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# Personalized Learning Modeling for the Control of Student Creativity in Physics Learning Media

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**ABSTRACT**
Students who program Physics Learning Media courses need creative competence in developing teaching media. By adjusting personal characteristics in the form of learning styles, it is expected that diverse learning experiences and the same program completion time. This research is an attempt to reduce the learning process concerning the unique characteristics of individuals associated with creativity, namely learning styles. Another paradigm of the control function in the educational process for (1) finding a form of modeling personalized learning to control creativity, (2) knowing the process and results of applying personalized learning in physics learning media lectures. The system approach was chosen as a research method to obtain various information and knowledge to increase efficiency in the Physics Learning Media lecture system. The 4 stages of personalized learning modeling to control creativity are discovery, task design, development, and monitoring. Four stages that correspond to the four P's of creativity (person, process, press, product). The discovery process is carried out by recognizing visual, auditory, and kinesthetic learning styles in student groups, assignment design with media development project planning, the stage of development by processing media according to the characteristics of group learning styles, and monitoring by reviewing the development learning media based on creativity criteria. Research findings that students with visual learning styles are classified as very high creativity.
***Keywords:*** *Modeling, personalized learning, creativity, learning style, higher education*

## 1. INTRODUCTION

Formal schools play a role in preparing an individual to be independent and contribute to his life in the future. For this reason, an educational process that not only transfers knowledge but also soft skills development such as honesty, leadership, creativity, communication skills, and personal competence is needed. Learners in this fast-changing era need a personalized learning (PL) approach in their learning process.

Some understanding of personalized learning including learning that pays attention to individual characteristics in learning [1], differences in learning experiences [2], according to background knowledge and skills [3], relevant to information needs and follow-up for individuals [4], interactive systems and depending on student learning needs [5], learning material based on students' interests and motivation [6]. These notions show that personalized learning is a process that values students' differences.

At first, PL was intended to direct individuals to achieve learning goals in their way [6]. This is according to a review of the process of receiving information [7] that a person will more easily and quickly receive information if it matches the way of learning. Salian [2] mentioned in the US educational technology plan that the adoption of OT adjusts the speed of student learning. This also exists in other individualized learning processes, namely the Personalized System of Instruction (PSI) by Fred S. Keller. This system pays special attention to learners in the preparation of learning objects according to the speed and ability of each [8]. Besides, PSI is also intended so that students can learn independently but remain in teacher support to maintain motivation and interest [9]. Another form, individual training [10], each student receives the same learning experience even though in the process some are quick to finish the topic of the material and some are slow. While the development of technology emphasizes diverse learning experiences, while a learning management system with a single method for all students is seen as ineffective [11].

The background of developing the 2013 curriculum in Indonesia expects school efforts to meet the individual needs of students. The need is stated in the Indonesian Minister of Education and Culture Regulation No. 36 of 2018 that for the similarity of competency achievements, each student has choices in the material he is interested in and his learning style. This requires the teacher to pay attention to the uniqueness of students who are present in their class.

The education curriculum in Indonesia has a lot of scope of material and usually, the problem of time becomes an issue that teachers often complain about.

 

The relationship between time management and stress level [12] is a problem that accompanies the learning process. The expected efficiency of the learning process is difficult to achieve. Whereas the learning process does not only transfer knowledge but also requires the development of creativity, especially at the university level. The development of aesthetic experience and evaluation of the teaching approach to creativity needs to be emphasized by universities [13].

Based on the results of learning with a personalized learning system found an increase in the efficiency and quality of learning [14], [15]. Efficiency is intended because students meet their learning needs, for example with appropriate learning styles, so that learning outcomes are on target.

Students as learning subjects have unique characteristics in the following lectures, namely learning styles. Learning styles are an easy and fun way for someone to receive and process information so they can understand it. The way to optimize sensory functions.

By considering these characteristics, it is expected that an effective learning process will be formed. A study showed that 70% of student learning styles are not relevant to lecturer teaching styles so that student learning outcomes are low [16].

Learning style is related to creativity, where students 'self-awareness of their creative potential is influenced by students' aesthetic experiences [13-Chang]. Aesthetics in the big Indonesian dictionary means interpretation of the product of art and the universe of its beauty. These results are obtained from sensory exploration. A strong relationship exists between sensory experiences (specifically hearing, vision, touch) and the aesthetic value students have. This means there is also a correlation with the creative potential of individuals in utilizing information. Abundant information in the current digital era cannot be separated from the role of the senses in recognizing it. Like visual media in the form of video, Artificial Intelligence (AI), Virtual Reality (VR). Audio technology as part of audio media and mechanical objects as part of kinesthetic. Future school challenges such as Maclaoughin and Lee's statement that students are more demanding of active experience in learning in the form of social involvement, contributions, and support of many varied media [5].

Prospective physics teacher students are faced with the challenge of being able to develop teaching materials that are quality, effective, and efficient learning media with the principle of innovation. This innovation is part of the creativity that must be developed in students.

Creativity is a field of study in education that still receives low attention from educators. Meanwhile in several studies show that high ability in solving problems is owned by students with high creativity [17] and they are better in achieving learning outcomes [18].

Related to the field experience on creativity the development of student creativity is already contained in the teacher's learning implementation plan, it's just that the goal has not been implemented in learning. Consistent implementation is carried out by certified teachers [19].

Duff defines creative abilities, namely the carrying of an individual in involving aesthetics to form new ideas. Ideas derived from the process of merging and evaluating thoughts involving associative imagination [20]. Further explained that creativity means different ways of solving problems quickly, flexibly, and there is a novelty in it.

Some opinions say that creativity is the fulfillment of new needs due to the transition of time [21], depending on general intelligence, emotions, and knowledge [22], as a source of progressive society's progress [20], a form of one's initiative towards a process or product to be more valuable [23]. Thus creativity is an educational goal that needs attention. The way that can be done is to look at aspects of developing creativity (Four P's of Creativity, namely person, process, press, product) and creative thinking processes including fluency (the ability to give lots of ideas quickly), flexibility (seeing problems from various points of view), elaboration (detailing ideas in more detail), and originality (sparking something new and unique). Then develop it in the learning process that focuses on student learning needs (learning styles) and the development of creativity.

Based on the previous presentation, this paper is aimed at: (1) What is the form of modeling Personalized Learning to control student creativity, (2) What is the process and results of the application of personalized learning in physics learning media lectures.

## 2. METHOD

A systems approach is used in this modeling. The variety of information and knowledge can be obtained with a systems approach to improve overall system performance [24]. Figure 1 shows the system approach process which was adapted from creativity research [25] to obtain Personalized learning modeling with creative control. The system approach consists of analyzing system requirements, designing systems, and analyzing system impacts. The system needs analysis was carried out using a learning style identification questionnaire [26] and an initial creativity analysis using the creativity questionnaire created the product [27] Analysis of the observed student creativity was elaboration, fluency, flexibility, and originality.

The study was conducted on Physics Education students at the Antasari Banjarmasin State Islamic University who programmed Physics Learning Media courses. The number of students is 16 people consisting of 9 women and 7 men. The process of designing the system resulted in a Personalized learning modeling instrument consisting of a Semester Lecture Plan which includes a form of modeling of individual learning reduction and four P creativity references, a Teaching Material Development Module, Student Project Sheets, and a Creativity Assessment Sheet with the assessment criteria as in table 1.

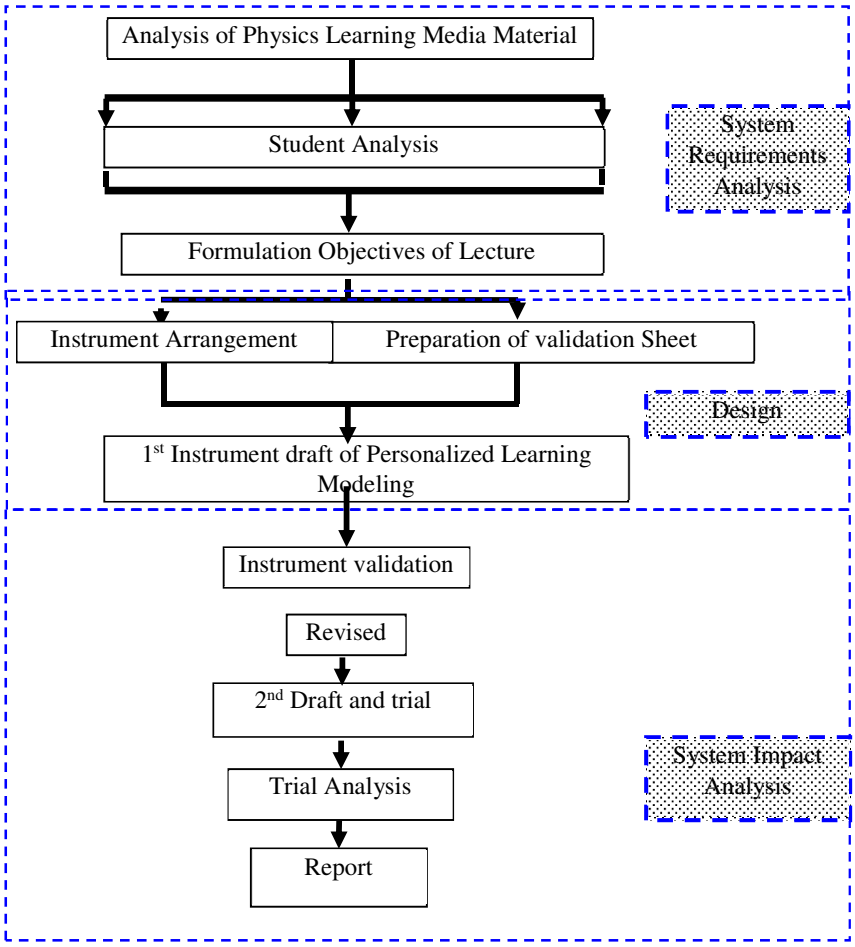


**Figure 1** Stages System Approach

**Table 1** Criteria for assessing creativity in physics learning media

| Assessment Criteria | Explanation |
|---|---|
| Very creative | Project tasks show **fluency, flexibility, and novelty**, or **novelty and flexibility** |
| Creative | Project assignments show **fluency and novelty**, or **fluency and flexibility** |
| Quite Creative | Project tasks show one aspect, **novelty** only or **flexibility** course |
| Less Creative | Project assignments show **fluency** |
| Uncreative | Project assignments do not show aspects of creativity |

Source: Adaptation of Student Creativity Levels [28]

In table 1 shows the criteria used to examine the task of developing physics learning media by students. These criteria exist on 5 scales ranging from very creative to not creative. As it is known that in the process student groups develop media following their learning styles.

## 3. RESULT AND DISCUSSION

The system approach process produces personalized learning modeling to control creativity and the results of its application in physics learning media lectures.

### 3.1. Forms of Personalized Learning Modeling for Control of Creativity

Personalized Learning for control of creativity (PLC) is reduced from personal learning patterns that have existed before. This is another form of learning that takes into account individual differences and relates them to the development of student creativity. The reduced pattern is from the *Personalized System of Instruction* (PSI), and [10] Individualized Learning (IL) adjusted to the four P creativity as shown in Figure 2.

The lecture system that is designed refers to the Four P strategy (Person, Press, Process, and Product ) on aspects of the creative thinking process which includes fluency (fluency of thinking), flexibility (flexible thinking), originality (original thinking), and elaboration (thinking detail) as a form of control. Munandar [28] explained that the four P's of creativity can be used as a foundation for conceptual frameworks and strategies for researching creativity. This is because creativity can be viewed from a different but interrelated perspective. Systematics of Physics Learning Media lectures is carried out by student group learning styles.

Chang and Hsiao [13] state that sensory experience is related to aesthetics. Students' aesthetics experience Aff their creativity and creative self-efficacy. This shows that there is a relationship between a sensory experience (learning style) and creativity. Creativity is a learning goal that is rarely noticed. For example, only assessing cognitive achievement [29] even though it has paid attention to individual differences (learning styles).

The form of modeling is reduced from the Personalized System of Instruction (PSI) by Fred S. Keller and Individual Training. Weaknesses in both systems are seen in terms of time and class management. PSI pays special attention to each student to master the learning object under their respective speed. If so, then there will be a lot of time needed to follow all the achievements of students who are different for a time as well as psychological for teachers. Besong [12] in a study of psychiatric stresses and time in educational management found a positive relationship between time management and stress levels in the learning process.

In contrast to individual training, it is stated that all students have the same learning experience but with different learning progress. Even though differences in experience let alone correspond to student learning styles can certainly be a support for student success in learning.

The four stages of personal learning to control creativity are Discovery, Task Design (with Problem Based Learning), Development (with Creative Problem Solving), and Monitoring which are presented in Figure 2.

**Discovery**. This learning emphasizes the stages of getting to know individual students. Creativity is related to sensory experience, in this case learning styles. For this reason, the teacher gives a questionnaire to identify the characteristics of learning styles for students and a questionnaire for creativity. The result is obtained the distribution of learning styles that exist in lectures the development of teaching materials. Ie visual 6 people, auditory 6 people, and kinesthetic 4 students.

**Task Design**. This stage uses Learning with Project-Based Learning (PBL) in its implementation. PBL is a learning model that involves students in an activity (project) that produces a product. Student involvement starts with planning, designing, implementing, and reporting the results of activities in the form of products and implementation reports. At this stage students who have been divided into 3 groups according to their learning style study the material on teaching material. The sub-themes studied are Student Characteristics and Material Characteristics. Furthermore, students conduct studies to school to analyze the characteristics of students (with a learning style questionnaire) and find out the material to be studied next (study the curriculum).

Visual learning style gets a project to make a learning video, an auditory student group works on an audio learning development project, and a kinesthetic group designs teaching materials in the form of a practical module.

**Development**. At this stage, the instructor prepares 3 learning media visuals (video learning), auditory (learning audio), and kinesthetic (Module practical instructions). Students learn together with their groups the types of learning media that are appropriate to the type of learning style. For example, a group of students with a visual learning style examines learning videos. The results of this activity will be in the form of an analysis of instructional media, including their advantages and disadvantages. These results are used for the development of teaching materials by students on material that will be taught in classes that have been previously observed.

**Monitoring.** The monitoring phase is assessed by the process of developing teaching materials carried out by student groups to produce a draft product I of teaching materials in the form of learning videos, learning audio, and practicum modules. At this stage also given a questionnaire to monitor the creativity of students.

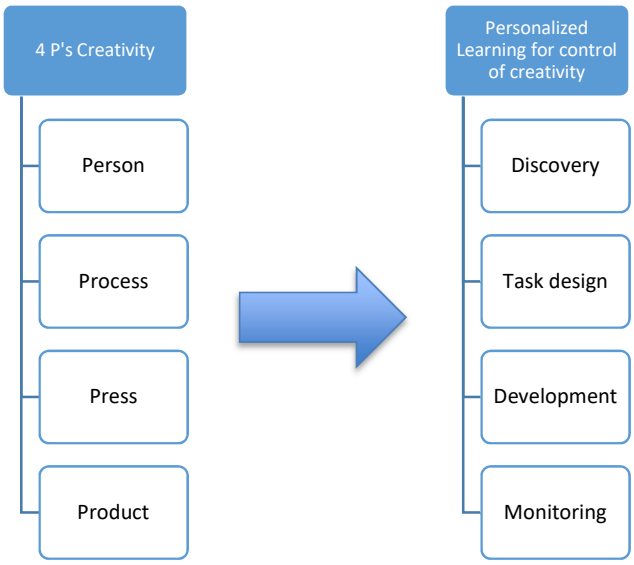


**Figure 2.** The Suitability of Personalized Learning for Control of Creativity with 4 P's Creativity

### 3.2. Results of Application of Personalized Learning Modeling

The results of the identification of learning styles obtained visual characteristics 37.5%, auditory 37.5%, and kinesthetic 25% as shown in Figure 3. While the initial creativity obtained the highest average in the aspect of fluency (43.75%), while the aspects of elaboration (37.5%), flexible (6.25%), and original (12.5%) as shown in Figure 4. Creativity has 4 sequential aspects ranging from fluency, flexibility, elaboration, originality. From the results of the analysis of students' initial creativity, it can be understood that the first level of creativity is already owned by students, namely the ability to provide many ideas in a quick time. While the lowest ability is flexibility, namely the ability of students to use various approaches in solving problems. One way to practice the point of view is through discussion. For this reason, personalized learning modeling for creativity control leads to the collaborative work of students who have the same learning style to develop physics learning media.
From the results of the monitoring stage which assesses the work of student groups based on the criteria of Table 1, it is obtained that the results of the visual student group are categorized as very creative because they meet the flexibility and original aspects. Auditory student groups are included in the creative category by fulfilling aspects of fluency and flexibility (table 2). While the kinesthetic group is included in the less creative category because it only meets the smooth aspects of completing project tasks.

**Table 2.** Analysis results of Creativity in Learning Media Physics

| Group | Aspects of creativity | | | |
|---|---|---|---|---|
| | Fluency | Flexibility | Elaboration | Originality |
| Visual (Video Learning) | not identified | identified | identified | identified |
| Auditory (Learning Audio) | identified | identified | not identified | not identified |
| Kinesthetic (Practicum Module) | identified | not identified | not identified | not identified |

Figure 3 shows that learning styles in class use personalized learning modeling. Besides that, it can be seen that the visual learning style is more owned by women, while the auditory learning style is more dominant in the male group.

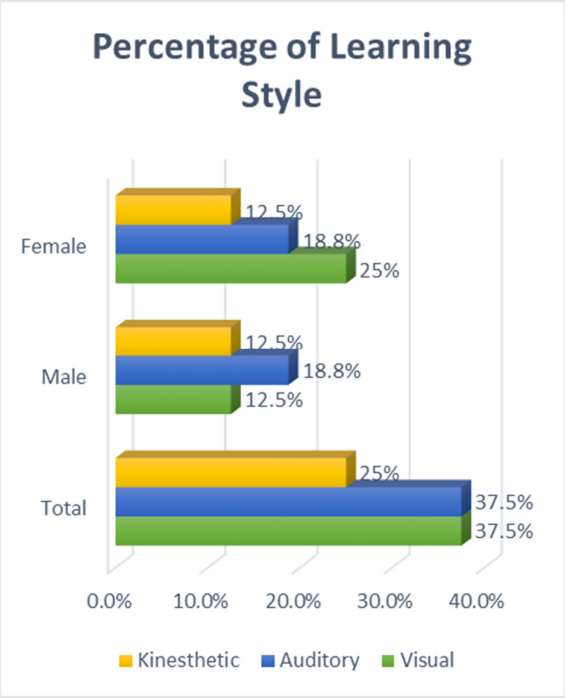


**Figure 3.** Percentage of Student Learning Styles

Figure 4 is the result of an analysis of students' initial creativity. Elaboration ability is higher in women at 31.25%. Whereas in men more smoothly and quickly in completing tasks. This can be seen from the 25% percentage shown while in women only 18.75%.

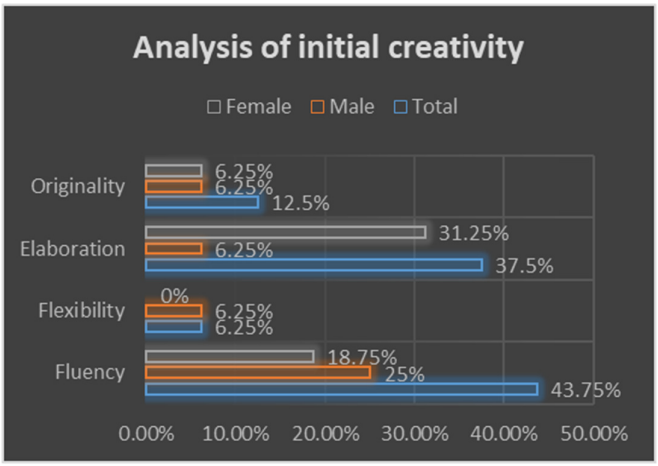


**Figure 4.** Students 'initial creativity

## 4. CONCLUSION

Modeling personalized learning to control creativity is reduced from the form of lectures that pay attention to previous individual needs such as personalized systems of instruction (PSI) and Individualized learning (IL) as other forms of personal learning processes that address problems of time and learning experiences. While discovering the function of learning control on student creativity. The stages of personalized learning modeling are discovery, task design, development, and monitoring.

Students in the classrooms that were tested in this modeling showed the dominant learning styles were visual and auditory. In the media analysis of the results obtained by visual development students with the highest creativity because it meets aspects of novelty and flexibility.

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