

Validity of Derivative Calculus Textbook to Increase Learning Motivation

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ABSTRAK

Tujuan penelitian ini adalah mengembangkan buku ajar yang valid dalam menumbuhkan motivasi belajar mahasiswa. Jenis penelitian ini adalah penelitian pengembangan, yaitu pengembangan Buku dengan model Plomp: (1) penyelidikan awal, (2) perancangan, (3) realisasi/konstruksi, (4) pengujian, evaluasi dan revisi, (5) implementasi. Subyek penelitian ini adalah mahasiswa Program Studi Pendidikan Matematika STKIP Andi Matappa. Instrumen penelitian: lembar validasi buku ajar. Hasil penelitian: skor validitas isi buku ajar termasuk dalam kategori tinggi. Hal ini menunjukkan bahwa buku ajar kalkulus derivatif yang telah dikembangkan memenuhi unsur validitas untuk menumbuhkan motivasi belajar mahasiswa.

ABSTRACT

The purpose of this research is to develop a valid textbook in fostering student learning motivation. This type of research is development research, namely the development of textbooks with the Plomp model: (1) initial investigation, (2) design, (3) realization/construction, (4) testing, evaluation and revision, (5) implementation. The subjects of this study were students of the Mathematics Education Study Program of STKIP Andi Matappa. Research instrument: textbook validation sheet. Research results: the content validity score of the coursebook is included in the high category. This shows that the derivative calculus textbook that has been developed meets the validity elements to foster student learning motivation.

Keywords:
Textbook,
Derivative Calculus,
Motivation of Learning

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Introduction

Derivative calculus is one of the courses in the mathematics education study program of STKIP Andi Matappa. This course is a prerequisite course for advanced calculus courses. Some of the materials in derivative calculus are in accordance with the curriculum of the mathematics education study program based on KKNi and National Higher Education Standards such as the real number system, one variable function, function limit, function continuity, function derivatives, and the use of function derivatives. With this material, it is

expected that students who have programmed this course have independent, quality and measurable performance competencies and are responsible for work in their field of expertise independently.

According to Prastii et al (2019), self-initiative or initiative in learning teaching materials, doing assignments, strengthening skills, and applying their learning experiences in the field or work are things that students must have if they study independently. Learning independently means having the flexibility of learning time, without being limited by space and distance. Especially after the Corona Virus Disease (Covid-19) Pandemic which caused public health emergencies that troubled the world also had an impact on the education sector. This clearly changes the learning pattern that requires lecturers and educational developers to provide learning materials and teach students directly through remote digital tools. In addition, applications such as e- classroom, video conference, telephone or live chat, zoom or through whatsapp group are means for students to interact with lecturers in online learning. Changes in teaching materials, teaching methods and the use of these applications are varied educational innovations to answer the challenges of the learning process after the Covid-19 Pandemic.

However, according to Nakayama, et al (2014) that differences in learning environment factors and learner characteristics mean that not all learners will be successful in online learning. According to Hardianto (2012)(2012), the characteristics of learners in online learning are independent, mature, learning motivation, discipline, and goal-oriented. One of the successes in learning is related to students' motivation (Schunk, et al., 2014). (Schunk, et al., 2014). According to Selvi (2010) that online learning is often required to be more motivated because the learning environment usually relies on motivation and related characteristics of curiosity and self-regulation to engage in the learning process. Motivation is considered an important factor for successful learning including in online learning environments, thus the need to reconsider learning motivation in learning environments that utilize technology. (Harandi, 2015)For this reason, it is important for researchers in the world of education to examine in depth how student motivation in online learning, especially learning activities carried out after the Corona Virus Disease (Covid-19) Pandemic.

In organizing online learning, both lecturers and students must prepare for learning. The preparations that teachers and students must make are related to the pedagogical relationship between lecturers-students and the availability of learning facilities (media, materials, application use, and network access). (Fitriyani, et al, 2020). The availability of teaching materials that have been developed is one of the strategies to increase student learning motivation. (Masni, 2015). Textbooks are teaching materials that are often developed for the learning process. The learning process also changes from teacher centered to student centered due to textbooks. (Muttakin, 2017). Textbooks consist of material, summaries, and assignments that must be done by students. However, as a learning tool, the existence of textbooks to date is still very minimal and ineffective. Therefore, a textbook must contain components and characteristics related to the achievement or not of a basic competency that must be mastered by students. Textbooks are not a collection of questions, but stages of activities carried out by students to build their knowledge, for example in the form of questions. Textbooks must also meet valid criteria in line with the opinion of (Syahputra, E & Rajagukguk, 2015)(Syahputra, E & Rajagukguk, 2015), learning media are of high quality and suitable for use if they have met the validity standards assessed by expert validators.

Student motivation to learn independently will increase with the availability and use of textbooks so that indirectly student learning outcomes will also increase. Research results (Taqwa, 2023)showed that using valid and reliable textbooks can foster student motivation to learn mathematics. The empirical findings of this study seem to be in line with the

theoretical review put forward by (Prastiti, Tri, Dyah et al., 2017; Taqwa, 2021) who said that media that have met valid criteria can increase student learning motivation.

Therefore, in the derivative calculus lecture process, it is deemed necessary to prepare a textbook that fosters learning motivation. Increased encouragement in students internally and externally to learn independently in facing difficulties in calculus which has an impact on improving student learning outcomes on calculus material. The purpose of this research is to develop textbooks in derivative calculus courses that are practical to foster student learning motivation.

Methods

This type of research is development research, namely the development of textbooks to foster student learning motivation. This research was conducted in the odd semester of the 2022/2023 academic year in the Mathematics Education study program of STKIP Andi Matappa which is located at Jl. A. Mauraga No.70 Pangkajene, Pangkep Regency, South Sulawesi. The research subjects were first semester students who were studying Derivative Calculus in the Mathematics Education study program of STKIP Andi Matappa.

The instruments in this study are: (1) student worksheet validation sheet. The data collected in this study are: (1) Student worksheet validation data. The content validity of the coursebook through the assessment of two experts using content validity

$$\text{Content Validity} = \frac{D}{A + B + C + D}$$

$$\text{Reliability} = \frac{2D}{B + C + 2D}$$

Information:

A = cell indicating disagreement between the two raters

B and C = cells showing differences in views between raters

D = cell indicating valid agreement between the two raters (Gregory, 2000; Martuza, 1977).

Strong relevance is the minimum criteria standard that must be met from the assessment of the two validators. The results of measurements or interventions carried out are valid, if the results of this content validity coefficient are high ($V > 75\%$). (Ruslan et al., 2018).

The flow chart of textbook development uses the Plomp model which consists of 5 stages, namely: (1) initial investigation, (2) design, (3) realization/construction, (4) test, evaluation & revision, and (5) implementation.

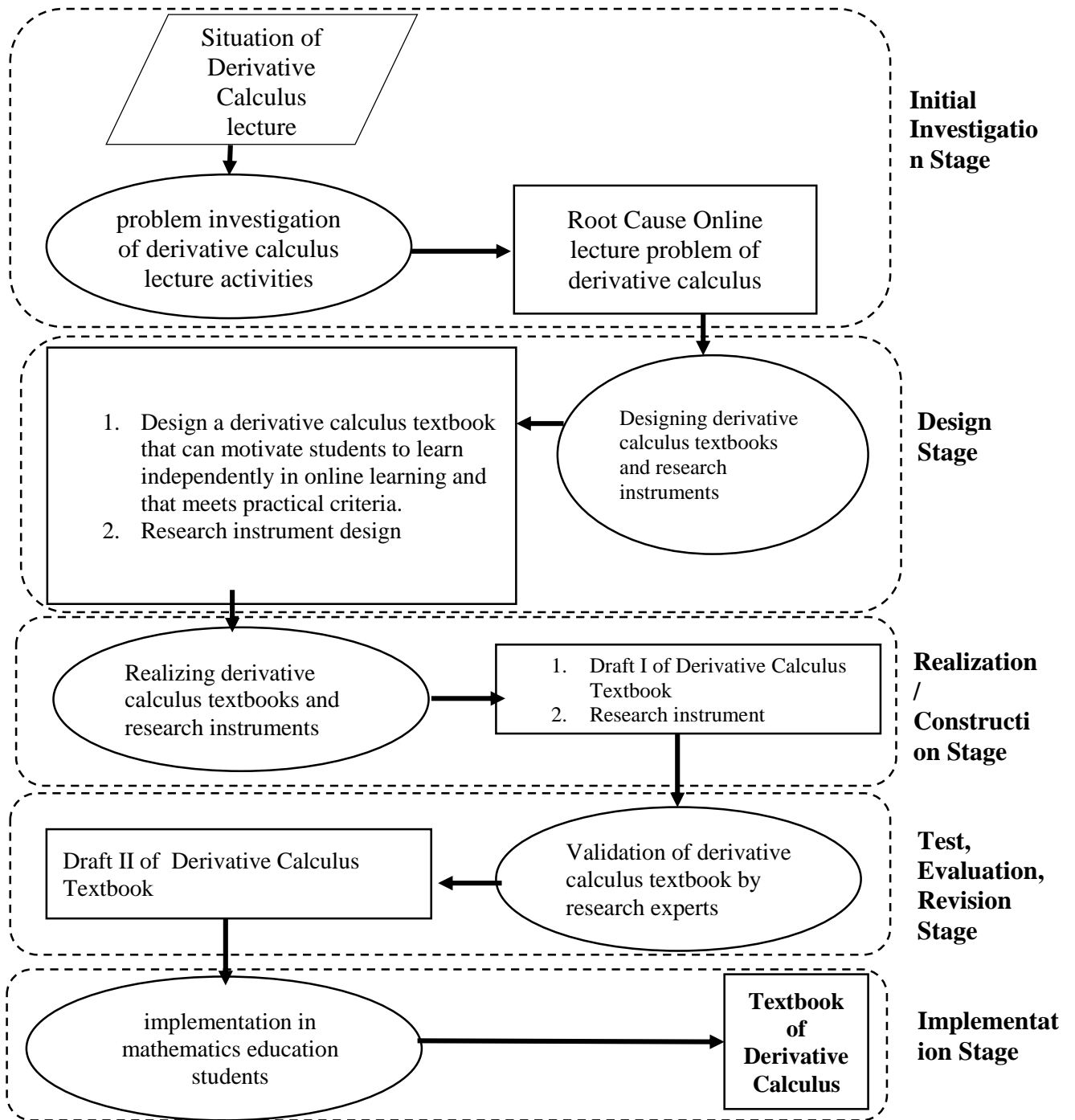


Figure 1: Research flow chart

Result and Discussion

The textbooks that have been prepared at the initial investigation stage are then tested through several stages. The second stage is the design stage, namely (a) designing coursebooks and research instruments, then the realization stage, namely making draft I coursebooks and research instruments. The fourth stage is the test, evaluation, and revision stage, namely the coursebook validation test using an expert validity assessment. The validity of the textbooks assessed is regarding content validity related to (a) aspects of the writing approach; (b) aspects of the truth of the concept; (c) aspects of the depth of the concept; (d) aspects of the breadth of the concept; (e) aspects of sentence clarity; (f) aspects of language; (g) aspects of learning evaluation; (h) aspects of student activities / experiments; (i) aspects of implementation; (j) aspects of physical appearance; and (k) reference literature. After going through the expert validation stage, then the implementation stage is carried out, namely the coursebook is tested on a limited basis to students. From the implementation results, two experts to see the content validity and reliability of the instrument. shown in Table 1 below:

Table 1. Results of Textbook Content Validation

No	Assessed Aspect	Validator	
		I	II
1	Emphasizes process skills	4	4
2	Connecting science and technology to life	4	4
3	Inviting students to be active in learning	4	4
4	Conformity of concepts with concepts proposed by statisticians	3	4
5	Correct arrangement of material for each chapter and prerequisites used	4	4
6	Contains the historical background of the discovery of concepts, laws, or facts	3	2
7	Depth of material in accordance with student competencies based on the	2	3
8	Curriculum	2	3
9	The suitability of the concept with the subject matter in the Curriculum	3	4
10	Relationship of concepts to daily life	4	3
11	The information presented keeps up with the times	3	4
12	Sentences do not cause double meanings	3	3
13	Sentences used are easy to understand	3	4
14	The language used invites students to be interactive	4	4
15	The language used is standard and interesting	3	4
16	Measures cognitive, affective, and psychomotor abilities	2	3
17	Measuring students' abilities in depth and based on competency standards determined by the Curriculum	4	4
18	The subject matter is in accordance with the time allocation on campus	3	4
19	Student activities / statistics experiments can be implemented	3	4
20	Provides hands-on experience	2	3
21	Encourage students to conclude concepts, laws or facts	4	4
22	Suitability of student activities / statistical experiments with the subject matter	4	4
23	Curriculum	4	4

No	Assessed Aspect	Validator	
		I	II
24	Design that includes consistency, format, organization, and appeal of good books	3	3
25	Clarity of text and images	4	4
26	The physical appearance of the book can encourage students' interest in reading	4	4

$$\text{Content Validity} = \frac{D}{A + B + C + D} = \frac{21}{26} = 0,81$$

$$\text{Reliability} = \frac{2D}{B + C + 2D} = \frac{42}{47} = 0,89$$

Information:

A = cell indicating disagreement between the two raters

B and C = cells showing differences in views between raters

D = cell indicating valid agreement between the two raters

The results of the analysis of the content validity of the coursebook show that the content validity score is 0.81, which means that the content validity of the coursebook is in the high category with a reliability of 0.89. Thus, the textbook is suitable to be used as a supporting tool for calculus learning activities.

The content validity of the coursebook shows that the content validity and reliability of the coursebook are in the high category. Thus the textbook is suitable for use as a tool to support statistical learning activities. The validity of a medium is important to test because validity is one of the criteria for determining a medium to be said to be good. The learning media developed can be said to be valid if all experts who validate it state that it is valid. This opinion is supported by the results of research (Syahputra, E & Rajagukguk, 2015) concluded that learning media is of high quality and feasible to use if it has met the validity standards assessed by expert validators. . This is reinforced by the results of research (Prastii, Tri et al., 2019) who said that media that have met valid criteria can increase student learning motivation, even 77% of students feel challenged and motivated to learn independently.

According to (Gaspersz, 2006) Validation of the design and development of a product must be carried out to ensure that the product produced is in accordance with the requirements of the use of the product. Validation of product design and development is basically to confirm that the final product produced is able to meet the needs of customers, in this study are lecturers and students, under certain conditions. It is to be expected that the increase in motivation to learn mathematics with the use of valid textbooks is due to indicators of learning motivation in the dimension of students' intrinsic goal orientation where the material in challenging textbooks causes students to learn new things.(Taqwa, 2020).

Conclusion

Derivative calculus textbooks have met valid and reliable criteria that can foster the motivation of mathematics learning of STKIP Andi Matappa students. The textbook developed in this study needs to be continued by checking the effectiveness of its use in learning.

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