



Misconception Analysis: A Necessary Complement to Investigated the Causes of Students' Misconception in Conducting Research and Development

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DOI: <http://dx.doi.org/10.15294/usej.v10i3.42719>

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Article Info

Submitted 2020-11-19

Revised 2021-07-21

Accepted 2021-11-04

Keywords

misconception, student errors,
research and development

Abstract

This study aims to analyze the need for the development of learning books in the form of research and development (R&D) model books to deal with student misconceptions in final project writing. This study analyzes student needs so that practical actions can be found in the early stages of developing research books. The development of R&D books that is carried out is expected to be able to deal with student misconceptions. Errors in understanding R&D are often experienced by students in the mentoring process which emphasizes the end result rather than the development process. The proposed solution is to use misconception analysis (MA). This type of research is research and development or R&D (research and development) which refers to the ADDIE model with data analysis techniques using descriptive statistics. This stage is the initial stage of ADDIE, namely analysis. Data were obtained from 11 student respondents from a university consisting of three men and eight women. Based on the data collected, the results of student assumptions in understanding development research are not in accordance with actual understanding. The assumption data for students' understanding of R&D development is 18.18% very understanding, 27.27% understanding, 36.36% quite understanding, 18.18% do not understand, 0.00% don't understand. Whereas in fact the understanding of students in R&D development is 0.00% very understanding, 9.09% understands, 27.27% understands quite well, 36.36% does not understand, and 27.27% does not understand. The majority of students in research using the R&D method experience misconceptions. The concept that they believed was correct, it turned out that after being studied there were several mistakes or misunderstandings. Students do not get the main source of input in the mentoring process. The misconception is also caused by the fact that in writing a thesis, students have not received references that are studied in depth about the development model.

How to Cite

Wicaksana, E. J., Lukman, A., & Siburian, J. (2021). Misconception Analysis: A Necessary Complement to Investigated the Causes of Students' Misconception in Conducting Research and Development. *Unnes Science Education Journal*, 10(3), 151-159.

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INTRODUCTION

The final project is one of the requirements that must be met by all students in order to graduate and hold an academic degree. The final project is a type of scientific writing. There are several kinds of final assignments, including a thesis as a final project for undergraduate students. Not all undergraduate students have ever made scientific papers at the previous education level (SMA / SMK). Before undergraduate students program their final project (thesis), they must first provide compulsory courses as support. Among these subjects are research methodology. Even though they have been equipped with research methodologies, in reality there are still many who do not understand the correct research concept.

There are various types of research, including qualitative, quantitative, action research, mix methods, research and development. Students mostly choose research and development (R&D). This is because in R&D research a product is produced, which can be in the form of books, e-books, evaluation questions, media, etc. Students also consider R & D as a type of research that is more prestigious than other types of research. As a result, the student's interest in choosing this type of R&D research increases from year to year. Unfortunately, this increase in interest was not matched by an increase in the quality of the writing in the final project. This is proven when students start to take the proposal seminar exam, seminar results up to thesis examination. It seems that students have not mastered the R&D concept properly. So it can be seen that many students experience misconceptions in understanding R&D.

Most students choose R&D using the ADDIE model in their development research. However, they also still experience misconceptions in the application of the ADDIE floating model. The misconceptions that were successfully recorded included the stages. Students do not fully understand the ADDIE stages starting from analysis, design, development, implementation, and evaluation. Most mistakes were made in stages 4 and 5, namely implementation and evaluation. There are many students who do not do the implementation stage because they consider the trial and teacher response to be in the implementation stage, even though the trials and teacher responses are still in the development stage.

The actual implementation stage is the product application stage by means of testing. According to (Branch, 2010) the implementation stage is the preparation and application of a learning environment that involves students and the evaluation

stage is carried out after implementation to assess the product and the learning process both before and after product application. Development research has 5 simplified main steps, namely analyzing the product to be developed, developing the product, expert validation and revision, small-scale field trials and large-scale field trials (Sugiyono, 2018).

Misconception can be viewed as a conception or cognitive structure that is firmly and stable in the minds of students, which actually deviates from the conceptions put forward by experts (Hammer, 2016; Irawan, Riyadi, & Triyanto, 2012). Misconceptions will greatly hinder the process of receiving and assimilating new knowledge in students. This will hinder the success of students in the further learning process (Aprilia, 2020).

This misconception can be caused by a lack of student understanding of the concept of development research. According to Hanafi (2017) Research and Development (R&D) is a research method used to produce certain products and test the effectiveness of these methods. So, before producing a certain product, researchers must first analyze the problem so that the resulting product will match the problem and then test the effectiveness of the product (Sugiyono, 2018).

Misconceptions in development research can be caused by several factors. These factors are the learning environment, the students' initial knowledge, activeness in learning, the ability to construct a relationship between the knowledge they already have and what is being studied (Sopiany & Rahayu, 2019). In the use of textbooks, incorrect explanations, writing errors, especially in formulas, the level of writing of books is too high for students, do not know how to read text books, fiction books and science cartoons are often misconceptions (Muna, 2015) especially for students when they are required to accommodate the knowledge. The way how to identify the occurrence of misconception among students as well as to distinguish it with having no idea of the concept is by occupying the method of Certainty of Response Index (CRI)

This misconception is of course very dangerous if left unchecked it will become a continuous misconception because after finishing the thesis examination, they will put their thesis in the library. If their type of thesis is about R&D and still misconceptions, this will be imitated by readers who are looking for references for their final assignments. The same goes for younger siblings who will be affected by misconceptions. The results of observations and interviews with

five students who use this type of R&D research show that they experience misconceptions because they imitated their senior's thesis. They tend to look for literature from ready-made papers, such as theses, theses and articles. Students rarely use book literature, because most books are in English. Even if there are books in Indonesian, students still have difficulty using them. This is because in the book there are no suggestions or instructions for each R&D model which is more suitable for any development.

The results of research on the stages of research and development research still have different perceptions, especially at the implementation stage. Based on research conducted by Purnamasari, (2020) implementation is a product trial stage that has been made. In fact, according to Sugiyono (2018) product trials are included in the development stage in the ADDIE model research. At the proper implementation stage is the activity of applying the product to achieve the desired goals and achieve satisfaction from product users so that it can proceed to the evaluation stage (Branch, 2010). Several studies conducted by Cahyadi (2019); Putra, Tastra, & Suwatra (2014) according to the requirements and follow the rules and be able to provide an incentive for the students are able to absorb the contents for maximum. This research is about development research. After pass production stage the early product was produce and then validated by a subject matter content expert, subject design expert, and instructional media expert. After that the product tested to the students through three stages such as personal test, small group test and field test. Test subject of this study consisted of six students for personal test, twelve students for small group test, and twenty students for field test. Data that collected in this research are data from subject matter content expert, subject design expert, instructional media expert and from students test. Data collection instrument such as evaluation sheets for expert test and students test. Data analysis using descriptive analysis of qualitative and quantitative descriptive. Valuation result of media products carried by six aspects such as : (1 have carried out the implementation stages correctly because the implementation activities carried out have the aim of knowing whether the application of the developed product is effective or not in improving the quality of learning, achieving learning objectives, and overcoming problems previously faced by students in learning. Based on these differences in perceptions, this research was conducted with the aim of producing a design of learning books in the form of re-

search and development (R&D) model books to overcome student misconceptions in developing research writing.

METHOD

This type of research is research and development or R&D (research and development) which refers to the ADDIE model. The selection of the ADDIE model is based on the consideration that this model is easy to understand, and can be carried out systematically. The stages of the ADDIE model consist of analysis, design development, implementation, and evaluation (Branch, 2010). The analysis stage is the analysis stage of the problems faced so that product development is needed. In the design stage, activities are carried out to plan the manufacture of products, and in the development stage, product development is carried out to get a decent product. At the implementation stage, the product is applied to determine whether the product developed has been effective or not in solving the problems faced by students. The final stage of evaluation is the stage of providing an assessment of the product developed (Cahyadi, 2019).

This research is at the analysis stage, namely the first stage of ADDIE. Research activities are carried out to obtain information about the need for book development (need assessment) and in the product development process through data collection, data analysis, expert validation and empirical validation or trial and implementation (Hasyim, 2016). The following is a schematic framework for analyzing student misconceptions about development research:

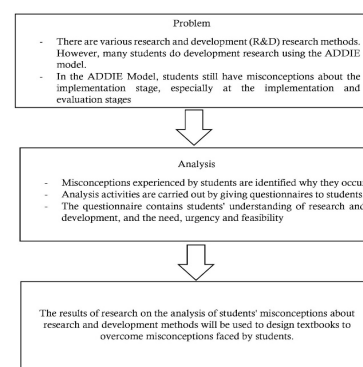


Figure 1. Research Framework

The research design used was a needs assessment research. Meanwhile, the approach used in this needs assessment research is the mix method. Mix Method is a research method with qualitative and quantitative data collection pro-

cedures (Fauzi & Pradipta, 2018; Zohrabi, 2013) analyzed and interpreted. In this article the main research instruments (questionnaire, interview and classroom observation. The research was conducted through a survey of respondents who were assigned as samples. The population of this study were all final year students who worked on their thesis with the R&D method.

The data collection instrument used a structured questionnaire. Data collection is emphasized on two groups of information, namely: (a) students' understanding of research and development, (b) needs, urgency and feasibility of developing research and development (R&D) books to deal with student misconceptions.

The data analysis technique used descriptive statistics, with the percentage technique. The trend of variable measurement results can be seen using the ideal mean. As a comparison norm, it can be divided into five categories as follows in table 1 below:

Table 1. Trend Criteria

Trend Criteria	Category
$X \geq M + 1,5 \text{ SD}$	Really understand/Really needed
$M + 0,5 \text{ SD} \leq X < M + 1,5 \text{ SD}$	Understand/Needed
$M - 0,5 \text{ SD} \leq X < M + 0,5 \text{ SD}$	Quite understand/Quite necessary
$M - 1,5 \text{ SD} \leq X < M - 0,5 \text{ SD}$	Not really understand/Not really necessary
$X < M - 1,5 \text{ SD}$	Not understand / Not necessary

(Puspitasari, Kristiantari, & Asri, 2018)

The determination of the distance of 1.5 SD for this category is based on a normal distribution curve which is theoretically within 6 standard deviations (6 SD) (Sutrisno, 1986). To calculate the ideal mean (M) and ideal standard deviation (SD), the formula is used:
 $M = 1/2$ (highest ideal value + lowest ideal value)
 $SD = 1/6$ (highest ideal value - lowest ideal value).

RESULTS AND DISCUSSION

The results of this study explain the analysis of misconceptions and their practical uses.

This misconception analysis aims to determine the level of understanding of students so that educators need to make remediation for students who experience misconceptions to avoid ongoing misconceptions (Nasir, 2017). A brief review of some of the research literature that discusses learner-focused misconceptions, which includes the need to address learners' misconceptions. Researchers will also discuss the application of misconception analysis as a basis for book development.

The research findings generated in the needs analysis serve as the basis for planning, implementation and evaluation designs in the development of research and development books. Especially as a form of support for improving the quality of learning and the quality of students. In addition, comprehensively, this research is also part of a strategic step in achieving the quality and quality of education by optimizing student understanding.

The questionnaire distributed in this study was in accordance with the data obtained by 11 student respondents at a university. The following shows research data related to understanding the concepts and procedures of the development model.

Understanding the Concept and Procedure for Research and Development Development

Based on the data collected, data was obtained about the understanding of concepts and development research and development procedures as follows: the lowest score was 5 and the highest was 13 with a mean of 9.45, and a standard deviation of 1.33. To determine the trend, the calculation of the percentage of the tendency and its comparison criteria is used to use the ideal average score and the ideal standard deviation. The results of the calculation show that the assumptions of the respondents' understanding of the concept of the R & D model, namely the very understanding category 18.18%, the understanding category 27.27%, the 36.36% sufficiently understanding category, the 18.18% lack of understanding category, and the category not understanding 0 %. When viewed from the mean or mean, that the respondent's understanding of concept understanding is in the category of quite understanding. An overview of the percentage of student assumptions in understanding R&D concepts can be seen in the following table and bar graph:.

Table 2. Students' Assumptions in Understanding the Concept of Research and Development Models

Score	Category	F	%
10.99 and above	Very Understand (VU)	2	18,18
9,67 – 10,98	Understand (U)	3	27,27
8,34 – 9,66	Quite understand (QU)	4	36,36
7,01 – 8,33	Not really understand (NRU)	2	18,18
8.32 and below	Not understand (NU)	0	0,00
Total		11	100

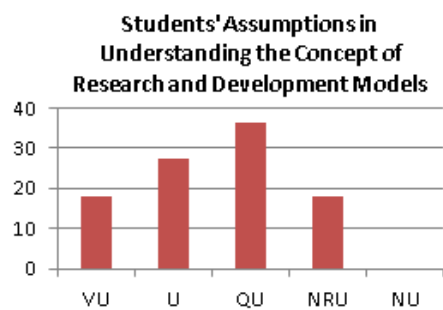


Figure 2. Graph of Students' Assumptions in Understanding the Concept of Research and Development Models

Student Understanding Data of R&D Concepts

Based on data collected from questionnaires and interviews, with several indicators asked, including understanding of various things, including the level of understanding of the R&D model, the reasons for choosing the type of R&D model, understanding development procedures, understanding each development stage to be undertaken, understanding analysis steps needs, problem formulation, defining, analyzing existing products, designing prototypes, making or developing products, real data is obtained from students' understanding of R&D concepts. The data obtained was not in accordance with the assumption data of students. The data obtained were respondents' understanding of the concept of the R & D model, namely the very understanding category 0%, the understanding category 9.09%, 27.27% quite understanding category, 36.36% less understanding category, and 27.27% not understanding category. . This data is presented in the following table:

Table 3. Data on Student Understanding of the Concept of Research and Development Model

Score	Category	F	%
10.99 and above	Very Understand (VU)	0	0
9,67–10,98	Understand (U)	1	9,09
8,34 – 9,66	Quite understand (QU)	3	27,27
7,01 – 8,33	Not really understand (NRU)	4	36,36
8.32 and below	Not understand (NU)	3	27,27
Total		11	100

Student Understanding of the Concept of Research and Development Model

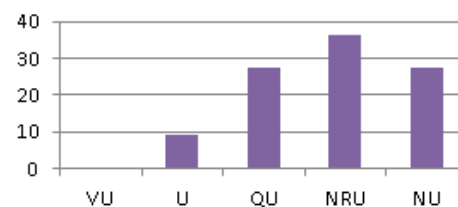


Figure 3. Graph of Students' Understanding of Research and Development Model Concepts

Comparison of Student Assumptions and Realities in Understanding the Concept of R&D

Based on the graphic data above, it can be analyzed using misconception analysis (MA) that most respondents have misconceptions in understanding the concept of R&D. Many students think that their understanding of the R&D concept is correct, but in reality it is still wrong.

R&D Book Development Needs For Students

Based on data collected from questionnaires and interviews, data was obtained about the need for R&D book development for students, which is presented in the following table:

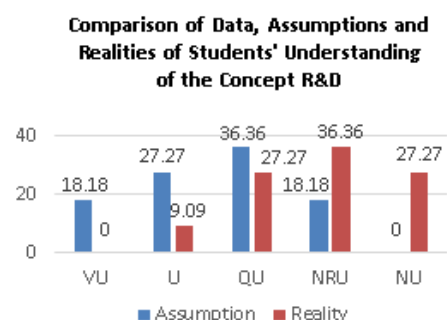


Figure 4. Comparison Data Assumption and Realities of Students' Understanding of the Concept R&D

Table 4. Student trends in terms of the need for R&D book development for students

Score	Category	F	%
10.99 and above	Really necessary (RN)	3	27,27
9,67 – 10,98	Necessary (N)	4	36,36
8,34 – 9,66	Quite necessary (QN)	2	18,18
7,01 – 8,33	Not really necessary (NRN)	2	18,18
8.32 and below	Not necessary (NN)	0	0,00
Total		11	100

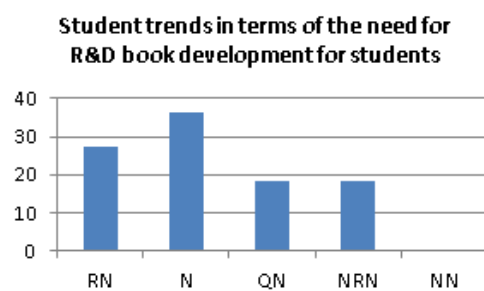


Figure 5. Graph of the Variable Trend of Needs for the Development of R & D Books for Students

Emphasis on needs assessment, which begins with a general explanation of the understanding of the concept of research and development (R&D) linking to the level of student needs in: (1) increasing understanding of research and development models, (2) the use of student skills, and (3) passion (motivation) individuals to improve learning output.

Need assessment is needed to dig up information to what extent development is needed. The existence of a needs analysis will facilitate the development of R&D books for students that are in accordance with the needs and characteristics of students to achieve optimal learning outcomes (Puspitasari, 2013; Rinawati, 2017).

This study discusses needs analysis to suggest practical actions in developing research and development books to address student misconceptions. This largely refers to findings of misunderstanding and mistakes in coaching that emphasize the end result rather than the development process.

Misconception analysis (MA) can be a solution for the analysis of the development needs of research development books. Misconceptions are obstacles that students do not realize. This shows that misconceptions can disrupt and hin-

der students in the learning process (Pakpahan, Hernawati, & Ardiansyah, 2020). Most students experience misconceptions due to incomplete or incomplete or incorrect understanding of information or data (Rahman & Enawati, 2014).

This research is the result of an incident experienced when testing a student's thesis. These observations are the researchers' own experience. Based on observations, it was found that students tended to ignore correct procedures. This is because students get a deadline to graduate immediately.

This is motivated by the fact that in writing a thesis, students have not received references that examine in depth the development model. In addition, they also do not get the main source of input in the mentoring process. Small mistakes in the development process can result in many misunderstandings in the next step and become a waste of effort.

Based on this research, it can be concluded that students have an assumption of understanding the concept of R&D with the majority of respondents who answered quite understandingly at 36.36%. The student's assumption data is not linear with the student's understanding data which is directly extracted using a questionnaire method and in-depth interviews with the 11 students who became respondents. Only a few students understand the concept of development research. The majority of students who choose the R&D model for their thesis research method actually show data as much as 36.36% or the majority of respondents do not understand. The inequality between the assumption data of students and the fact that students' understanding shows a misconception of their understanding of the concept of R&D.

This misconception will have a big impact if it is not addressed immediately. The impact of misconceptions in understanding and implementing R&D models can result in the invalidity of their research and development. Development procedures are not carried out according to the correct concept, and testing is not carried out properly. As a result, the products that are made are not in accordance with the needs.

Development research is the process used to develop and validate educational products (Hanafi, 2017). According to Purnama (2016) research and development methods are research methods used to produce certain products and test their effectiveness. Development research aims to produce new products that have never existed before or existing products are developed so that they become new products (Mulyatinig-

sih, 2011; Yuberti, 2014). This research and development (R&D) activity is quite time-consuming because the steps are quite long (Adib, 2017).

Development research steps according to Borg & Gall (1985) in Dwiantoro & Kusumandari (2016); Lusiana & Lestari (2013) consists of several steps, namely conducting preliminary research, planning, developing initial products, conducting expert tests, revising products, conducting limited trials and field trials, then making final revisions to produce ready-to-use products. Other development research methods are ADDIE model and 4D model.

The steps of development research using the ADDIE model consist of analysis, design, development, implementation, and evaluation. The analysis stage is an activity to analyze the needs of the problems that exist in learning, the design stage is carried out by formulating learning objectives, determining materials, and compiling teaching materials, the development stage is the stage of compiling and making learning media, then the implementation stage is the stage of implementing the product to determine its effect on the quality of learning can include effectiveness, attractiveness, and efficiency of learning, the last stage is evaluation which can include formative and summative evaluations (Kurnia, Lati, Fauziah, & Trihanton, 2019; Putra et al., 2014).

The 4D model is one of the systematic research development design models (Arywiantari, Agung, & Tastra, 2015). The 4D model consists of 4 stages, namely define, design, develop, and disseminate. The definition stage is the initial analysis activity of the need for a development to overcome problems in learning, the design stage is the activity of designing learning tools, the development stage is the stage of producing the final draft of the learning device. The activities carried out are expert validation and product testing, and the last stage namely the disseminate stage at this stage the product is distributed to the field (Kurniawan & Dewi, 2017). So, it is known that there are various models that can be used in development research. However, students mostly used the ADDIE model, and did not try to use other development models. Therefore, it is necessary to develop a product to increase students' understanding of development research methods.

Solutions based on these problems were made instruments to explore the needs of students in overcoming these misconceptions. From the results of data collection through questionnaires and interviews, data on student needs were obtained. They feel they need a book with a very high percentage of 27.27% need, 36.36% need,

just 18.18% need and 18.18% less need, and 0% need no answer. This development book, whose context does not meet the needs of students, is also a basis for consideration of developing R&D books for students. The development of this book aims to address students' misconceptions about R&D research methods by analyzing the misconceptions that occur during student thesis writing.

CONCLUSION

Based on the data obtained through interviews and questionnaires, it can be concluded that students in understanding development research are not in accordance with their real understanding. From the assumption data, 18.18% of R&D development students understand very well, 27.27% understand, 36.36% understand enough, 18.18% do not understand. 0.00% don't understand. Whereas in fact the understanding of students in R&D development is 0.00% very understanding, 9.09% understands, 27.27% understands quite well, 36.36% does not understand, and 27.27% does not understand. The majority of students who choose the R&D method experience misconceptions. The concept that they believed was correct, it turned out that after being studied there were several mistakes or misunderstandings. So, misconceptions really need to be straightened out by developing an R&D book that is compiled based on the needs of students who experience misconceptions. The only solution that is the most appropriate is to develop an R&D book that suits the needs and level of students' understanding of R&D concepts.

ACKNOWLEDGMENT

Thank you to Jambi University for supporting this research. This research is an analysis of misconceptions in R & D research where the implementation is carried out by students. Based on the observations, many students experience misconceptions in the study. This is why it is necessary to develop R&D books that are able to increase students' understanding of R&D concepts.

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