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Integrating Good Character Values in Mathematics Learning

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Abstract: The general purpose of this study is to integrate good character values in mathematics learning. Beginning with develop teaching material on analytical geometry of flat field. The teaching materials are designed to make the capacity fit the character development. Learning activities are included in the unit of lecture which is designed to facilitate knowledge of moral values, to realize the importance of values and to internalize good character values. The development is based on modified 4-D model consisting of define, design and develop.

Keywords: Integration, good character values, math learning.

INTRODUCTION

The establishment of good and quality character needs to be done in a systematic and continuous way starting from kindergarten to university. For that, character formation must be an integrated part of education. As it is stated by Firdaus Syam, says "Character building wants to restore the paradigm of thinking, so that the students are not only smart, knowledgeable and superior, but also responsible and ethical, this challenge must be answered by any campus" [1].

The emphasis on character building in education is also clearly stated in the description of Indonesian National Curriculum Framework *Kerangka Kurikulum Nasional Indonesia* (KKNI) that "In accordance with the ideology of the State and culture of the Indonesian Nation, the implementation of national education system which is conducted in Indonesia at every level of qualification includes processes that foster affection namely good morals, ethics and personality in the accomplishment of their duties, is able to cooperate and have high social sensitivity and concern for the community and the environment, respect for diversity of cultural, views, beliefs and religions as well as the original opinions/findings of others, etc."

In the purpose of mathematics education, it is "putting the emphasis on reasoning, foundation, and character formation of students as well as putting pressure on skills in the application of mathematics".

The importance of instilling character to learners is also expressed by the humanist Frans Magnis Suseno [2] that "To build the character of learners, it must be supported with critical initiative and give time to those who put forward new ideas". Similarly, Lickona [3] states: "The role of schools as a place of moral education is becoming increasingly important when millions of children get little moral education from their parents and when the meaning of the most influential values which is gained through other worship places is getting meaningless and disappeared of their lives". At this time, when schools do not provide moral education, the influence of violence on children characters so quickly enters and makes the prevailing values become vacuum. "In another part it states that" value education is a work that is very likely to be done."

It is considered that Higher Education has a choice in teaching the formation of characters that can integrate them naturally with the standard curriculum or teach in tandem with the standard curriculum. Instead of adding a series of separate meetings to the curriculum that is already solid, the easy option is to integrate character education with subjects/courses in all classes by all educators [4].

As an institution that produces educational personnel, mathematics education program at FKIP UMSU needs to prepare 21st century mathematics teachers who are not only ready to complete the curriculum (cognitive aspect), but also the character. So that later, they are able to form the next generation characters who can face the challenges of the future that is fast-paced, constantly changing and dynamic.

From the values that are developed above, there are ten characters that are required to be developed in learning. These ten characters are discipline, appearance, politeness, ability to work

together, communication skills, commitment, exemplary, passion, empathy and responsibility. So the purpose of this study is to integrate good characters values in mathematics learning that begins by developing the materials on analytical geometry of flat field.

THEORETICAL STUDY

Character Education in Mathematics Learning

Aristotle [3] defines good character as life by doing the right actions with respect to the person and others. A virtuous life includes self-oriented goodness (such as self-control and moderation) as well as other things-oriented goodness (such as generosity and mercy), and both types of goodness are related. While Koesoema [2] states that character as "the personality is the characteristic of a person who comes from the formations that are received from the environment". In the same section, Winnie states there are two notions of character. First, it shows how someone behaved. Second, it deals with "personality". A person is called character if his behavior is in accordance with moral rules.

So, character is a way of behaving that is the formation of environment. This environment is, such as family, school and community.

Character consists of an operative value, a value in action. We proceed in our character, as a value becomes a virtue, a reliable inner disposition to respond to situations in a way that morally is good.

Character has three interrelated parts of moral knowledge, moral feeling and moral behavior. Good characters consist of knowing good things, wanting good things and doing good things-habits in way of thinking, habits in the heart, and habits in action. These three things are necessary to guide a moral life; they form moral maturity.

Values that are in Mathematics

If it is traced, in mathematics there are three main values, namely practical value, discipline values and cultural values. Basic knowledge of mathematics and skills using it is a necessity. This can be seen in everyday life. To learn about other fields, mathematical help is necessary.

Mathematics is one means to instill the habit of reasoning in the soul. Mathematics is also an exact science, true and always direct to the target. Because of that, it can foster discipline in the soul. To declare the truth or error of the statement, it must have the right reasons. Mathematical reasoning is excellent and is suitable for training the learners' souls for simplicity, accuracy, authenticity, checking and testing results.

Mathematics is created out of necessity and to facilitate problem solving. Values with respect to

cultural values are the development of concentration power, the nature of economics, the ability to express opinions, believe in oneself, the desire to discover, the desire to learn and read and the ability to work hard.

Thus, mathematical learning contributes significantly to the development of good characters. The value of characters that can be developed through mathematics learning is respect, discipline, honest, hard work, creative, curiosity, independent, communicative, responsibility and humility.

Development of Teaching Materials

The purpose of teaching materials preparation are: (1) to provide teaching materials in accordance with the demands of the curriculum by taking into account the needs of learners, that is teaching materials that match the characteristics and settings or social environment of learners; (2) to help learners in obtaining alternative of teaching materials in addition to text books that are sometimes difficult to obtain and (3) to facilitate in carrying out learning.

The principles that need to be considered in the development of learning materials include the principle of relevance, consistency, and adequacy. The principle of relevance implies that teaching material should be relevant or there is a connection to the achievement of competency standards, basic competencies and content standards. The principle of consistency means sharpness. If the basic competency that must be mastered by students is one kind, then the learning materials that must be taught must also include one kind. The principle of adequacy relates to the scope and sequence of learning materials.

Problems of scope, depth, and sequence in delivering learning materials are important. Accuracy in determining the scope, scope, and depth of learning materials will prevent the lecturer from teaching too little or too much, too shallow or too deep. While the precision of the presentation sequence (sequencing) will make it easier for learners to learn the learning materials.

In determining the scope of learning materials, the principles that need to be considered concern the breadth of the material and the depth of the material. The breadth of the material describes how much material which is included in the lesson. While the depth of matter is how detailed the concepts that must be studied/controlled by learners.

Learning materials that have been determined its scope and depth can be sorted through two main approaches, namely: procedural and hierarchical approach. The sequence of learning materials procedurally describes the steps in sequence in accordance with the steps to carry out a task. While the sequence of learning materials hierarchically describes

a sequence of steps from easy to difficult, or from simple to complex. In this study, the preparation of teaching materials use information arrangement model by considering the principle of relevance, consistency, and adequacy.

Integrating Character Values in Mathematics Learning

Integrating character values into mathematical learning in this case is analytical geometry of flat field, starting from planning, implementation, and evaluation of learning. The integration is seen in the implementation of learning at classroom. Integration can be done by adopting several models of learning by considering the material nature on analytical geometry of flat field that is discussed, the characteristics of students and the psychological condition of the students

at the time of the learning and the time of learning is conducted.

In the lesson planning, Semester Learning Plan *Rencana Pembelajaran Semester* (RPS), the unit of lecture including learning activities and teaching materials are designed to fit the character development. The learning activities that are designed are facilitating the knowledge of moral values, realizing the importance of values and the internalization of values.

The development of good character values can work effectively if it is supported by existing components. These components are the students (raw input), the learning process (learning teaching process), facilities and infrastructure (instrumental input) and environment (enviromental input) as it is shown in Figure 1 below" [5].

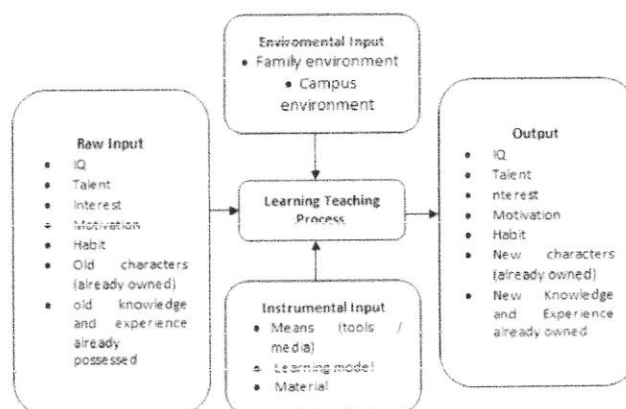


Fig-1: Conceptual framework

The above components are processed in the learning process so as to produce output (students) who have good character. The values of characters that appear as it is stated by the Ministry of National Education are religious, honesty, tolerance, discipline, democratic, meticulous, hard work, creative, curiosity, and responsibility.

RESEARCH METHODS

The type of study is development research. Learning devices are developed in the first year, including RPS (Semester Course Plan/ *Rencana Perkuliahan Semester*), Unit of Lectures and Materials on Analytical Geometry of Flat Field. The development model that is used refers to the modified 4-D model consisting of define, design and develop steps.

At the defining step, the activities focus on the analysis of the situation which is faced by the lecturer, the characteristics of the students, the concepts that are taught and ended with the formulation of learning

objectives. The purpose of this step is to set and to define the requirements of learning production by analyzing the objectives and limitations of learning materials.

Data collection techniques in this study are documentation, obtaining information relating to the integration of good character values in mathematics learning and observation, obtaining information relating to the quality of the implementation in teaching and learning activities and characteristics of students.

Data analysis techniques are done in three steps of data reduction step, data presentation step and conclusion drawing step. Activities in the data reduction step include the process of selecting, focusing, abstracting and formulating all data that is obtained from the field. Data presentation step includes the activities of writing a data set that is arranged / organized in relation to the research question so as it is possible to draw conclusions from the data that has

been collected. Conclusion is based on data reduction and data presentation as the answer to the research problem.

RESEARCH RESULTS AND DISCUSSION

The analytical activities that have been through at this step are the final preliminary analysis, student analysis, task analysis, concept analysis and learning goal setting.

In this final preliminary analysis step, it is conducted curriculum analysis, relevant learning theory and future challenges and demands to make the students which are produced have good character. Thus the description of the learning pattern is considered the most appropriate.

The analysis result on the curriculum of mathematics education in UMSU is obtained the course of analytical geometry of flat field is the basis for programming the course of space analytical geometry, high school mathematics and advanced calculus in the next semester. Therefore, it needs to be a strong emphasis on the importance of the material in this course as a foundation for studying this course. For example, the line on field will underlie the line in space, the vector on field will underlie the vector in space, the circle will underlie the ball, the parabola will underlie

the parabolite, the ellipse will underlie the ellipsoid, and the hyperbole will underlie the hyperboloid.

An analysis of the secondary school curriculum relates to analytical geometry of flat field is also conducted. The result of the deepening to the secondary school materials, first the related material is the location of points on the field of cartesian coordinates and polar coordinates, vectors on field, lines on field, circle, parabola, ellipse and hyperbola. The depth of the discussion on material of circular, parabola, ellipse and hyperbola is only to the tangents in those places of position.

In the teaching materials that have been compiled, in addition to accommodating secondary school materials relate to the analytical geometry of flat field above, it is also considered that this course is the foundation for deepening courses of space analytical geometry, calculus and secondary school mathematics. So the depth of the material is also highly regarded. For example, the material of circle comes to the discussion of circle file. While on parabola, ellipse and hyperbola, the discussion is up to the point and polar line to parabola, ellipse and hyperbole. Even on hyperbole teaching materials, the discussion goes to the vocal hyperboles. Thus, based on curriculum analysis, the analytical geometry of flat field is as in table 1 below.

Table-1: Achievements of Course and Indicators of Field Analytical Geometry

Achievements / <i>Capaian Pembelajaran</i> (CP) of Course	Indicator
Material: Coordinate System 1. Determine the location of the point on the coordinate plane. 2. Calculate the distance between two specified points. 3. Determine the coordinates of the points on the line through the two specified points. 4. Determine the location of the point on the polar coordinates.	• Accuracy to describe the point on field of the Cartesian coordinate and the Polar Coordinate. • Accuracy to calculate the distance of two points. • Accuracy to determine the location of points on the polar coordinate field
Material: Vector on Field 1. Determine the vector location. 2. Determine the multiplication result on two vectors scalar. 3. Determine the vector equation of a straight line.	• Accuracy to determine the vector equation of a straight line.
Material: Equation of Straight Line 1. Develop equation of a straight-line. 2. Identify the position of two straight lines. 3. Calculate the distance of points and lines. 4. Determine the angle between two lines. 5. Determine the meeting point of two lines. 6. Determine the equation of line beam.	• Accuracy to formulate a straight-line equation • Accuracy to identify the position of two lines. • Accuracy to calculate the distance of point and line • Accuracy to determine the angle between two lines • Accuracy to determine the meeting point of two lines
Material: Circle 1. Develop equation of circle. 2. Determine the tangent to the circle. 3. Arrange the polar line. 4. Determine the power of a point on the circle. 5. Draw a power line. 6. Determine the power point. 7. Identify Position of Two Circles.	• Accuracy to arrange the equation of circle. • Accuracy to determine the tangent to the circle, the power of a point on the circle, the polar line, the point of power and the power line. • Accuracy to identify the position of two circles
Material: Ellipse 1. Develop equation of ellipse. 2. Sketch the ellipse chart. 3. Determine the tangent to the ellipse. 4. Determine Polar Points and Lines	• Accuracy to arrange equations of ellipse • Accuracy to sketch ellipse • Accuracy to compose tangents on the ellipse • Accuracy to determine polar points and lines to an ellipse.
Material: Parabole 1. Develop equation of parabole 2. Sketch the parabole chart 3. Determine the tangent to the parabole. 4. Polar Points and Lines	• Accuracy to arrange equation of parabole • Accuracy to sketch of parabole charts • Accuracy to determine the tangent to the parabole. • Accuracy to determine polar points and lines to a parabole
Material: Hyperbole 1. Develop equation of hyperbole 2. Sketch the hyperbole chart. 3. Determine the tangent to the hyperbole. 4. Determine Polar Points and Lines 5. Determine the same hyperbole	• Accuracy to arrange equation of hyperbole. • Accuracy to sketch of hyperbole chart. • Accuracy to determine the equation of tangents to hyperbole • Accuracy to determine polar points and lines to a hyperbole. • Accuracy to determine the same hyperbole

The analysis of student characteristics is done by observation to students who have the course on analytical geometry of flat field in the even semester of academic year 2016/2017. Observations are conducted for one semester. The analysis result of student characteristic are: a) The background of understanding on the concept to analytical geometry of flat field is very low; b) After attending lectures for seven meetings, the movement of understanding is not as it is expected. This appears on the midterm exam in which the score of most students is below 60; c) The tendency to follow the completion of the examples is greater than the effort to attempt in solving in their own way the questions that are given in analytic geometry courses. Thus, students tend to be less motivated to be creative; d) At the time of presentation, only few of the students who attempt to master the material on analytical geometry of flat field that is assigned to their group; e) Students' ability to describe the graphs of ellipse, parabola and hyperbola is lacking. Especially, if the centers of such position places are not at the origin point; f) the ability to prove theorems in analytical geometry of flat field is lacking.

The result of observations on the characteristics of students is in accordance with the results of classroom action research which is previously conducted by Panggabean [1]. In cycle I with Line on Field, it is found that

"Most of the students still have difficulties in understanding the lecture material, the difficulty is seen from the mistakes of students in answering the result test of learning. The errors are then identified and the result is as follows.

- False in determining the meeting points to X axis and Y axis, consequently false in drawing a straight line graph in the coordinate field.
- Be able to specify meeting points but false in placing the points on the coordinate field.
- Some students can specify the line meeting point to either X or Y axis but not both. In this case the student forgets the theorem that states "from two points can be made one line".
- False in determining the straight line gradient. The result is false in calculating the angle which is formed by two straight lines.
- Be able to determine the line gradient but false in the procedure of determining the angle which is formed by two lines.
- False in the procedure of determining the distance of point to lines.
- Correct in the procedure of determining the distance of point to line but the final result is negative.
- False in writing the equation of line mark.

Similarly in cycle II. The findings, some students still have difficulty in understanding the circle material. This is shown by mistakes which are made by

students in completing the test of learning results, namely:

- In determining the equation of a circle through three points, student can write 3 equations with 3 unknown numbers but can not solve the system of linear equations.
- False in determining the circle radius and center.
- False in determining the equation of the tangent line which is parallel to the Y axis, parallel to the X axis and the equation of tangent at a specified point.

Based on the analysis result of student characteristics and the results of the above study, to facilitate and to improve the students' ability in understanding a concept, to describe the cone graphs, to prove the theorem and to integrate good character setting, it is compiled the teaching material on analytical geometry of flat field analytical after preparing the semester learning plan, unit of lecture. The preparation is done after analyzing the concept and tasks analysis that must be done by the students.

Relevant concepts which will be taught based on the analysis results are as in Table 1 above. Based on the table, a concept map is created for each subject.

The identification results of the main tasks / skills which are undertaken by the students during the learning are then analyzed into a more specific sub skill framework. In accordance with the study materials that are selected is Analytical Geometry of Field I then based on the syllabus it gets learning achievement as follows.

S9: Demonstrate a responsible attitude towards the work of his expertise field independently.

P1: Mastering the concepts and principles of pedagogy, mathematical didactic and mathematical science to perform planning, management, implementation, evaluation, and using IPTEKS that is oriented on Life Skills (IPTEKS).

KUI: Able to apply logical, critical, systematic, and innovative thinking in the context of scientific or technological development or implementation that cares and implements the value of humanities which is appropriate to their expertise field.

KKI: Able to apply the concepts and principles of pedagogy, mathematics didactic and mathematics science to perform planning, management, implementation, evaluation, by using IPTEKS (life skills) that life skill-oriented.

Task analysis can also be seen as in table 1 above.

The series of indicators on learning outcomes achievement later become the learning objectives that are the basis in preparing the design of teaching materials. While Semester Learning Plan (RPS) includes learning activities and teaching materials are designed so that the content in accordance with the development of good characters. Learning activities are designed to facilitate knowledge of moral values, to realize the importance of values and the internalization of good character values. Learning Plans, unit of lectures and courses on analytical geometry of flat field can be seen in the appendix.

During this study, the outcomes that have been achieved are Semester Learning Plan / *Rencana Pembelajaran Semester* (RPS) which is based on KKN1, contract design of lecture, unit of lecture and teaching materials of analytical geometry on flat field along with the draft of scientific articles. All of them can be seen in the attachment.

The teaching materials that have been prepared are the teaching materials of Coordinate System. Coordinate system consists of Cartesian and Polar Coordinate System, teaching materials of vector on fields, teaching materials of straight line on fields, teaching materials of circle, teaching materials of ellipse, teaching materials of parabola and teaching materials of hyperbola.

These teaching materials are arranged chronologically, by topic or by improvement in the skill or complexity step. Teaching materials allow students to learn a competence coherently and systematically so that they are accumulatively able to master all the competencies as completed and integrated. Teaching materials are packed in such a way that students are expected to have an interest in mathematics. This will motivate them not to miss mathematical concepts.

In the opening section of each teaching material, researcher incorporates a concept map of each subject and mathematician who becomes the inventor of each concept which is discussed.

The purpose of concept maps drafting is so that students can remember the concepts as well as interconnectedness of concepts in analytical geometry of flat field. While the purpose of the inclusion on mathematics history, to make students understand the process of concept formation which is being discussed. The connection with character is that by knowing this, students will be more motivated and prefer to study math and will always try hard to understand the concepts in mathematics.

The compiled teaching materials refer to the competencies to be achieved, in accordance with the characteristics of the objectives and the demands of

learning problems solving. With compiled teaching materials, students are expected to be prepared to study at their own speed and they can even be an independent learner.

Other factors to consider are the use of language, the use of illustrations or examples, and presentation. In order for the message can be digested properly then it is used the language which is effective, communicative and dialogical. While the appropriate illustrations or examples are included with the purpose of supporting the delivery on material better. Illustrations are images, schemes, self-made tables to clarify messages, vary and motivate.

At the unit of lecture, several models, strategies and approaches are included. But the lecturer should still consider some things when they will choose the model, strategy or approach. Each lecturer can select and develop a distinctive individual learning model by taking into account the characteristics of the student including the student's psychological condition, the nature of the material to be discussed or taught and the time of learning.

In the unit of lecture, it is also considered the knowledge, skills and attitudes that students bring to class, including initial thoughts and misperceptions that they have.

There are ten characters that are required to be developed in the implementation of learning in the classroom. These characters are written on the unit of lecture. These ten characters are discipline, appearance, politeness, ability to work together, communication skills, commitment, exemplary, passion, empathy and responsibility. The development of the assessment criteria for these ten characters is submitted to the lecturer.

In units of lecture, several models, approaches and strategies that influence the character formation which are mentioned earlier are also listed. Some of the models, approaches or strategies that influence character formation are Problem Based Instruction (learning based on problems), Contextual teaching and learning, concept map-assisted MASTER Strategy, class discussions, cooperative learning and others.

Problem Based Instruction is an effective approach for teaching high-level thinking processes. This learning helps learners to process the ready-made information in their minds and to develop their own knowledge of the social world and its surroundings. Even Resnick [7] states that the problem-based learning model is essential to bridge the gap between formal school learning and more practical mental activity which is encountered outside of school.

The main features of this model are the posing of questions or problems, focusing interdisciplinary linkages, authentic investigations, cooperation and producing work and demonstrations. With these characteristics, learning with PBL approaches, the aspects of beliefs such as self-esteem, optimistic, objective, responsible, rational and realistic can be developed [6].

The concept map-assisted MASTER strategy is also worth considering. The result of class action research which is conducted by Panggabean [1] shows that student activity during learning of Analytical Geometry on Flat Field by applying concept map-assisted MASTER Strategy shows an increase of each cycle. Developing concept maps requires students to identify and to organize information and to build relation between parts of the information. Students also create a knot that shows a concept and the concepts are linked using lines, which are labeled to show the relation between concepts. This will naturally help students understand the interconnectedness of concepts. They can even see a wider connection between ideas and learn them as a cohesive unity.

Contextual teaching and learning (CTL) which is constructivistic, is also an appropriate learning approach to analytical geometry on flat field. With seven major components, namely constructivism, inquiring, inquiry, learning community, modeling and authentic assessment, this approach helps students to search for relation of mathematical concepts with their sensible and useful environmental situations. The researcher's reason for contextual teaching is the teaching that enables learners to strengthen, extend, and apply their academic knowledge and skills in a variety setting of inner and outer class.

In addition to these elements, the characteristics of CTL are collaboration, mutual support, fun, integrated learning and use of various sources. These things will result in a deep knowledge base of which students are rich in understanding the problem and how to solve it.

Cooperative learning also teaches the value of character and academic as well. This strategy involves students working in collaboration to achieve common goals. This learning is structured in an effort to increase student participation, to facilitate students with leadership experience and to make decisions in groups, and to provide opportunities for students to interact and to learn together with students of different backgrounds.

The more specific advantages are (1) cooperative learning teaches the values of cooperation; (2) cooperative learning builds community in the classroom; (3) cooperative learning teaches basic life skills that is to work together to achieve common goals;

(4) cooperative learning improves academic achievement, self-esteem [3].

The learning of class discussion model is the suggested approach in unit of lecture. Two aspects of classroom discussion are the ability to develop cognitive growth and the ability to connect and to incorporate cognitive aspects and social aspects of learning.

Discussion is a situation in which students and lecturers, or between students and other students talk to each other and share ideas and opinions. Lecturer will understand what is in the student's mind and how to process ideas and information which is taught through the communication that occurs during the learning takes place. Questions which are posed to stimulate discussion are the questions with high cognitive level. Thus, the Discussion System is central to create a positive learning environment.

CONCLUSION

Learning that integrates good character works through the content of the material in learning. The process of integrating good character begins with the planning step. This planning can be seen in the semester learning plan, unit of lecture and teaching materials that will be used in the classroom, the implementation step is during lecturing and evaluation step.

Because the process of integrating a good character can work effectively if it is supported by all learning components such as, the input component which is the student itself, the input instrumental component which is in the form of supporting facilities and the input environmental components which is environment, then in subsequent research, teaching materials will be validated by the experts before it is being used on small class trials and real classes. The integration of good characters is done in the implementation of learning.

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