities by developing their critical thinking and creative thinking in learning.

LITERATURE REVIEW

Critical Thinking

Critical thinking can be defined as a metacognitive technique consisting of many sub-skills such as interpretation, assessment, and inference that increase the chances of generating a rational conclusion to an argument or answer to a problem when used appropriately (Dwyer et al., 2014). The critical thinking aspect can be measured from four aspects: giving effective and practical reasoning, using several thinking styles, making a judgment and decision based on the data and fact, and solving the problems (Arends, 2012).

There are several aspects to identify the ability of critical thinking such as analyzing the evidence, arguments, or claims; ability to judge or evaluate; ability to solve the problems of making a decision; and making inferences by using both inductive and deductive reasoning (Amran et al., 2019).

A student with critical thinking should provide a better logical reason for understanding, analyzing, solving the problem, making complex choices, and improving high-level thinking skills (Saputri et al., 2018).

Creative Thinking

Other 21st-century skills that are also important are creative thinking and innovation. These skills consist of three aspects: thinking creatively, working creatively with other people, and implementing innovation (Arends, 2012).

Abilities related to creative thinking include identifying problems, generating ideas and frequently thinking divergently, and solving problems in creative ways (Amran et al., 2019).

Development of Learning Process

For a long time ago, many educators have focused on left-brain thinking, such as logical thinking, analysis, and calculation, rather than developing right-brain thinking as the primary process of imagination, creativity, and intuition (Do & Gross, 1997; Emam et al., 2019). Four main focusing areas should be developed for students related to architectural design teachings: cognitive theory, design science, philosophical thinking, and aesthetics (Soygenis et al., 2010). To increase and develop those four main focusing areas, the teacher should perform several teaching strategies such as classroom teaching, life-oriented teaching, and assistant teaching (Gürel & Potthoff, 2006).

Project-based learning is student-centered learning, which pursues students to be more active and involves in courses. Moreover, this learning method also introduced students to the nearly-real working environment atmosphere, and students also can get real experience during the course process. There are changes in the learning process by conducting project-based learning, from the traditional classroom learning process to the active learning process. This learning experience allows students to optimize the surrounding environment as a learning experience that facilitates students understanding and challenges the lecturers to prepare the materials earlier, a wide range of knowledge understanding, and ensure the readiness of facilities used by students (Nuraini & Muliawan, 2020).

To support the success of the project-based learning implementation, we follow the characteristics and guidance that have been researched and applied before (Hosnan, 2014): (1) there are existence activities from participants that produce products, services, or works; (2) the basic concept of learning materials that deliver into participants are related to daily life; (3) the learning process should be done in the classroom or out of the classroom; (4) participants formulate or create the activities or design the products that they produced, (5) assessment is performed from the planning activities, the process activities, until the results.

Cultural Heritage Buildings

Bandung City, West Java Province, Indonesia, has many cultural heritage buildings. According to the Bandung City Government Regulation Number 7, the year 2018 about Cultural Heritage Management stated that cultural heritage is material in the form of Cultural Conservation Objects, Cultural Conservation Buildings, Cultural Conservation Structures, Cultural Conservation Sites, and Cultural Conservation Areas on land and/or in water. The cultural heritage criteria can identify from the minimum age of buildings at least 50 years, the value of architecture, historical value, knowledge value, and social value. Based on the criteria given, there are three categories of cultural heritage buildings in Bandung, Grade A, Grade B, and Grade C. The cultural heritage can be categorized in grade A if the buildings have a minimum age of 50 years and have added three other criteria given, category grade B if the buildings have a minimum age of 50 years and have added two other criteria given, and category C if the buildings have minimum age 50 years and have added one other criterion given.

Previous Study

A study showed that experiential learning by conducting project-based learning could increase the students motivation and performance in many levels of academics. For example, in junior high school and senior high school (Pamungkas et al., 2020; Paristiowati et al., 2019), and the higher education level (Nargundkar et al., 2014) by comparing the before and the after students abilities.

The framework of the right-brain thinking teaching method has a positive effect on students learning experiences to develop their creative thinking and critical thinking (Zhang et al., 2018). The study also

showed that students with the collaborative learning method could improve the students participation and contributions during the project-design studio process and increase the students skills (Emam et al., 2019).

METHODOLOGY

We conduct this research with an action research approach, a systematic exploration conducted by experts such as lecturers, administrators, or counselors with a specific purpose in the teaching and learning process to gather information (Mills & Gay, 2019). Other researchers define that action research elaborates both theory and action to identify, address, and analyze the critical aspect in the organization, community, or social issues together with those who are expert and competent in that issues (Coghlan & Brydon-Miller, 2014). In general, the action research model can identify the activities starting from the planning process, acting process, observing the process, and reflecting process, as shown in figure 1.

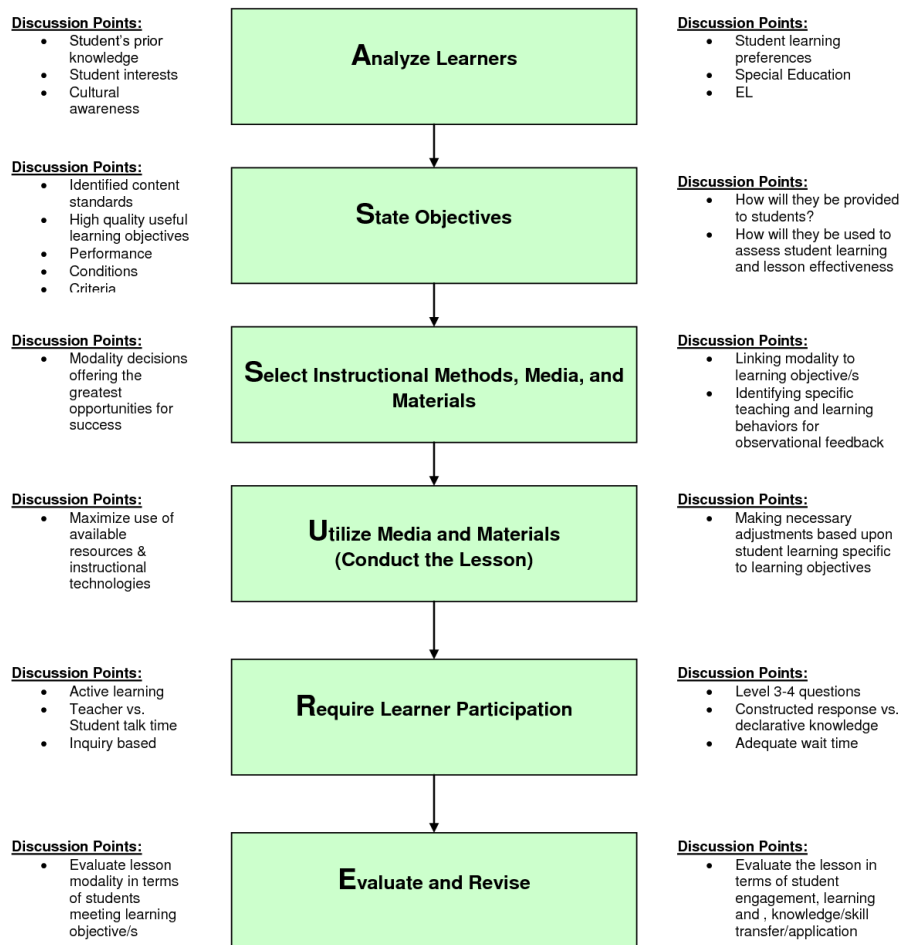
FIGURE 1
ACTION RESEARCH MODEL



Source: Mackinnon et al., 2019

We conduct this study through project-based learning for the second grade of a college student who takes the Interior Design II Course to implement the action research method. The class consists of forty-seven students. Many kinds of instructional design models can be implemented to support project-based learning activities, such as the ADDIE model, Dick and Carey model, Kemp model, Rapid Prototyping ASSURE Learning Model, and PDPIE Learning Model. All instructional design models provide the guidelines or frameworks that might help learners organize the structures of procedures in designing and developing the learning process activities or experiences for students (Sharif & Cho, 2015). Based on the information related to the instructional design model and the project-based learning method and considering the action research model approach, we choose the instructional design model with ASSURE learning design model method that consists of six stages such as 1) analyzing the learners or students; 2) State the clear objective of learning; 3) Select the right tools, media, material, and delivery methods; 4) Utilize the tools, media, and material; 5) Require learner of students active participation; 6) Evaluate and revise the overall process of activities and learning objective (Ramadhani & Fitri, 2020; Smaldino et al., 2012). The steps of ASSURE learning design model showed in figure 2.

FIGURE 2
THE STAGES OF ASSURE LEARNING DESIGN MODEL



Source: Kinneth G. Zapanta, 2015

Based on the ASSURE Learning Design model, we design some procedures and activities guidance for students during the whole semester of the Interior Design II Course. We also provide guidelines and discussions for the lecturers in this course about each criterion learning objective, class activities, and assessment rubric. The guidance for students and lectures given as below shown:

1. Student Preparation and Analysis
In the first week of the lecturing session, all lectures brief students about the learning objectives of the subject.
2. Design the Learning Objective (LO)
The objective of this course is: students able to construct and give recommendations to the design concept based on the functions and aesthetics of the building. To assess these criteria, we try to define the students achievement in each of the Learning objectives (LO) that we create. In this course, we have the Four Learning objective (LO) such as:
 - a. Analyze the design process,
 - b. Apply the conceptual theory into the design process,
 - c. Apply the design concept based on the conceptual theory and best practice,
 - d. Apply the right element for the design concept and outcome
3. Assessment criteria

In the project assessment criteria that also represent the critical thinking and creative thinking aspects, we create an assessment rubric as guidance for lecturers and assessors to score a student. Here is the assessment rubric for this course:

- a. Idea concept – 10%
 - b. Construct and execute the idea concept based on theory and practice– 25%
 - c. The suitability of the proposed elements, materials, and colors with the building construction – 20%
 - d. Technical drawing – 20%
 - e. Concept book – 10%
 - f. The mockup – 15%
4. Assistance program of the project
 During students conduct of the project, we also provide and support them with the assistance program that students should follow and attend, such as sharing sessions, discussion sessions with teachers and experts that conduct regularly and scheduled, and collaborative learning with peers. By conducting this program, the student can learn and practice their creative thinking and critical thinking process.
 To ensure the objectivity during the assistance program implementation of the students project, researchers use the formative assessment strategies concept (Black & Wiliam, 2009), which are:
- a. Clarifying and sharing the learning objective and criteria for success;
 - b. Create a practical classroom discussion and other learning activities that obtain evidence of student understanding;
 - c. Provide positive feedback that encourages the students;
 - d. Activate students discussion forum as a resource for one another;
 - e. Activating students as proprietors of their learning.
5. Facilitation for students
 To ensure the objectivity of grading for all students, teachers facilitate the students with the buildings complete information to implement their design concept idea into a complete floor plant, material suggestions, and a detailed mockup. There are five cultural heritage buildings selected by lecturers that students can be chosen such as Drie Locomotive Building at Dago, Bandung; De Driekleur Building at Dago, Bandung; Dago 34 Building at Dago, Bandung; Dian Theater Building at Bandung Square Area; and BCCF Building at Braga, Bandung. For an object that students must study, lecturers offer some student startup entrepreneurs as their project object observations to elaborate the owner's idea into the design concept
6. Regular progress review
 We conduct regular progress reviews for all students to view the progress of the project. We conduct this review four times during a semester. The item that should students report can be seen in table 1:

TABLE 1
REGULAR PROGRESS REVIEW ACTIVITIES & OBJECTIVES

Term of Review	Attributes to Review	Objectives
1 st review	1. Analyze micro and macro of building. 2. Analyze the users (owners of the business). 3. Preliminary concept design 4. Spatial programming	Assessing the critical thinking skills and creativity skills
2 nd review	1. Schematic design – layout, wall, ceiling, and floor, create facade and landscape concept	Assessing the critical thinking skills and creativity skills

3 rd review	<ol style="list-style-type: none"> 1. Students technical drawing – site plan, floor, furniture, and wall. 2. Detail information in technical drawing – coloring, animation, and rendering 3. Presentation preparation – deck and mockup 	Assessing the critical thinking skills
4 th review	<ol style="list-style-type: none"> 1. Presentation and assessment 	Assessing the critical thinking skills

7. Mockup Showcase and Evaluation

In this part, we encourage students to present their idea design concept and try to convince the judges that consist of experts, lecturers from the interior design study program, and lecturers from the entrepreneurship study program. The judges also give feedback and recommendation to the students to enrich students critical thinking skills and creative thinking skills.

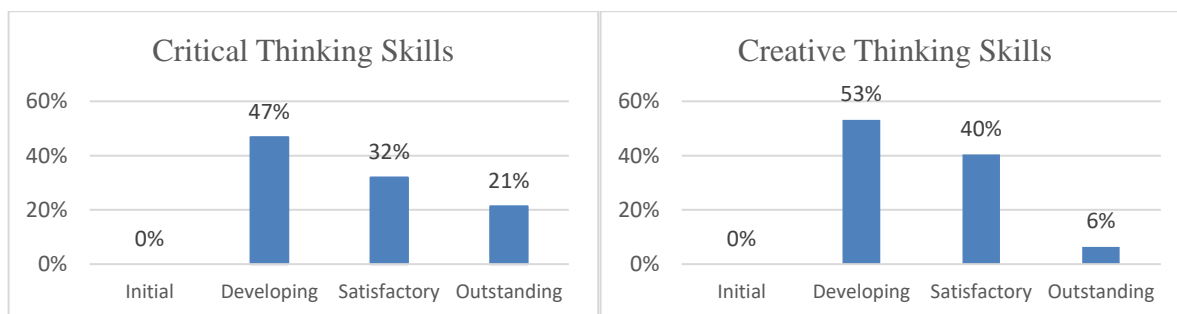
RESULT AND DISCUSSION

In the first through third review, its reflection on the regular progress reviews, we can see progress and evaluate the students creative thinking and critical thinking process. The lecturer can measure the result of students from all the criteria given in each regular process review, then give input and recommendations to improve and develop students skills regarding improving their critical thinking skills and creative thinking skills. The example of the regular progress review and assistance program is shown in figure 3, and the result of students critical thinking and creative thinking for this project is shown in figure 4.

**FIGURE 3
ASSISTANCE AND REGULAR PROGRESS REVIEW (FIRST THROUGH THIRD REVIEW)**



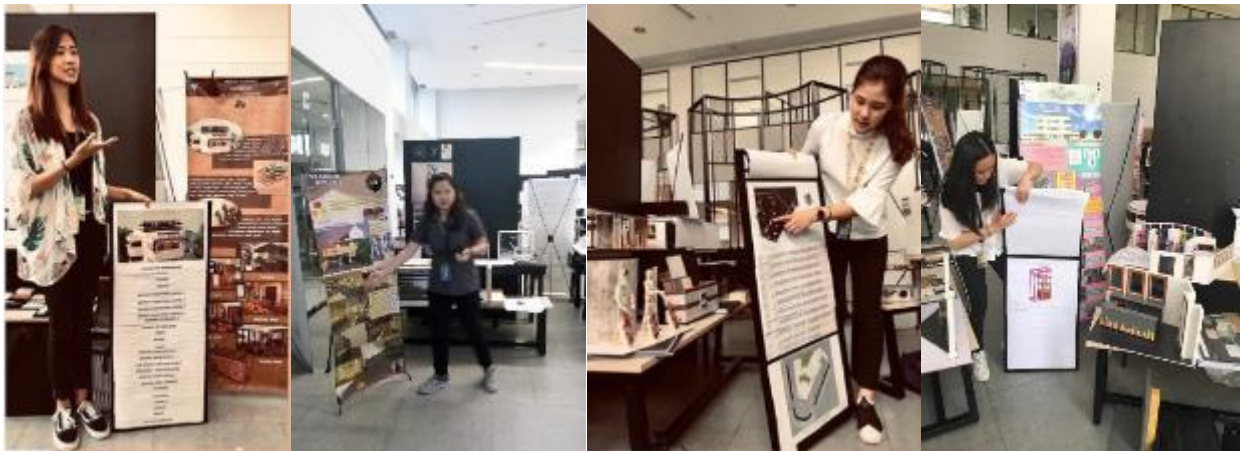
**FIGURE 4
CRITICAL THINKING AND CREATIVE THINKING RESULT**



For critical thinking, there are 47% of students in category developing, 32% in category satisfactory, and 21% of students get outstanding results. For creative thinking, 53% of students in category developing, 40% in category satisfactory, and 6% get outstanding results. Based on these results, we can see that most of the students are in the developing phase. It means that there is much room to improve students critical thinking and creative thinking through other courses in the next semester, discussions with lecturers, and discussions with experts that conduct regularly eager to enrich student knowledge-understanding.

For the fourth review, the final project session, the student must present their work, starting with the mockup, material used, color, technical drawing, and the concept book in front of the lecturers and experts. By doing these activities, the student can get insight into their work from internal and external parties. These learning processes can be shown in Figures 5 and 6. For the student mockup, there can be seen in figure 7

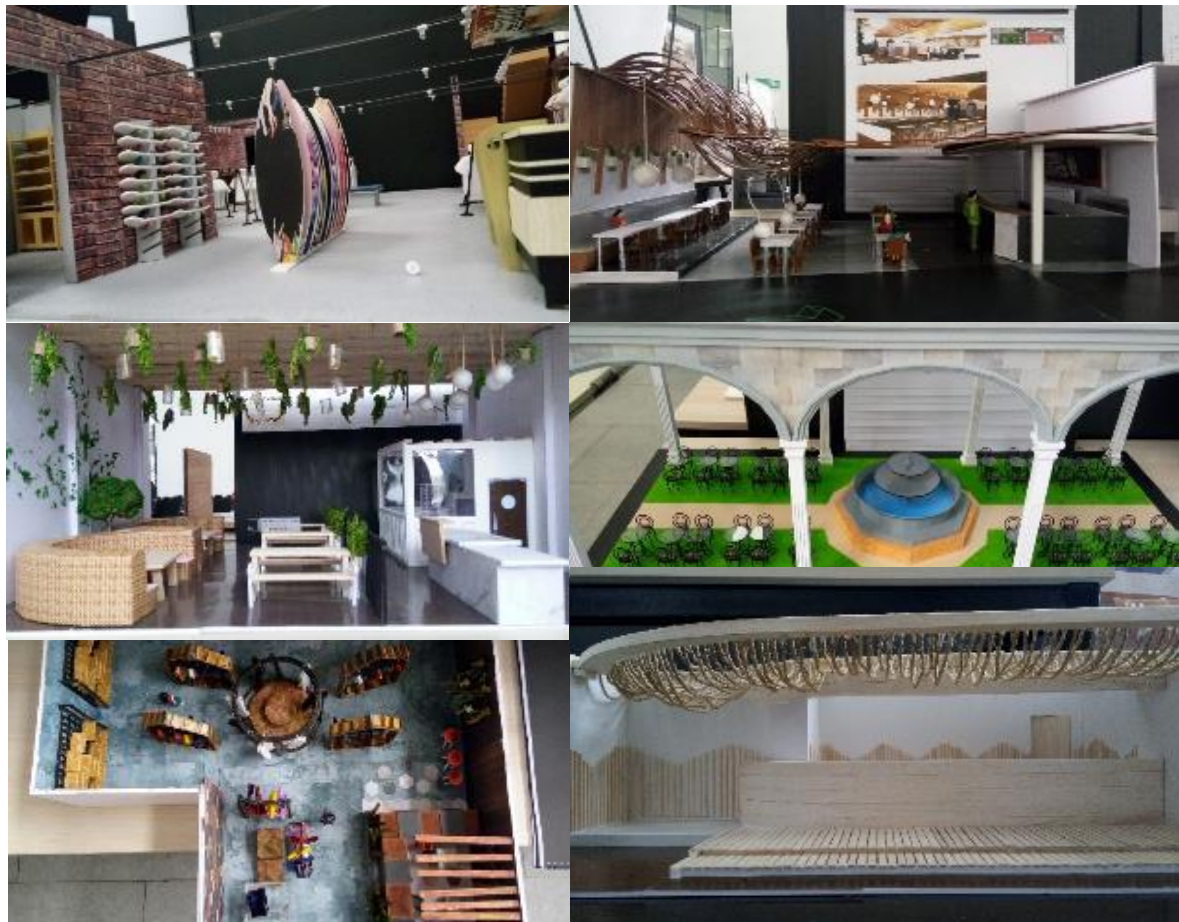
**FIGURE 5
STUDENTS FINAL PRESENTATION**



**FIGURE 6
EXPERTS REVIEWS FOR STUDENT**



**FIGURE 7
STUDENT MOCKUP**



The next thing that we do is measure the achievement of learning objectives. Firstly we should map each of the assessment criteria with each of the learning objectives that are given in the course outline of the subject. By conducting this step, we can measure the achievement in each learning objective (LO) and give the improvement for this course for the next period. The achievement of each learning objective can be seen in table 2.

**TABLE 2
RESULT OF EACH LEARNING OBJECTIVE**

Learning Objective	Below	Fair	Good	Above
LO1	6%	32%	62%	0%
LO2	11%	49%	36%	4%
LO3	6%	41%	53%	0%
LO4	5%	48%	47%	0%

As we can see in table 2, more than 85% of students already meet the expectation with the result are fair, good, and above in each learning objective. However, few students earn below the expectation in learning objectives 1 through 4. The highest below expectation score is in Learning Objective 2, and there are 11% of students did not meet the expectation of this course. Learning objective two measures how

student knowledge-understanding and apply the conceptual theory during the design process. We try to evaluate this result by look the student process. We discovered that many of these students in this category were absent, did not attend the assistance program, and did not follow the direction given in the regular progress review. By knowing the causes, we can evaluate that students should be more pay attention, ask, discuss, and be aware during the class session, assistance program, and regular progress review activities.

On the lecturers side, by knowing this result, lecturers should explain the basic conceptual theory during class sessions and give some review and assessment at the end of the session to know the students conceptual understanding. During the assistance and regular progress review activities, lecturers are encouraged to interact actively, discuss with their students, and monitor their work progress to get more information and knowledge about the students conceptual understanding.

Although showed satisfactory results in each learning objective, only 4% of students got above expectation results represented in Learning Objective 2. This result means that we have to try to increase the number of students at this level criteria. Several strategies can perform such as conducting some exercises or targeting them to finish their work. Lecturers are also encouraged to monitor and check students work by creating active discussion in class or off class and during the assistance program session.

CONCLUSION

The ASSURE learning model design can help identify the learning process step and be implemented to measure students creative thinking and critical thinking process. The result showed that 53% of students get satisfactory and outstanding results in the critical thinking category, and for the creative thinking category, 47% of students get satisfactory and outstanding results.

The achievement of the learning objective in this course also showed a satisfactory result. Most of the students in this course pass in all aspects of learning objectives, and few achieve below the minimum standard score.

Regular progress review conducted in this course has a role for students to improve their critical thinking skills and creative thinking skills by giving some suggestions and active discussion about their work project. Regular progress review also emphasizes that students manage their work, time, and energy properly to finish their project on time.

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