JoSLEPI 3 (2) (2025)
Journal of Science Learning Process and Instructional Research
https://journal.riau-edutech.com/index.php/joslepi
Publisher :
Andester Riau Edutech
Pusat Inovasi Pendidikan dan Teknologi
ISSN 3031-3252

Development of Research and Development Based Learning Innovation Model at SMP N 2 Dayun

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Submiited: 11/04/2025
Review : 16/07/2025
Accepted: 16/08/2025
Published: 21/08/2025
Vol. 3
No. 2

Abstract- This research aims to develop a learning innovation model based on Research and Development (R&D) at SMP N 2 Dayun. Learning requires an innovative approach to overcome various educational challenges, including low student interest in learning and limitations in the methods used. In this study, the R&D method is used to design, test, and evaluate a learning model that meets student characteristics and applicable curriculum requirements. The research process includes the stages of needs analysis, learning model design, classroom testing, and implementation of the developed model. The results of the study indicate that applying a basic R&D-based model to SMP N 2 Dayun increases student participation, improves understanding of learning materials, and significantly enhances student learning outcomes. Based on the results of the study, it can be concluded that using an R&D-based learning model can contribute to the quality of education at SMP N 2 Dayun and can be used as a reference for developing learning in other schools. Furthermore, the research emphasizes the importance of adapting instructional design to the local learning environment. The innovation model developed through this study integrates active learning strategies, problem-based activities, and collaborative tasks to stimulate student engagement and critical thinking. Teachers reported that the model facilitated a more dynamic classroom atmosphere, reduced student passivity, and promoted a stronger connection between theoretical knowledge and real-life application. The evaluation results from both students and teachers show that the model is not only feasible but also practical for continuous classroom use. In addition, this study highlights the sustainability of the R&D-based model by demonstrating its adaptability across different subjects and grade levels. By focusing on iterative refinement through feedback and classroom practice, the model ensures relevance and long-term impact on teaching quality. Thus, the findings of this research are expected to serve as a foundation for future educational innovations, particularly in schools facing similar challenges of low engagement and limited resources.

Kata Kunci: *Learning Model, Learning Innovation, Research and Development Model*

1 Introduction

Education is one of the main pillars in the development of a country. In order to create quality education, innovative approaches are needed that can adapt to the demands of the times and the ever-changing development of technology. In the era of globalization and rapid technological development, the world of education faces a major challenge to produce human resources who have high competence and are able to adapt to changing times(Amalia & Irianti, 2024). One way to achieve this is through innovation in the learning process. Learning innovation aims to improve the quality of education by developing more effective and efficient methods, techniques, and media. (Yulianti et al., 2024) Therefore, it is important to develop a learning model that can meet the needs of students, enrich the learning experience, and encourage their active involvement. One of the most widely used approaches to develop learning innovation is Research and Development (R&D) (Alfirahmani et al., 2025).

How to Cite :
Annisa Rahmadatul. *Et Al*. 2025. Development of Research and Development Based Learning Innovation Model at SMP N 2 Dayun. *Journal Of Science : Learning Process And Instructional Research* (Joslepi), 3 (2), 1-12

Research and Development (R&D) is an approach that combines the research process with product or model development that aims to solve a particular problem or improve the quality of a system. In the context of education, R&D aims to create a more effective learning model, in accordance with the needs of students, and relevant to technological developments and changing curriculum demands (Sukmadinata, 2005). Through this approach, learning models are not only developed based on theory or predictions alone, but are also tested and improved based on empirical data obtained from the field (Mardapi, 2012).

R&D-based learning innovation provides opportunities for educators and curriculum developers to create models that are more in line with student characteristics, such as the need for 21st century skill development including creativity, collaboration, communication, and problem solving (Alfirahmani et al., 2025). Through R&D, learning innovation models can be designed, tested, and improved systematically based on empirical research results that describe the conditions and characteristics of students, the development of learning models that focus on increasing active student involvement in the teaching and learning process can be more measurable and directed (Rusman, 2017).

As one of the junior high schools in Siak Regency, SMP N 2 Dayun has an important role in providing quality education for the younger generation in the region. With the rapid development of the era, the challenges in the world of education are increasing in the complex, including SMP N 2 Dayun. In this case, learning methods in schools must be adjusted to technological developments, 21st century skill needs, and changes in students' mindsets that are increasingly critical and creative (Puspita & Andriani, 2021).

SMP N 2 Dayun has tried to improve the quality of education in various ways, but several obstacles that hinder progress still remain. Several issues that often arise include limitations in the use of technology for learning, teaching methods that are still very conventional, and low student participation in learning activities. In addition, although the national education curriculum has been directed at developing 21st century competencies, its implementation at the junior high school level has not been sufficiently improved. Skills such as critical thinking, creativity, collaboration, and problem-solving skills have not yet been fully adopted in the learning approach being implemented. The R&D approach allows for the creation of a learning model that is more adaptive to changing times, relevant to student needs, and focused on developing skills needed by students in the 21st century (Do et al., 2022). Therefore, it needs to be an effort to develop an innovative learning model, based on research and development (R&D) that can overcome these various problems.

This study aims to develop a learning innovation model based on Research and Development at SMP N 2 Dayun. The R&D (Research and Development) learning model is a research approach used to develop and test the effectiveness of a learning product before it is widely implemented (Delviandri & Irawan, 2023). This model aims to produce learning methods, strategies, or media that are more innovative and in accordance with the needs of students. Previous research has shown that the R&D-based approach has the potential to improve the quality of learning. According to Borg and Gall in 2003 (Akinosho et al., 2020), R&D in education is a process that aims to produce more effective and relevant learning products or methods through the stages of analysis, design (Zhang & Zhu, 2019), trials, and evaluation (Rabiah, 2018). In addition, research conducted by Widodo in 2016 also showed that the R&D-based learning model can improve the quality of learning by encouraging the development of student creativity, increasing their involvement in learning activities, and introducing the use of technology in learning (Widodo et al., 2021). Therefore, this strategy can be a good answer for SMP N 2 Dayun in overcoming various existing problems. Although the R&D model has been proven to work well in various studies, its implementation in SMP N 2 Dayun is still very limited. In addition, few studies specifically focus on the development of R&D-based learning models in junior high schools in the area. Therefore, this study was conducted to contribute to improving the quality of education that is more relevant at the junior high school level, especially in rural areas. By creating a learning model based on R&D, it is hoped that SMP N 2 Dayun can present a more

interesting, interactive learning system that is able to meet various student needs, and prepare them to face more complex challenges in the future.

This study aims to create an innovative learning model based on research and development that can be applied at SMP N 2 Dayun. This study intends to study and analyze learning needs at SMP N 2 Dayun, design a learning model that is in line with the situation and character of students at the school, and conduct experiments and evaluations of the effectiveness of the learning model that has been designed. It is expected that the learning model created can improve the quality of teaching, improve student participation in the educational process, and hone essential 21st century skills for students, such as critical thinking, creativity, and collaboration. In addition, this study aims to provide insight into the potential for applying technology in education and how technology can be utilized efficiently to support the learning process at SMP N 2 Dayun. Through this research, it is expected to be able to provide an important contribution to improving the learning process at SMP N 2 Dayun and become a reference for other educational institutions in creating more creative and efficient learning methods.

2 Research Methodology

Research methodology is a systematic process or method used to collect, analyze, and interpret data in order to understand or solve a problem. This methodology includes the approaches, techniques, and tools used in research to obtain valid and reliable results. Research methodology can be categorized into several types based on the approach and nature of the research, that is:

a. Based on approach
   - Qualitative Research, focuses on exploring social phenomena, meanings, and understandings using non-numerical data (interviews, observations, documentation).
   - Quantitative Research, uses numerical data analyzed statistically to test hypotheses or relationships between variables.
   - Mixed Methods Research, combines qualitative and quantitative approaches to obtain more comprehensive results.

b. Based on purpose
   • Descriptive Research, aims to describe a phenomenon or event systematically.
   • Experimental Research, aims to test cause-and-effect relationships through experiments with control variables.
   • Research and Development (R&D), Developing and testing innovative learning products or models.

The research has the following methodological components:

a. Research approach
b. Type of Research
c. Location and Subject of Research
d. Data Collection Techniques
e. Data Analysis Techniques

Research methodology is an important foundation in research that determines how data is collected, analyzed, and interpreted. The selection of methodology must be adjusted to the research objectives so that the results obtained are valid and accountable. The research methodology used in this study is Research and Development (R&D) which aims to develop an innovative learning model at SMP N 2 Dayun. This methodology is suitable for research on the development of learning models, teaching media, or other educational strategies. The research and development (R&D) method aims to produce certain products and test the effectiveness of these products in improving the quality of learning (Sugiyono, 2021), The R&D approach is very important in the world of education to create effective, efficient, and research-based learning innovations. The R&D method is used because this research not only describes the phenomenon, but also produces a product in the form of a learning model that can be applied in the education process.

The stages used in this study are needs analysis, model design, trial, evaluation, and implementation according to the Borg and Gall mode.

2.1 Needs analysis

Needs analysis is an approach or method used to understand and identify the needs required to achieve goals or solve a problem. This stage is very much needed in the implementation of learning activities, such as the use of what teaching materials are appropriate for use by a student (Trinaldi et al., 2022). This stage aims to identify problems in learning through observation, interviews with teachers and students, and literature studies. The results of this analysis are used to design a learning model that is in accordance with educational needs. (Rabiah, 2018). Needs analysis is a systematic process in identifying gaps between current learning conditions and expected conditions. In the context of developing a learning innovation model at SMP N 2 Dayun, needs analysis aims to understand the challenges and needs of teachers and students in increasing learning effectiveness. Needs analysis is carried out to:

a. Identify gaps in the current learning process.
b. Determine innovative strategies that are in accordance with student characteristics.
c. Analyze the readiness of teachers and students in adopting new learning methods.
d. Adjust the curriculum to technological developments and the needs of the world of work.

Needs Analysis Methods

Some of the methods used in this needs analysis include:

a. Classroom Observation
   Observing learning activities in the classroom to understand the interaction patterns of students and teachers.
   Example: Observing whether the current learning method is interactive enough or still tends to be one-way.
b. Teacher and Student Interviews
   Exploring the challenges faced by teachers and students in the learning process.
   Example: Interviews with teachers regarding the effectiveness of the methods they use.
c. Questionnaires
   Collecting data from teachers and students regarding their needs and preferences in learning.
   Example: Survey regarding student readiness in using digital technology in learning.
d. Curriculum Document Analysis
   Reviewing the curriculum to see if the learning material is relevant to students' needs.
   Example: Checking whether there is a gap between the theory taught and its application in real life.
e. Focus Group Discussion (FGD)
   Group discussion with teachers, principals, and students to explore challenges and opportunities in learning innovation.
   Example: Discussion about project-based or technology-based learning models that can be applied.

The learning model designed must meet several main principles:

a. Relevance, In accordance with the curriculum and student needs.
b. Effectiveness, can improve student understanding and engagement.
c. Innovative, using new methods that are interesting and interactive.
d. Flexibility, can be applied in various learning conditions.

The needs analysis in developing learning innovation models at SMP N 2 Dayun shows the need for changes in learning methods, technology utilization, and the roles of teachers and students in the learning process. By implementing a Research and Development (R&D)-based learning model and

innovations such as Blended Learning, PjBL, and PBL, the quality of learning can be improved to achieve more optimal results.

2.2 Model Design

Model design is an approach used to design and develop models in various contexts, such as software engineering, information systems, and research. The designed model aims to describe a system (Fernández-Mesa & Alegre, 2015), process, or phenomenon in a simpler way, allowing for easier understanding and analysis before real implementation is carried out (Fraj et al., 2015). Based on the results of the needs analysis, a learning model design is carried out which includes learning strategies, supporting media, and evaluation methods. The designed model must be based on educational theory and consider its effectiveness in improving student learning outcomes. (Borg & Gall, 1983). The design of the learning innovation model at SMP N 2 Dayun aims to create a more effective, interactive, and modern method. With the Research and Development (R&D) approach, this model is designed based on the results of the needs analysis that has been carried out previously.

Principles of Model Design

The learning model that is designed must meet several main principles:

a. Relevance, In accordance with the curriculum and student needs.
b. Effectiveness, Can improve student understanding and involvement.
c. Innovative, Using new methods that are interesting and interactive.
d. Flexibility, Can be applied in various learning conditions.

Evaluation Instrument Development

a. Formative assessment, Quizzes and reflections during the learning process.
b. Summative assessment, Final test to measure student understanding.
c. Observation, Observing student participation in projects and discussions.

The design of this learning innovation model aims to improve the quality of learning at SMP N 2 Dayun with a more interesting method and in accordance with student needs. The model that has been designed is tested on a small scale, evaluated, and improved before being widely applied. This model is expected to significantly increase student motivation and learning outcomes.

2.3 Trial

At this stage, the approach used to test systems, products, or solutions to ensure that they function properly, meet the desired specifications, and are acceptable to users or stakeholders (Tu & Wu, 2021). Trials are conducted to assess the performance, functionality, and reliability of a product or system. The designed model is tested on a small scale to measure its effectiveness. At this stage, data collection is carried out through pre-tests and post-tests, as well as interviews with teachers and students. If weaknesses are found, the model will be improved before being tested further. (Rabiah, 2018). Trials are an important stage in Research and Development (R&D) research to measure the effectiveness of the learning innovation model that has been designed. This trial aims to evaluate the extent to which the developed model can improve learning outcomes and student engagement.

Trial Objectives:

a. Identifying the weaknesses and strengths of the developed learning model.
b. Measuring the effectiveness of the model in improving student understanding.
c. Adjusting the model based on the evaluation results before full-scale implementation.

Trial Method

The trial is conducted in two stages:

a. Initial Trial (Small-Scale Trial)

Initial trial or small-scale trial is a stage in Research and Development (R&D) research that aims to test a prototype or model developed on a small scale before being widely implemented. This stage

serves to identify the weaknesses and strengths of the model and obtain feedback for further improvement.

This stage is carried out through the following steps:

• Preparation
  o Prepare trial instruments (observation sheets, interviews, questionnaires).
  o Determine the classes or groups that will be trial participants.
  o Train teachers or instructors in implementing the developed model.
• Trial Implementation
  o The model or product is applied in real situations.
  o Teachers and students use the model according to the scenario that has been prepared.
  o Researchers observe and record responses and obstacles that arise.
• Data Collection
  o Use observation, interviews, questionnaires, and documentation to evaluate the success of the model.
  o Collect feedback from teachers and students regarding the strengths and weaknesses of the model.
• Analysis of Trial Results
  o Analyze data from observations and interviews.
  o Identify aspects that need to be improved or adjusted.

Initial testing is an important stage in R&D research to ensure that the model or product being developed is feasible to use. Through this stage, weaknesses can be identified early and improvements can be made before wider implementation.

b. Field Trial

A field trial is a stage in Research and Development (R&D) research that aims to test the effectiveness of a revised model, method, or product based on initial testing. At this stage, testing is carried out on a wider scale involving more research subjects in a real environment.

Purpose of Field Trial

• Assess the effectiveness of a model or product in more complex situations.
• Identify the strengths and weaknesses of implementation in a real environment.
• Collect more extensive data for final improvements before finalizing the model.
• Test the extent to which the model can be applied widely and sustainably.

The stages in the field trial include:

• Preparation
  o Developing a scenario for implementing the model on a larger scale.
  o Preparing measurement instruments (tests, questionnaires, observation sheets).
  o Training teachers or facilitators who will use the model.
• Implementation of the Trial
  o The model is applied in the real learning process.
  o Teachers and students use the model according to the research design.
  o Researchers observe the learning process, student participation, and the effectiveness of the model.
• Data Collection
  o Through direct observation of the implementation of the model.
  o Interviews and questionnaires with teachers and students to evaluate their experiences.
  o Tests or formative assessments to measure improvements in student understanding.
• Analysis of Trial Results
  o Comparing results before and after the implementation of the model.
  o Identifying challenges faced in large-scale implementation.

o Evaluating the sustainability and effectiveness of the model in the long term.

Field trials are an important stage in Research and Development (R&D) research that ensures that the developed model is not only successful on a small scale but also effective on a wider scale. The results of this stage determine whether the model is ready to be widely implemented or still needs further improvement.

Based on the results of the trial, this innovative learning model has proven effective in increasing student engagement and understanding. However, some improvements are needed before full implementation, such as adjusting learning time and additional training for students in the use of learning technology. This model was then improved based on the trial findings before being widely implemented at SMP N 2 Dayun.

2.4 Evaluation

Evaluation is an activity to collect information about how something works, which information is then used to determine the right alternative in making decisions (Habiburrahman, 2016). Evaluation means "looking for something valuable (worth) can be information about a program, production and certain alternative procedures". After the trial, an evaluation of the effectiveness of the learning model is carried out. This evaluation includes analysis of student learning outcome data, the level of student involvement in learning, and feedback from teachers. The model that has been tested and evaluated is then refined before being widely implemented. (Sugiyono, 2021). Evaluation is the final stage in the Research and Development (R&D) process to assess the effectiveness of the learning innovation model that has been tested. This evaluation aims to determine the extent to which the developed model can improve the quality of learning and student learning outcomes.

Evaluation Objectives:

a. Assess the effectiveness of the model in improving student understanding.
b. Identify the advantages and disadvantages of the learning model.
c. Determine the improvements needed before full implementation.

Type of Evaluation

Evaluation is conducted in two main aspects:

a. Process Evaluation
   • Measuring how the model is applied in the classroom.
   • Observation of the role of teachers and student participation.
   • Identification of obstacles during implementation.

b. Outcome Evaluation
   • Measuring the improvement in student learning outcomes before and after the implementation of the model.
   • Analysis of test score data and student engagement.
   • Collecting feedback from teachers and students.

Based on the evaluation results, the learning innovation model has proven effective in improving student understanding. However, some adjustments are needed before full implementation, such as:

a. Provision of technology training for students and teachers.
b. Flexibility of learning time so that project-based methods are more optimal.
c. Increasing access to technological devices to support digital learning.

With these improvements, the model is expected to be widely applied in SMP N 2 Dayun to improve the quality of learning sustainably.

2.5 Implementation

Implementation is usually carried out after planning is considered perfect, Nurdin Usman implementation is based on activities, actions, actions or the existence of a system mechanism, implementation is not just an activity, but a planned activity and to achieve the objectives of the activity. Simply put, implementation means implementation or application (Mamoto et al., 2018). Learning models that have gone through the development and evaluation stages are implemented more widely in various schools or other educational environments. This stage aims to see the effectiveness of the model on a large scale and ensure that the learning model can be widely adopted by teachers and students. (Plomp & Nieveen, 2013). After going through the stages of needs analysis, design, trial, and evaluation, the next stage is the implementation of the learning innovation model. This implementation is carried out to apply the model that has been developed in a real learning environment at SMP N 2 Dayun and ensure its effectiveness in improving student learning outcomes.

Implementation Objectives

a. Applying the learning innovation model widely in the classroom.
b. Assessing the effectiveness of the model in real learning situations.
c. Identifying obstacles and solutions during implementation.

Role in Implementation

a. Teachers, Facilitators who guide students in project-based learning and discussions.
b. Students, Active in exploration, discussion, and completing projects.
c. Schools, Supporting infrastructure and training for teachers.

3 Results and Discussion

3.1 Results

The purpose of this study was to develop a learning innovation model based on Research and Development (R&D) at SMP N 2 Dayun. The method used is the Borg and Gall model which consists of five key steps: needs analysis, model design, trial, evaluation, and implementation. Through observations made by researchers throughout the research process, information regarding the implementation of the designed learning model was successfully collected, including its impact on student participation, learning quality, and students' 21st century skills. The main results of this study can be seen as follows:

3.1.1 Needs Analysis

The initial study at SMP N 2 Dayun revealed that the existing learning methods still prioritize a teacher-focused approach. Educators tend to use lecture techniques and give simple assignments in the learning process. Students' academic results show less than satisfactory achievement, with average scores below the minimum standards set. The use of media in learning is still limited to textbooks and blackboards, while the use of educational technology has not been carried out optimally. Observations show that students' motivation to learn is at a low level, as seen from the lack of active participation in learning activities.

a. Implementation of Learning Models
   Based on observations made, the implementation of learning methods based on R&D at SMP N 2 Dayun has a real positive impact in improving the quality of education. This approach uses more interactive and technology-oriented methods, which provide more opportunities for students to be actively involved in the learning process. The interaction between teachers and students becomes more dynamic, with students being more courageous in asking questions, discussing, and collaborating.
b. Student Involvement
   Observations regarding the extent to which students are involved in the learning process reveal clear progress. In the past, students tended to be passive and only

received knowledge from teachers. However, after the R&D-based learning model was implemented, students showed increased participation in group discussions, presentations, and the use of technology. Student involvement in learning activities can be seen from how often they ask questions, give opinions, and participate in ongoing practicum activities.

c. Increased Understanding
In terms of mastery of teaching materials, the results of observations show that students show a stronger understanding of the material after the implementation of the R&D-based learning model. This is due to the approach that emphasizes more on active and collaborative learning, and provides opportunities for students to interact directly with the material through technology. Learning that focuses on real contexts and relevance to students' lives also contributes to improving their understanding of the material being taught.

d. Use of Technology in Learning
The use of technological devices in education, which used to be very limited, is now an element that is experiencing rapid development in a learning model based on research and development. Students are now starting to be familiar with the use of technology to access information, make presentations, and collaborate on group projects. Teachers are also increasingly using technology to deliver learning materials visually and attractively, which ultimately makes the teaching and learning process more effective and interesting.

e. Improving 21st Century Skills
The application of the R&D-based learning model at SMP N 2 Dayun also contributes to the development of students' 21st century skills. Students not only learn to remember information, but are also trained to think critically, creatively, and collaboratively. Through various project-based activities, students learn to solve problems as a team, solve creative challenges, and make decisions based on analytical thinking.

3.1.2 Model Design

The learning model is designed based on constructivism theory and active learning methods. Its structure uses the ICARE (Introduction, Connection, Application, Reflection, Extension) approach which focuses on active student participation. In this framework, the social environment encourages collaboration in learning, where the teacher's role is limited as a facilitator. The driving devices created include RPP, LKS, learning modules, books as sources of literature, and assessment tools for teachers. The results of consultations with experts indicate that this learning model meets the eligibility standards in terms of material, delivery, language, and visuals. The validators in this study consisted of teachers who teach informatics, Indonesian, and mathematics. They gave very positive reactions to all elements of the model, with notes for improvements in the technical aspects of implementation.

3.1.3 Trial

A limited trial was conducted in one class, namely class VIII 1 consisting of 34 students. The findings showed that the model was implemented well and received positive responses from students and teachers. The increase in learning outcomes was categorized as moderate based on the analysis carried out. The learning process becomes more dynamic with increased interaction between teachers and students and between students. In the next trial covering two classes, namely VIII 1 and VIII 2, the researcher observed an increase in the quality of the implementation of the model. Responses from students and teachers were very positive, with

learning outcomes increasing rapidly compared to the initial trial. Interactions in learning became more collaborative and had deeper meaning.

3.1.4 Evaluation

The evaluation of the process showed significant progress in students' learning activities. Their science process skills grew through experimental activities and observations. The ability to work together was seen in the effectiveness of groups and discussions in class. They also showed progress in digital literacy by utilizing various digital learning resources using tablets provided by the school, as well as literacy materials from teachers. The evaluation of the results showed an increase in students' understanding and enthusiasm in learning outcomes. Learning motivation increased as reflected in enthusiasm and active participation in the learning process. The level of satisfaction with the learning network and students' self-confidence also showed positive developments.

3.1.5 Implementation

The implementation of the model has been successfully implemented in two classes, namely VIII 1 and VIII 2. Educators demonstrated adequate skills in adjusting the model based on the characteristics of each subject. The quality of teaching shows visible improvements in classroom atmosphere and student achievement. The school has also kept evidence of best practices as a reference for development.

3.2 Discussion

Based on the research results obtained, the R&D-oriented learning method has proven effective in dealing with learning problems at SMP N 2 Dayun. The application of this innovative method provides positive results for the quality of the learning process and student learning outcomes. Observations that have been made show that this learning approach has succeeded in increasing student participation in the learning process, which directly improves their understanding of the material being taught. In addition, this method also supports students in honing the skills needed in the 21st century, such as critical thinking, creativity, and collaborative skills, which are very important to prepare them for future challenges. Learning that utilizes technology provides opportunities for students to learn in a more independent and active way, so that they do not only rely on teachers as the main source of information. The selection of the R&D method in this study is very appropriate, because it allows researchers to design, test, and evaluate learning models that are appropriate to student needs and the local context of the school. Evaluations carried out continuously during the trial phase and implementation of the model help researchers identify the strengths and weaknesses of the model used, and provide a strong basis for improvement and development of the model in the future. This is in line with the basic principle of R&D which prioritizes product validation through empirical data collected in the field. Overall, the results of this study indicate that the development of an R&D-based learning model at SMP N 2 Dayun can make a significant contribution to improving the quality of learning and student learning outcomes. This model is not only in accordance with technological advances and skill needs in the 21st century, but is also relevant to the local context of the school and the characteristics of the students faced. Therefore, this model can be used as a reference for other schools that want to develop a more innovative and effective learning approach.

4 Conclusion

This study was designed to create a learning innovation model through the Research and Development approach at SMP N 2 Dayun with the aim of improving the quality of the learning process and outcomes. The findings obtained showed that the implementation of the R&D-based learning model proved effective in increasing student participation, understanding of teaching materials, and essential 21st-century skills such as critical thinking, creativity, and collaboration. In addition, this model successfully introduced the use of technology in learning, which encouraged

students to be more active and independent in their learning process. Through the observation method, it was revealed that the developed model was able to create a learning environment that was more interactive, enjoyable, and in accordance with the needs of students in this digital age.

Increasing student understanding of the material and the ability of students to collaborate in solving problems are important indicators of the success of this model. Therefore, the R&D-based learning model at SMP N 2 Dayun can be used as a reference in developing more innovative and responsive learning in other schools. The learning innovation model developed through the R&D method is generally more effective because it is based on systematic research, empirical validation, and trials in real environments. The resulting model is oriented towards the needs of students, educators, and curriculum dynamics so that it is more in line with the development of the times and learning challenges.

This model allows for continuous innovation through the process of evaluation and revision, so that it can be adapted to various different learning contexts. Based on research, the learning innovation model can improve the quality of teaching and learning interactions, student engagement, and achieve more optimal learning outcomes. The success of this model also depends on collaboration between researchers, educators, and other stakeholders in implementing and adapting the innovation model in various educational settings. Overall, this study indicates that the use of the R&D method in creating learning models has a significant impact on improving the quality of education at SMP N 2 Dayun and can be applied in other educational institutions to improve learning effectiveness.

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