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The Influence of The Blended Learning Website Based on Creativity in Supporting Students Learning Basic Math

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Abstract: This research aims to demonstrate the impact of implementing a Website-based Blended Learning method in enhancing student creativity to support basic mathematics learning. The method used in this study employs the ADDIE development model with 5 stages: Analysis, Design, Development, Implementation, and Evaluation. The resulting learning product underwent validity testing by experts and practicality assessment by students. The products created through student creativity were evaluated using a Paired-sample T-Test to determine whether they were flexible, novel, and elaborative in relation to technological advancements. Research results calculated using SPSS 23 show that the product's practicality score is 0.989, meaning the product is deemed suitable with a "very good" category. The learning model, in the form of a website-based Blended Learning model, proved to be valid and practical when tested based on learning indicators (face-to-face and online), learning materials, and learning media. Consequently, this model is effective in influencing the development of student creativity in studying basic mathematics.

Keywords: Blended Learning; Website; ADDIE; Basic Math; Creativity

1. Introduction

Education in Indonesia aims to develop the potential of students to become creative individuals (Menteri, 2019). This objective is reflected in Law No. 20 of 2003 concerning the National Education System, particularly in Article 3, which states that national education functions to enhance capabilities and shape the character and civilization of a dignified nation. In this context, Meri et al. (2022) argue that creativity is viewed as a crucial component in character formation and the competencies of students, preparing them to face global challenges and contribute positively to national progress.

Mathematics education at the higher education level often encounters significant challenges. One major issue is the gap between the curriculum taught in secondary schools and the complexity of mathematics at the university level. Many students feel unprepared to tackle the higher levels of abstraction and complexity found in advanced mathematics, leading to frustration and a decline in interest in mathematics courses (Sriyanto, 2017).

The dominance of traditional teaching methods in many higher education institutions also poses a barrier. Lecture-based approaches that focus on delivering theoretical content without practical context often fail to actively engage students in the learning process. As a result, students may develop weak conceptual understanding and struggle to apply their mathematical knowledge in real-world situations or other fields of study.

Moreover, the lack of technology integration in mathematics education is another critical issue. In this digital age, many universities have yet to optimize the use of mathematical software, computer simulations, or online learning platforms to enhance

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conceptual understanding (Rahayu et al., 2023). Proper use of technology can aid in visualizing abstract concepts and improving student engagement.

Another concern is the relevance of the mathematics curriculum to workforce needs. There is often a disconnect between what is taught in classrooms and the mathematical skills required in various professional fields. This gap can lead students to perceive their mathematics education as less meaningful for their future careers.

Creativity among students in mathematics learning is a crucial aspect that needs to be developed. As noted by Siregar (2024), the ability to think creatively enables students to discover innovative solutions to complex mathematical problems. By honing their creative skills, students can view mathematical concepts from different perspectives, develop unique problem-solving strategies, and connect mathematical ideas to real-life contexts.

In this regard, educators play a vital role in facilitating and encouraging student creativity. They can design challenging and open-ended tasks, promote experimentation with various approaches, and create a learning environment that supports exploration and intellectual risk-taking. The integration of technology and visualization tools can also assist students in exploring mathematical concepts more dynamically and creatively (Darmawati, 2024).

Creativity in mathematics extends beyond merely finding solutions; it encompasses the ability to pose new questions, make interdisciplinary connections, and communicate mathematical ideas effectively. Students who cultivate their creativity are generally better prepared to face challenges in a workforce that increasingly demands innovative thinking and adaptability.

Online learning supported by websites has become an increasingly popular and effective educational method in this digital era (Hidayat, 2019). Nugraha et al. (2020) assert that web-based platforms enable students to access learning materials, interact with instructors, and collaborate with peers anytime and anywhere. With various features such as instructional videos, discussion forums, interactive quizzes, and multimedia resources, educational websites can create a dynamic and engaging learning experience. This method not only provides flexibility in terms of time and location for learners but also allows for personalized learning tailored to individual paces and styles.

According to Usman (2018), the concept of Blended Learning based on websites aims to integrate face-to-face and online experiences for optimal learning outcomes. In an ever-evolving digital landscape, education is undergoing significant transformation in how knowledge and skills are conveyed to learners. One emerging innovation is the web-based blended learning method, which combines the strengths of traditional face-to-face instruction with the flexibility and accessibility of online learning, creating a dynamic and effective learning environment. Web-based blended learning is a pedagogical approach that integrates information and communication technology (ICT) into conventional teaching processes. This method not only replaces or adds digital elements to traditional classrooms but also redesigns the overall learning experience to leverage the strengths of both modalities (Akhmadi, 2021).

Amin (2017) highlights that the main components of the web-based blended learning model include face-to-face interactions that facilitate direct communication between educators and students for discussions and feedback on the learning process, as well as online learning through digital material delivery, quizzes, assessments, virtual discussion forums, and web-based tasks. Integration and synchronization are crucial in this model for aligning online components with face-to-face interactions. This model requires educators to exhibit flexibility, personalization, expanded access, interactivity, efficiency in optimizing resources, and appropriate timing in instruction for students (Hertina et al., 2024).

Norman (2023) states that the blended learning model can utilize various interactive and collaborative online tools such as videoconferencing platforms (Zoom, Google Meet, or Microsoft Teams for synchronous sessions), virtual whiteboards, document collaboration tools (Google Docs, Microsoft Office 365), project management tools (Trello, Asana), authoring tools, interactive content creation, and mobile learning optimized for short content consumption. This approach enhances students' ability to design interactive learning experiences that foster creativity in supporting mathematics education, particularly in foundational mathematics courses.

2. Materials and Methods

This research employs the ADDIE development method within a website-based blended learning context, utilizing an instructional design framework that includes Analysis, Design, Development, Implementation, and Evaluation, as illustrated in Figure 1.

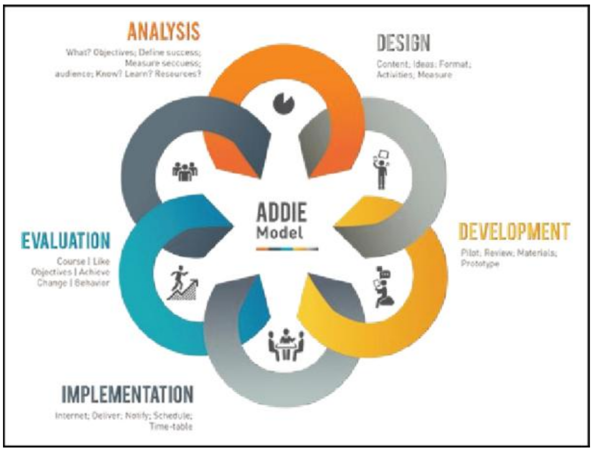

Figure 1. ADDIE Development Method

According to Cahyadi (2019), the ADDIE development method, as depicted in Figure 1, consists of the following detailed stages:

1. **Analysis Phase:** In the initial phase, educators identify learning needs and student characteristics, define learning objectives, and analyze available technological infrastructure.
2. **Design Phase:** In the second phase, educators design a course structure that integrates online and face-to-face elements, determine appropriate assessment strategies for both modalities, and plan the learning flow and interactions.
3. **Development Phase:** In the third phase, educators develop digital content (videos, e-books, interactive quizzes), prepare materials for face-to-face sessions, and configure other technological tools.
4. **Implementation Phase:** In the fourth phase, educators launch the web-based blended learning course, facilitate online and face-to-face learning, and provide technical and pedagogical support.
5. **Evaluation Phase:** In the fifth phase, educators collect feedback from students, analyze performance and engagement data, and make adjustments based on the evaluation.

Data collection techniques in this research utilize the results of the web product developed by educators to support the basic mathematics learning process, focusing on the product's feasibility, practicality, and effectiveness. Feasibility testing is conducted by providing feedback to instructional media and material experts, with assessment criteria including very good, good, fair, poor, and very poor. For web product practicality testing, researchers provide questionnaires to peer educators and student users of the product. Meanwhile, the product's effectiveness is tested by comparing the outcomes of the website product in implementing the website-based blended learning model.

This research employs data analysis techniques with feasibility testing to evaluate the web product with the Blended Learning model as follows:

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[(n\sum X^2 - (\sum X)^2) - (n\sum Y^2 - (\sum Y)^2)]}} \quad (1)$$

Where:

r = Product Moment correlation coefficient

n = number of respondents (experts)

X = Item score

Y = Total score

Firdaus (2021:35).

The criteria for the correlation coefficient are shown in Table 1 below:

Table 1. Correlation Coefficient Criteria

Interval	Category
0.9 – approaching 1	Very Good
0.7 – 0.8	Good
0.5 – 0.6	Fair
0.3 – 0.4	Poor
0.1 – 0.2	Very Poor

Based on the correlation coefficient criteria, the website-based Blended Learning model is considered feasible for use in the learning process if the category value is fair (≥0.5).

The practicality test is assessed from the respondents' results on the application of the website-based Blended Learning model. The effectiveness test is conducted by comparing the product results in applying the website-based Blended Learning model with student post-test results before and after the model's implementation, using creativity criteria that include flexibility, website novelty, and elaboration. The t-test is then performed using SPSS 23.

The ADDIE model is a systematic approach to instructional design that consists of five phases: analysis, design, development, implementation, and evaluation. Blended learning, which combines online and offline teaching methods, can enhance training outcomes and overcome the limitations of traditional face-to-face instruction.

3. Results and Discussion

Results

The product development employed the ADDIE model, which includes Analysis, Design, Development, Implementation, and Evaluation. The outcomes for each stage are detailed below:

Analysis Phase: Student Identification

In the initial analysis phase, educators identify learning needs and student characteristics, define learning objectives, and analyze available technological infrastructure, considering creativity in developing learning media. The identification results are summarized in Table 2.

Table 2. Analysis Phase Results of Student Identification

No	Identification of Students	Actions Undertaken by Researchers
1	Identification of Learning Needs	• Conducting surveys or interviews with students • Analyzing previous learning outcomes • Consulting with a materials expert • Analyzing the curriculum and competency standards
2	Analysis of student characteristics	• Collecting demographic data (age, gender, background) • Identifying dominant learning style • Evaluation the level of prior knowledge and skills • Understanding the motivations and interests of learners
3	Determining learning objectives	• Formulating general learning objectives

		• Determine specific, measurable objectives • Adapt objectives to the needs and characteristics of students • Validate objectives with relevant stakeholders	
4	Technology Infrastructure Analysis	• Inventory available hardware • Evaluate internet and network connectivity • Identify learning management systems or platforms in use • Analyze the technology skills of students and teachers	
5	Synthesis and Recommendations	• Integrate findings from all stages of analysis • Develop appropriate learning design recommendations • Determine the needs for material and technology development • Create an implementation plan based on the results of the analysis	

In Table 2, the researcher effectively conducted a five-stage analysis to identify students. The first stage, learning needs analysis, involved surveys and interviews. The second stage, learner characteristic analysis, involved analyzing dominant learning styles and understanding student learning motivation. The third stage, learning objective analysis, involved formulating objectives based on student needs and characteristics. The fourth stage, technological infrastructure analysis, involved analyzing the technological skills of students and instructors. The fifth stage, synthesis and recommendation, involved developing instructional designs, developing materials, and implementing the results of the analysis.

A specific conclusion from these stages is that some lecturers' teaching processes are unengaging and lack creativity. Consequently, students' understanding of basic mathematics and the development of creativity remain limited. This concept serves as the basis for the trigger that students are less creative in supporting the learning process.

Stages of Determining Learning Objectives

In this stage, the researcher identifies the basic competencies, learning indicators, descriptions, and formulations of learning objectives to enhance students' creativity in studying basic mathematics. A detailed description can be found in Table 3, which outlines the basic competencies, indicators, and descriptions of the mathematics course.

Table 3. Competencies, Indicators, and Descriptions of Basic Mathematics Course

No	Course Outcames
1	Define and apply logical principles (disjunction, conjunction, implication, and bi-implication) in real-world contexts.
2	Master and apply the concepts of tautology, contradiction, and contingency in practical scenarios.
3	Identify and apply the concepts of set theory in real-world situations.
4	Identify and apply operations on sets in practical contexts.
5	Implement and apply the concept of relations on sets in real-world applications.
6	Implement and apply the concepts of relations and functions on sets in practical situations
7	Master and apply the principles of function graphs
8	Determine solutions and apply number concepts in real-world scenarios.
9	Determine solutions and apply arithmetic operations on numbers.
10	Prove and apply proportions in real-world contexts.
11	Use and apply number lines.

12	Solve problems and apply the concepts of the greatest common factor (GCF) and the least common multiple (LCM).
No	**Specific Learning Objectives**
1	Students are able to identify statements in mathematics
2	Students are able to determine tautology, contradiction, and contingency in real-world contexts.
3	Students are able to explain the concept of sets.
4	Students are able to accurately explain set operations.
5	Students are able to apply relations on sets.
6	Students are able to explain the concept of relations between sets and functions in real-world contexts.
7	Students are able to apply quadratic function graphs.
8	Students are able to determine solutions and apply number concepts in real-world situations.
9	Students are able to explain number bases.
10	Students are able to explain the concept of proportions and scales.
11	Students are able to draw number lines.
12	Students are able to explain the concepts of factoring and multiples, prime factors, GCF, and LCM.

Based on the basic competencies, indicators, and descriptions of the course, the instructor (course lecturer) formulates the learning objectives to be achieved through a Web-based Blended Learning method. This is illustrated in Table 4 as follows.

Table 4. formulation of Learning Objectives for Web Based Blended Learning Method

No	Formulation	Learning Objectives
1	Concept Mastery	• Students are able to understand and explain basic mathematical concepts. • Students can identify and apply mathematical principles in various contexts
2	Problem-solving Ability	• Students can analyze and solve mathematical problems using appropriate methods. • Students are able to develop effective problem-solving strategies.
3	Technological Skills	• Students are skilled at using online learning platforms and digital mathematics tools. • Students can utilize web resources to support mathematics learning.
4	Collaboration and Communication	• Students are able to collaborate effectively in online learning groups. • Students can communicate mathematical ideas clearly through online discussion forums and visual presentations.
5	Learning Independence	• Students develop independent learning skills and effective time management. • Students can manage and evaluate their own learning.
6	Knowledge Integration	• Students are able to connect basic mathematical concepts with practical applications in everyday life. • Students can integrate mathematical knowledge with other studies.

7	Digital Literacy	• Students develop the ability to find, evaluate, and use mathematical information from credible online sources. • Students can use digital tools for visualization and analysis of mathematical data.
8	Adaptability	• Students are able to adapt to a blended learning environment, both online and face-to-face. • Students can overcome technical challenges in web-based learning.
9	Reflection and Metacognition	• Students develop the ability to reflect on their own learning process. • Students can identify their strengths and weaknesses in mathematics learning.
10	Motivation and Engagement	• Students show increased motivation and engagement in mathematics learning through the blended learning method. • Students actively participate in online and offline learning activities.

Stages of Determining Learning Methods, Media, and Teaching Materials

In this stage, determining the methods, media, and teaching materials for the Blended Learning method involves two activities. First, face-to-face learning (Offline) uses discussion, cooperative (formation of learning groups), and problem-solving methods with media and teaching materials using interactive tools for mathematics (such as GeoGebra, Desmos) containing basic mathematics material, then problem-solving with website-assisted group discussions. The second activity is online learning (Online) using the Zoom Meeting platform with Google Sites media, equipped with materials to be presented and learning evaluation materials with the Liveworksheet website.

Stages of Using Media and Teaching Materials

The stages of using the required learning media include several things, namely learning tools in the form of lesson plans and student worksheets with the help of websites (Geogebra, Desmos, and Liveworksheet). Before using the prepared tools, they will be tested by learning experts, media experts, and teaching material experts to determine the validity and reliability of the tools used in the basic mathematics course learning process. The test results can be seen in Table 5 as follows, according to the assessment indicators, namely the first indicator regarding online (IA) and offline (IB) learning activities, the second indicator regarding the learning media used (II), and the third indicator, namely teaching materials/learning materials (III).

Table 5. Expert Assessment Results

No	Indicator	Expert Assesment Score		Ideal Score
		Expert 1	Expert 2	
1	IA	54	55	60
	IB	44	43	55
2	II	22	27	30
3	III	28	32	35

Based on the expert assessment in Table 5, testing will be conducted using the Product Moment Correlation Coefficient formula (1) with the aid of SPSS 23 software by comparing the ideal score and the assessment score of each expert. The results of the analysis can be seen in the following table.

Table 6. Results of Expert 1's Assessment with SPSS 23 Calculation.

Correlations

	PAKAT1	SKOR

PAKAT1	Pearson Correlation	1	.989*
	Sig. (2-tailed)		.011
	N	4	4
SKOR IDEAL	Pearson Correlation	.989*	1
	Sig. (2-tailed)	.011	
	N	4	4

*. Correlation is significant at the 0.05 level (2-tailed).

Based on Table 6, it can be concluded that Expert 1's assessment of the feasibility of online learning activities, learning media, and learning materials indicates "very good" with a value of 0.989. Therefore, the online Blended Learning model is deemed suitable for use.

Table 7. Expert 2's Assessment Results with SPSS 23 Calculations"

Correlations

		PAKAT2	SKOR
PAKAT2	Pearson Correlation	1	.964*
	Sig. (2-tailed)		.036
	N	4	4
SKOR IDEAL	Pearson Correlation	.964*	1
	Sig. (2-tailed)	.036	
	N	4	4

*. Correlation is significant at the 0.05 level (2-tailed).

In Table 7, it can be concluded that Expert 2's assessment of the feasibility of face-to-face learning activities (Luring), learning media, and teaching materials indicates a rating of "very good" with a score of 0.964. This suggests that the Blended Learning model for face-to-face instruction is suitable for implementation. The next step involves testing the practicality of the model with data from 15 students who will provide feedback on the Blended Learning model through a limited trial. The results of this feedback can be found in Table 8 below.

Table 8. Results of Student Feedback on Practicality

No	Aspek yang Ditanggapi	Tanggapan Mahasiswa									
		STB	%	TB	%	CB	%	B	%	SB	%
1	IA	0	0	0	0	2	13.3	6	40	7	46.6
2	IB	0	0	0	0	4	26.6	5	33.3	7	46.6
3	II	0	0	0	0	2	13.3	7	46.6	6	40
4	III	0	0	0	0	1	6.6	8	53.3	6	40

Note: STB (Very Poor), TB (Poor), CB (Fair), B (Good), SB (Very Good)

Table 8 indicates that the students' responses to the four aspects Online Learning and Face-to-Face Learning (Luring), media, and learning materials scored over 80% in the categories of "Very Good" and "Good." Therefore, the Blended Learning model is deemed suitable for future classroom instruction.

Learning Activities Conducted in Face-to-Face (Luring) and Online Formats

The learning process is conducted through both Face-to-Face (Luring) and online methods within the Blended Learning model, fostering student creativity. This model aims to optimize the learning process by leveraging the advantages of both methods. The face-to-face learning sessions, supported by the Geogebra website, facilitate direct interaction as students engage in solving fundamental mathematical problems, particularly in spatial geometry. This spontaneous and brainstorming approach significantly enhances student creativity. Direct practical experiences stimulate creativity through experiments and real projects, requiring students to present their creative ideas for immediate feedback. An example of the initial setup for face-to-face learning (Luring) with the assistance of the Geogebra website is illustrated below.

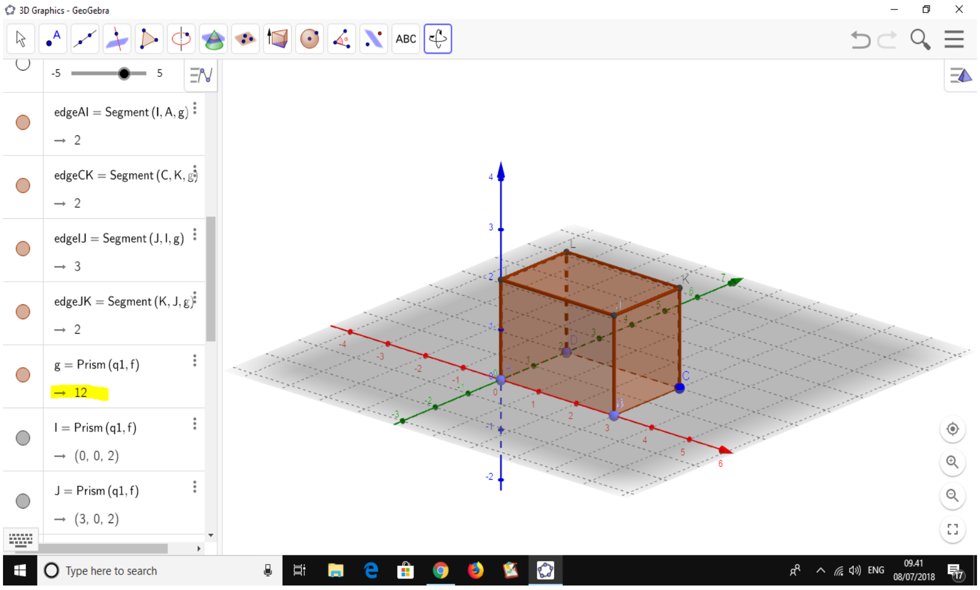

Figure 2. Initial Display of Geobera Online Learning Space

The Geobera online learning space is presented through Zoom meetings, structured with a design encompassing 16 sessions. Out of these, 8 sessions are conducted face-to-face (offline), while 6 are held online. An example of the online classroom can be seen in **Figure 3** below.

Figure 3. Example of Google Sites Initial Display

In **Figure 3**, it is evident that the Google Sites interface includes a top menu featuring a homepage that provides descriptions of the course, learning outcomes, assessment criteria, and supporting texts. The schedule menu contains the course timetable from sessions 1 to 16, complete with assignments and exams. The newsletter menu offers additional information as needed during the learning process. Access to Google Sites can be found at the following link: https://sites.google.com/ubibanyuwangi.ac.id/matematika-dasar/beranda. In addition to attending classes both offline and online, students complete assignments that foster their creativity using websites such as GeoGebra for creating geometric figures or LiveWorksheet for developing student worksheets. An example of a worksheet created by students on the topic of sets for seventh grade can be viewed in **Figure 4** below.

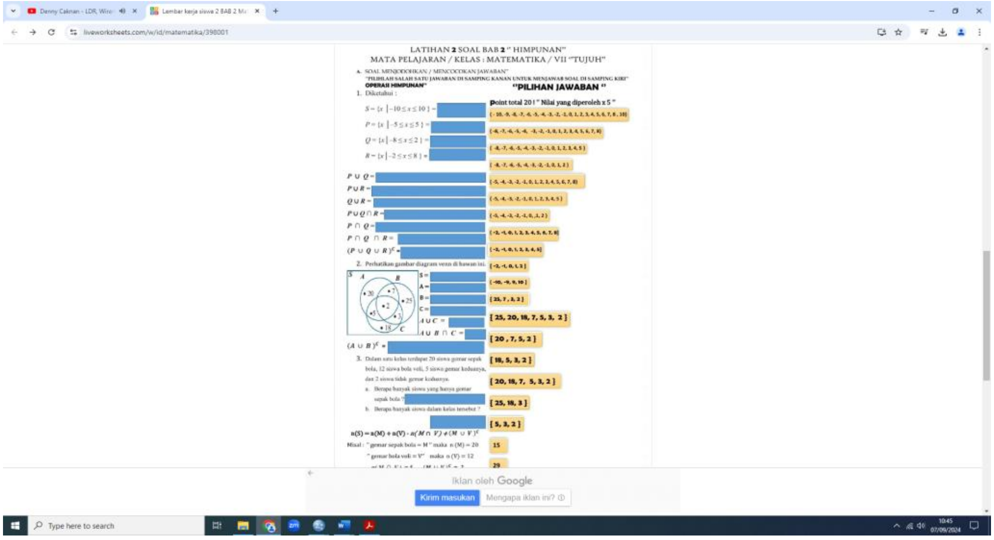

Figure 4. Example of Student Worksheets on Set Theory

In **Figure 4**, utilizing LiveWorksheet, students are encouraged to enhance their creativity by designing worksheets for seventh graders on set theory. These worksheets will be presented to receive feedback from instructors and peers, as this blended learning model based on websites promotes student autonomy in developing creativity both individually and collaboratively.

The products designed by students to support creativity within the Blended Learning model will be evaluated against criteria such as flexibility, novelty, and elaboration in application. The results from a Paired Samples Test indicate an average product score of 88 with a significance (2-Tailed) value of 0.000, suggesting a significant difference in student creativity before and after implementing the website-based Blended Learning model. Therefore, it can be concluded that the use of this model significantly enhances students' creative character development.

Discussion

The research findings indicate that a website-based blended learning model can enhance students' creativity in learning basic mathematics. This is achieved because students are provided with Geogebra, Liveworksheet, and Google Sites as learning resources that can be freely accessed, aligning with the core principle that creativity arises from unexpected encounters between seemingly unrelated ideas, experiences, or situations. Chance plays a crucial role in sparking creativity by opening space for the mind to make new and unexpected connections. By remaining open to possibilities and embracing emerging opportunities, we can harness the power of chance to drive innovation and creative thinking.

Surveys and interviews conducted in this study also support the notion that novice students tend to imitate, which can stimulate creative ideas. Furthermore, the relationship between educators and students can influence perceptions of teaching styles, impacting how students interact with instructors. This, in turn, can affect the quality of communication and understanding of the material. Therefore, if the goal is to develop student creativity, lecturers must also be more creative in providing learning experiences. This aligns with Salsabilah et al. (2021), who state that good teachers must be creative, thus setting a positive example for their students.

Nurdyansyah & Fahyuni (2016) argue that an effective learning concept aligns with the principles held by a good teacher. A qualified educator understands that learning is an active and personal process, where students must deeply engage with the material. They recognize the importance of creating a supportive environment that motivates curiosity and encourages critical thinking. Effective teachers also recognize that each student has different learning styles and comprehension rates, so they strive to adapt their teaching methods accordingly. Based on the research of Magdalena et al. (2024), by implementing these learning principles, a teacher not only transfers knowledge but also guides students to become independent learners capable of applying their knowledge in various life contexts.

The success of the website-based blended learning model in enhancing student creativity is not only influenced by the flexibility and ease of access it offers, but also by the explicit demands placed on students to produce high-quality work (Belawati, 2019). Through online platforms, students are faced with a series of tasks and projects carefully designed to challenge their creative thinking abilities, in accordance with pre-established learning designs and target achievements. The combination of face-to-face (offline) and online learning encourages students to explore new ideas, experiment with various approaches, and produce innovative solutions in completing their assignments. Thus, consistent with Irene's (2023) view, the obligation to meet high-quality standards in every work produced serves as a primary catalyst in developing and sharpening student creativity, while also preparing them to face the challenges of an increasingly competitive job market.

Student creativity in designing basic mathematics learning is an important aspect of preparing innovative future educators. Students need to develop the ability to create teaching methods that are interesting, effective, and relevant to the needs of students, based on research by Kistoro et al. (2023). This includes the use of technology, educational games, and contextual approaches that connect mathematical concepts with everyday life. A learning environment that supports creativity plays a significant role in developing students' potential. A classroom atmosphere that is open to new ideas, encourages experimentation, and provides space for trial and error can stimulate creative thinking. Lecturers can facilitate this by providing tasks that are challenging yet flexible, encouraging open discussions, and appreciating the diversity of approaches in solving mathematical problems.

According to Meo et al. (2023), collaboration among students is also an important catalyst for creativity. Through group work, joint projects, and brainstorming sessions, students can share ideas, provide constructive feedback, and build upon each other's ideas. An environment that encourages positive interaction not only enhances individual creativity but also creates synergy that results in innovation in the design of basic mathematics learning.

This research is considered successful because it can be proven by the significant increase in student product scores after the implementation of the website-based Blended Learning model. Data analysis shows a real difference between scores before and after the implementation of this learning model. Before implementation, the average student product score was at a lower level. However, after participating in learning with the website-based Blended Learning model, there was a substantial increase in the final score. This increase indicates that the applied learning model has successfully improved the quality of student work significantly. This clear difference in scores confirms the effectiveness of the website-based Blended Learning model in improving student learning outcomes in compiling learning products and creating student character.

4. Conclusions

Based on the research findings and the discussion presented in this study, it can be concluded that the implementation of a website-based Blended Learning model effectively enhances students' creativity in learning basic mathematics. This approach fosters the development of flexible, novel, and elaborative products across various aspects of learning, media, and instructional materials. This is evidenced by the product testing results, which yielded an average score of 88 with a significance level (2-tailed) of 0.000. As a result of this research, it is recommended that prospective teachers who aspire to be more creative adopt the website-based Blended Learning method. This method facilitates a learning process that combines both face-to-face (offline) and online activities, thereby optimizing learning and promoting flexibility. The incorporation of this method in university courses can enhance educators' creativity in the learning process, enabling them to cultivate student outputs that are more advanced and aligned with technological advancements.

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