Analysis of Students' Affective Character in Microbiology Class Through Mini Research Based on Learning Model

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Abstract— **Microbiology materials are taught with mini-research patterns, namely observation of bacterial colonies, fungal characteristics, bacterial staining, bacterial biochemical tests, and bacterial identification. The purpose of this study is to describe the character of students related to the affective abilities of students in microbiology. The research sample was taken from random sampling with 200 students. Data obtained through Likert scale questionnaire in the form of percentage techniques. The results obtained a score of 3.60 included in the category very well, responding obtained a score of 3.55 including the category very well, valuing obtained a score of 3.25 included in the good category, the organization obtained a score of 3.40 including the category good, and characterization obtained a score of 3.35 including in the good category. Affective domain indicators are obtained through: honest indicators 78.82% (enough), 82.26% responsibility (good), 91.24% cooperation (very good), respect for others 82.84% (good), and always do good 92.38% (very good).**

Keywords—character; affective; microbiology; mini research.

I. INTRODUCTION

A person who has good behavior and implements it in the daily activities can be considered to have a good character. This character can be formed from the learning process and the environment. A person's character can be properly seen from society's view in their environment. Education is a conscious effort to build a person's character so that he has the right behavior.

The microbiology students who are learning through mini-research patterns are not only expected to obtain high cognitive abilities and good skills, but also a good character. Having a good character is part of being an affective person. Character measurement is very important to determine the success of learning programs, including in microbiology class. Character measurements can be done by observing the students while studying in class, during practices, when conducting mini research, and in the campus yard. But to gain a holistic understanding, interviews and questionnaires are needed.

Following the enactment of the new curriculum at Universitas Negeri Medan (Unimed), since 2016 the Indonesian National Qualification Framework (INQF) has been implemented (Unimed Rector's Decree, 2016). This new curriculum implements a pattern of six types of tasks, namely: Routine Tasks (RT), Critical Books Report (CBR), Critical Journal Review (CJR), Mini-Research (MR), Engineering Ideas (EI), and Project (P). Thus, in microbiology class, this pattern of six kinds of assignments is also applied, with an active student approach, and using various kinds of learning resources. This is also in line with Unimed's motto as character-building university.

Microbiology courses are taught to 6th-semester students which are compulsory courses for students. This microbiology course is taught in integrated lectures and practices with a weight of 3 credits. The material taught to students concerns: Microbiology Concepts and Development, Basic Microbiology, Microbial World, Microbial Characteristics, Microbial Classification, Microbial Growth and Reproduction, Microbial Measurement, Microbial Physiology, Microbial Genetics, Water Microbiology, Soil Microbiology, Environmental Microbiology, and Industrial Microbiology.

Reference [1] stated that there are five affective domains, namely: receiving (attending), responding, valuing, organization, and characterization. The highest effective domain rank is the characterization of a complex value. In this ranking, students have a value system that controls behavior until a certain time to form a lifestyle. Learning outcomes in this ranking are related to personal, emotional, and social.

Learning that is oriented towards student activity and using diverse learning resources, will be more meaningful for students in character formation. Students can interact with lecturers and students' orders and at least can do some good character indicators as follows: honesty, integrity, fairness, freedom, and cooperation. But in this study indicators related to moral character include honesty, responsibility, cooperation, respect for others, always wanting to do the best.

Based on the explanation above, the questions of this research are: (1) How does the character description relate to students' attitudes toward microbiology, student interest in microbiology, student self-concepts formed from studying microbiology, and the values students have from studying microbiology with apply to learn mini-research patterns? And (2) How is the moral picture related to honesty, responsibility, cooperation, respect for others, want to always do good in

microbiology lectures by applying the learning process of mini-research patterns?

II. METHODS

The research method used in this research is quantitative descriptive, although many data obtained are of qualitative data, but interpreted using numbers. This research was conducted on as many as 200 students from 260 students of the Biology Department, Faculty of Mathematics and Natural Sciences Unimed. The sample is determined by a random sampling technique because all samples are of the same and homogeneous characteristics. Microbiology learning carried out in this study has occurred without manipulation, namely by using learning based on mini-research patterns to all populations and research samples.

Mini research patterns conducted for all students who receive microbiology lectures. Microbiology material is carried out with a mini-research pattern, namely: (1) Identification of Bacteria from the front yard of the Microbiology Laboratory; (2) Identification of Mold from the front yard of the Microbiology laboratory; (3) Identification of fungi that grow on a variety of food scraps; (4) Microbiological examination of various drinking water sources; (5) Microbiological examination of food snacks: (6) Biochemical Tests of various bacteria captured from free air around the microbiology laboratory room; (7) Effect of bean type and wrapper type on Tempe quality; and (8) Test various natural ingredients as antimicrobials.

Data about student characters are obtained by using observations while students are in class, in the laboratory, on the campus yard, in the campus canteen to see student behavior in applying microbiology lectures. Data was also obtained by using interviews with students to ascertain their character. To measure quantitatively, data were obtained using a questionnaire. Data were analyzed using percentage techniques to measure the tendencies of students according to their character. Data is presented in the form of frequency tables

III. RESULT

TABLE I. CHARACTER OF STUDENT ATTITUDES IN LEARNING MICROBIOLOGY

No	Behavior	Categorization (%)			
1	Read microbiology books at home	always 46.50 very good	often 33.34 good	rarely 20.16 enough	never 0 poor
2	Study microbiology diligently	always 44.28 very good	often 36.68 good	rarely 19.04 enough	never 0 poor
3	Interaction with microbiology lecturers	always 45.21 very good	often 40.55 good	rarely 14.24 enough	never 0 poor
4	Interaction with student assistants	always 52.25 very good	often 42.28 good	rarely 5.47 enough	never 0 poor
5	Doing routine tasks	always 46.50 very good	often33.34 good	rarely 20.16 enough	never 0 poor
6	Doing CBR	always 44.28 very good	often 36.68 good	rarely 19.04 enough	never 0 poor
7	Doing CJR	always 45.21 very good	often 40.55 good	rarely 14.24 enough	never 0 poor
8	Doing MR	always 52.25 very good	often 42.28 good	rarely 5.47 enough	never 0 poor
9	Doing EI	always 44.28 very good	often 36.68 good	rarely 19.04 enough	never 0 poor
10	Doing Project (P)	always 45.21 very good	often 40.55 good	rarely 14.24 enough	never 0 poor
11	Discussion of microbiology	always 52.25 very good	often 42.28 good	rarely 5.47 enough	never 0 poor
12	Has a microbiology book	more than 20 pieces 16.20 very good	between10-20 pieces 22.21 good	between 2-10 pieces 46.24 enough	only 1 and has no 15.35 poor

In Table I, there are twelve behaviours on the character of students' attitudes in learning microbiology, those behaviours are distinguished into four categorizations namely always, often, rarely and never. The twelve behaviours are read microbiology books at home, study microbiology diligently, interaction with microbiology lecturers, interaction with student assistants, doing routine tasks, doing CBR, doing CJR, doing MR, doing EI, Doing Project (P), discussion of microbiology and has a microbiology book. The percentage of every categorization has the same average number. This

description will describe behaviour categories from the highest to the lowest category. The first behaviour is interaction with students' assistants. There are 52.25% students who are categorized as having very good interaction with the students' assistants. There are 42.28% students who are categorized as having good interaction with students' assistants. There are 5.47% students who are categorized as having enough interaction with students' assistants. And there is no student who is categorized as never having interaction with students' assistants. The second behaviour is doing Mini Research. There are 52.25% students who are categorized as having very good attitude in doing Mini Research. There are students who are categorized as having very good attitude in doing Mini Research. There are 36.68% students who are categorized as having good attitude in doing Mini Research. There are 5.47% students who are categorized rarely doing Mini Research. And there is no students categorized as having poor attitude in doing Mini Research. The third behaviour is the having discussion of microbiology. There are 52.25% students who are categorized as having very good discussion of microbiology. There are 42.28 students who are categorized as having good discussion of microbiology. There are 5.47% students who are categorized as having only enough discussion of microbiology. And there is no students who have poor discussion of microbiology. The fourth behaviour is reading microbiology books at home. There are 46.50% who are categorized as having very good habit of reading microbiology books at home. There are 33.34% students who have good habit of habit of reading microbiology books at home. The fifth behavior is doing routine tasks. There are always 46.50% students who are categorized as having very good habit of doing routine tasks. There are often 33.34% students who are categorized as having good habit of doing routine tasks. There are 20.16% students who are categorized as having only enough habit of doing routine tasks. There is no students who are categorized as having no habit to do routine tasks. The sixth behavior is having interaction with microbiology lecturers. There are 45.21% students who are categorized as having very good interaction with microbiology lecturers. There are 40.55% students are categorized as having good interaction with microbiology lecturers. There are 14.24% students who are categorized as having rare and only enough interaction with microbiology lecturers. There is no student categorized as having no interaction at all with the microbiology lecturers. The seventh is doing Critical Journal Review. There are 45.21% students who are categorized as having very good habit of doing Critical Journal Review. There are 40.55% students who are categorized as having good habit of doing Critical Journal Review. There are 14.24% students who rarely do Critical Journal Review. There is no students categorized as never doing Critical Journal Review. The eighth behavior is studying microbiology diligently. There are 44.28% students who are categorized as always studying microbiology diligently. There are 36.68% who are categorized as having good habit of studying microbiology diligently. There are 19.04% students who rarely have the habit of studying microbiology diligently. And there is no student categorized as having no habit at all in studying microbiology diligently. The

ninth behavior is doing Critical Books Report. There are always 44.28% students who are categorized as having very good habit in doing Critical Books Report. There are 36.68% students who are categorized as having good habit in doing Critical Books Report. There are 19.04% students categorized as rarely doing Critical Books Report. No student is reported as not having the habit of habit in doing Critical Books Report at all. The tenth behavior is Engineering Ideas. There are 44.28% students are categorized as having very good habit of Engineering Ideas. There are often 36.68% students are categorized as having good habit in Engineering Ideas. There are 19.04% students who are categorized as rarely do Engineering Ideas. No student is categorized as not having the habit of Engineering Ideas at all. The eleventh behavior is Doing Project (P). There are 45.21% students who are categorized as having very good habit of doing project. There are 40.55% students who are categorized as having good habit of doing project. There are 14.24% students who rarely do projects. No student is categorized as having no habit of doing project at all. The twelfth behavior is having microbiology book. There are 16.2% students reported to have more than 20 pieces of microbiology books and thus categorized very good. There are 22.21% students who reported to have between 10-20 pieces, and thus categorized as good. There are 46.24% students reported to have only 1 microbiology book, and thus categorized as only enough. And there are 15.35% students admitted that they do not have microbiology book at all and thus categorized as poor.

TABLE II. STUDENT'S INTEREST IN STUDYING MICROBIOLOGY

No	Behavior	Categorization (%)			
1	Microbiology is useful for learning success	always 44.40 very good	often 31.43 good	rarely 21.17 enough	never 0 poor
2	Students try to understand microbiology courses	Always 44.22 very good	often 35.6 good	rarely 20.05 enough	never 0 poor
3	Students enjoy reading books related to microbiology	always 46.21 very good	often 41.54 good	rarely 12.25 enough	never0 poor
4	Students ask in class on microbiology lessons	always 50.26 very good	often 43.26 good	rarely 6.48 enough	never 0 poor
5	Students try to understand microbiology by asking whom even.	always 43.41 very good	often 35.42 good	rarely 21.17 enough	never 0 poor
6	Students doing microbiology assignments	always 48.36 very good	often 34.59 good	rarely 17.05 enough	never 0 poor

In Table II, there are six types of behaviours that reflect the student's interest in studying microbiology. The first behaviour is having the attitude that microbiology is useful for learning success. The second behaviour is trying to understand microbiology courses. The third behaviour is enjoying reading

books related to microbiology. The fourth is students ask questions in microbiology class. The fifth is students try to understand microbiology including trying to get further information by asking friends and other parties. And the last is students do microbiology assignments. From table II above, it can be observed that 50.26% of the students always ask questions in class on microbiology lessons, 43.26% of them often ask questions in class on microbiology lessons, and 6.48% of them rarely ask questions in class on microbiology lessons, but none of them never ask questions in class on microbiology lessons. Concerning the second behavior, 46.21% of the students always enjoy reading books related to microbiology, 41.54% often enjoy reading books related to microbiology, and 12.25% of them rarely enjoy reading books related to microbiology. With the third behavior, 44.40% of the students always believe Microbiology is useful for learning success, 31.43% of the often believe Microbiology is useful for learning success, and 21.17% of them rarely believe Microbiology is useful for learning success. On the fourth behavior, 44.22% students claim they always try to understand microbiology, 35.6% claimed they often try to understand microbiology, and 20.05% of them say they rarely try to understand microbiology. With the fifth behavior, 43.41% of the students state they always try to understand microbiology by asking around, 35.42% of them state they often try to understand microbiology by asking around, and 21.17% of them rarely try to understand microbiology by asking around.

TABLE III.   STUDENT SELF CONCEPTS

No	Behavior	Categorization (%)			
1	Microbiology is felt very difficult for students	always 40.54 very good	often 38.31 good	rarely 21.15 enough	never 0 poor
2	Students feel its superiority because it has a strong physique	always 46.25 very good	often 35.69 good	rarely 20.06 enough	never 0 poor
3	Students find it easy to memorize microbiology lessons	always 47.25 very good	often 39.42 good	rarely 13.33 enough	Never 0 poor
4	The weakness of students is the ability to communicate	always 54.47 very good	often 41.35 good	rarely 4.38 enough	Never 0 Poor
5	Students feel happy by doing skills activities in microbiology lectures	always 49.54 very good	often 31.31 good	rarely 19.15 enough	Never 0 poor

Table III is about student's self-concepts. There are five behaviors proposed to measure the students' self concept, namely students feel microbiology is very difficult for students, students feel its superiority because it has a strong physique, students find it easy to memorize microbiology lessons, students feel they have weakness in communicating, students feel happy in doing skills activities in microbiology lectures. In the first behavior, 54.47% of the students always assume

microbiology is very difficult for students; 41.35% often assume microbiology is very difficult for students, and 4.38% assume microbiology is very difficult for students. With the second behavior, 49.54% of the students state they always feel happy in doing skills activities in microbiology class, 31.31% of them state they often feel happy in doing skills activities in microbiology class, and 19.15% of them state they rarely feel happy in doing skills activities in microbiology class. On the third behavior, 47.25% of the students always find it easy to memorize microbiology lessons, 39.42% of them often find it easy to memorize microbiology lessons, and 13.33% of them rarely find it easy to memorize microbiology lessons. Concerning the fourth behavior, 46.25% of the students always feel its superiority because it has a strong physique, 35.69% often feel its superiority because it has a strong physique, and 20.06% rarely feel its superiority because it has a strong physique. With the fifth behavior, 44.40% of the students always think Microbiology is useful for learning success, 31.43% of them often think Microbiology is useful for learning success, and 21.17% of them rarely think Microbiology is useful for learning success.

TABLE IV.   VALUE WHICH IS OWNED BY STUDENTS WHEN STUDYING MICROBIOLOGY

No	Behavior	Categorization (%)			
1	Students believe that their learning achievement is difficult to improve	always 50.37 very good	often 35.45 good	rarely 18.20 enough	never 0 Poor
2	Students believe that the lecturer performance is maximum	always 46.64 very good	often 33.17 good	rarely 20.19 enough	never 0 Poor
3	Students believe that learning microbiology can change life behaviors	always 44.15 very good	often 42.72 good	rarely 13.13 enough	never 0 Poor
4	Students believe that the results obtained in microbiology lectures are due to luck	always 51.17 very good	often 44.47 good	rarely 4.36 enough	never 0 Poor
5	Students believe that the mini research conducted will get high achievements.	always 51.62 very good	often 30.23 good	rarely 18.15 enough	never 0 Poor

Table IV is about value owned by students when studying microbiology. There are five behaviours concerning this value, namely: students believe that their learning achievement is difficult to improve, students believe that the lecturer performance is maximum, student believe that learning microbiology can change life behaviours, students believe that the results obtained in microbiology lectures are due to luck and students believe that the mini research conducted will get high achievements. From Table IV, it can be observed that 51.62% students always believe that the mini research conducted will

get high achievements, 30.23% often believe that the mini research conducted will get high achievements, and 18.15% rarely believe that the mini research conducted will get high achievements. Concerning the second behavior, 51.17% of the students always believe that the results obtained in microbiology lectures are due to luck, 44.47% of them often believe that the results obtained in microbiology lectures are due to luck, and 4.36% of them rarely believe that the results obtained in microbiology lectures are due to luck. With the third behavior, 50.37% of the students always believe that their learning achievement is difficult to improve, 35.45% often believe that their learning achievement is difficult to improve, and 18.20% rarely believe that their learning achievement is difficult to improve. On the fourth behavior, 46.64% of the students always believe that the lecturer performance is maximum, 33.17% of them often believe that the lecturer performance is maximum, and 20.19% of them rarely believe that the lecturer performance is maximum. And with the fifth behavior, 44.15% of the students always believe that learning microbiology can change life behavior, 42.72% of them often believe that learning microbiology can change life behavior, and 13.13% of them rarely believe that learning microbiology can change life behavior.

TABLE V. STUDENT CHARACTERISTICS RELATED TO MORALS

No	Behavior	Categorization (%)			
1	Honest	always 5.06 very good	often 16.12 good	rarely 78.82 enough	never 0 poor
2	Responsibility	always 16.25 very good	often 82.26 good	rarely 1.49 enough	never 0 poor
3	Cooperation	always 91.24 very good	often 7.22 good	rarely 1.54 enough	never 0 poor
4	Respect for others	always 15.82 very good	often 82.84 good	rarely 1.34 enough	never 0 poor
5	Want to always do good	always 92.38very good	often 7.24 good	rarely 0.38 enough	never 0 poor

Table V is about students' characteristics related to moral. There are five behaviors stated above, namely honest, responsible, cooperative, respectful, and wanting to do good. From Table V, it can be observed that 92.38% of the students always want to always do good, want to always do good 7.24% students often want to always do good, and 0.38% students rarely want to always do good. In terms of cooperation, 91.24% students stated they are always cooperative, and only 1.54% of students stated they rarely want to always do good. In terms of responsibility, 16.25% students state they are always responsible, 82.26% state they are often responsible, and 1.49% state that they are rarely responsible. In terms of honesty, 5.06% of the students state that they are always honest, 16.12% state they are often honest and 78.82% stated they are rarely honest. In terms of respecting others, 15.82% of the students state that they always respect others, 82.84% state they often respect others, and 1.34% state they rarely respect others.

IV DISCUSSION

The attitude of students in learning microbiology tends to be positive. This research shows that students are very responsive in learning microbiology. They have goodwill in learning. Moreover, learning activities using mini-research patterns. The attitude of students in doing assignments is felt to be very meaningful to obtain high achievement. Mini research patterns build the attitude of students diligently reading, observing, classifying, designing experiments, conducting experiments, collecting data, analyzing data, concluding, and communicating reports. Learning patterns with mini-research are in line with the paradigm of active learning for students. This is in line with various views of education experts who are involved in the active learning paradigm, such as [2] with a contextual approach, [3] with an inquiry approach, [4] with a discovery approach.

The positive attitude from students is formed in communicating with lecturers and student assistants in learning microbiology through this mini-research pattern. Students tend to show a goodwill attitude in establishing this communication. This is also in line with the results of [5] which states that learning carried out with a constructivist paradigm will provide positive meaning in conducting communication. It can be realized that the mini-research pattern is constructivism because it encourages students to build their knowledge.

The results of this study also show that the mini-research pattern encourages students to behave like a scientist. The attitude is shown by students in microbiology lectures that they have diverse learning resources. They have textbooks and students are diligent in reading and reviewing journals. This attitude is in line with the thought of [6] and also [7] which states that students who have a diligent attitude to read help them to have bright ideas.

Student interest has a high intensity in obtaining better results. Students do the assignments with pleasure. They have high enthusiasm for understanding lecture material by diligently asking questions. The ability to ask questions that are continuously carried out consistently will produce quality questions that weigh. This can be seen that by learning this mini-research pattern, students are motivated by asking questions. By asking this question, students' interests become better for activities. Reference [8] also has a similar opinion, which states that learning designed with inquiry activities will build good activities for students.

The students' self-concept in this study is found to be positive. Learning with a mini-research pattern builds students to have positive self-concepts. Lecturers can provide further motivation for self-concepts owned by this student. If a student's self-concept is found to be still low, motivation is applied to the student. Motivation by lecturers is very important to get self-concepts like better students. For lecturers, it can be assumed that planting self-concepts for students are a primary need. This is in line with the opinion of [9] which states that lecturers provide primary competence in motivating students.

The learning process is basically to strengthen the values possessed by students. In this study, I obtained good grades owned by students in microbiology lectures with the application of the INQF curriculum. The implementation of the INQF curriculum is for students to prepare them to be able to compete globally. This is in line with [10] and [11] which states that INQF can shape values for students in responding to global challenges and strengthen the affective domain that is not only cognitive and skills.

Student character is related to morals, such as honesty, response, cooperation, respect for others, and always want to do good in this research tends to be good. Students are trained to do high honesty by learning mini-research patterns. Students are accustomed to compiling reports of what happened. Thus, it can be stated that the moral status of students is better by implementing the INQF curriculum with a mini research-based learning pattern. This supports government policy in implementing the INQF curriculum in tertiary institutions [12, 13, 14].

IV. Conclusion

Microbiology learning by applying the Indonesian national qualification framework curriculum and a mini-research learning pattern has a positive impact on the affective domain of students. Students formed positive characteristics related to attitudes, interests, self-concepts, and values. With the implementation of the new curriculum in microbiology lectures through mini-research learning patterns have a positive impact on honesty, responsibility, cooperation, respect for others, and always want to do well. These characters are needed in developing students who will become the hope of the nation to lead Indonesia in the future.

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