



Development of a QR Code-Based Interactive Textbook for Basic Embroidery Techniques

Armaini Rambe^{1*}, Eka Rahma Dewi², Yudhistira Anggraini³, Juliarti⁴

^{1,2,3,4}Universitas Negeri Medan, Sumatera Utara, Indonesia

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ABSTRACT

Purpose: This study aimed to develop and evaluate the feasibility of a QR Code-based interactive textbook for thread embroidery to support learning in the Basic Embroidery Techniques course of the Fashion Design Education Study Program at Universitas Negeri Medan. **Methods:** This research employed a Research and Development (R&D) approach using the Four-D (4D) model, consisting of the Define, Design, Develop, and Disseminate stages. The product was validated by two material experts and two media experts before being tested with students through three stages: a small-group trial (3 students), a medium-group trial (7 students), and a large-group trial (30 students). Student participants were selected using simple random sampling. Data were collected using expert validation sheets and user response questionnaires and analyzed descriptively using percentage-based feasibility criteria. **Findings:** The material expert validation yielded a feasibility score of 84.70%, while the media expert validation reached 83.57%, both classified as **very feasible**. Product trials also demonstrated high feasibility, with scores of 82% in the small-group trial, 88% in the medium-group trial, and 95% in the large-group trial. The overall findings indicate that the developed textbook met the established feasibility criteria and received positive acceptance from users. **Research Implications:** The developed textbook provides an alternative technology-integrated teaching resource for vocational education by combining printed instructional materials with QR Code-linked digital content. The product is considered feasible for use as a learning resource in basic embroidery instruction. **Originality:** The novelty of this study lies in the development of a QR Code-based interactive textbook that integrates conceptual explanations, visual illustrations, and digital learning resources into a single instructional medium specifically designed for thread embroidery learning in Fashion Design Education.



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INTRODUCTION

Vocational education plays a strategic role in preparing graduates with the knowledge, technical competencies, and professional attitudes required to meet the demands of the workforce and technological development. In the era of the Industrial Revolution 4.0 and Society 5.0, vocational education institutions are expected not only to provide theoretical knowledge but also to facilitate the development of practical competencies supported by digital technology. Consequently, learning resources should enable students to acquire procedural knowledge, practice independently, and access instructional materials flexibly beyond classroom activities. The integration of technology into vocational learning has therefore become an important strategy for improving the quality of teaching and learning processes while responding to the increasing need for digital literacy among university students (Siahaan, 2023; Febrian et al., 2024; Wulansari & Tyas, 2025)

Within Fashion Design Education, mastery of practical skills constitutes the core competency that students must achieve before entering professional practice. One of the essential competencies is basic thread embroidery, which serves as the foundation for producing decorative textile products with aesthetic, functional, and commercial value. Students are expected to master various basic stitches before progressing to more advanced embroidery techniques because the quality of basic stitches directly influences the neatness, precision, and artistic quality of the final embroidery product. (Kurniati et al., 2022; Amanda et al., 2023) emphasize that embroidery is a manual textile

decoration technique requiring systematic mastery of stitch variations and continuous practice, while (Tanassy, 2022; Mayer, 2024) explains that successful embroidery learning depends not only on manual dexterity but also on students' understanding of sequential procedures and correct stitching techniques. Therefore, effective learning resources are required to support the acquisition of both conceptual understanding and procedural skills throughout the learning process.

Despite its importance, learning basic embroidery techniques remains challenging because practical instruction generally relies on face-to-face demonstrations conducted by lecturers during classroom sessions. Based on preliminary observations and interviews conducted in the Fashion Design Education Study Program, Universitas Negeri Medan, students experienced difficulties reviewing practical procedures outside scheduled laboratory sessions due to the limited availability of structured learning resources specifically designed for embroidery practice. Existing learning resources primarily consist of lecturer explanations and examples of previous student work, whereas comprehensive instructional materials that systematically integrate conceptual explanations with demonstrations of embroidery procedures are still limited. As a result, students have fewer opportunities to revisit learning materials independently according to their individual learning pace, particularly when practicing outside formal classroom activities. These findings indicate the need for instructional resources that are more systematic, accessible, and capable of supporting continuous practical learning.

Recent advances in educational technology have encouraged the integration of digital resources into printed instructional materials to enhance accessibility and flexibility in vocational education. Learning media function as an important communication tool that facilitates the delivery of instructional content and supports students in understanding complex concepts and practical procedures (Yasin et al., 2023; Sari et al., 2024; Ratnasari et al., 2024; Hasan et al., 2021) further argue that appropriate instructional media contribute to improving learning quality by assisting students in acquiring new knowledge and developing practical competencies, while (Harahap et al., 2022; Tsoukala et al., 2024) emphasize that learning media should facilitate effective interaction between lecturers, instructional materials, and students. Among various digital technologies, Quick Response (QR) Codes have attracted considerable attention because they enable instant access to multimedia resources, including demonstration videos, digital documents, and interactive learning materials through mobile devices. The integration of QR Codes into printed textbooks therefore provides opportunities to combine the advantages of conventional instructional materials with digital learning resources in a single learning medium that is practical, accessible, and relevant to vocational education.

Several previous studies have demonstrated the potential of QR Code technology to enrich learning resources across various educational contexts. (Mayer, 2024; Cattaneo et al., 2025 Antonietti et al., 2022) reported that QR Code-integrated textbooks can support the development of teaching competencies by providing direct access to supplementary digital materials through printed learning resources. Likewise, previous studies have shown that QR Code technology has been successfully implemented in digital learning media, electronic books, and instructional materials to improve the accessibility of learning resources and facilitate students' interaction with multimedia content. These findings indicate that QR Code technology offers practical advantages by connecting conventional printed materials with digital resources that can be accessed efficiently using mobile devices (Hadismi et al., 2024.; Pratiwi et al., 2025) Nevertheless, most previous studies have focused primarily on general learning media, electronic books, or teacher education, while relatively limited attention has been given to the development of QR Code-integrated instructional materials specifically designed for practical skill acquisition in vocational fashion education, particularly in learning basic thread embroidery techniques.

The limited availability of specialized instructional resources for embroidery practice reveals an important research gap. Existing studies have generally emphasized the technological implementation of QR Codes without comprehensively integrating conceptual explanations, visual illustrations, practical demonstrations, examples of embroidery products, and learning resources into a single instructional medium specifically developed for vocational practical learning. Furthermore, previous studies have rarely addressed the characteristics of embroidery learning, which requires students to repeatedly observe procedural demonstrations while simultaneously studying theoretical concepts. Consequently, there remains a need to develop instructional materials that combine printed textbooks with multimedia resources in an integrated format capable of supporting practical learning activities while maintaining the accessibility and flexibility required in vocational education.

Responding to this gap, the present study develops a QR Code-based interactive textbook for thread embroidery that integrates printed instructional content with digital learning resources accessible through mobile devices. Unlike previous instructional media that generally present either printed materials or digital content separately, the developed textbook combines conceptual explanations, sequential visual illustrations, QR Code-linked demonstration videos, examples of embroidery products, and supporting learning materials within a single instructional resource. This

integrated design enables students to access relevant digital content directly from each section of the textbook without searching for external learning resources, thereby providing a more organized and technology-supported learning experience for practical embroidery instruction. The contribution of this study therefore lies not merely in the application of QR Code technology, but in the development of an integrated instructional medium specifically designed to address the learning characteristics of practical embroidery education in vocational higher education.

Based on the identified research gap, this study aims to develop and evaluate the feasibility of a QR Code-based interactive textbook for thread embroidery in the Basic Embroidery Techniques course of the Fashion Design Education Study Program. Specifically, the study evaluates the product through expert validation and user feasibility testing to determine its appropriateness as an instructional resource. Accordingly, the contribution of this research is limited to the development and feasibility evaluation of the instructional product rather than to measuring its effectiveness in improving students' learning outcomes, motivation, practical skills, or learning independence. This scope ensures consistency between the research objectives, the Research and Development methodology, and the evidence generated from the study

METHOD

Research Design and Development Procedure

This study employed a Research and Development (R&D) approach to develop a QR Code-based interactive textbook for Basic Embroidery Techniques learning. Research and development is a systematic research approach used to produce and validate educational products through structured development procedures (Rustamana et al., 2024; Winaryati, 2021). The development procedure adopted the Four-D (4D) model developed by (Thiagarajan & Others, 1974), which consists of four stages: Define, Design, Develop, and Disseminate.

The 4D model was selected because it provides a systematic framework for developing instructional products through needs identification, product design, expert validation, revision, and limited dissemination. This study focused on developing and evaluating the feasibility of the QR Code-based interactive textbook and did not aim to examine its effectiveness in improving student learning outcomes. Therefore, the research evaluation was limited to expert validation and initial user acceptance.

The Define stage was conducted to identify learning needs and problems related to Basic Embroidery Techniques learning. Data were collected through classroom observations, interviews with lecturers, and needs analysis questionnaires distributed to students. This stage focused on identifying students' difficulties in understanding embroidery procedures, existing learning resources, and the need for technology-integrated instructional materials.

The Design stage involved preparing the initial prototype of the interactive textbook. The design process included determining learning objectives, organizing instructional content, preparing illustrations, designing textbook layouts, and integrating QR Codes connected to digital learning resources. The developed textbook combined printed instructional materials with digital content, including embroidery demonstration videos, visual examples, and supporting learning resources.

The Develop stage involved expert validation, product revision, and user trials. The prototype was evaluated by material experts and media experts to determine the feasibility of content, presentation, visual design, usability, and QR Code accessibility. Suggestions from experts were used as the basis for product revision. After revision, the product was tested through small-group, medium-group, and large-group trials to obtain user responses and evaluate product feasibility. The Disseminate stage was conducted after the product passed validation and trial procedures. The final version of the QR Code-based interactive textbook was introduced to lecturers and students in the Fashion Design Education Study Program on a limited basis.

Research Setting and Participants

The research was conducted in the Fashion Design Education Study Program, Faculty of Engineering, Universitas Negeri Medan, Indonesia, during the 2025/2026 academic year. The developed product was implemented in the Basic Embroidery Techniques course, a practical course designed to develop students' competencies in embroidery concepts, stitch techniques, and textile decoration procedures.

The population of this study consisted of 45 first-semester students enrolled in the Basic Embroidery Techniques course. The inclusion criteria were: (1) students officially registered in the course, (2) students who had participated in introductory textile and fashion learning activities, and (3) students who voluntarily agreed to participate in the research by providing informed consent. The needs analysis stage involved 30 students and two lecturers. This stage aimed to identify students' learning difficulties, evaluate the availability of existing instructional resources, and determine the instructional requirements for developing a QR Code-based interactive textbook. The product evaluation

was conducted sequentially using different groups of participants. The small-group trial involved three students, the medium-group trial involved seven students, and the large-group trial involved 30 students. Different participants were assigned to each trial stage to minimize response bias and to obtain more comprehensive feedback for product refinement.

Participants were selected using the simple random sampling technique. According to (Sugiyono, 2022), simple random sampling provides every member of the population with an equal opportunity to be selected as a research participant. In this study, all eligible students were identified from the course enrollment list, assigned identification numbers, and randomly selected for each trial stage. This procedure ensured that participant selection was conducted objectively and reduced the potential for selection bias. The developed textbook was evaluated by two material experts and two media experts. The characteristics of the validators are presented in Table 1.

Table 1. Characteristics of Expert Validators

Validator	Expertise Area	Qualification	Relevant Experience
Material Expert 1	Embroidery and textile education	Master/Doctor degree in Fashion Education	More than 5 years teaching experience
Material Expert 2	Textile craft and fashion learning	Master/Doctor degree in Fashion Education	More than 5 years teaching experience
Material Expert 3	Educational media development	Master/Doctor degree in Educational Technology	More than 5 years experience in instructional media development
Material Expert 4	Digital learning technology	Master/Doctor degree in Educational Technology	More than 5 years experience in technology-based learning media

Research Instruments and Data Collection Procedures

Data collection was conducted using observation sheets, interview guidelines, expert validation questionnaires, and student response questionnaires. The instruments were designed to evaluate learning needs, product feasibility, and user acceptance of the developed textbook. The research instruments and assessment indicators are presented in Table 2.

Table 2. Research Instruments and Assessment Indicators

Instrument	Respondent	Assessment Aspects	Number of Items
Needs analysis questionnaire	Students and lecturers	Learning problems, availability of learning resources, and instructional material requirements	10
Material expert validation sheet	Material experts	Content suitability, material organization, and material presentation	15
Media expert validation sheet	Media experts	Visual design, presentation quality, usability, and QR Code accessibility	12
Student response questionnaire	Students	Ease of use, learning attractiveness, presentation quality, and QR Code accessibility	13

The material expert validation instrument consisted of 15 items distributed across three assessment dimensions: content suitability (5 items), material organization (5 items), and material presentation (5 items). The media expert validation instrument consisted of 12 items, covering visual design (6 items) and presentation and usability (6 items). The student response questionnaire consisted of 13 items representing four assessment dimensions: ease of use (4 items), learning attractiveness (4 items), presentation quality (3 items), and QR Code accessibility (2 items). All questionnaire items were assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (Likert, 1932).

Prior to data collection, all research instruments underwent content validation by expert validators to ensure that each item was relevant, clear, and appropriate for measuring the intended constructs. Suggestions and recommendations provided during the validation process were incorporated into the revision of the instruments before they were administered to the research participants. The internal consistency reliability of the student response questionnaire was evaluated using Cronbach's alpha coefficient. The reliability analysis yielded a coefficient of 0.87, indicating good internal consistency and demonstrating that the questionnaire was sufficiently reliable for use in the product evaluation process (Cronbach, 1951).

Data Analysis

The quantitative data obtained from expert validation and student response questionnaires were analyzed descriptively using percentage-based feasibility analysis. The feasibility percentage was calculated using the following formula:

$$X = \frac{X}{X_{\max}} \times 100\%$$

where:

P = feasibility percentage,

X = obtained score, and

X_{max} = maximum possible score.

The feasibility criteria were adapted from [Sugiyono \(2021\)](#). The interpretation categories are presented in [Table 3](#).

Table 3. Feasibility Interpretation Criteria

Percentage Range	Category
81–100%	Very Feasible
61–80%	Feasible
41–60%	Moderately Feasible
21–40%	Less Feasible
0–20%	Very Less Feasible

The feasibility results were used to determine whether the developed QR Code-based interactive textbook was appropriate as a learning resource for the Basic Embroidery Techniques course. Before data collection, participants were informed about the objectives, procedures, and voluntary nature of the study. Participation was voluntary, and participants' identities were kept confidential. Institutional permission was obtained from the Faculty of Engineering, Universitas Negeri Medan. All collected data were used solely for research purposes and were reported in aggregated form.

RESULTS

Development of QR Code-Based Interactive Textbook

The development of the QR Code-based interactive textbook for Basic Embroidery Techniques was carried out using the Four-D (4D) model, consisting of Define, Design, Develop, and Disseminate stages. The results of each stage are presented to describe the development process, validation results, product revisions, and user evaluation.

The Define stage was conducted to identify learning problems and instructional needs related to Basic Embroidery Techniques learning in the Fashion Design Education Study Program, Universitas Negeri Medan. The needs analysis involved 30 first-semester students and two lecturers. Data were collected through observation, interviews, and questionnaires. The observation results indicated that learning activities still relied heavily on lecturer demonstrations and printed learning materials. Students experienced difficulties in reviewing embroidery procedures independently outside laboratory sessions because available learning resources did not provide systematic explanations and visual demonstrations of embroidery steps.

The interview results with lecturers showed that students required instructional materials that could integrate theoretical explanations with practical demonstrations. Lecturers also emphasized the importance of learning resources that could support independent practice and allow students to repeatedly access embroidery procedures. The needs analysis questionnaire consisted of four indicators: availability of structured learning materials, need for visual demonstration, need for digital learning access, and need for independent learning support. The results are presented in [Table 1](#).

Table 1. Results of Student and Lecturer Needs Analysis

Respondent	Indicator	Percentage (%)	Category
Students	Need for structured embroidery learning materials	88.0	Very Needed
Students	Need for video-based embroidery demonstrations	90.0	Very Needed
Students	Need for QR Code-based learning access	85.0	Very Needed
Students	Need for independent learning resources	83.6	Very Needed
Students	Average	86.6	Very Needed
Lecturers	Need for interactive QR Code-based textbook	90.0	Very Needed

The results confirmed that students and lecturers required an interactive learning resource that could combine printed materials with digital content to support Basic Embroidery Techniques learning. Based on the needs analysis results, the Design stage was conducted by developing the initial prototype of the QR Code-based interactive textbook. The developed product was designed as a printed textbook integrated with digital learning resources accessed through QR Codes. The textbook consisted of five chapters covering introduction to embroidery techniques, tools and materials, basic embroidery stitches, embroidery practice procedures, and examples of embroidery products with evaluation activities.

Each chapter contained conceptual explanations, illustrations, practical instructions, and QR Codes connected to digital resources. The digital resources consisted of 12 demonstration videos with a duration of approximately 3–5 minutes for each video. These videos demonstrated embroidery procedures step-by-step, enabling students to observe practical techniques repeatedly during independent learning activities. The initial design of the developed textbook is presented in Figure 1.



Figure 1. Textbook Design.

The functionality of QR Codes was tested using several mobile devices to ensure accessibility and reliability. The results showed that all QR Codes could be scanned successfully and accessed through commonly used smartphone devices. The QR Code functionality test results are presented in Table 2.

Table 2. QR Code Functional Testing Results

Testing Aspect	Result
QR Code scanning using Android smartphone	Successful
QR Code scanning using iOS smartphone	Successful
Accessibility of linked learning resources	Accessible
Demonstration video playback	Successfully accessed
QR Code readability after printing	Good

The Develop stage involved expert validation, revision, and product trials. The developed prototype was evaluated by two material experts and two media experts. Material expert validation assessed content suitability, material organization, and material presentation. The results of material expert validation are presented in Table 3.

Table 3. Material Expert Validation Results

Validator	Content Suitability (%)	Material Organization (%)	Material Presentation (%)	Average (%)
Material Expert 1	84.0	85.0	86.0	85.0
Material Expert 2	80.0	85.0	87.2	84.4
Average	82.0	85.0	86.6	84.7

The material expert validation obtained an average score of 84.7%, categorized as Very Feasible. The experts stated that the developed textbook was consistent with learning objectives, provided systematic explanations, and contained appropriate illustrations to support practical embroidery learning.

Media expert validation was conducted to evaluate visual design, presentation quality, usability, and QR Code accessibility. The results are presented in [Table 4](#).

Table 4. Media Expert Validation Results

Validator	Visual Design (%)	Presentation and Usability (%)	Average (%)
Media Expert 1	82.5	84.0	83.25
Media Expert 2	81.0	86.5	83.75
Average	81.75	85.25	83.57

The media expert validation resulted in an average score of 83.57%, categorized as Very Feasible. The experts considered that the textbook had appropriate visual presentation, readable typography, organized layout, and functional QR Code integration. Based on expert suggestions, several revisions were conducted to improve the quality of the developed textbook. The main revisions are presented in [Table 5](#).

Table 5. Product Revision Based on Expert Suggestions

Expert Suggestion	Product Revision
Improve explanation of embroidery procedures	Added detailed step-by-step explanations and illustrations
Improve material organization	Rearranged learning materials according to competency sequence
Improve QR Code visibility	Enlarged QR Code size and standardized placement
Improve visual consistency	Revised layout, typography, and image arrangement

After revision, the product was tested with students through small-group, medium-group, and large-group trials. Different participants were involved in each trial stage to obtain broader feedback regarding usability and feasibility. The results are presented in [Table 6](#).

Table 6. Student and Lecturer Evaluation Results

Evaluation Stage	Number of Participants	Average Score (%)	Category
Small-group trial	3 students	82.0	Very Feasible
Medium-group trial	7 students	88.0	Very Feasible
Large-group trial	30 students	95.0	Very Feasible
Student Trial Average	40 students	88.33	Very Feasible
Lecturer Evaluation	2 lecturers	87.7	Very Feasible

The results indicate that the QR Code-based interactive textbook received positive responses from students and lecturers. The increase in feasibility scores across trial stages indicates that the product revisions improved the usability and acceptance of the developed learning resource. The final stage was dissemination, which involved introducing the revised textbook to lecturers and students in the Fashion Design Education Study Program, Universitas Negeri Medan. The dissemination was conducted on a limited basis by providing access to the printed textbook and explaining the use of QR Code features for supporting Basic Embroidery Techniques learning. Overall, the results demonstrate that the developed QR Code-based interactive textbook fulfilled the feasibility criteria based on expert validation and user evaluation. The product successfully integrated printed instructional materials with digital learning resources to support practical embroidery learning.

DISCUSSION

The findings of this study indicate that the QR Code-based interactive textbook developed for Basic Embroidery Techniques achieved a high level of feasibility based on expert validation and user evaluations. The material expert assessment (84.7%) and media expert assessment (83.57%) demonstrate that the developed product was considered appropriate in terms of content organization, instructional presentation, visual design, and technical aspects. These findings should be interpreted as evidence of product feasibility and perceived acceptance rather than evidence of effectiveness in improving students' learning outcomes, skills, motivation, or independence, as these variables were not directly measured in this study. Therefore, the contribution of this research lies in providing a validated instructional resource that has the potential to support practical learning activities in Fashion Design Education.

The feasibility of the developed textbook can be explained by its integration of printed instructional materials with digital learning resources through QR Code technology. Basic embroidery learning requires students to understand sequential procedures, observe detailed techniques, and repeatedly practice specific movements. Conventional printed materials often provide explanations and illustrations but have limitations in demonstrating

dynamic practical procedures. By integrating QR Code-linked demonstration videos into the textbook, students can access additional visual resources related to embroidery techniques without leaving the structure of the printed material. This approach supports the principles of multimedia learning, in which the combination of verbal explanations and visual representations can facilitate the presentation of complex procedural information. Similar findings have been reported in previous studies showing that QR Code-based learning media can increase accessibility and enrich learning resources by connecting printed materials with digital content.

The increase in feasibility scores across the trial stages, from the small-group trial (82%), medium-group trial (88%), to large-group trial (95%), reflects the iterative nature of the Research and Development process. The higher scores obtained in broader trials may be related to improvements made after the initial evaluation stage. Feedback from students and experts was used to refine the organization of learning materials, visual presentation, and accessibility of QR Code features. In development research, repeated evaluation and revision cycles are important processes for improving product quality before wider implementation. However, these increasing scores should not be interpreted as evidence of improved learning achievement because the trials measured user perceptions of feasibility rather than learning outcomes.

The findings also strengthen previous studies regarding the application of QR Code technology in educational materials. Previous research has demonstrated that QR Code integration in textbooks, worksheets, and digital learning media can provide easier access to supplementary resources and encourage interaction between learners and instructional content. However, this study provides a different contribution by applying QR Code integration specifically to practical skill learning in Fashion Design Education. Unlike general learning media, the developed textbook was designed according to the characteristics of embroidery instruction, which requires students to observe procedures, identify stitch structures, and understand the relationship between theoretical concepts and practical implementation. The novelty of this research is therefore positioned in the instructional integration of embroidery concepts, visual illustrations, demonstration videos, and supporting materials within a single learning resource.

From a practical perspective, the developed textbook can serve as an alternative supplementary learning resource for lecturers and students in Basic Embroidery Techniques courses. Lecturers can use the textbook to support classroom demonstrations, while students can utilize the QR Code features to review embroidery procedures independently. Nevertheless, the implementation of this product requires consideration of technological factors. The accessibility of QR Code-based resources depends on the availability of smartphones, internet connectivity, and the sustainability of digital links. Therefore, future development should consider maintaining digital content availability and integrating the textbook with more sustainable learning platforms, such as institutional Learning Management Systems.

This study has several limitations that should be considered when interpreting the findings. First, the research was conducted in only one study program at a single institution, which limits the generalizability of the results to other educational contexts. Second, the number of participants involved in product trials and the number of expert validators were limited. Third, the evaluation data were obtained primarily from expert assessments and user response questionnaires, which may be influenced by response bias, including positive perceptions due to the novelty of the developed product or researcher involvement during implementation. Fourth, this study did not include an experimental or quasi-experimental design; therefore, the effects of the textbook on learning outcomes, practical skills, motivation, or learning independence remain unknown. Future research should examine the effectiveness of the QR Code-based interactive textbook through comparative studies involving appropriate outcome measurements and statistical analysis.

CONCLUSION

This study successfully developed a QR Code-based interactive textbook for Basic Embroidery Techniques using the Research and Development (R&D) approach with the Four-D (4D) model consisting of Define, Design, Develop, and Disseminate stages. The developed product integrates printed instructional materials with QR Code-linked digital resources, including embroidery demonstration videos, visual illustrations, and supporting learning materials designed for students in the Fashion Design Education Study Program.

The feasibility evaluation showed that the developed textbook met the established criteria based on expert validation and user assessments. Material expert validation obtained an average score of 84.70%, while media expert validation obtained an average score of 83.57%, both categorized as Very Feasible. Product trials involving students resulted in an average feasibility score of 88.33%, consisting of small-group, medium-group, and large-group evaluations. In addition, lecturer evaluation obtained a score of 87.7%, indicating that the developed textbook was considered feasible as a learning resource for Basic Embroidery Techniques.

Therefore, the contribution of this study is limited to the development and feasibility evaluation of a QR Code-based interactive textbook within the context of Fashion Design Education at Universitas Negeri Medan. The findings indicate that the developed product has potential as an alternative instructional resource that integrates printed and digital learning materials. However, this study does not provide empirical evidence regarding its effectiveness in improving students' learning outcomes, practical embroidery skills, motivation, or learning independence.

Future research is recommended to conduct effectiveness testing using experimental or quasi-experimental designs involving comparison groups. Further studies should employ objective assessment instruments, such as embroidery performance rubrics, skill retention measurements, motivation scales, and learning independence instruments, to examine the actual impact of the textbook on students' learning processes and outcomes. Long-term implementation studies are also needed to evaluate the sustainability and applicability of QR Code-based learning resources in vocational education.

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***Armaini Rambe (Corresponding Author)**

Universitas Negeri Medan,

Jalan Willem Iskandar Pasar V, Medan Estate, Kecamatan Percut Sei Tuan, Kabupaten Deli Serdang, Sumatera Utara, kode pos 20221, Indonesia

Email: armainirambe@yahoo.com

Eka Rahma Dewi

Universitas Negeri Medan,

Jalan Willem Iskandar Pasar V, Medan Estate, Kecamatan Percut Sei Tuan, Kabupaten Deli Serdang, Sumatera Utara, kode pos 20221, Indonesia

Email: ekarahma0107@gmail.com

Yudhistira Anggraini

Universitas Negeri Medan,

Jalan Willem Iskandar Pasar V, Medan Estate, Kecamatan Percut Sei Tuan, Kabupaten Deli Serdang, Sumatera Utara, kode pos 20221, Indonesia

Email: dist.tira@gmail.com

Juliarti

Universitas Negeri Medan,

Jalan Willem Iskandar Pasar V, Medan Estate, Kecamatan Percut Sei Tuan, Kabupaten Deli Serdang, Sumatera Utara, kode pos 20221, Indonesia

Email: ijuliarti@gmail.com
