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Implementation of Problem-Based Learning Using Mind Mapping and a Growth Mindset in the Covid-19 Pandemic Situation

Sri Siswati[1,*], Elsa Giatri[1], Fahmi Rizal[2], M.Giatman[2]

[1]*Andalas University Padang Indonesia*
[2]*Universitas Negeri Padang, Indonesia*
[*]*Corresponding author. Email:* *Siswati@ph.unand.ac.id*

ABSTRACT
Education data in the world can be seen in the Program for International Student Assessment (PISA). Indonesia in 2018 was ranked 183 out of 189 countries. For thinking ahead or Growth Mindset, Indonesia is ranked 186 out of 189 countries. Education and this way of thinking is quite worrying because it is at the bottom. Human Development Index (UNDP) 2020, Indonesia is in position 107 out of 189 countries with 3 indicators, namely education, health and economy. Facing the 21st century, education is directed at students' creative, critical, communication, collaborative and computational skills, compassion to solve increasingly complex and uncertain problems. This study aims to change the mindset of students into a growth mindset and aims to develop a case-based model with a valid mind mapping, practical and effective by using the 4 skills to solve problems. Research and development method with "Analysis, Design, Development, Implementation, Evaluation" approach . The study showed that student achievement in the experimental class was valid, practical and effective with a score of 82.73 and the control class 69.17. Students are prepared to learn with a growth mindset, the ability to use the left and right brain in a balanced way step by step in learning.

Keywords: *Problem Based Learning, Mind Mapping, Growth Mindset, Thinking 4 C*

1. INTRODUCTION

Educational achievements in the world can be seen from Program for International Student Assessment (PISA) data, Indonesia's position in 2018 was ranked 183 out of 189 countries and this is quite worrying. Meanwhile, in the way of thinking ahead or Growth Mind-Set, it is ranked 186 out of 189 countries. According to the United Nations Development Program UNDP [1] Indonesia is in position 107 out of 189 countries with 3 related indicators, namely education, health and economy. During the COVID-19 pandemic with various policies to save the dangers of the COVID-19 pandemic, there were Large-Scale Social Restrictions (PSBB) policies in various provinces in Indonesia, Limited-Scale Social Restrictions, and finally the PPKM policy or Enforcement of Restrictions on Community Activities.

The Covid-19 pandemic has completely changed our education, where the face-to-face learning system was forced to switch to an online learning system. Developments in the Industrial Revolution 4.0 era, education is faced with challenging conditions known as VUCA (Volatility, Uncertainty, Complexity, Ambiguity). Volatility is an ever-changing state. Uncertainty, is uncertainty in the future, Complexity, which is a very complex problem faced and Ambiguity, which describes uncertainty. Education in the XX1 century requires graduates who have good competence in dealing with the problems above, known as the abilities of Creativity, Critical Thinking, Collaboration, Communication (4C). In line with the need for 4C, it

has also been expanded by adding another 2C to 6C, Computalogic and Compassion.

The learning model began to change according to the demands of learning needs, starting from the change from Teacher Center Learning to Student Center Learning. Learning is no longer from lecturers to students, but occurs in two directions and is more dominant in students. Learning is directed at students' independence to seek knowledge independently and that is made possible by the Internet of Things. Students are free to independently search easily from the e-library what they want to know, learn and implement. Students through cyberspace travel around the world seeking knowledge and thinking creatively and critically, communicating easily and collaborating with various desired networks in solving problems at hand.

Ethics and Health Law are subjects taught in various health study programs such as medicine, midwifery, pharmacy, and public health. This course equips students with material on public health ethics, clinical ethics, professional ethics and research ethics. The competencies expected from the Bachelor of Public Health are Science 40%, Skills 30% and Ethics 30% IAKMI [3]. Learning Ethics and Health Law by using problem-based learning is a necessity in achieving competence. Skills and ethics can be implemented in the Ethics and Health Law course by using the main ideas that will be discussed, either ethics or health law.

Problem-based learning is a learning model whose process requires critical and creative thinking to find solutions in problem solving. This creative thinking requires higher order thinking skills. However, higher-order thinking in question still pays attention to basic abilities. The goal to be achieved from problem-based learning is the ability of students to think critically, analytically and logically to find alternative problem solving through exploration of empirical data to foster scientific attitudes [4][5]. According to Amir [6] the problem-based learning process is not just a procedure, but it is part of learning to manage oneself as a life skill. Understanding Problem Based Learning (PBL) according to Esema et al [7], is a learning approach that uses real-world problems as a context for students to learn. about critical thinking and problem-solving skills, as well as to acquire important knowledge and concepts from learning materials. Therefore, problem-

based learning is expected to train and develop students' abilities to be creative and critical.

Develop higher order thinking skills. According to Resnick & Mathematics [8] higher-order thinking has characteristics, namely: (1) non-algaritic, meaning that the flow of thinking cannot be fully determined in advance, (2) tends to be complex, meaning that the entire flow of thinking cannot be observed from one point of view. course, (3) generates many solutions, (4) involves consideration and interpretation, (5) involves the application of many criteria, which sometimes contradict each other, (6) often involves uncertainty, in the sense that not everything related to the task is known, (7) involves self-regulation in the thinking process, which means that in the process of looking for problem solving, it is not allowed to help others at every stage of thinking, (8) involves searching for meaning, in the sense of finding structure in situations that seem disorganized, (9) requires hard work, in the sense that massive mental effort is required when performing various tasks. types of elaboration and consideration needed.

Studying various adult roles by involving students in real or simulated experiences (adult modeling), helps students to perform in real life situations and learn to perform adult roles. Being a self-study student, does not always depend too much on the lecturer.

1.1. Characteristics of Problem Based Learning Model

Based on the theory explained by Shoimin [9], several characteristics of problem-based learning include (1) Student-centered learning, namely a student-centered learning process, where students are encouraged to be able to develop their knowledge independently. based on constructivism theory, (2) authentic problems, where students need to be presented with real problems (authentic), so students can easily understand the problem and can apply it in real life later, (3) learning occurs in small groups, there needs to be interaction scientific research and brainstorming in developing knowledge collaboratively in small groups with clear division of tasks and formulation of objectives, (4) new information through independent study, where students will try to find new information through various sources in the context of the problem solving process that they do not understand well, (5) the lecturer acts as a facilitator, I emphasize the role of the lecturer as a facilitator and motivator in

the learning process. In addition, the need for lecturers to monitor the development of student activities and will always encourage the achievement of learning targets (learning outcomes).

1.2. Problem-based learning syntax model

The syntax for the Problem Based Learning Model is also known as Seven Jumps Steps [10]. This study uses Seven Jumps Steps which was developed using Mind Mapping. Consists of 7 steps. In Problem Based Learning, there is what is called a tutor and is the basis of problem-based learning. Learning in context, through a collaborative process from not knowing to knowing. The learning method remains centered, namely student-centered learning, independent learning, from small groups and large groups. Small groups can be 2 people or one person depending on the students they are dealing with. In team teaching, if only one lecturer enters, then they can also function as lecturers and tutors. The Seven Jumping Steps are 1) Understanding scenarios and explaining difficult terms; 2) Problem statement; 3) Brainstorming, 4) Analyzing the problem; 5) Studying learning problems, and 5) Looking for references and 6) Synthesizing and reporting.

In learning using Problem Based Learning with seven meetings, students often do not heed these steps so that they seem boring and provide a bad experience. To make it easier to understand, you can see the tables below on the Problem Based Learning model with tutorials. Lecturers usually double as tutors. According to Laksono [11], it can be described in a step flow using seven jumps (Figure 1).
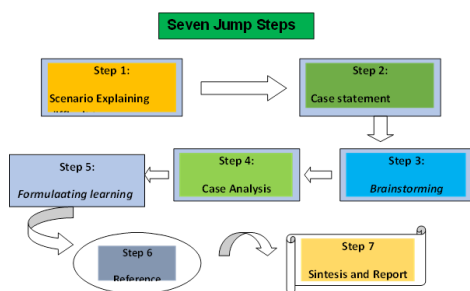

Figure 1 7 jump steps chart

Mind mapping is a process that is used as a model or method, or technique. Usually mind mapping or in Indonesian means mind maps is a creative writing learning technique to make it easier for students to remember the knowledge and information that has been obtained. This method was discovered by Tony Buzan in his book The Mind Book in several of his writings, there are those who direct this mind map as a model, method, technique or tool.

The benefits of using the Mind Mapping technique can make it easier for students to process conceptual information and understand it gradually. In addition, this learning model can be made beautifully and attractively, making it easier to review. Mind mapping also makes it easier for students to remember and view notes holistically, covering all the aspects described. Mind Mapping makes students use the balance of their brains to see the rays of thought and make it easier to find solutions to problems that occur.

2. METHOD

The development of the Problem Based Learning model with Mind Mapping is research conducted in the Ethics and Health Law course at the Faculty of Public Health, Unand in 2020. This model was developed in an effort to achieve higher-order thinking skills. Skills in accordance with the demands of competence in the era of the Industrial Revolution 4.0. This type of research is Research and Development using the ADDIE development model (Analysis, Design, Development, Implementation and Evaluation). This research was conducted based on the Research Master Plan of Andalas University and the Faculty of Public Health. The results of this study will be synchronized with the Case Method Classroom Action Research which is currently being developed at Andalas University. The Case-Based Method is also a Key Performance Indicator for University Leaders in line with the fulfillment of the accreditation form implementation. This study uses the Research and Development approach [12], namely the research method used to produce certain products and test the effectiveness of the method.

This Problem Based Learning Model is trying to be integrated with various other tools that can make this model further improve the thinking skills of high-level students in achieving learning effectiveness, one of which is by using Mind Mapping or mind maps. Buzan Online in his book Mind Mapping Research and Studies says that Mind Mapping is a combination that uses symbols, colors and visual-spatial arrangement, which has been shown to significantly improve a

person's memory of information, compared to note-taking and conventional learning methods.

Eggem & Kauchak [13] in their book Strategies and Learning Models said problem-based learning is a set or teaching model that uses problems as a focus to develop problem-solving skills, materials and self-regulation. Problem-based learning and learning have 3 characteristics described in Scott and Laura's learning. The characteristics of Problem-Based Learning include learning focused on problem-solving, problem-solving responsibility rests with students, and lecturers support the process when students work on problem solving.

The world of education is required to have a high level of education in the era of the Industrial Revolution 4.0. The ability to solve problems, the ability to communicate, the ability to develop soft skills. Thinking is the main process in the human brain from direct learning, and students become Higher Order Thinking called (High Order Thinking Skill).

2.1. ADDIE Development Model

The model and procedure for developing Problem Base Learning based on the main map is carried out using the model (ADDIE) in the image above. Appeared in the 1990s developed by Reiser and Mollenda.
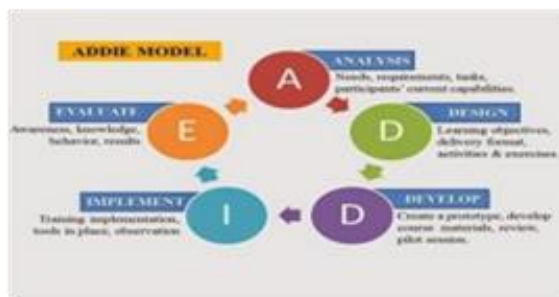

Figure 2 ADDIE development model

2.1.1 Analysis Phase (Analysis)

The activity at this stage of analysis is to find out the components needed at the stage of developing problem-based learning using mind mapping. The mind-mapping process itself is carried out in stages: (1) Determining the characteristics; (2) analyzing student needs (3) "eating a concept map based on initial research, followed by designing a flow chart that provides clear directions for product production; (4) determine the type of media to be developed; (5)

analyze the constraints found; (6) designing assessments to test students' competence. (7) analyze the difference between the control class and the regular class; and (8) consider whether the implementation is virtual or not."

2.1.2. Design

This stage is also known as the design (blueprint) of the "Case or Problem" Based Learning Model using mind mapping on the topic of Public Health Ethics and Public Health Research Ethics. The stages carried out in the design process (1) formulate SMART learning objectives (specific, measurable, applicable, and realistic), (2) determine the appropriate learning strategy to achieve these goals with Focus Group Discussion (FGD).

2.1.3. Development

At this stage of development, it includes a problem-based learning model. It consists of 7 syntaxes and the syntax is known as seven Steps [15]. After going through the analysis and evaluation of learning needs in the Health Ethics and Law course, the above syntax was adjusted by integrating the Mind-Mapping tool into the Problem Based Learning model.

The steps (syntax) of the developed model are: (1) Understanding the "learning process plan that is guided by lesson plans and lecture contracts, (2) Organizing students to learn to look for real problems and how to use mind mapping conventionally or by using Mindmapping, (3) Guiding individual and group problem investigations, (4) Developing and making group work results in problem solving using mind mapping; (5) Analyzing and evaluating the problem solving process using mind-mapping, (6) Looking for references related to problem topics independently and communicating with the group, (7) presenting the results of group discussions using mind-mapping with a moderator and meeting minutes (8) Summarizing the results of the presentation of problem solving and follow-up discussions in the form of a "policy brief" and/or policy.
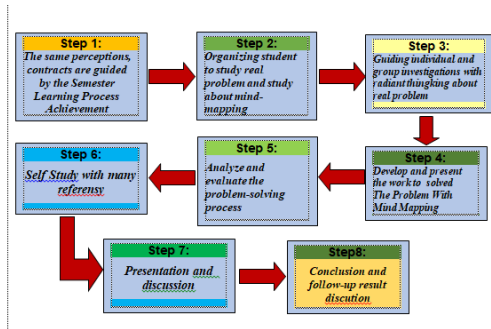
Figure 3 Development of syntax

2.1.4. Implementation

The model "Problem-Based Learning Using the Mind-Mapping Model which has been developed in accordance with the results of the analysis of special needs for the Health Ethics and Law course has been tested for its limited application to the students of the Bachelor of Public Health Program in that semester. July – December 2020, consisting of 1 experimental class and 1 control class. The experimental class carried out the learning process by applying the Problem Based Learning learning model using the mind mapping learning model, while the control class carried out the learning process by applying the learning method which was usually done in the previous law and health ethics lectures.

2.1.5. Evaluation

The evaluation stage in this study was conducted to see the results of the Problem-Based Learning trial using the Mind Mapping Model in the learning being studied. Therefore, all stages of evaluation aim to obtain the feasibility of the final product. This means it's decent in terms of content, design and user-friendliness.

3. RESULTS AND DISCUSSION

3.1. Model Validity

No	Component	Validity	V Model
1	Rational Model	Valid	**0.887**
2	Model Supporting Theory	Valid	**(Valid)**
3	Model Syntax	Valid	
4	Social System	Valid	
5	Reaction Principle	Valid	
6	Support Systems	Valid	
7	Accompaniment Instructional Impact	Valid	

The results of the study were adjusted to the research objectives by looking at the Validation of Model Development. The model was validated theoretically by 5 experts, namely linguists, model experts, vocational technical education experts, content experts, and evaluation experts.

Table 1. Model validity

3.2. Model Practical

Practicality of the Model to determine the practicality of using descriptive statistical analysis with the percentage formula, then converting from quantitative data to qualitative data as shown below with a quality measurement scale based on the following results: 1) 90%-100% Very practical; 2) Practical; 3) Currently, 4) Not Practical and 5) Very Impractical. To see the results of the practicality of the developed model, the following results are obtained in the table below:

Practicality Measurement from 5 experts results from 10 indicators, namely 84 to 96. The average of these results is 89. Based on the data from the assessment results from the Expert group, Peer Lecturers and Students, where the Problem-Based Learning Model Using Mind-Mapping can be concluded as Practical for implementation

Before the t-test was carried out in the control class and the experimental class, a normality test of the data was carried out, both visually the distribution of histogram data, as well as statistical tests "and through the calculation of Zskewness and Zkurtosis. From these results obtained visually normally distributed data, statistical tests (Kolmogorov-Smirnov and Shapiro-Wilk) were normal with sig > 0.05 and data analysis of Zskewness and Zkurtosis calculations was still in the range of ±1.96, declared normal and qualified for the test. t-test.

3.3 Model Effectiveness

To test the effectiveness of the model, the learning outcomes measurement method (CPL) was carried out, namely "through the direct application of the Problem Based Learning Model using Mind-Mapping to students of the Public Health Undergraduate Study Program. The population of respondents was 170 people, and the samples taken were 1 experimental class and 1 control class.

In this study, there were 2 classes, namely the experimental class and the control class, each of which consisted of 41 students. To ensure that the two classes are homogeneous and have the same knowledge of learning materials, a pre-test was conducted for both the control class and the experimental class.

The next stage is the experimental class is given the learning process of Health Ethics and Law through the application of Problem Based Learning using the Mind Mapping Learning Model, while the control class learning process is carried out with the usual learning model through guided group presentations. with topics in the Learning Process Plan. Furthermore, after being given the learning process in the Experimental Class and Control Class, a Post Test was conducted in both classes with the same questions between the pre-test and post-test and between the Experiment class and Control class.

3.3.1 Results of Pre-Test Control and Pre-Test Experiments

The results of the normality test of the experimental class pretest data using SPSS Ver16, at a 95% confidence level, the processed data were obtained as follows. From the results of the visual histogram, it can be seen that the distribution of the data is close to normal, the average value of the pre-test experimental class with 41 students is 60.54 with a standard deviation of 6.797. The histogram image can be seen in the image below. From the results of the normality test of the control class pretest data using SPSS Ver16, at a 95% confidence level, the processed data were obtained from 41 students with an average score of 58.10 with a standard deviation of 6.79242.

3.3.2. Results of the Control Class Post Test and Experimental Post Test

Both classes, both the experimental class and the control class, were given a post test to see the results of developing the PBL model using this mind mapping. From the results of processing the control class post-test scores using SPSS Ver 16, at a 95% confidence level obtained from 41 students, the data obtained an average value of 68.51 and a standard deviation of 4664.34. From the results of processing the post-test scores of the experimental class using SPSS Ver 16, at a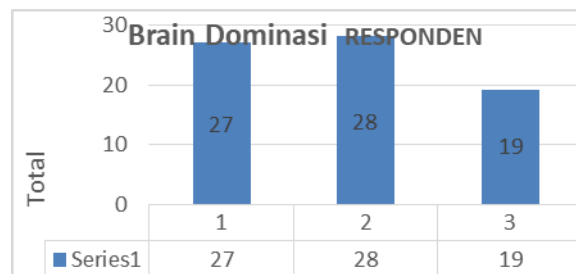 95% confidence level obtained from 41 students, the data obtained an average value of 82.73 and a standard deviation of 5.72287.

3.3.3. Model Effectiveness Test

From the results of the calculation of the post-test value between the experimental class and the post-test control class, there are differences in the results, namely the experimental class 82.73 and the control class 69.17. The pre-test and post-test of the experimental class also showed different results, which were between 82.73 and 60.54. Thus, the use of problem-based learning using the mind mapping model is effective.

3.4. Measurement of Respondents' Creativity

From the results of measuring student creativity in the experimental class and control class using the measurement application in Tony Buzan's book. to see the creativity of a person's genius by answering 10 yes or no questions. The results of the creativity class measurement were filled in by 74 respondents and the results obtained in the table below:

There are 25.67% of respondents who are balanced using the left and right brain.

4. CONCLUSION

Learning using case-solving methods or problem-based learning in principle is also called problem-based learning. This method can improve competence on solving complex cases in the future, creativity and critical thinking, collaboration and communication. Learning uses case solving with Mind-Mapping using an 8-step syntax. In addition, this model is considered valid by scientists, educators, and students who apply it. Problem-Based Learning with Mind-Mapping was also considered practical by the assessment team consisting of experts, peer lecturers and students.

Problem solving-based learning is also considered practical, especially by making cases in the form of mind maps. The learning process using cases that occur in the field with mind mapping has proven to be effective. The specific instructional impact obtained from the Problem Based Learning Model Using Mapping can be trained from linear thinking to luminous thinking. To produce an innovation, people who think creatively are needed. The impact of the accompaniment of the use of problem-based learning models is, summarizing the results of notes, making it easier to remember problems and solving them, generating creativity that results in innovation, not boring and making the brainstorming stage interesting.

Problem Based Learning Model with Mind mapping allows students to learn independently with the right reference and can stimulate creativity and critical thinking through the balance of the left brain and right brain. This model can stimulate the emergence of a growth mindset [16] and is relevant to learning in the era of the industrial revolution 4.0 with its 4 Cs and the era of society 5.0. Through the application of this model, students' abilities will develop a) Identify problems and solutions, b) individual and group investigations c) form group work, d) Analyze, evaluate problem solving, e) Look for related references, f) communicate with groups g) Presentation and h) policy summary . Step by Step mindset can be changed from a fix mind set to a growth mindset.

AUTHORS' CONTRIBUTIONS

All authors contributed to the creation of the article.

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