

# Enhancing Students' Creativity and Innovation in Designing Car through the Implementation of Problem-Based Blended Learning Model

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**Abstract**— **Selecting appropriate learning strategy to develop students' creativity and innovation in designing exterior design of a car is essential. Relying on face-to-face meetings was not sufficient. Therefore, the learning process did not run optimally. Problem-based blended learning model was expected to be the solution to overcome this issue. Hence, problem-based blended learning model was studied. This study was done by collecting literature reviews in relation to problem-based blended learning model. By then it could be concluded whether the integration of blended learning model and problem-based learning could enhance students' creativity and innovation in designing the body of a car.**

**Keywords:** *Blended learning, PBL, Creativity, Innovation*

## I. INTRODUCTION

Automotive design is a subject in Automotive Engineering Education Study Program which has characteristics in relation to the development of students' creativity and innovation. With regards to the Course Learning Outcomes (Capaian Pembelajaran Mata Kuliah or CPMK), students are trained to make designs component for the interior and exterior designs of a car. In addition to that, students will also improve the quality of safety and comfort in the use of motorized vehicles. In line with the implementation of problem-based curriculum at Universitas Negeri Malang (UM), thus, the learning of the Automotive Design Course must be upgraded by applying a problem-based blended learning model. This model is an integration of the advantages of blended learning model and the advantages of problem-based learning (PBL) model.

According to Rovai and Jordan (2004), blended learning is an integrated combination of face to face learning and e-learning with various communication methods which can be used by lecturers or students [13]. Meanwhile, in PBL, students face problems during learning, and through this students would learn certain knowledges and skills. Students' ability to perform high creativity and innovation in designing car would improve better if the learning proces is not only done through face to face meeting but also virtual learning. This is inline with the result of a study done by Pradhana. The

result of the study suggested that blended learning is effective to be implemented in automotiv body courses showed by the indicators achieved in classical learning, e-learning, and learning through field study which has high effectivity. The students' learning outcomes also showed the effectivity of blended learning in which the percentage of completeness of student learning outcomes was 100% with the average score of 81,59 [9]

## II. RESEARCH RESULT AND DISCUSSION

### A. Blended Learning

In general, blended learning has three meanings, they are: (1) the integrated combination of traditional learning and web online based approach; (2) the combination of media and tools (e.g. text books) which are used for e-learning, and (3) the combination of number of teaching and learning approaches regardless of the technology used [10]. Blended learning is an approach which supports flexibility in terms of time and place. [15]. It is a learning approach that integrates traditional learning or classical learning which requires face-to-face learning, distance learning using online learning sources and variety of communicative approaches used by lecturers and students [9].

According to Rovai and Jordan (2004), blended learning is an integrated combination of face to face learning and virtual learning or e-learning [13]. In other words, blended learning is a combination of face-to-face learning (conventional learning, where students and teacher have direct interaction and exchange information about teaching materials), self-paced learning (learning using provided modules) and online self-paced learning [11]. So, in blended learning there is a process of integrating the advances of the use technology from online learning with traditional face-to-face learning [16]. Blended learning has several characteristics, which are: (1) a learning which integrates materials delivering method, teaching method, learning style with various ICT based media, (2) a combination of direct face-to-face teaching, self-paced learning, and online learning, (3) a learning which is supported by the integration of the effectivity of materials delivering method, teaching

method, and learning style, and (4) teacher and students' parents have same important roles, where the teacher has a role as a facilitator and parents have role as supporters [17]. The correlation between components in blended learning can be seen in Figure 1.

From Figure 1, it can be seen that blended learning intersects face-to-face learning with computer based learning which explains that blended learning process includes a web-based and internet-based online learning process combined with face-to-face learning.

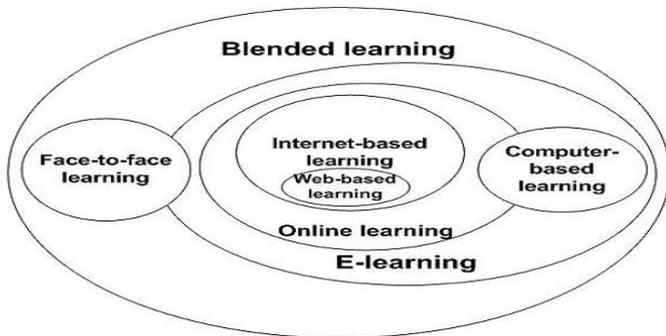


Figure 1 Component of Blended Learning [3].

1. The Proportion of Offering

Allen et al. provided a clearer categorization of blended learning, traditional learning, web-facilitated learning and online learning [1]. The offerings proportions of traditional learning, web-facilitated learning, blended/hybrid learning, and online learning are presented in Table 1. From the table it can be inferred that a learning is called a blended or hybrid learning when the portion of e-learning is in the range of 30-79% when it is combined with face to face learning.

Table 1. Proportion of Content Delivered Online[1].

Proportion of Content Delivered Online	Type of Course	Typical Description
0%	Traditional	Course with no online technology used — content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course which uses web-based technology to facilitate what is essentially a face-to-face course. Uses a course management system (CMS) or web pages to post the syllabus and assignments, for example.
30 to 79%	Blended/Hybrid	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face-to-face meetings.
80+%	Online	A course where most or all of the content is delivered online. Typically have no face-to-face meetings.

2. The Implementation of Blended Learning

The implementation of e-learning needs a Learning Management System (LMS), functioning to manage the implementation of e-learning model. LMS is often known as CMS (Course Management System), which generally is built up in web-based, runs on a web server and can be accessed by participants using web client. The server usually is placed in a university/school or other institutions where it can be accessed from anywhere by the students as long as there is internet connection [14]. Carman mentioned that there are five keys in the implementation of blended learning, those are: (1) Live

Event, which is a direct learning or face-to-face learning that is synchronously at the same time and place or the same time but different places, (2) Self-Paced Learning allows students to have online learning at any time and place, (3) Collaboration, which combines collaboration; instructor collaboration and collaboration between students, (4) Assessment, the ability of an instructor to construct an appropriate online and offline assessments in the form of both test and non-test, and (5) Performance Support Materials, the ability of an instructor to prepare digital learning materials which can be accessed by the students both online and offline [2].

3. Blended Learning Development Model

In Blended Learning Development Model, according to Haughey, there are three possibilities in the development of internet-based learning systems [12], they are:

- a. Web course is the use of internet as an educational necessity in which there is completely no face-to-face meeting between students and teaching. All learning materials, discussions, consultations, assignments, exercises, tests, and other learning activities are fully delivered through the internet. This learning model uses long distance learning system. For teachers, this kind of learning improves “knowledge and skill” that strengthen teacher’s knowledge about the learning materials and as well as strengthen students’ comprehensive through the implementation of learning methodology which utilize the use of internet, such as, video streaming, video conference and many others.
- b. Web centric course is a learning using internet combining long-distance learning and conventional learning (face-to-face learning). Some of the materials are delivered in class, while some others are delivered through internet. The instruction to learn given to the students will be put on the web. In face-to-face learning, the learning focuses more on classroom discussion. The teacher and students discuss findings students have learned after reading the materials that are put on the web.
- c. Web enhanced course is a utilization of internet to support the improvement of classroom learning quality. Internet functions as the enrichment and communication between students, group member, and students with other interviewees, so that teacher are required to master the technique of collecting the information from the internet, to guide and to find reputable and relevant resources which can complement students provided learning materials.

4. Findings

Pradhana, in his study, mentioned that blended learning is an effective strategy to be implemented in automotive body courses proven by the indicators achieved in classical learning, e-learning, and learning

through field study which has high effectivity [9]. The effectivity of blended learning is also proven by the result of students' learning outcome in which the percentage of completeness of student learning outcomes was 100% with the average score of 81.59.

Another study done by Sjukur showed that (1) there were differences in learning motivation between the students who were taught using blended learning and the students who were taught using conventional learning; (2) there were differences in students' learning outcomes between the students who were taught using blended learning and the students who were taught using conventional learning; (3) there was an improvement in students' learning motivation as a result of teaching using blended learning; (4) there was an improvement in students learning outcomes as a result of teaching using blended learning [14]. These findings are also supported by a study done by Syarif which mentioned that (1) there was a significant difference in students learning motivation between students who were taught using face-to-face learning and students who were taught using blended learning, (2) there was a significant difference in students' achievement between students who were taught using face to face learning and students who were taught using blended learning (3) there was no interaction effect of the application of learning models and motivation on student learning achievement. Therefore, the improvement of students' learning achievement is really significantly influenced by the implementation of the learning model [15].

## B. Problem-Based Learning

Problem-based learning or PBL is an approach that challenges students to learn through collaboration in solving real world problem [6]. PBL allows students to work in collaborative team, develop thinking and reasoning skills as well as self-directed learning (SDL) or self-paced learning [4]. It happens because the main principles of PBL is laid on how to optimize learning through inquiring, explaining, and solving real and meaningful problem so that PBL is an art of problem solving [8]

### 1. Characteristics of PBL

Kolmos et al. explained that the characteristics of PBL are: (1) ill-structured problems; complex and unstructured problems are taken from the real world into a focal point and act as a stimulus (2) students learning centered (3) instructor or teacher role is as supervisor or facilitator, (4) small group learning; students are required to analyze, discuss, and draw conclusion to solve open-ended problem, and (5) peer- and self-assessment. Regarding to the process, [5] Massa, explained the four-steps in PBL, they are: (1) problem analysis, students are given problems and are required to identify, analyze, and then make plan to get information needed; (2) SDL, instructor acts as a facilitator and students independently find the information and resources needed to construct their own knowledge; (3) brainstorming, students make groups and do brainstorming to find possible solutions, and (4) solution testing, construct a test to validate the solutions. If the solutions is considered insufficient to

overcome the problem, another cycle needs to be conducted [6]. Students in group presents the final solution for reviews and comments, as well as reflection of what they have learned.

### 2. PBL Framework

PBL Process which is commonly used in learning is the model promoted by Maastricht. This model consists of seven steps, they are:

- a. *Clarifying the text and explaining unclear terms and concepts*; a problems is presented to a group of students. Then, students are given time to read their text books and identify every concept in order to enhance their understanding.
- b. *Defining the key problem*; students work in group and define problems or tasks operationally.
- c. *Analyzing the problem and suggesting possible solutions*; this is the step where brainstorming is. It is like thinking the causes of the problem. In this step, students discuss the topic of the problem from a certain point of view and offer possible solutions to the problem.
- d. *Elaborating, testing, reviewing and refining*; the group discusses ideas proposed in step 3, students present their findings and consider to eliminate irrelevant information; each solution has to be written down in note and discussed.
- e. *Formulating learning objectives*; the group agree to relate to basic knowledge needed to solve the problems. The learning needs are identified by prioritizing what is not understood.
- f. *Self-study*; students do self-study to get the information regarding to the learning objectives. Encouragement should be given to obtain information from various sources, includes books, journal, and personal contact.
- g. *Integrating and testing new information*; the result of self-study is discussed with the group. Knowledge and understanding need to be synthesize to serve relevant solution obtained from group discussion or debate. After students are given feedbacks, the group go back to step 2 to define the problem in order to get the final solutions.

## III. TEACHING MATERIAL PRODUCT REVISION

The combination of Blended Learning and Problem Based Learning is a form of the implementation of the problem-based curriculum being applied at Universitas Negeri Malang (UM). Blended learning is aimed to combine conventional (face-to-face) learning and online learning. While Problem-Based Learning (PBL) is a learning that directs students to solve problems. This learning makes students actively participate in learning to find hypotheses by developing their thinking and reasoning skills. Therefore the combination of both learning models can be a solution to enhance students' creativity and innovation.

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