

# DESIGNING PROJECT-BASED LEARNING TO DEVELOP STUDENTS' CREATIVITY IN THE FOURTH INDUSTRIAL REVOLUTION

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**Abstract**— Students' creativity in the learning process still needs to be improved. Educators need to think about how to improve students' creativity in the learning process. Based on Guilford's creativity theory Students' creativity is still at the Routine/Ordinary level, and only dominant in the fluency aspect. Therefore, it is necessary to design a learning that can emphasize creativity improvement. Project-based learning (PjBL) is a learning activity that emphasizes projects as its main activity to achieve the expected competencies. The resulting product required students to carry out activities that applied the skills needed to produce products that were able to reflect learning outcomes. Products that were expected to emerge from project implementation include design, schemes, writing, artwork, technology works, crafts, and others. In order for the PjBL process to run well, it was necessary to develop an effective learning plan. The learning plan was prepared using the ADDIE (Analyze, Design, Develop, Implement, and Evaluate) approach. ADDIE learning design is a systematic learning design. The results of this design underwent expert judgment as the basis for the implementation of learning. The project that was produced by students was a Tutorial Book, which contained material on how to design an image using software. In addition to the impact of learning of increased creativity and competence in developing books, accompanying impact is also expected to emerge in students in the form of collaboration and communication skills, discipline, and time management.

**Keywords:** *Project-based learning; students' creativity; ADDIE Approach*

## I. INTRODUCTION

The fourth industrial revolution (Industry 4.0) is in sight, and undeniably there are many challenges will be faced in this era. Increasing technological developments such as the presence of digital economy, artificial intelligence, big data, and robots are challenges that must be faced by today's society (Menteri Riset, Teknologi, dan Pendidikan Tinggi. 2018). This era is also often called the disruptive era, which is a time when technology develops rapidly, and its benefits are felt in every part of life. However, on the other hand, this era has a tremendous impact that can destroy every element that is developing without realizing it (Morrar, R., Arman, H., & Mousa, S. 2017). To be able to survive in this era with the presence of digital technology, a variety of skills is required, so that the people are not left behind.

Regarding the challenges and opportunities that arise in the face of the industrial revolution 4.0, the

disruptive era, the 21st century or whatever it is called, various aspects must be well prepared, including human resources (HR) and other resources. Various innovations and creativity are needed so that every human resource, especially in Indonesia, is ready to face this era. The human resources who must be prepared to compete against the challenges and opportunities are of course students who are currently studying in the primary education up to higher education. The innovation and creativity that need to be developed in this digital era are not just skills and knowledge, but also the students' attitudes and behavior. Knowledge and skills need to be supported by the attitude and behavior of every human being. Complete abilities make quality human resources in terms of intellectual, skill, and attitude, which include discipline, endurance, ability to cooperate and collaborate, respect, ability to communicate well, willingness to uphold local cultural values, and a number of other attitudes that strengthen the students' intellect and skills (Bloem, J, et al. 2014)

Higher education as one of the formal education institutions that produce graduates who will dive into the world of work, certainly must adjust to the various changes that occur. The phenomenon that has been happening so far is often said that college graduates in general cannot be absorbed in the world of work because most of them are more prepared for training rather than prepared for work (Beghetto, R. A 2010). Whereas the current challenge is that every graduate who enters the world of work must be ready to work and has a number of skills, knowledge, and good attitude (Irawan, J., F. P. 2018). To address these challenges, the education system and curriculum in universities have undergone various changes by referring to the Regulation of the Minister of Research, Technology and Higher Education No. 44 of 2015 concerning National Standards for Higher Education and to the National Working Competency Standard (SKKNI/*Standar Kompetensi Kerja Nasional*) developed by National Education Standardized Body (BNSP/*Badan Nasional Sertifikasi Profesi*). In the regulations, it is stated that every college graduate student must have a number of competencies that are certified from recognized institutions.

Producing quality graduates starts from quality learning process. Educators need to make maximum effort in designing, implementing, and evaluating learning in accordance with the demands of the community. Students today are students born in the

digital native era, namely people who were directly related to computer technology since they were newborns. The changes that occur to our students are very fast. Students who are currently learning using old learning designs and approaches will not be able to survive, both in the learning process and in finding work.

Dealing with digital native students requires lecturer competencies, such as in education, technology pedagogical content, internet, research, competencies, and globalization. A number of these competencies are needed to design quality learning to produce quality graduates. An indicator of qualified students are the ability to solve various learning problems well using critical thinking, creativity, good communication, and collaboration with various parties (Partnership 21<sup>st</sup> Century Skills, 2010). The learning system in this digital era must adapt to the existing technological developments, so that someday it can produce skilled graduates in the aspects of technological literacy, data literacy, and human literacy (Lee, M. & Yuan, Y. 2018: 93-119).

To produce skilled graduates in the aspects of technology literacy, data literacy, and human literacy, various efforts in the learning process that can support the improvement of these skills are needed. Increasing creativity is one way that must be prepared so that students are ready to face the challenges and opportunities in the future. The term creativity is not a new term. It is one of the focuses in improving the skills that students must have in the learning process (Tremblay, K., Lalancette, D., Roseveare, D. 2012).

Creativity is a seemingly easy concept, yet its application is very difficult. Creative people are people who have original and high quality ideas further explains that the indications of a creative person are as follows: “1) recognize the importance of a deep knowledge base and continually work to learn new things; (2) are open to new ideas and actively seek them out; (3) find source material in a wide variety of media, people, and events; (4) organize and reorganize ideas into different categories or combinations and then evaluate whether the results are interesting, new, or helpful; and (5) Use trial and error when they are unsure how to proceed, viewing failure as an opportunity to learn”. How to develop creativity has been put forward by many experts, Guilford is one of the psychologists who focuses on improving and measuring creativity.

Currently to be able to measure the level of creativity, the same instruments tend to be used to measure divergent thinking skills. These instruments that can measure creative thinking skills have been developed by several experts, including TTCT (Torrance Test of Creative Thinking), CAMT (Creative Ability in Mathematical Thinking), and Guilford Alternative Uses Tasks (Division, E. T.

2006). Although the contents and systematics of creativity the tests vary, the categorization of responses tends to be similar, namely through measurement of fluency, flexibility, originality, and elaboration.

Various research results indicate that the students' skills still need to be improved (Menteri Riset, Teknologi, dan Pendidikan Tinggi. 2018). This certainly requires the lecturer to develop various learning processes so that students can develop their creativity better. In order to improve the quality of learning to prepare students for facing the Industrial Revolution 4.0, one of the skills that can be improved is creativity through learning in universities that focus students as the subjects of learning. Therefore, this study aims at developing learning designs using Project Based Learning (PjBL), which can improve students' creativity that includes the stages of analysis, design, development, implementation, and assessment using the ADDIE approach (Plucker, J. A., Kaufman, J. C., Beghetto, R. A. 2010) in its preparation.

PjBL is a learning method that can help teachers or educators in an effort to improve the creativity of their students. Through PjBL, the learning process is packaged into systematic learning involving knowledge and skills possessed by students through integrated direct experience in building their knowledge involving different academic skills, such as reading, writing, analyzing, and calculating. Stoller (in Mikulec & Miller, 2011) explains that PjBL has a complete and integrative series, which includes activities to process and produce products, to give students the opportunity to have ownership of the project being developed, to make the time available, and most importantly to foster a number of skills integratively, so that it is suitable to build conceptual understanding through a process of combining a number of different materials (Perkins, D. N. (1981).

## II. METHOD

In the effort to increase students' creativity in the learning process by using the PjBL strategy, learning designs that take into account the stages of learning need to be developed. This study is part of the Design Based Research (DBR) research, especially in the second stage, namely developing a learning design based on problem analysis. The DBR method was suitably chosen as a research method since the research problem raised focuses on increasing students' creativity through the process of learning using Project Based Learning (PjBL) which is systematically designed based on needs analysis (Fardah, D. K., 2012). Overall, the stages in DBR research are: (1) identifying and analyzing problems; (2) designing of learning process, which are developed based on problem analysis; (3) carrying out an iterative process to test and improve solutions

practically; and (4) reflecting to produce a final design that can improve the desired results. This learning used Graphic Media course in the Educational Technology Study Program. The learning design was assessed by experts who focused on compatibility between components in the learning design.

**III. RESULTS AND DISCUSSION**

The results below are answers to the proposed research objectives relating to 1) how to design learning using PjBL, which can enhance students' creativity, and 2) how are the results of expert assessment of the developed learning design. The content developed in designing this learning is the content in the Graphic Media Course given to students in one of the study programs in a university in Indonesia.

The design of the learning should be arranged systematically in order to appropriately meet the students' needs and can also improve the quality of the learning process. Thus, the PjBL learning design to improve students' creativity refers to the learning design using the ADDIE approach proposed by Branch (Dewi, L & Sutisna, M.R. 2018). The stages of developing learning designs begin with "Analysis, Design, Development, Implementation, and Evaluation". At the development stage, this learning design did not develop the entire course program, but only focused on developing a tutorial book as one of the products of Graphic Media learning. This tutorial book contained a number of materials about the steps to create graphic products as students' task, namely tutorials to design a logo, CD/DVD labels and covers, posters, brochures, and Powerpoint templates. Students were asked to compile several tutorials made the class. In addition to a series of tutorials that explain in detail how to make graphic media, students were asked to explain about the concepts and theories of the types of media in the tutorial book.

In the preparation of the learning plan, the following are the steps to develop the learning:

**1) Analyze**

The design of learning using PjBL was based on the results of identification of the initial conditions of students' creativity. The results of study conducted by Dewi & Sutisna (Dewi, L & Sutisna, M.R. 2018) that explored students' perceptions related to their creativity by referring to the creativity criteria proposed by Brookhart (2010: 128-129) that consists of five points, namely: (1) recognize the importance of a deep knowledge base and continually work to learn new things; (2) are open to new ideas and actively seek them out; (3) find source material in a wide variety of media, people, and events; (4) organize and reorganize ideas into different categories or combinations and then

evaluate whether the results are interesting, new, or helpful; and (5) use trial and error when they are unsure how to proceed, viewing failure as an opportunity to learn. Based on these indicators, the following table presents the results of the identification of students' creativity based on self-assessment.

Table 1. Self-assessment of Self-creativity

No	Aspect	Score
1	Recognize the importance of a deep knowledge base and continually work to learn new things	3.15
2	Are open to new ideas and actively seek them out	3.63
3	Find source material in a wide variety of media, people, and events	3.54
4	organize and reorganize ideas into different categories or combinations and then evaluate whether the results are interesting, new, or helpful; and	3.28
5	Use trial and error when they are unsure how to proceed, viewing failure as an opportunity to learn	3.20

Source: Dewi & Sutisna (2018)

As seen from the value of the students' self-assessment results about their creativity, each indicator was rated highly in the creative category. This data could not be directly used as a basis for conclusions that the students were creative. Another form of assessment was needed so that their creativity improved. Perkins, in Brookhart (2013: 28) states that "creativity is a simple concept that can be difficult to get your head around. In its most basic sense, creative means 'original and of high quality.'" To know if one is creative, one needs to show it with a product that is original and has high quality.

Apart from it all, creativity today is very important for students as future human resources who will struggle to build themselves into useful citizens. The era of Industrial Revolution 4.0 supports the students' self improvement of quality. The learning process is one of the tools that can be used to support the improvement of 21<sup>st</sup> century skills needed in the face of challenges in the future, a period of uncertainty.

**2) Design**

The learning was designed in an effort to improve students' creativity through PjBL. PjBL was suitable for increasing creativity because students were honed to produce a product through a project. The students' skills could be improved in an integrated manner related to the four 21<sup>st</sup> century skills, namely

creativity, critical thinking, collaboration, and communication (Mikulec, E. & Miller, P. C. 2011).

This stage was determining the learning outcomes and indicators that were expected after the learning process. Determining the learning outcome or competency was important as a reference for materials and actions given to students, so that a form of evaluation form could be made to measure learning achievement (Capraro, et al. 2013).

The formulation of learning achievement of Graphic Media course had adapted to the CPPS of Education Technology Study Program that had been agreed upon by the association of Indonesian Education Technology Study Program. In addition, it had also been adjusted to the learning outcomes set out in the National Standard for Higher Education.

The formulation of learning achievement in the Graphic Media Course refers to the learning program learning achievement (CPPS/*Capaian Pembelajaran Program Studi*) in Educational Technology, which has knowledge in the development and management of media and learning resources and has special skills in developing, managing media and learning resources. The CPPS is then lowered to the Learning Outcomes Achievement, namely 1) understanding the concepts and theories of graphic media; and 2) applying them to meet the needs of graphic materials for educational and non-educational purposes in the daily life as educational personnel.

In this program design, the learning material chosen was in accordance with the implementation of PjBL which was learning that could involve students in planning a project that could produce a graphic media for learning or education. The formulation of learning outcomes, subject matter, and learning activities is presented in the following table.

Table 2. Sub-learning outcomes, subject matter, and learning activities

Sub-Learning Outcome	Indicator	Subject Matter
<b>Understanding the orientation of graphic media lectures</b>	<ul style="list-style-type: none"> <li>• Explaining the purpose of the course</li> <li>• Identifying the outcomes of the lectures</li> </ul>	Course orientation
<b>Understanding the essence of graphic media in mass communication in the world of education</b>	<ul style="list-style-type: none"> <li>• Explaining the basic concepts of graphic media</li> <li>• Explaining the relationship between graphics and communication theory</li> </ul>	Essence of Graphic Media
<b>Understanding the types of</b>	<ul style="list-style-type: none"> <li>• Identifying the types of graphics</li> </ul>	Types of Graphic

graphic media	media	Media
<b>Understanding the characteristics of graphic media</b>	<ul style="list-style-type: none"> <li>• Describing the strengths and weaknesses of the implementation of graphic media types.</li> </ul>	Characteristics of Graphic Media (Advantages and Disadvantages of Graphic Media)
<b>Understanding the principles of visual readability of graphic media</b>	<ul style="list-style-type: none"> <li>• Describing the principles of visual element management on graphic media</li> </ul>	Principles of Graphic Visual Media Readability
<b>Understanding the design of graphic media scripts</b>	<ul style="list-style-type: none"> <li>• Implementing steps in designing graphic media scripts</li> </ul>	Design of graphic media scripts
<b>Creating simple graphic media</b>	<ul style="list-style-type: none"> <li>• Creating simple graphic media products</li> <li>• Presenting simple graphic media products</li> </ul>	Simple Graphic Media
<b>Creating graphic media with Raster- and Vector-Based Graphic Processing Applications</b>	<ul style="list-style-type: none"> <li>• Describing the differences in the characteristics of vector- and raster-based graphics media</li> <li>• Applying techniques for using raster- and vector-based graphics processing computer software</li> <li>• Creating graphic media using graphic templates</li> <li>• Creating a logo design</li> <li>• Creating designs of CD/DVD label and cover</li> </ul>	Free Logo Design Template CD/DVD Label and Cover Design
<b>Creating posters</b>	<ul style="list-style-type: none"> <li>• Creating graphic media work of posters</li> </ul>	Poster Graphic Media
<b>Creating brochures</b>	<ul style="list-style-type: none"> <li>• Creating graphic media work of brochures</li> </ul>	Brochure Graphic Media
<b>Applying graphic media in daily life</b>	<ul style="list-style-type: none"> <li>• Creating presentation slideshow templates</li> </ul>	Presentation Slideshow Template

Based on the formulation of the learning achievement of the Graphic Media Course, the stages of learning by using PjBL as a learning strategy to improve students' creativity can be seen in the following table,

Table 3. Learning Stages PjBL based on the formulation of the learning achievement

Learning Stage	Learning Activity
<b>Preliminary Activity</b>	<ul style="list-style-type: none"> <li>• Apperception</li> <li>• Deliver the learning objectives</li> </ul>
<b>Core Activity</b>	<p><b><u>Project based learning</u></b></p> <p><b><u>Preparation</u></b></p> <ul style="list-style-type: none"> <li>• Students are put in small groups (3-4 members) to prepare a project</li> <li>• Students are asked to think of a book that will be developed in a limited time.</li> </ul> <p><b><u>Assignment/Topic Selection</u></b></p> <ul style="list-style-type: none"> <li>• Students are facilitated to find solutions to develop good books that are easy to make in limited time</li> </ul> <p><b><u>Activity plans</u></b></p> <ul style="list-style-type: none"> <li>• Students arrange plans for developing tutorial book</li> <li>• Arranging schedule</li> </ul> <p><b><u>Project Implementation</u></b></p> <ul style="list-style-type: none"> <li>• Prepare all the materials for the tutorial book</li> </ul> <p><b><u>Monitoring dan Evaluation</u></b></p> <ul style="list-style-type: none"> <li>• Checking for obstacles faced in writing or making the tutorial book</li> <li>• Asking the ways to resolve the obstacles</li> </ul> <p><b><u>Product Finishing</u></b></p> <ul style="list-style-type: none"> <li>• Each student is given opportunities to finish in complete product</li> </ul> <p><b><u>Presentation</u></b></p> <ul style="list-style-type: none"> <li>• Students present tutorial book product</li> <li>• Other students comment the developed product.</li> </ul>
<b>Final Activity</b>	Students conclude the techniques to create a tutorial book

3) **Development of learning resources**

The development of learning resources used in supporting this learning is certainly very important. Branch (Branch, R.M. 2009) explains that what must be considered in developing learning resources in learning design includes developing learning materials, selecting media and learning strategies, developing test kits, and developing learning guides. *Develop learning material.* At this stage, the material chosen to support the application of using PjBL was the material related to the development of graphic learning media using certain applications. In its development, the students were asked to compile the steps for making the media and make it a tutorial book.

The learning media used was presentation media, Corel Draw and Photoshop softwares. These media were chosen because they were appropriate with the characteristics of the material and learning outcome that students must meet in the Graphic Media Course.

To facilitate the learning process and the achievement of the learning outcomes of the course, it is best to develop the test tool at the beginning, so that it will meet the expectations. Considering that the learning process was oriented towards increasing students' creativity, the evaluation tools developed certainly had to refer to the learning outcome. The test instruments used were a questionnaire about the attitude scale related to creativity that the students possess pre-test to measure creativity by using tests from Guilford, written test to measure cognitive abilities, and rubric assessment of creativity by referring to Brookhart's (2010) assessment rubric to assess student products produced.

Each tutorial book developed had a uniform delivery structure that consisted of four main parts with the following structure.

Table 4. Structure of Tutorial Book

PART 1: GBPM	Explanation of GBPM arrangement in general
PART 2: CONCEPT OF MEDIA X	Conceptual explanation of products of the tutorial according to the type of media that would be developed
PART 3: TUTORIAL 1	Every part of the tutorial consists of: 1) Description of graphic media development plan 2) Description of tutorial steps 3) Illustration/visualization 4) Explanation of product at each step of the tutorial Every tutorial book has 5-10 tutorials
PART 4: TIPS AND TRICKS	Provide specific suggestions on the graphic media development process according to type

4) **Implementation**

In order for the implementation of learning to run well, preparation needed to be made by both parties, namely the lecturer and the students. The preparation made by the lecturer had been carried out from the beginning of the designing of the learning program in the form of RPS, and then derived into a lesson plan, preparing learning material delivered in the form of presentation media, and preparing assessment tools. The most important thing from the lecturer's preparation was to coordinate and to collaborate with the lecturers in the team-teaching. So that, the developed designs were

understood together and carried out according to the learning outcomes that had been set.

Regarding the students' preparation, the developed design using PjBL and creativity that is the outcome of the learning needed to be conveyed at the beginning of the lecture, and also agreeing on a learning contract and other agreements to facilitate the learning process. Students' involvement in the learning process is very important. Therefore, the preparations that students must do before entering the class are the most important things. It will be best if students come to the classroom with the initial knowledge they have. For this reason the efforts of lecturers in supporting students to learn are very important. One of them was through the storage of learning materials on SPOT. Additionally, students could search for and add other materials from other sources.

### 5) *Evaluation*

The learning process is basically the process of interaction between students and the surrounding sources with the goal of behavioral change in students which includes aspects of knowledge, attitudes, and skills. Through PjBL learning, it was expected that the students' creativity was honed and improved. Therefore, the evaluation procedures were carried out in steps of initial assessment, process evaluation, and final assessment.

The preliminary assessment (pre-test) was conducted to determine the initial condition of knowledge and the level of creativity that the students had. Assessment of processes was important to see the students' engagement in the learning process, both in delivering comments, expressing opinions, and providing solutions to the problems faced. The students' participation was important to be assessed during the process, as well as the in working on the product as a project in the Graphic Media course. This assessment certainly supported further assessment. The next assessment was the final assessment of learning. This assessment was a summary of a number of overall assessments. This assessment determined whether cognitive abilities, skills, and creativity increased or not. Further, it was used as a basis for improving the next learning design.

The assessment criteria followed the policies that apply to the guidelines for implementing education. The basic details of assessment considerations began with the attendance of at least 80%, participation in the learning process, involvement in each group assignment, written tests to measure cognitive abilities, as well as graphic media products and tutorial book assessment to measure students' creativity.

The tutorial book was measured by using media assessment criteria based on good media minimum criteria, namely having relevance and providing

added value. Hence, the tutorial book was be assessed based on the following criteria.

- a. Variations in product output types
- b. Coherence of delivery style
- c. Clarity/legibility of the tutorial steps
- d. Focus and suitability of illustrations / visualizations

## IV. CONCLUSION

In general, the learning designs that were arranged systematically in accordance with one of the principles of preparation of learning design stating that a learning process can run well and effectively if they are designed and arranged in a systematic way and in accordance with learning needs. The learning design adapted to the ADDIE approach developed by Branch.

Specifically, the steps in the preparation of the learning design were the process of analysis, design, development, implementation, and evaluation. The analysis process was carried out by identifying the initial conditions of students' creativity, and the results showed that the students' creativity were in the creative category and needed to be improved further. The design process was carried out starting with the formulation of the learning outcomes of the course which referred to the learning outcome of the study program by choosing PjBL as a learning strategy that can support learning achievement, especially in the aspect of increasing creativity. The development of learning resources was carried out starting with the development of learning materials, media selection and learning strategies, and determining the evaluation tools to be used. At the implementation stage, the preparation of lecturers and students was carried out through a process of communication and coordination so that learning objectives could be achieved. The next stage was evaluation and the process was carried out at the beginning, the process, and the end of the learning.

## VII. RECOMMENDATION

To carry out an effective learning process, the learning design is the most important initial step that determines the learning success. The drafted learning plan should be based on the needs of the students, the demands of the society, and the world of work. The structured learning design can systematically predict learning outcomes obtained by students. The improvement of students' creativity in the learning process needs to be done through various activities. An effective PjBL can be an alternative to improve students' creativity.

## VIII. ACKNOWLEDGEMENTS

This study was conducted on grants provided by the Research and Community Service Institute (LPPM/*Lembaga Penelitian dan Pengabdian*

*Masyarakat*) of Universitas Pendidikan Indonesia with a Learning Quality Improvement scheme, as one of the efforts to achieve the UPI's strategic plan in 2016 - 2020.

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