# Development of Case Method and Team Based Project Based Textbooks to Improve Students' Science Process Skills in Plant Morphology Courses

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**ABSTRACT**

Textbooks are books that teachers and students use in learning activities.Textbooks contain learning materials and instructional learning activities that are in accordance with the learning plan that has been prepared by the teacher. Textbooks based on Case method and team-based projects can direct students to carry out several science process skills that are integrated into the learning activities contained in the textbook.This study aims to determine the role of Plant Morphology textbooks based on case methods and team-based projects in improving the science process skills of Biology students. This type of research is descriptive quantitative. This Plant Morphology textbook was developed using the ADDIE development model with stages of analysis, design, development, implementation and evaluation and has been tested for its feasibility. The subject of this study is a plant morphology textbook based on case methods and team-based projects used in learning plant morphology courses. The object of the study is the science process skills of Biology students at the State University of Medan which include ability interpret, predict, analyze data, group, design, conclude and communicate. The results of the study showed that the average value of the ability to interpret 79.4 (high), predict 78.4 (high), analyze data 79.6 (high), group 78.9 (good), design 80 (good), conclude 86 (very good), communicate 86.5 (very good). The number of students who have science process skills with a good category is 90.9% and those who have a less good category are 9.1%.

**Introduction**

According to the Directorate General of Higher Education, a textbook is a book used as a reference in lectures compiled by experts in their fields. A textbook is a teaching material that has components of learning outcomes which are instructional objectives; a logical and systematic description of the material and instructions for implementing learning tasks, both theoretical and practical, which refer to the learning outcomes set; a summary and exercises/evaluations. With these textbook components, it is clear that textbooks have an important role in a learning process. Textbooks used in teaching and learning activities can make students active in the teaching and learning process, help students find, prove and develop concepts, improve their ability to analyze data, design skills, investigate and other science process skills.

Textbooks in accordance with curriculum demands and are able to increase student activity, motivation and learning outcomes are the answer to problems that arise in learning (Rahmi et al., 2014). Furthermore, he said that the use of textbooks can motivate students to learn independently so that lectures can be more effective and efficient. This is because textbooks contain work methods that directly involve students in carrying out lecture assignments that have been packaged in the textbook. Pasandaran, RF et al. (2018) stated that textbooks can build students' overall abilities in various aspects such as learning independence, reasoning, the ability to investigate and solve problems

Case method is a problem-solving learning method (Sukadinata and Syaodih, 2012), students are directed to be able to solve a problem. Case method is a participatory learning method based on discussion to solve cases or problems. The application of this method can help students hone and improve critical thinking skills to solve problems, communication skills, collaboration, and creativity. Case method is a constructivist learning method, is a learning that provides opportunities for students to build their own knowledge.

Learning method team base project or can also be said project based learning is a learning method that involves students in designing, creating and displaying products to solve a problem. The role of the instructor/lecturer in this learning method is as a facilitator/intermediary to obtain optimal results according to the imagination, creativity, and innovation of the students. Like the case method, team base project is also constructivism. Murfiah (2017) stated that Project Based Learning is a learning method that uses problems as an initial step in collecting and integrating new knowledge based on their experience in carrying out their activities in real terms.

In learning by applyingcase method and team base project learning methods students are led to carry out science process skills such as analyzing, predicting, discovering, evaluating, designing, concluding, and collaborating. These science process skills can shape the character of students who are skilled, creative, innovative and also cooperative, because learning is done in teams or groups.

Science process skills are abilities in science learning that must emerge and be developed so that students can better master a concept, can solve a problem and then be able to design science products. According to Turiman et al. (2012), science process skills can be divided into basic process skills and integrated process skills. From the following explanation, several examples of science process skills are presented, such as observing, measuring, summarizing, predicting, communicating and classifying, including basic process skills. While integrated process skills, for example, include:; identify variables, create graphs, create tables, describe relationships between variables, design investigations, analyze investigations.

Plant morphology is one of the courses in the Biology Department of FMIPA Unimed, both in the Biology Education study program and in the Biology Study Program. According to Riastuti (2021), Sunarso et al. (2022); Tjitrosoepomo (2005); Tunny, R (2022), the plant morphology course discussesPlant Morphology discusses the morphological characteristics of roots, stems and leaves (properties, parts, shapes, types, etc.); morphological characteristics of flowers (uniflora, multiflora, single flowers, compound flowers, flower formulas, flower diagrams); morphological

characteristics of fruits and seeds (parts, types, etc.); morphology of metamorphosis organs of roots, stems and leaves in Spermatophyta plants and terminology in plant morphology.

In learning plant morphology, textbooks are very necessary because in addition to making learning activities more focused and systematic, textbooks can also foster and improve students' science process skills. It has been explained that ideally, textbooks should contain learning outcomes, descriptions of materials along with learning activities, summaries and exercises/evaluations. The learning outcomes listed in the textbook serve as a reference for what material will be described and also as a reference in designing learning activities both in theory and practice classes.

The Key Performance Indicators (KPI) of Higher Education, especially in the 7th KPI, state that collaborative and participatory classes can be realized through the case method and team-based project learning methods (Directorate General of Higher Education, 2021). The case method and team-based project learning methods can improve critical, creative and innovative thinking skills in thinking and acting in students. Critical, creative and innovative thinking in thinking and acting are products of high science process skills. It is assumed that textbooks based on the case method and team-based project will be able to improve science process skills. Likewise, plant morphology textbooks designed based on the case method and team-based project, especially in their learning activities, will be able to improve students' science process skills in plant morphology lectures.

**Research method**

This type of research is descriptive quantitative. This Plant Morphology textbook was developed using the ADDIE development model with stages of analysis, design, development, implementation and evaluation and has been tested for its feasibility. The subject of this research is a plant morphology textbook based on the case method and team base project used in learning the plant morphology course. The object of the research is the science process skills of students majoring in Biology at the State

University of Medan which include ability interpret, predict, analyze data, group, design, conclude and communicate. The research instrument is in the form of a descriptive test.Science process skills data were obtained from the results of science process skills tests.

Science process skills score = $\dfrac{\text{Score obtained}}{\text{Maximum score}}$ X 100

Data on students' science process skills were obtained from the results of the science process skills test. The criteria for science process skills can be seen in the following table.

Table 1. Criteria for science process skills

| Ability Level | Criteria Score |
|---|---|
| Very Bad | <65 |
| Not good | 65 - 74 |
| Good | 75 - 84 |
| Very Good | 85 -100 |

(Sugiyono, 2008)

**Results and Discussion**

Plant morphology textbooks based on case method and team-based projects have been developed using the ADDIE development model (analysis, design, development, implementation, evaluation). Based on the results of the analysis of PTN IKU and curriculum achievements: to realize the 7th IKU and to realize Learning Outcomes at level 6 of the KKNI, it is necessary to develop textbooks that accommodate case method and team-based project learning activities..in accordance with theSemester Learning Plan (RPS). Based on the results of the analysis of textbook needs, it is necessary to develop a plant morphology textbook that contains learning activities by integrating student assignments including Critical Book Report (CBR), Critical Journal Review (CJR), Mini Research, Idea Engineering, Project Assignments and Routine Assignments, all of which are based on the case method and/or team-based project.

The design of the textbook is adjusted to the RPS for plant morphology courses which are based on the case method and team-based project. The number of chapters in the book is 11 according to the number of sub CPMKs in the RPS.In each chapter of the book, learning outcomes, material presentations, summaries and exercises/evaluations are presented. At the

beginning of the material presentation, a discourse is presented as a trigger to lead to the material according to the learning outcomes. To further improve mastery of the material, in the material presentation section in each chapter of the book, there are learning activities based on the case method and team-based projects that are integrated with student assignments.CBR, CJR, Mini Research, Idea Engineering, Project Assignments and Routine Assignments. Plant morphology textbooks have been validated for their eligibility based on aspects of their material, learning and book design. Case method and team base project based textbooks are declared feasible for use in plant morphology learning.

To see the science process skills (SPS) of students in plant morphology lectures, plant morphology textbooks based on case methods and team-based projects were implemented in learning, and the results obtained were as can be seen in the following table.

Table 2. Student KPS using textbooks case method based and team based project

| KPS | Average | Value category |
| --- | --- | --- |
| Interpreting | 79.4 | Good |
| Predict | 78.4 | Good |
| Analyzing data | 79.6 | Good |
| Grouping | 78.9 | Good |
| Designing | 80 | Good |
| Conclude | 86 | Very Good |
| Communicating | 86.5 | Very Good |

The results of the study showed that the use of plant morphology textbooks based on case methods and team-based projects in lectures resulted in an average value of the ability to interpret data of 79.4 (high), predict 78.4 (high), analyze data 79.6 (high), group 78.9 (good), design 80 (good), conclude 86 (very good) and the ability to communicate 86.5 (very good).

To see more clearly the comparison of values between the types of KPS mentioned above, please see Figure 1 below.

Figure 2. Diagram of average KPS values in lecture plant morphology
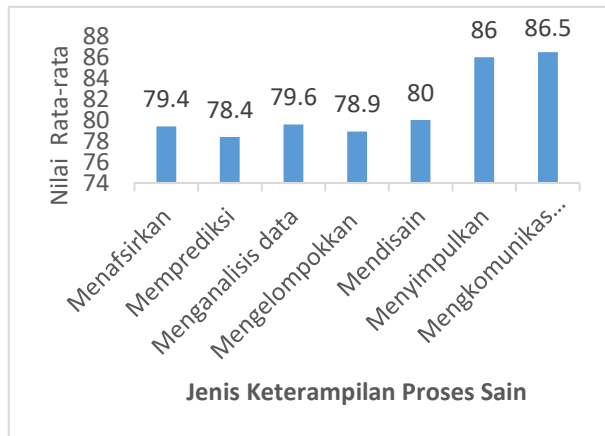


The average KPS value data above was obtained from 33 students. Students who have science process skills with a good category in the 7 science skills above are 90.9% (30 students) while those who have a less good category are 9.1% (3 students), no students get less or very good scores. All of the science skills above are obtained by students through the "learning activities" section listed in the plant morphology textbook based on the case method and team-based project. In addition, also through the "exercise/evaluation" section in the textbook. Learning activities and exercises/evaluations are always in each chapter of the book (there are 11 chapters in the book). So many science skills are done repeatedly by students because these skills are alternately in each chapter of the book.

The science skills of interpreting, predicting and analyzing data are obtained by students in practical learning activities, in idea engineering tasks and mini research. In practical learning activities through case methods and team-based projects, students are trained to interpret, predict and analyze data. The three science skills are also obtained by students through the practice/evaluation sections in each chapter of the book, although not always at the same time.

Design science skills are obtained by students in learning activities through project assignments with the team-based project method. Students are trained in groups to analyze a learning topic according to learning outcomes and then design a lecture product that is assigned. All student activities are listed in the learning activities section in detail.

The science skills of grouping are acquired by students mainly in practical learning activities.namely during the activity of differentiating, revealing the characteristics of plant organs, finding similarities and in the activity of comparing. In addition, also in the practice section in several chapters of the book.

Rustaman (2005) said that the skills Grouping includes several activities such as looking for differences, contrasting characteristics, looking for similarities, comparing, and looking for the basis for classification.

The science skills of concluding are obtained by students in almost all learning activities written in each chapter of the book. The skills of concluding are in every practical learning activity and theory class through various tasks, namely assignments.CBR, CJR, Mini Research, Idea Engineering, Project Assignments and Routine Assignments which are all based on case method and/or team based projects.

Science communication skills are acquired by students in all learning activities in each chapter of the book through various lecture assignments. In each learning activity, whether through the case method or team-based project, students communicate the results of their group assignments in groups at the end of the activity before concluding the activity. These communication skills are also demonstrated in a power point portfolio, creating and reading graphs/tables/diagrams from the results of an experiment or case study results. Rustaman (2005) stated thatreading graphs, tables or diagrams from experimental results including communicating.

So all the science skills above can be obtained by students through all learning activities in all chapters of the plant morphology book based on the case method and team-based project. In addition, some science skills are also obtained in the practice/evaluation section in each chapter of the book. All learning activities listed in the textbook are based on the case method and/or team-based project.

## Conclusion

The plant morphology textbook based on case method and team based project was developed using the ADDIE development model with stages of analysis, design, development, implementation and evaluation and has been tested for its feasibility. The feasibility test of the textbook based on the material aspect, learning aspect and design aspect of the textbook shows that the plant morphology textbook based on case method and team based project is suitable for use in plant morphology lectures. The use of plant morphology textbooks based on case method and team based project in plant morphology lecturesshows that the average value of students' science process skills is in the good and very good categories with details of the average value of the ability to interpret 79.4 (high), predict 78.4 (high), analyze data 79.6 (high), group 78.9 (good), design 80 (good), conclude 86 (very good), communicate 86.5 (very good). The number of students who have science process skills in the good category is 90.9% and those who have the less good category are 9.1%.

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