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Development of Digital Research-Based Learning (D-RBL) strategy in instructional media course

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ABSTRACT
Proper selection and utilization of learning media facilitate information delivery to improve the learning experience. This research develops a Digital Research Based Learning (D-RBL) learning strategy to improve the quality of learning in learning media courses. D-RBL integrates flipped classrooms with research-based learning in a learning syntax consisting of three phases: pre-class, in-class, and post-class. The method used in this research is the research and development (R&D) method of the Dick and Carey model, which consists of 10 systematic stages. The validation results showed positive results where the D-RBL strategy was feasible. The results showed that D-RBL effectively improved student learning outcomes and developed interaction, collaboration, and procedural skills. This strategy encourages students to learn and actively take responsibility for their learning, allowing them to apply their knowledge in a real context. D-RBL is considered an innovative step in improving the quality of learning in learning media courses.

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ABSTRAK
Pemilihan dan pemanfaatan media pembelajaran secara tepat memfasilitasi penyampaian informasi sehingga dapat meningkatkan pengalaman belajar. Penelitian ini mengembangkan strategi pembelajaran Digital Research Based Learning (D-RBL) untuk meningkatkan kualitas pembelajaran di mata kuliah media pembelajaran. D-RBL mengintegrasikan flipped classroom dengan pembelajaran berbasis penelitian dalam sebuah sintaks pembelajaran yang terdiri dari tiga fase: pra-kelas, di kelas, dan pasca-kelas. Metode yang digunakan dalam penelitian ini adalah metode penelitian dan pengembangan (R&D) model Dick and Carey yang terdiri dari 10 tahapan sistematis. Hasil validasi menunjukkan hasil yang positif dimana strategi D-RBL layak untuk diimplementasikan. Hasil penelitian menunjukkan bahwa D-RBL efektif dalam meningkatkan hasil belajar mahasiswa dan mengembangkan interaksi serta keterampilan kolaborasi, dan prosedural. Strategi ini mendorong mahasiswa didik untuk aktif belajar dan bertanggung jawab atas pembelajarannya sendiri, serta memungkinkan mereka menerapkan pengetahuannya dalam konteks yang nyata. D-RBL dianggap sebagai langkah inovatif dalam meningkatkan kualitas pembelajaran di mata kuliah media pembelajaran.
Kata Kunci: *digital research-based learning; pembelajaran terbalik; research-based learning; strategi pembelajaran*

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INTRODUCTION

Educational media is one of the compulsory courses that must be studied by students majoring in education who will primarily become educators. This course provides prospective teachers or instructors with insights into how they can select and utilize various media effectively to enhance the learning experience. Educational media itself can facilitate the delivery of information. The selection of appropriate learning media can support learners' understanding of the material educators teach (Degeng et al., 2021; Wulandari et al., 2023).

Learning media as a strategy for delivering messages includes all sources necessary for communication in the learning process. Learning media plays a crucial role in increasing engagement and understanding. Various types of learning media, such as interactive technology, mobile applications, games, and concept maps, have been proven effective in improving learning achievement and fostering interest in various subjects (Sumantika et al., 2023; Ulfa, 2016; Wani et al., 2023). The use of learning media not only increases knowledge but also significantly improves interest and overall learning outcomes. Therefore, combining diverse and innovative learning media in an educational environment can result in more effective teaching methods and better Performance (Handayani et al., 2023; Lubis et al., 2023).

The results of interviews and observations conducted by the author with the learning media course instructor revealed that learning in the classroom does not always utilize technology. Communication in learning is still one-way, with learners being the sole source of information. The use of technology in the learning process should facilitate interaction between students in the classroom (Lathifah, 2024). Only some students in the class independently search for information in the form of online literature related to the learning material being studied. However, independent learning is important for developing self-knowledge, and independent learning should be seen as a means of teaching practice (Max, 2022).

Based on the information above, an appropriate learning strategy is needed to accommodate the problems found. Effective learning strategies are crucial for academic achievement (McDaniel et al., 2021). Modeling learning strategies pay attention to interests, and learning outcomes that are influenced by these strategies tend to be higher than those taught with conventional learning strategies (Chen et al., 2019). A learning strategy is a plan or method designed to achieve specific educational goals. It includes steps or methods to organize learning materials according to needs, facilitating independent knowledge construction. Learning strategies are not merely about following activity procedures; learning is involved in them (Dick, 1996).

Developing 21st-century learning strategies should focus on student-centered learning approaches to support achieving higher-order thinking skills. Hoidn and Reusser in "Foundations of student-centered learning and teaching" State that Student Centered Learning (SCL) is learner-oriented learning that emphasizes the use of methods that actively involve learners, taken from various educational theories to overcome passivity and improve the quality of learning in higher education. Therefore, the learning model applied in the learning process must necessarily place students at the center of learning. The research-based learning model is one of many student-centered models and is a learning model applied in higher education (Rangkuti, 2017). Research-based learning is a constructivist learning method that is student-centered and related to the scientific inquiry process (Gezim & Xhomara, 2020). Research-based learning is acquiring knowledge by analyzing, experimenting, and interpreting data using a scientific approach. Research-based learning helps improve students' research skills, boost motivation, and enhance academic performance (Pirozhkova, 2021).

Implementing constructivist theory through a research-based learning model builds students' understanding independently (Sugrah, 2019), develops prior knowledge, and increases social interaction (Mohammed & Kinyó, 2020). This model requires significant time allocation because teachers, as

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facilitators, are responsible for facilitating each student's learning needs to construct knowledge (Huet, 2018; Oztas Cin & Yurumezoglu, 2020). The significant time required for teachers to facilitate each student's learning needs in a research-based, constructivist model can be overcome using a blended learning format with a flipped classroom approach (Carmona-García et al., 2020; Jurmey et al., 2022). A flipped Classroom is a teaching method consisting of two parts, namely interactive group learning in the classroom and direct computer-assisted learning guidance (Almasseri & AlHojailan, 2019). The flipped classroom utilizes teaching materials that the instructor provides students to study at home. The flipped classroom applied in higher education shows significant knowledge acquisition and competency development (Sevillano-Monje et al., 2022). Learners benefit from the flipped classroom experience when the learning design is planned and aligned effectively. This design has an impact on learner satisfaction and engagement in classroom activities. Learner satisfaction with their learning experience is associated with motivation, self-confidence, and engagement (Awidi & Paynter, 2019). The success of the flipped classroom approach depends on their ability to organize independent learning (Jung *et al*., 2022; van-Alten *et al*., 2020).

The elaboration of research-based learning with digital technology can facilitate the learning process because it can accommodate the independent learning styles of students (Halik et al., 2022). Learning using digital technology allows the transfer of knowledge without being constrained by time and place (Rosyiddin et al., 2023). Technology has improved and made learning more effective (Mubaroq & Ilham, 2023). The author used the results of this study as a basis to show that learner-centered learning has a positive influence with the help of digital technology. Based on the above description, this study aimed to develop a Digital Research-Based Learning (D-RBL) strategy that is expected to effectively facilitate learning in media learning lectures.

LITERATURE REVIEW

Research-Based Learning

Research-Based Learning (RBL) is one of the student-centered learning models. RBL can improve the higher-order skills of students (Nuraini *et al*., 2021). Previous studies have shown that implementing research-based learning (RBL) can develop thinking skills (Susiani *et al*., 2018). The improvement in students' higher-order thinking skills is evident from their ability to demonstrate interpretation, analysis, evaluation, inference, and explanation skills. Research-based learning increases students' achievement and creative thinking skills (Rohim & Sucianto, 2019). The application of research-based learning makes students more critical and creative compared to teaching with traditional methods (Usmeldi et al., 2017). The use of *Cloud Classroom* also greatly facilitates research-based learning. Research-based learning improves critical thinking skills, as applied in astronomy courses (Ridlo & Nugroho, 2020). Engagement in research-based learning significantly enhances students' competencies in reviewing research status, methodology, communication, reflection on findings, and content knowledge (Thiem et al., 2023). Research-focused learning has proven effective in improving skills and knowledge acquisition at various educational levels and subjects, emphasizing its importance in promoting holistic growth and critical thinking skills among students.
RBL is a learning approach that utilizes contextual, authentic, problem-solving, cooperative, direct, and inquiry-based learning (Maylisa et al., 2020). RBL is research-focused learning that allows students to search for information, formulate hypotheses, collect data, analyze data, and draw conclusions from the data they have collected independently (Yudha et al., 2018). Tremp explains in his book "Research-based Teaching and Learning" that RBL research has the following learning stages: formulating a general question, conducting a literature review, defining a question, planning research activities and clarifying methods, undertaking investigation, interpreting and considering results, and reporting results.

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Flipped Classroom

The flipped classroom provides more opportunities for students to engage in active learning. It has been shown to have a greater positive impact on student learning performance compared to traditional approaches (Abeysekera & Dawson, 2015; Farmus et al., 2020; Hew & Lo, 2018; Lo & Hew, 2019; Strelan et al., 2020). The flipped classroom gives students sufficient time to complete interesting and meaningful tasks and understand the subject (Lage et al., 2000).

The main opportunity in implementing the flipped classroom is to improve understanding of the material in greater depth by giving students more control over what is learned and how learning is conducted (Wagner & Urhahne, 2021). Other studies also show that flipped classrooms positively affect students' academic performance (Al-Said et al., 2023). In addition, most students expressed satisfaction with their learning experience in flipped classrooms. Flipped classrooms emphasize the role of students, where the primary focus of learning is their activities and achievements. This model is seen as supporting a curriculum that emphasizes the active involvement of students in constructing their knowledge (Anggoro *et al*., 2023).

METHODS

This type of research uses a research and development method that refers to Dick and Carey's learning development model, which has ten systematic stages, as shown in **Figure 1**. With the help of a systematic approach, we can understand the learning process as something that must be planned systematically and systemically. A systematic approach can be defined as a logical and repetitive process for improving and enhancing the quality of educational programs. Dick et al., in their book "The Systematic Design of Instruction", State's that data collection and data analysis are incorporated into the Dick and Carey development model in Steps 8 and 10.

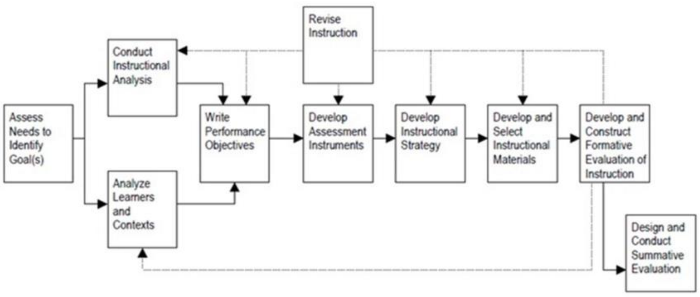

Figure 1. The Dick and Carey Model Development Procedure in the book "The Systematic Design of Instruction"

The first stage is to identify the general learning objectives. At this stage, the general learning objectives obtained from the curriculum are identified. The main objective is to determine the types of knowledge and skills that students must master as learners after completing the learning process. The results of this identification will determine steps 2 and 3. The general learning objectives in this study were taken from the analysis of the existing MBKM curriculum used in the educational media course at Program Studi Pendidikan Ekonomi, Fakultas Ilmu Keguruan and Ilmu Pendidikan Universitas Pattimura Ambon. The author adopted them to establish the general learning objectives.

The second stage, conducting a learning analysis, aims to determine the concepts students must master to achieve the general learning objectives.

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The third stage, identifying students' initial learning characteristics, involves analysing their characteristics and learning context to determine their prior knowledge to achieve the learning objectives. By analysing students' characteristics and learning context, the author or designer can develop learning tailored to learners' needs and appropriate to the context in which the learning will occur. Tailoring instruction this way can help ensure that teaching is compelling and engaging for students.

The fourth stage is writing Specific Objectives (TK). At this stage, more specific objectives are determined. General objectives will be easier to achieve if specific objectives are met. The rules for writing specific objectives must meet the ABCD elements, where A (Audience) refers to students, B (Behavior) refers to the desired attitude, C (Condition) refers to the prevailing learning conditions, and D (Degree) refers to the ideal level of ability to be achieved.

The fifth stage is developing assessment instruments. Assessment instruments measure the extent to which students have achieved the established learning objectives. By developing valid and reliable assessment instruments, learning designers can ensure that the learning design effectively achieves the desired learning outcomes. Assessment can also provide valuable feedback to students and instructors and help identify areas requiring further attention or support.

The sixth stage is developing learning strategies. The development of learning strategies uses the CLEs (Constructivist Learning Environment) learning design process or a constructivist learning model that focuses on the process of content mastery and the achievement of learning outcomes. The development of learning strategies using the Constructivist Learning Environment (CLEs) must meet the following learning needs in the form of activities: (1) Designing learning environments (Planning The Learning Environments), (2) Designing student engagement (Planning for Learner Engagement), (3) Designing learning guidance (Planning Learning Guidance), (4) Designing authentic assessment (Planning Authentic Assessment).

The seventh stage, developing and selecting appropriate learning materials, aims to facilitate students in learning new information and knowledge independently or with peers.

The eighth stage, developing and implementing formative evaluation, aims to provide relevant feedback and information during the learning process. Formative assessment in this study involves compiling all development outcomes into a single research instrument, which is then validated by learning design experts with expertise in learning design and learning outcome instruments. This validation is conducted to assess the feasibility of the developed design, which will be tested on undergraduate students in the Program Studi Pendidikan Ekonomi Class of 2022, Fakultas Keguruan and Ilmu Pendidikan, Universitas Pattimura, who are taking the Media Learning course. The research subjects were concentrated in Class A, with 31 students, and Class B, with 32 students. The learning process was conducted over 7 class meetings. In this study, five answer options were used to facilitate data collection. The average score was used to evaluate the validity of expert assessments and the results of the design trial. In the decision-making process, the total score for each element was presented in percentage form. The assessment scale consists of five levels: Very Good (90-100), Good (75-89), Fair (65-75), Poor (55-64), and Very Poor (0-54). All quantitative data obtained are described descriptively in the results section.

The ninth stage, revising learning, involves reviewing the results of the formative evaluation process and making necessary changes to the instruction to improve its effectiveness in achieving the desired learning outcomes.

The tenth stage, developing and revising summative evaluation, aims to comprehensively evaluate the quality, effectiveness, and efficiency of a developed product, method, or innovation.

RESULTS AND DISCUSSION

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This chapter presents the results of developing the D-RBL strategy and its supporting components. The D-RBL learning strategy was developed through several phases described in **Figure 2**.

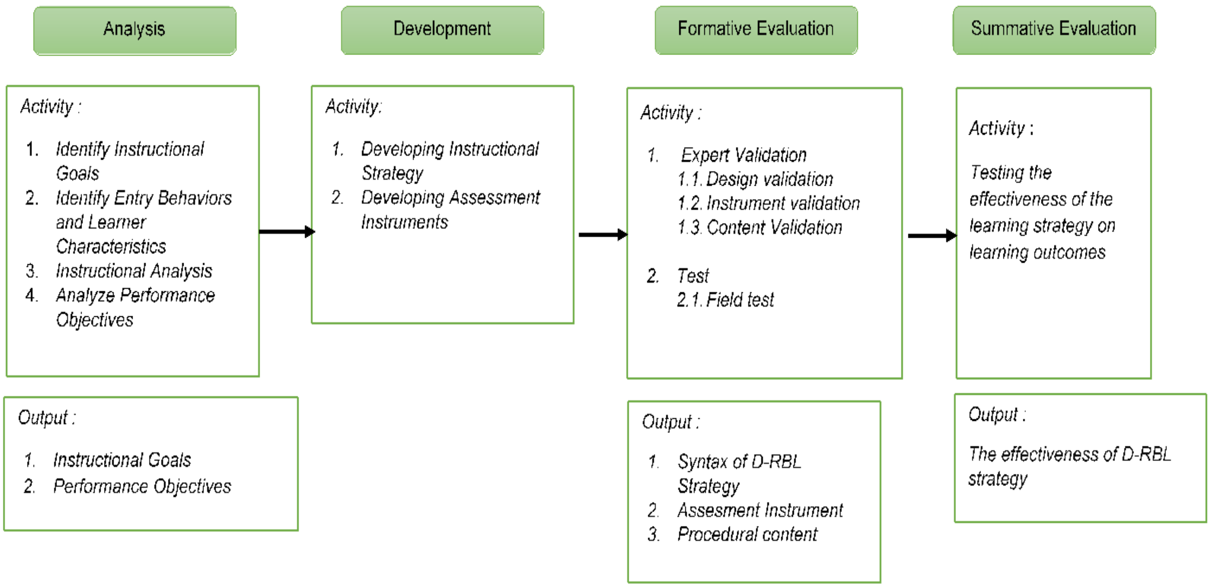

Figure 2. Research and Development Stages of Digital Research-Based Learning Strategy
Source: Research 2024

The results of this research development in the analysis phase are general and specific learning objectives. In the activity development phase, research instruments for learning outcomes, learning strategies, and lesson content/material were developed, which were then validated and produced learning outcome instruments, content/material, and D-RBL learning strategies in the formative evaluation phase. In the summative evaluation phase, the effectiveness of the D-RBL strategy was assessed.

Syntax of Digital Research-Based Learning Strategy

The results of this study produced a syntax for a Digital Research-Based Learning Strategy. The Digital Research-Based Learning Strategy was obtained from Bergmann and Sams' flipped classroom theory in "Flip Your Classroom: Reach Every Student in Every Class Every Day" and Tremp's research-based learning theory in "Research-Based Teaching and Learning." The flipped classroom has learning steps consisting of learning outside the classroom (pre-class, post-class) and learning in the school (in class). Meanwhile, the steps in research-based learning are 1) Formulating a general question, 2) Conducting a review of research literature, 3) Defining a question, 4) Planning research activities and methods, 5) Undertaking investigation, 6) Interpreting and considering results, 7) Reporting results. An overview of the D-RBL syntax can be seen in **Figure 3**.

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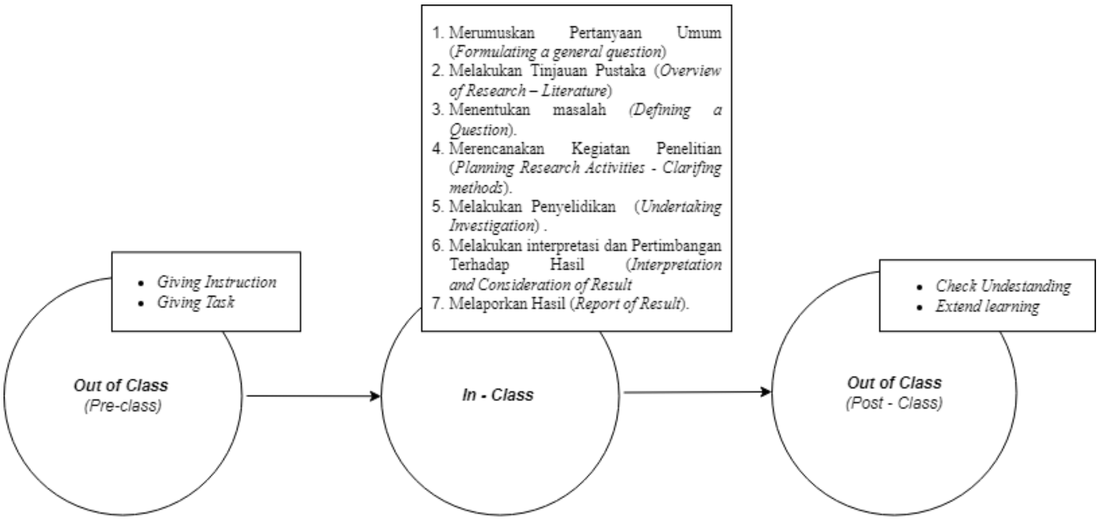

Figure 3: *Syntax of Digital Research-Based Learning Strategy*
Source: Author's Documentation 2023

The syntax of the Digital research-based Learning strategy is based on the flipped classroom learning process, which includes a research-based learning syntax in one of its phases. The D-RBL learning strategy consists of three phases.

1. Pre-class phase (Out of class)
   The pre-class phase (out of class) is the pre-learning process in which students study independently at home, following the learning instructions and assignments provided.
2. In-Class phase
   The in-class phase refers to the learning process that takes place in the classroom where students apply the knowledge they have acquired to formulate general questions (formulating a general question), conduct a literature review (overview of research - literature), define problems (defining a question), plan research activities (planning research activities - clarifying methods), undertake investigations (undertaking investigation), interpret and consider the results (interpretation and consideration of results), and reporting results (report of results).
3. Post-Class Phase (Out of Class)
   The post-class phase (out of class) involves evaluation and further learning through assignments completed at home or outside the classroom.

Digital Research-Based Learning as a Strategy

Dick and Carey explain that product development can be considered a strategy if it contains several components. These components are: 1) Pre-instructional activities involve motivating students and presenting the material to be learned. 2) Content Presentation, where knowledge construction occurs through assignments and the presentation of material synchronously using the microsite s.id. 3) Learner Participation, where the learning process uses collaborative teamwork to construct knowledge independently. Knowledge is constructed by following the D-RBL strategy stages. 4) Assessment takes the form of performance (portfolio), in which students present their findings/ideas in groups, and each group presents its findings to other groups in the class. 5) Follow-through activities consist of collecting the performance results through research articles.

After going through all the steps in the Dick and Carey procedure, a learning strategy and its supporting elements have been formed. The final result of this process is called a learning system because, according

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to Setyosari in "Rancangan Pembelajaran Teori dan Praktik," it consists of several parts, including 1) learning objectives, 2) learning materials, 3) learning methods, 4) learning tools/sources/media, and 5) learning assessment (see **Figure 4**).

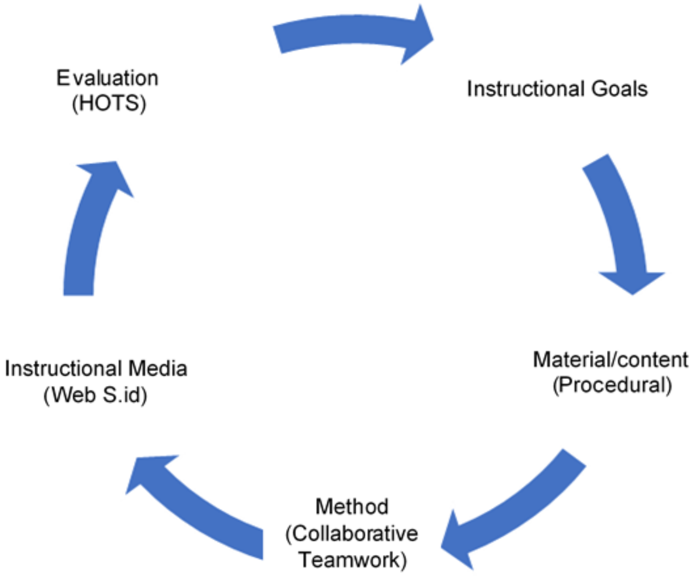

Figure 4*. Digital Research Based Learning as a System.*
Source: Research 2024

The learning objectives applied in the development of this curriculum are based on the MBKM of Prodi Pendidikan Ekonomi Universitas Pattimura. The formulation of specific learning objectives refers to the Graduate Learning Outcomes Standards, the minimum abilities expected of students after completing a series of learning experiences. The indicators of success focus on the ability to develop learning media specifically for island regions. This learning process consists of seven meetings through research procedures in developing learning media for island regions. This research prioritizes achieving specific learning objectives, including understanding procedures and collaborative skills.

The learning materials were developed based on learning objectives, in which students developed learning media for island regions, requiring them to go through media development procedures. The method used was collaborative teamwork, in which groups were formed to complete assignments. The aim was to facilitate the knowledge-construction process. The learning media selected were adapted to the development strategy, in which learning was conducted through blended learning with a flipped classroom type. The material is delivered using the microsite s.id platform, where the developed material is uploaded into the media and accessed before classroom learning. Learning evaluation is conducted on group performance (portfolio) through presentations of work results in front of the class, group participation, and articles.

Expert Validation Results

After the D-RBL strategy was developed, expert validation was carried out on the development results. Expert validation aims to determine the feasibility of the strategies produced before they are implemented in learning. The results of expert validation (Learning Design, Material / Content, Learning Outcome Instruments) can be seen in **Table 1.**

Table 1. Expert Validation Results

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Validator	Score obtained	Maximum Score	Percentage	Criteria	Decision
Learning Design	108	120	90%	Very Good	Worth implementing
Contents/Materials	67	76	88,16%	Good	Worth implementing
Learning Outcome Instruments	48	52	92,31%	Very Good	Worth implementing

Source: 2024 Research

The overall results of validating the supporting components for developing the D-RBL Strategy indicate that the criteria are good and very good, meaning that the D-RBL Strategy is suitable for implementation in educational media courses. After implementation, excellent results were obtained, with 92% of students achieving final grades above the course passing standard. The grades were based on an assessment of group performance in developing educational media for island regions. The variations in the products designed by each group were tailored to the needs of the island region. The D-RBL strategy was also highly effective in developing students' procedural knowledge and collaboration skills.

Discussion

D-RBL is a learning strategy combining the flipped classroom concepts and research-based learning. It is designed to facilitate the development of learning media for island regions. D-RBL focuses on student-centered learning. With this strategy, students are independently responsible for studying the learning materials provided before class. Students also search for relevant digital learning resources related to the taught material through the internet, such as e-books, e-journals, educational videos, and others.

The D-RBL syntax learning flow begins with students accessing the s.id web link shared on WAG (WhatsApp Group). Then, in the pre-class phase, students study the available material. In the in-class phase, students are divided into groups. The group division process is carried out independently, each assessing its strengths. Next, these groups will collaborate to complete the assignments given over the next seven weeks. Groups are required to complete tasks according to the given guidelines. In the first week, groups must successfully formulate a general question. In the second week, they conducted a literature review of reliable and relevant digital learning resources related to the assignment. In the third week, they define the problem. In the fourth week, they plan research activities and clarify methods. In the fifth week, they will undertake an investigation, which involves the process of developing learning media. In the sixth week, they will interpret and consider the development results. In the seventh week, they will report the results of the media development in the form of a prototype product and an article. The post-class phase is used for group interaction outside the classroom to complete assignments and evaluations.

The selection of the collaborative teamwork learning method facilitates collaboration skills among students in completing assignments in class. This process occurs when each student communicates ideas or findings obtained independently in the pre-class phase to their group. Collaborative teamwork is important in encouraging creativity, improving learning outcomes, and overcoming complex challenges in various educational environments (Daniati et al., 2022; Georgiev et al., 2023). Using web-based learning media through the s.id platform, which students can access, facilitates the delivery of learning materials. Learning

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using web-based media can improve learning outcomes (Anam et al., 2023; Aprilia et al., 2023). Learning materials are created in the form of procedures. These include procedures for developing learning media and learning procedures. Evaluation is conducted on learning media development performance (portfolio) for island regions and group research articles.

The D-RBL strategy has proven effective in improving student learning outcomes. Students also improved procedural knowledge and collaboration skills after implementing the D-RBL strategy. The D-RBL strategy produced various learning media products designed by students, tailored to the island region's needs. The effectiveness of the D-RBL strategy in improving student learning outcomes aligns with the research by Poonpan and Siriphan in "Indicators of Research-Based Learning Instructional Process: A Case Study of Best Practice in a Primary School," which proves that research-based learning can build new knowledge in students through research procedures. In addition, other findings in this study show interaction between learners and students. In line with previous research, the collaboration between the flipped classroom and the learning model proved to improve the quality of learning in the classroom and drive the personal development of students (Sun, 2022). The same was found in other studies that combining learning methods and the flipped classroom can support independent learning (Liu *et al*., 2024).

Developing the D-RBL strategy is an innovative step in improving the quality of learning in educational media courses. This strategy has several advantages, including (1) increasing student engagement, as the D-RBL strategy encourages students to learn and actively take responsibility for their learning. (2) Developing collaboration skills and procedural knowledge essential for the 21st century. (3) Enhancing the relevance of learning, as the D-RBL strategy enables students to apply their knowledge in real-world contexts by developing educational media for island regions. The advantages of the D-RBL strategy align with previous research, indicating that digital research-based learning is important to implement as it accommodates students' independent learning styles, precision, inquiry-oriented, problem-solving, context-based, authentic, and collaborative approaches (Halik et al., 2022).

It should be noted that the D-RBL strategy also has several limitations, namely that implementing the D-RBL strategy requires more time and preparation than traditional learning strategies. The D-RBL strategy requires adequate technology to support online learning and student collaboration. Educators need training to implement the D-RBL strategy effectively. Overall, the D-RBL strategy is a promising learning strategy for improving the quality of learning in educational media courses. Overall, the D-RBL strategy is a promising learning strategy for improving the quality of learning in educational media courses. The effectiveness of this approach is supported by research indicating that a technology-integrated learning strategy can bring about changes in the teaching and learning process.

CONCLUSION

The development of strategies in this study resulted in a Digital Research-Based Learning (D-RBL) strategy by integrating the flipped classroom with research-based learning in a learning syntax. Although much research has not explained the D-RBL strategy in higher education, expert validation results show that this strategy is feasible to implement in learning media courses. The D-RBL strategy effectively improves student learning outcomes through collaboration and procedures. Applying research in learning encourages students to independently seek information to generate new findings relevant to their learning needs. The D-RBL strategy holds promise for improving the quality of learning in the digital age. Based on the findings from this development, the D-RBL strategy can be used as an evaluation tool for future research on different topics.

AUTHOR'S NOTE

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The research results presented in this article are the product of our study. We ensure that no third party has influenced or controlled the content of this article. All opinions and findings disclosed herein are the direct result of our research. No party or institution has any influence or control over this research's content, findings, or interpretation.

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