

# Development of Inquiry Learning Model-Oriented Learning Tools on Plant Tissue Structure and Function Materials to Train Students' Creative Thinking Ability

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**Abstract:** This research is a development research that aims to produce learning tools in the form of Learning Implementation Plans (RPP), Student Worksheets (LKPD) and Creative Thinking Tests oriented to inquiry learning models that are, practical and effective, so that they can be used in the learning process. The results showed that the quality of the products produced based on practicality aspects in limited trials met very practical criteria with an average value of 95. In the broad trial it met very practical criteria with an average score of 100 and the response assessment of learners got a score of 50 on the limited trial and a score of 101 on the broad trial. The results of the creative thinking test field test are limited to the average value of the pretest answers, namely the Elaboration indicator at 5.3%, then the Fluency indicator at 3.3%, then Flexibility at 3.1% and the lowest is Originality at 0.2%. The average results of the post-test answers to students' creative thinking ability in the limited test found that the most percentage was the Fluency indicator at 15.9%, then the Elaboration indicator at 12.6%, then Flexibility at 6.3% and the lowest was Originality at 1%. In the main field test, the average value of the pretest answer is the Fluency indicator of 2.9%, then the Elaboration indicator of 2.6%, then Flexibility of 2.4% and the lowest is Originality, which is 0.1%. The average result of the post-test answers to the creative thinking ability of students in the main field test was found that the most percentage was the Fluency indicator of 5.2%, then the Elaboration indicator of 4.8%, then Flexibility of 3.9% and the lowest was Originality, which was 1%.

**Keywords:** Creative thinking; Inquiry; Learning tools

## Introduction

Teaching and learning activities are a means for teachers to teach and educate students in delivering the material to be studied. Therefore, the thing that needs to be considered is the selection of the right learning model. Asyafah (2019) suggests that a learning model is defined as a systematic design or steps that can be used in compiling curriculum, materials, regulating student activities, providing instructions for teachers, setting up learning, creating a supportive learning environment, directing to expected goals, and evaluating them (measuring, assessing, and providing feedback). The selected learning model must be in accordance with the basic competencies,

indicators and learning objectives in accordance with the material taught.

Student learning outcomes are the output of the teaching and learning process (Djononiarjo, 2020). The way teachers teach and carry out learning models greatly affects the results achieved by students. Improper selection of learning models can reduce the motivation of learners' learning in the classroom and students can find it difficult to understand a material being taught. This kind of problem often becomes an obstacle during the learning process.

One of the right learning models that can make students motivated in the classroom is the Inquiry learning model. A study on human biology and medical students conducted by Rodriguez et al. (2019) on developing research skills and creative thinking through

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open IBL courses shows that students who take inquiry-based learning courses think that inquiry-based learning stimulates their creative thinking, where they feel better able to determine the topic of their research proposal. Ulandari et al. (2019) found that the inquiry learning model was effective to improve the students' mathematical creative thinking skills.

Inquiry-based learning is an instructional approach where students become the center of learning by utilizing meaningful tasks such as cases, projects and research to situate learning (Avsec et al., 2016). Inquiry learning model is a learning model that requires students to conduct an investigation. The investigation in the Inquiry learning model is to invite students to identify problems in the surrounding environment that have to do with the subject matter so that students can be invited to think creatively. In learning, students cannot be independent without the guidance and direction of the teacher to guide students towards the ideal learning process (Jundu et al., 2020). The teacher in the classroom acts only as a facilitator who creates an active, creative and fun learning process. This activity requires students to analyze the results of the investigation carried out by the group by being given an activity sheet that is still relevant to the results of the investigation to be done independently.

Marwiyah et al. (2015) explained that the creative thinking ability of students in science subjects still requires practice and development with the aim of making students accustomed to answering questions that can train creative thinking skills. Creative thinking is one of the higher-order thinking processes that must be developed and trained in students. In essence, creative thinking is related to the discovery of something, about the discovery that is newly produced using something that already exists. Haryanti et al. (2019), creative thinking is a thought that seeks to find a new idea. Creative thinking is a series of processes, in understanding the problem, making hypotheses about the problem, looking for answers, finding evidence, and finally reporting the results. Creative thinking is becoming one of the most sought-after life and work skills of the 21st century (Ritter et al., 2020).

Creative thinking helps students create new ideas based on their knowledge to solve problems from different points of view. According to Munandar (2009), the factor that can improve students' creative thinking ability is with teachers provide support to students so that students are more motivated to be active by using a variety of learning models and by using the formulation of questions that can develop creative thinking skills.

The creative thinking ability of students can be trained by providing questions that can measure the creative thinking skills of students themselves. One of

them is the essay question instrument that makes students give creative answers. According to Sekar et al. (2015) that in an effort to develop creative thinking skills, teachers must cultivate an attitude of curiosity in students, provide challenges to students, foster a sense of dissatisfaction with existing ones, foster confidence that problems can be solved, and teach the ability that problems can definitely be solved.

The results of observations at SMPN 1 Bolangitang Timur School, students have not been able to answer questions that contain the concept of creative thinking. The efforts made in overcoming this are by developing inquiry-based learning tools to train creative thinking skills both in the form of pretests and post-tests as well as questions in LKPD. This is done so that students can think actively and creatively in learning. Based on these problems, the author is interested in conducting research with the title "Development of Learning Tools Oriented to Inquiry Learning Models on Plant Structure and Function Materials to Train Students' Creative Thinking Ability".

## Method

This type of research is development research. Research and development (R&D) is a research method used to produce products, test products and test the effectiveness of certain products (Sugiyono, 2019). This research was conducted at SMPN 1 Bolangitang Timur in the odd semester of the 2021–2022 academic year. The target of the research was for field trials limited to class VIII as many as 1 class which was divided into 2 small classes at SMP Negeri 1 Bolangitang Timur and for the main field trials carried out in class VIII as many as 2 classes at SMP Negeri 1 Bolangitang Timur.

The research design used is pre-experimental designs. The pre-experimental form of designs used is the one group pretest and posttest design model. The stages in conducting research are shown in Figure 1.

The instrument in this study is a practicality test sheet consisting of a learning implementation sheet, a student activity sheet, a student response questionnaire, and a practicality test sheet using a creative thinking test sheet. This study uses creative thinking indicators according to Munandar (2009) consisting of fluency thinking, elaboration thinking, original thinking, flexible thinking.

The technique of analyzing data on the practicality of learning tools by analyzing learning implementation sheets, to assess the implementation of learning by teachers in accordance with the criteria made. This observation uses the answer "YES" or "NO". Analysis of student activity can be known from the results of observations on students as a whole according to the

number of students that have been determined. Assessment of student activities in the form of a checklist. The scoring of student activities is assessed using a score scale of 1 to 4. Student response questionnaires are given during limited-scale trials. The results of the learners' responses were then analyzed using the Guttman scale. Analysis of students' creative thinking result sheets is filled in according to creative thinking indicators. The ability to think creatively, researchers use PAP type 1 because it can be done by students and not comparing a learner to a classmate.

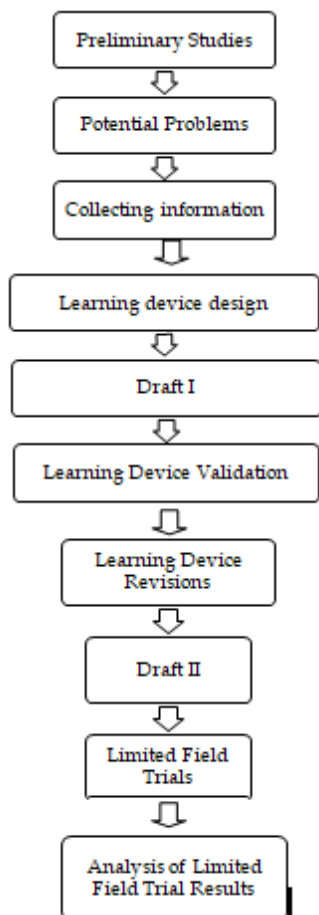


Figure 1. Chart of the stages of research implementation

## Result and Discussion

The Results of the Analysis of the Practicality of Learning Tools Oriented to Inquiry Learning Models to Train Creative Thinking Skills

### *The Results of Learning Implementation Analysis*

This limited trial 1 was carried out in class VIIIa of SMPN 1 Bolangitang Timur as many as 15 students. Limited trials are carried out with the aim of obtaining an assessment of the implementation of learning. The assessment was carried out four times according to the number of meetings planned in this study. The results of

the calculation of the practicality criteria for the implementation of limited trial learning 1 by the observer as a whole obtained a varied total score (X), at meeting 1 = 83, meeting 2 = 88, meeting 3 = 94, and meeting 4 = 100. It is these values that define the practicality assessment category with an assessment aspect of 18, an ideal highest score of 100 and an ideal lowest score of  $\leq 40$ . So the overall practicality criteria score interval at the four meetings came in the range of 81-100 in the very practical category.

Based on the results of the assessment of learning implementation from the observer, the practicality criteria for the implementation of learning oriented inquiry learning models are in the very practical category with a total score (X) that varies from each meeting. Here's a graph showing the results of his assessment.

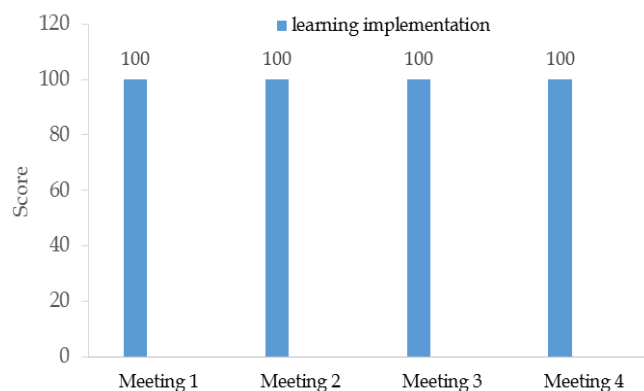


Figure 2. Graph of the result assessment learning implementation of learning by observers in limited field tests 2 (small class)

Assessment of the implementation of learning by observers has the aim of obtaining practicality value as one of the requirements in development research. The thing that becomes a reference for the assessment is all activities listed in the learning implementation plan starting from preliminary activities, core and closing activities. The results of the observer assessment in the limited trial obtained an average score of 96 and in the broad trial obtained an average value of 100. Both trial results obtained very practical criteria. The learning implementation plan developed oriented to the inquiry learning model can motivate students to be actively involved in problem solving. Rinarta et al. (2014) the implementation of good learning is closely related to the role of the teacher in guiding students in the teaching and learning process, providing motivation and encouragement to students to learn actively.

### *Results of Student Activity Analysis*

Assessment of student activities was carried out four times according to the number of meetings planned

in this study. The results of the calculation of the activity criteria of the learners of the limited trial 1 by the observer as a whole obtained a total score (X) which varied, at meeting 1 = 75, meeting 2 = 81, meeting 3 = 100, meeting 4 = 100. It is these values that define the practicality assessment category with an assessment aspect of 16, an ideal highest score of 100 and an ideal lowest score of ≤ 40. Overall practicality criteria score interval at the four meetings came in the range of 81-100 in the very practical category.

Based on the results of the assessment of student activities from the observer on the criteria for student activity-oriented inquiry learning model is in the very practical category with a total score (X) that varies from each meeting.

Assessment of student activities by observers has the aim of obtaining practicality value as one of the conditions in development research. This assessment is very necessary to determine the behavior of students during the teaching and learning process. The results of the observer assessment in the limited trial obtained an average score of 90.5 and in the broad trial obtained an average score of 85. Both trial results obtained very practical criteria. In general, students have curiosity about the problems around them. This attitude of curiosity will help smooth the teaching and learning process. Sanjaya (2009) stated that education basically provides a learning experience in order to develop the potential possessed by students, through interactions between students, between students and teachers and between students and their environment.

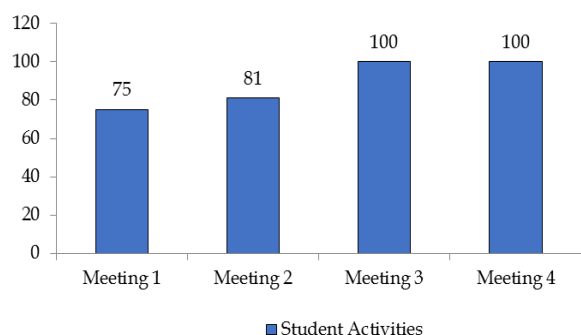


Figure 3. Graph of the results of the limited trial student Activity assessment 2 (small class)

Student Response Analysis Results

Assessment of learners' responses to learning Assessment of learners' responses to learning was carried out in class VIIIa (limited test) with a total of 15 students that differed from the previous trial. This assessment has a score range of 1-4 with weighting strongly agree (4), agree (3), disagree (2) and disagree (1). The total number of assessment aspects was 15, 6 respondents on the criteria

strongly agreed, 8 respondents on the criteria agreed and 1 respondent on the criteria dissented. The highest weighting per criterion score is on the criteria of strongly agreeing with the value of 24, the criterion agreeing with the value of 24 and disagreeing with the value of 2, thus the result of the student response is 83%. So that the assessment of the practicality of learning tools comes in the range of 75-85, by agreeing.

Based on the assessment above, it shows that students in the limited trial of 2 classes VIIIa strongly agree that the inquiry learning model-oriented learning tool developed by researchers is used at SMPN 1 Bolangitang Timur to train students' creative thinking skills on the structure and function of plant tissues. The following is a graph of learners' responses to the limited trial 2.

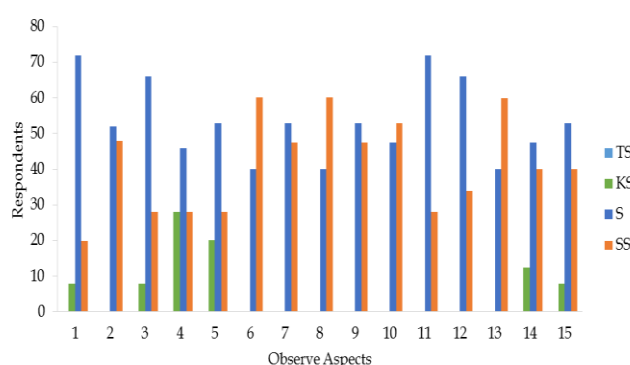


Figure 4. Graph of learner response to limited trial 2s (small class)

Learning tools have an important role for a teacher before starting the learning process. Learning tools are things that must be owned by teachers in the learning process so that the implementation of learning is more directed to achieve the expected learning objectives (Rasyid, 2017). To prepare various learning activities in the classroom, teachers should compile learning tools to support the learning process (Fatkhurrohman et al., 2017). From the student response data taken through the questionnaire, especially the use of LKPD products, the average score for the limited trial was 48 and the average score for the broad trial was 99. This shows that learners have a positive response to inquiry learning model-oriented learning tools. Fadilah et al. (2017) said that learning tools that use inquiry learning models are very important in training students' thinking skills in learning.

Ngalimun (2017) suggests that the purpose of the inquiry learning model is to help students in discipline, train intellectual skills in identifying problems and can find their own answers so that students can solve problems found in learning. Irham et al. (2017) suggest that the general ability of learners can be interpreted as individual comparative achievements in various tasks, for example the ability of individuals to solve problems. Furthermore, according to Purba (2020) is said to be

feasible to be implemented in the classroom if an assessment of the validity, effectiveness and practicality assessment of students and teachers has been carried out.

*Effectiveness of Inquiry Learning Model-Oriented Learning Tools to Train Creative Thinking Skills*

*Results of the assessment analysis of creative thinking*

Assessment of learning outcomes to see the creative thinking ability of students in limited trial 2 was carried out in class VIII of SMPN 1 Bolangitang Timur, the number of students in class 15 people was different from the previous trial. The average result of the pretest answers to the creative thinking ability of students in the limited trial 2 was found that the most percentage was the Elaboration indicator at 5.4%, then the Fluency indicator at 3.3%, then Flexibility at 3.3% and the lowest was Originality at 0.4%. The average result of the post-test answers to the creative thinking ability of students in the limited trial 1 was found that the most percentage was the Fluency indicator of 16.1%, then the Elaboration indicator of 14.4%, then Flexibility of 6.1% and the lowest was Originality of 1.2%. A comparison of the results of the pretest and posttest of the limited field test based on creative thinking indicators can be seen in figure 5.

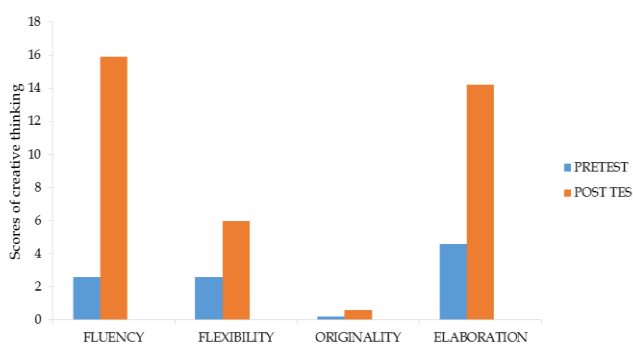


Figure 5. Graph of learners' creative thinking ability in limited trial 2 (small class)

The completeness of the evaluation value of students is closely related to the effectiveness of students to be involved in the learning process oriented to the inquiry learning model. Daryanto et al. (2017) argue that to find out the effectiveness of the teaching and learning process, at the end of each learning it is necessary to conduct an evaluation test.

Based on the results of the pretest and post-test conducted, it shows the value obtained by students for each creative thinking indicator, namely Fluency of 10.5%, Flexibility of 5.1%, Originality of 1% and Elaboration of 4.8%. The results of the trials conducted there is a gap in the results of the creative thinking test achieved by class 8C in the broad trial 2. The results of the creative thinking test in class 8C are lower compared to other classes. This is because this class is a class that needs special attention from subject teachers. It is expected that teachers interact more

with students in the class. According to Firdaus et al. (2018) qualitatively the process of developing creative thinking which is realized in the form of interaction between teachers and students is expected to encourage and spur an increase in student creativity.

Warif (2019) learning activities for these students sometimes experience disturbances, both from the students themselves, which may be caused by internal conditions that do not or do not support the learning activity process, such as unhealthy physical conditions, disabilities, intelligence, talents, interests, motivations, mental health, and internal factors. As well as those caused by external factors such as parental factors, the atmosphere of the house and the economic situation of the family, the school environment, mass media, and the social environment in which the student lives.

The results showed that the level of creative thinking achieved by students was in the fluency indicator (fluency). Febrianti et al. (2018) that students who have fluent thinking skills are students who can ask several questions, are proficient in conveying ideas or ideas, and have the ability to think quickly than students in general. Putra et al. (2016) stated that Fluency is fluency in solving problems to determine the fluency of students. So that students do not have to have many solutions to a problem but simply by showing the smoothness of solving problems by answering test questions appropriately.

Meanwhile, the least achieved level of creative thinking is in the Originality indicator. The Originality indicator is very rarely achieved by learners because this indicator requires a high level of thinking, for example students are able to write the answers presented using their own language. According to Samura (2019) that authenticity is a student's skill in solving problems in their own way or in other words ways that are not thought of by ordinary people. Amtiningsih et al. (2016) the development of originality indicators is closely related to the Fluency and Flexibility indicators. If Fluency and Flexibility develop optimally, originality indicators will also develop.

Research by Dewi et al. (2019) explained that the ability to think creatively in Indonesia is still low, this fact can be confirmed from the results of The Global Creativity Index in 2015, Indonesia is ranked 115 out of 139 countries. Therefore, the results of this study are expected to be a reference in further research and in activities to improve students' creative thinking skills. On the other hand, to improve students' creative thinking skills, teachers can explore several learning models. The choice of learning model is also influential in training students' creative thinking skills (Qomariyah et al., 2021). One of them is by linking learning with the surrounding environment. The type of learning that relates to life or the surrounding environment, can sharpen students'

creative thinking skills, because students are required to be able to solve problems that arise (Armandita, 2018).

The analysis of prerequisite testing was done using the normality and homogeneity test. The results of the normality test of significant value in Pretest of Shapiro Wilk obtained the value of  $0.557 > 0.05$  which meant that the data was normally distributed. On the other hand, the significant value obtained in Posttest was  $0.062 > 0.05$  which meant it was also normally distributed.

## Conclusion

In this study, there are many aspects that become a reference for the implementation of inquiry-oriented learning tools on the material structure and function of tissues in plants, namely validity, practicality and effectiveness. Learning tools in the form of rpp, LKPD and creative thinking tests developed are feasible to be applied in teaching material in class VIII of SMPnN 1 Bolangitang Timur. Inquiry-oriented learning model-oriented learning devices positively affect the implementation of the learning process in accordance with observer observations so that the developed devices are included in the very practical criteria, this is supported by the activities and responses of students. The percentage of Post test results for creative thinking of Fluencyc students was 10.5%, Flexibilityc was 5.1%, Originality was 1%, Elaboration was 4.8%. Where for the achievement of the level of creativity of students is still at a low level. The author suggests further research to improve learning tools and train students' creative thinking skills, especially on the structure and function of plant tissues and the attention of all educators, especially teachers of science subjects, to focus on training students' creative thinking skills by developing learning tools combined with learning models that are in accordance with the 2013 curriculum.

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## Author Contributions

Masra Latjompoh: writing-original draft preparation, methodology, result, discussion, conclusion; Jusna Ahmad and Winda Minarti Jusuf data collect, analysis, proofreading, review, and editing.

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## Conflicts of Interest

The authors declare no conflict of interest.

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