Development of Procedures in Designing Blended Learning Integrated Soft Skills in Higher Education

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Blended learning is a teaching approach that combines face-to-face and online learning, requiring instructors to design instruction that considers the combination and timing of both types of learning. The integration of these approaches aims to achieve learning goals. Thus, there is a need for a guide to assist instructors in designing valid, practical, and effective blended learning experiences. This study follows an Educational Design Research (EDR) methodology, which includes preliminary research, a prototyping phase, and an assessment phase, following the Plomp model. The research instruments used in this study include validation sheets, implementation assessment sheets completed by subjects, and participant response questionnaires. The data were analyzed using techniques to assess validity, practicality, and effectiveness. The analysis results indicate that all instruments fall within the valid category. The evaluation of practicality based on participant response questionnaires yielded an overall score of 80%, indicating practicality. The evaluation of effectiveness for the assessment of the design created by the subjects showed excellent results. Participant responses were positive, and the data on the impact of the design structure on new

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knowledge and skills indicated that participants effectively applied the acquired knowledge and skills. Therefore, the soft skills-oriented blended learning design in higher education has met the criteria of validity, practicality, and effectiveness.

Keywords: Blended learning; soft skills; procedure design.

1. INTRODUCTION

So and Bonk [1] stated that important questions in designing blended learning are: "What combination is most relevant? When should online learning be used? When should face-to-face learning be used? How can the integration of both approaches achieve learning goals?" Instructors often face difficulties not only due to a lack of knowledge and skills but also because of the ingrained mindset of traditional teaching methods they have been accustomed to. Other studies have also reported similar findings. Kenney and Newcombe [2] concluded that the ability to effectively integrate synchronous and asynchronous learning patterns is crucial in creating a blended learning experience. The success of blended learning heavily relies on careful planning and design by instructors. Implementing a blended learning framework that incorporates technology into the learning process aligns with the developments of the 21st century.

Based on the findings of preliminary studies related to needs analysis, learning analysis, and student characteristics through document analysis and questionnaires regarding the instructors' abilities, several gaps in designing blended learning were identified as follows (Table 1).

Table 1. Gap in designing soft skills-oriented blended learning

No.	Ideal Condition	Actual Condition	Requirement
1.	Possesses knowledge of blended learning	Lacks sufficient knowledge of blended learning.	Operational definition of blended learning.
2.	Possesses integrated skills and knowledge in formulating learning outcomes that align with the criteria for well-formulated and appropriate learning outcomes.	Lacks sufficient knowledge and skills in formulating learning outcomes that align with the criteria for well-formulated and appropriate learning outcomes.	The criteria for formulating learning outcomes are based on the criteria for well-formulated and appropriate learning outcomes, considering integrated skills.
3.	Possesses sufficient knowledge and skills in mapping and organizing instructional materials in accordance with the learning outcomes.	Lacks sufficient knowledge and skills in mapping and organizing instructional materials in accordance with the learning outcomes.	Criteria, guidelines, and examples for mapping and organizing instructional materials in accordance with the learning outcomes.
4.	Possesses knowledge and skills in designing asynchronous and synchronous learning activities in accordance with the learning outcomes.	Lacks sufficient knowledge and skills in designing asynchronous and synchronous learning activities.	Criteria, guidelines, and examples for designing asynchronous and synchronous learning activities in accordance with the learning outcomes.
5.	Possesses knowledge and skills in incorporating instructional, social, and cognitive elements into the learning process.	Lacks knowledge and skills in incorporating instructional, social, and cognitive elements into the learning process.	Criteria, guidelines, and examples in formulating learning activities to incorporate instructional, social, and cognitive elements into the learning process.
6.	Possesses knowledge and skills to enhance the integration of students' soft skills in the learning	Lacks sufficient knowledge and skills in integrating soft skills into the learning process.	Criteria, guidelines, and examples for integrating soft skills into the learning process.

No.	Ideal Condition	Actual Condition	Requirement
	process.		
7.	Possesses knowledge and skills in designing appropriate assessments aligned with the learning objectives.	Lacks sufficient knowledge and skills in designing appropriate assessments aligned with the learning objectives.	Criteria, guidelines, and examples for designing appropriate assessments aligned with the learning objectives.

Several previous studies that have been examined by researchers and the results of preliminary studies indicate the need to develop a practical blended learning design that facilitates instructional design and implements effective and concrete blended learning scenarios. These scenarios are identified as important variables to engage student participation objectively. The objective of this study is to develop a blended learning design integrated with soft skills for mathematics education. The design would be based on the Community of Inquiry framework, utilizing both synchronous and asynchronous approaches, serving as a reference for designing blended learning courses. The expected outcome of this research is a valid, practical, and effective procedural guide for designing blended learning with an emphasis on soft skills in mathematics education at the tertiary level.

2. METHODOLOGY

This study employed an Educational Design Research (EDR) approach, which involves a systematic investigation of the design, development, and evaluation of educational interventions as solutions for complex problems in educational practice. These problems often lack appropriate solutions or clear guidelines for resolution, and the research aims to advance our knowledge of intervention characteristics and the design and development process [3]. The objective of this study was to produce a high-quality blended learning design integrated with soft skills as a guide for instructors in higher education to design their instructional practices. The research subjects consisted of instructors in the mathematics education program.

The development process followed the Plomp development model (2013), which consists of three phases: preliminary research, prototyping phase, and assessment phase. In the preliminary research phase, needs and content analysis were conducted, along with a literature review and the development of a theoretical framework for the intervention. In the prototyping phase, testing, formative evaluation, and revisions were conducted. The formative evaluation results are presented in Table 2 as follows.

To assess the feasibility of the design through formative evaluation activities, the researchers referred to the formative evaluation stages proposed by Tessmer [4] and Chaeruman [5], as depicted in Fig. 1.

Table 2. Focus of formative evaluation in this study

		Initial Design (Prototype 1)		Prototype 2 (Field Study 1)		Prototype 3 (Field Study 2)	
		Experts ($n = 2$)	Users ($n = 1$)	Experts ($n = 2$)	Users ($n = 5$)	Experts ($n = 2$)	Users ($n = 6$)
Validity	Content	Expert assessment	One-on-one testing				
	Construct						
Practicality	Content				Small group testing		
	Construct						
Effectiveness	Content						Field testing
	Construct						
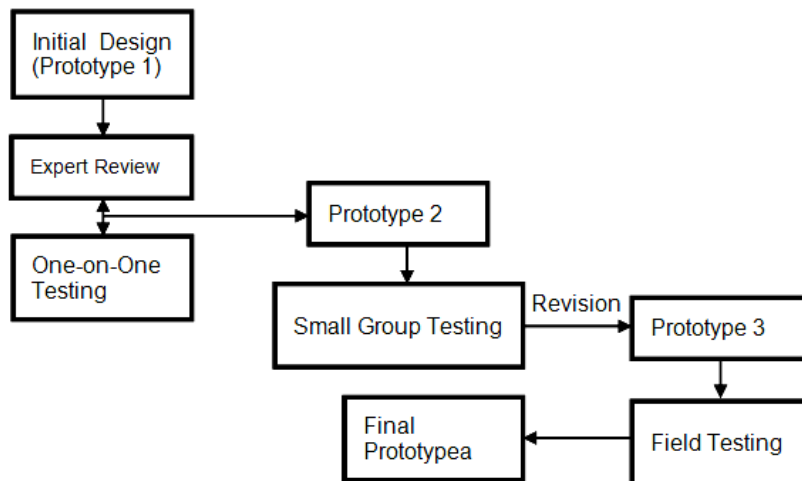
Fig. 1. Design feasibility process

The assessment stages involve semi-summative evaluation to determine whether the developed intervention meets the established quality and specifications, specifically addressing the criteria of validity, practicality, and effectiveness as defined by Nieveen.

The criteria used to determine the level of validity for each instrument are as follows: (i) a minimum value of for the overall aspects falls within the category of sufficiently valid, and (ii) a minimum value of for each aspect falls within the valid category. Referring to Table 3. as follows.

Table 3. Categories of validity level

Value Range	Validity Level
$3,5 \leq M \leq 4$	Highly Valid
$2,5 \leq M < 3,5$	Valid
$1,5 \leq M < 2,5$	Sufficiently Valid
$M < 1,5$	Invalid

(Source: Arsyad, [6])

The criteria used to determine the level of practicality are based on the completed questionnaires, and it is considered practical if the minimum overall percentage meets the criteria for practicality. Referring to Table 4 as follows.

Table 4. Criteria for practicality

Percentage (%)	Criteria
0 – 20	Not Practical
21 – 40	Less Practical
41 – 60	Sufficiently Practical
61 – 80	Practical
81 – 100	Highly Practical

(Source: Riduwan, [7])

The criteria used to determine the level of effectiveness are based on (1) subject reactions or responses, (2) subject learning outcomes in relation to the design developed by the subjects, and (3) the utilization of new knowledge and skills by the subjects. The criteria set for subject responses require that more than 50% of the subjects provide a positive response to at least 70% of the total aspects queried, falling within the criteria for positive response. Referring to Table 5. as follows.

Table 5. Subject response criteria

Score Interval	Criteria
$85\% \leq PRM \leq 100\%$	Highly Positive
$70\% \leq PRM < 85\%$	Positive
$60\% \leq PRM < 70\%$	Sufficiently Positive
$50\% \leq PRM < 60\%$	Less Positive
$PRM < 50\%$	Not Positive

(Source: Arsyad, [6])

The criteria set for subject learning outcomes, specifically for the design developed by the subjects, fall within the category of good assessment based on Table 6. below.

Table 6. Assessment categories of rubric for design developed by subjects

Value Range	Assessment Category
$3,5 \leq T \leq 4$	Excellent
$2,5 \leq T < 3,5$	Good
$1,5 \leq T < 2,5$	Fair
$T < 1,5$	Poor

The criteria for the utilization of new knowledge and skills by the subjects are qualitatively described and linked to relevant research findings.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Preliminary research phase

During the initial stage, several preliminary studies were conducted, including needs analysis, content analysis, literature review, and the development of a theoretical framework or conceptual framework for the intervention. In the preliminary research phase, the results of the initial investigation would be presented based on two activities: (1) needs analysis and content analysis, and (2) development of the conceptual framework. The data from the needs analysis and content analysis were obtained through surveys conducted with students and instructors. The student survey referred to the National Student Survey [8] to assess students' perceptions of teaching and learning in synchronous, asynchronous, and blended learning during the COVID-19 pandemic and to compare the effectiveness of these three learning approaches. Based on the survey, it can be concluded that to address the shortcomings that occurred during both synchronous and asynchronous learning processes, instructors need to improve certain aspects to overcome these limitations and implement blended learning with more effective planning.

Furthermore, the survey was administered to instructors regarding 21st-century teaching and learning and the knowledge and skills gap in designing blended learning integrated with soft skills in mathematics education. The survey results indicated that, overall, the design of blended learning integrated with soft skills is a necessary reference for instructors in designing their instructional practices. The identified needs for each component of the design include: (1) a clear operational definition of blended learning, (2) guidelines and criteria for formulating learning outcomes that meet the standards of quality and appropriateness, (3) guidelines, criteria, and examples for mapping and organizing instructional materials in alignment with the learning outcomes, (4) guidelines, criteria, and examples for designing asynchronous and synchronous learning activities aligned with the learning outcomes, (5) guidelines, criteria, and examples for formulating instructional activities to

incorporate instructional, social, and cognitive elements in the learning process, (6) guidelines, criteria, and examples for integrating soft skills in the learning process, and (7) guidelines, criteria, and examples for designing appropriate assessments aligned with the learning objectives.

The data obtained from the development of the conceptual framework in this study aimed to create a design guideline for instructors in designing blended learning integrated with soft skills in higher education. The design guideline can be seen in Fig. 2.

3.1.2 Results of the prototyping phase

The prototyping phase is the second stage in the Plomp model [9], which involves designing interventions and the micro cycle. The interventions in this study consisted of (1) a guidebook on blended learning design with a focus on soft skills in mathematics education at the higher education level, and (2) research instruments comprising validity, practicality, and effectiveness assessment instruments. The design of the interventions included an initial design, which encompassed two aspects: (1) the initial design of the guidebook, outlining the format used, including an introduction, conceptual framework, design structure, implementation instructions, design format, operational verbs, and appendices, and (2) the initial design of the instruments to gather the necessary data during the development process, which consisted of validity, practicality, and effectiveness assessment instruments.

The micro cycle in this phase involved the implementation and feasibility testing based on Fig. 1., which includes the validation analysis by experts, expert review of the blended learning design procedure with a focus on soft skills, and evaluations through one-on-one evaluations, small group evaluations, and field testing of the blended learning design product with a focus on soft skills. The overall validation results of the instruments can be seen in Table 7.

Furthermore, expert review and one-on-one evaluations were conducted based on the feedback and input from experts and participants. Revisions were made to Prototype 1 based on the results of these evaluations to produce Prototype 2, which was then used for small group testing. The assessment results of the rubric for the design created by participants in the small group are presented in Fig. 3.
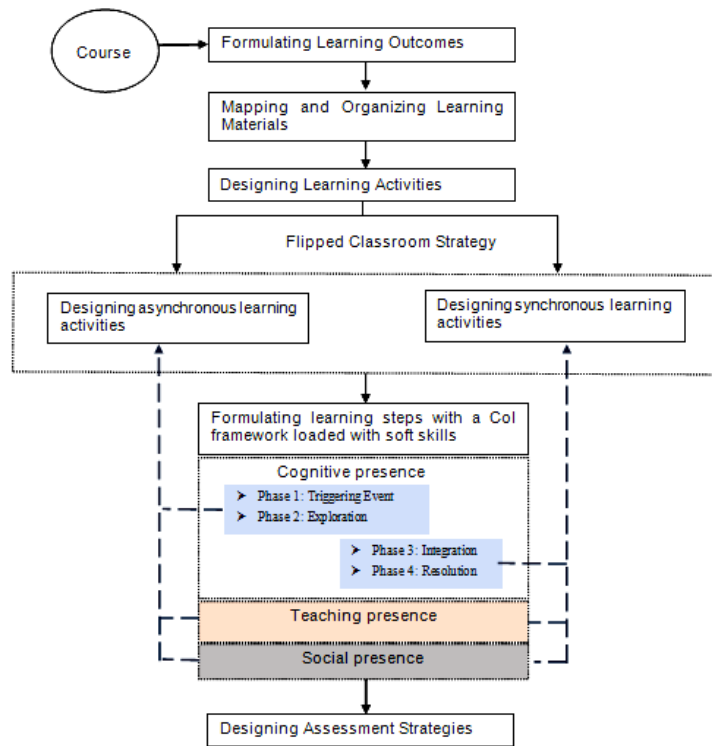
Fig. 2. Integrated blended learning design with soft skills

Table 7. Validation results of the instruments

| Instrument Type		*R*	*M*	Description
Design Guidebook		0,83	2,7	Valid
Assessment Sheet of Implementation of the	Content	1	3,75	Highly Valid
Design Prepared by Research Subjects	Construct	1	3,1	Valid
Expert Response Questionnaire on the	Content	1	3,88	Highly Valid
Design Guidebook	Construct	0,79	3,18	Valid
Expert Response Questionnaire	Content	0,75	3,63	Highly Valid
	Construct	1	3,32	Valid
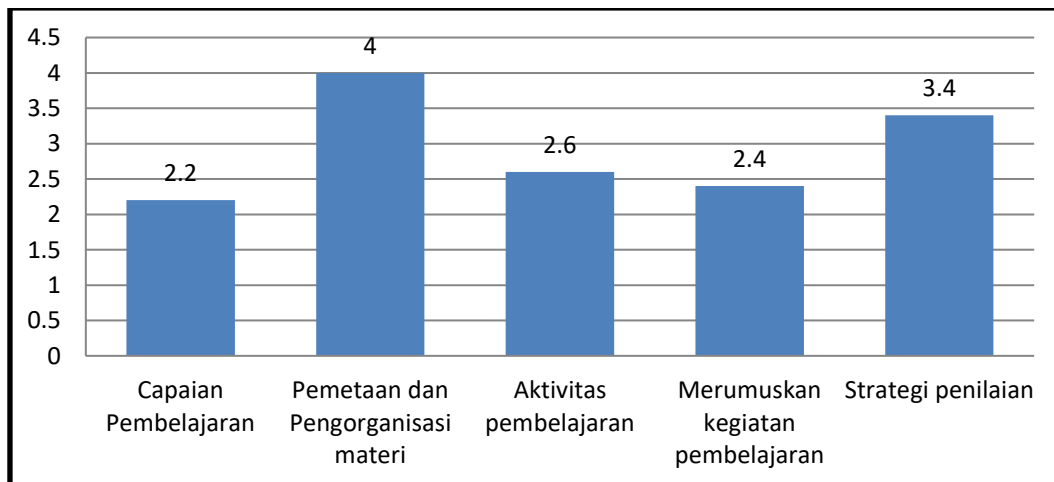
Fig. 3. Assessment results of the rubric for the design created by participants in the small group testing

The results of the participants' feedback in the small group testing indicate that the blended learning design integrated with soft skills is generally interesting, good, and helpful in assisting participants in designing detailed learning activities. However, it is suggested that the design be simplified further. Additionally, there were specific suggestions for improving the formulation of learning outcomes, mapping and organizing learning materials, designing asynchronousand synchronous learning activities, and formulating learning activities using the Community of Inquiry framework. Subsequently, revisions were made, resulting in Prototype-3, which was used for field testing.

The assessment results of the rubric for the design created by the research participants in the field testing are presented in Fig. 4.

The results of the participants' feedback in the field testing indicate that the blended learning design integrated with soft skills is overall good, logical, systematic, easy to understand, easy to follow, and comprehensive. It effectively assist

participants in designing detailed learning activities. The design can be implemented with some revisions, including the need for simplified explanations, the inclusion of varied examples, and the addition of references related to digital media or applications used in blended learning. Overall, the design has reached its final version and is ready for implementation.

3.1.3 Results of the assessment phase

The assessment phase, which is the third stage of the Plomp model [9], involves conducting a semi-summative evaluation to draw conclusions about whether the developed intervention meets the quality criteria of validity, practicality, and effectiveness, as defined by Nieveen. The overall results of the validity evaluation, based on the input of two experts, are presented in Table 8 as follows.

Results of the practicality data evaluation based on the questionnaires filled out by the subjects to assess the level of practicality of the developed product are presented in Table 9 as follows.
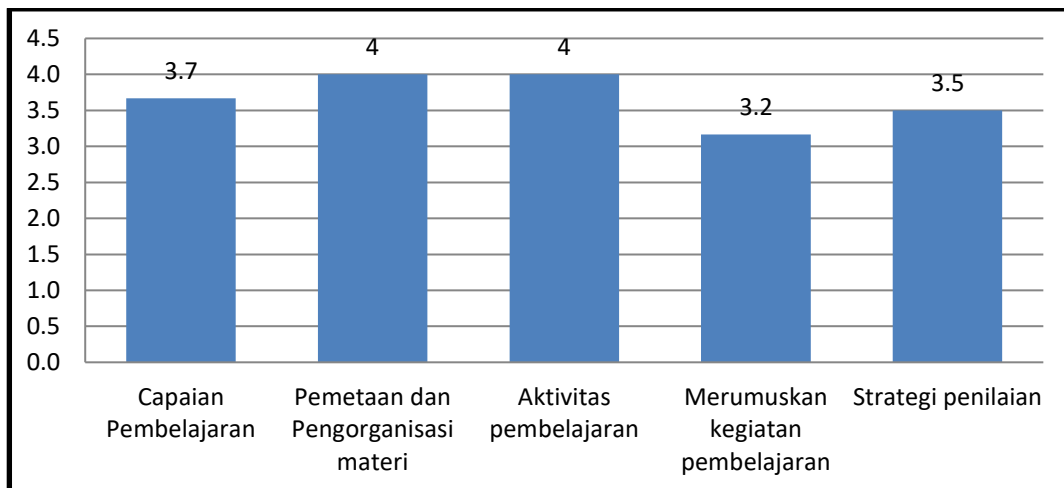

Fig. 4. Assessment results of the rubric for the design created by participants in the field testing

Table 8. Results of validity data analysis

Instrument Types		Overall Mean	Validity Criteria
Design Guidebook		2,7	Valid
Design Feasibility Assessment Sheet	Content	3,75	Highly Valid
Prepared by Research Subjects	Construct	3,1	Valid
Expert Response Questionnaire	Content	3,88	Highly Valid
	Construct	3,17	Valid
Subject Response Questionnaire	Content	3,63	Highly Valid
	Construct	3,32	Valid

Table 9. Results of practicality data evaluation

Observed Aspects	Small Group Testing		Field Testing	
	Overall Average Percentage	Practicality Criteria	Overall Average Percentage	Practicality Criteria
Relative Advantages	81%	Practical	76%	Practical
Suitability to Needs	93%	Highly Practical	81%	Highly Practical
Level of Complexity	82%	Highly Practical	84%	Highly Practical
Level of Observable Capabilities	90%	Highly Practical	82%	Highly Practical
Level of Testable Capabilities	84%	Highly Practical	77%	Practical
Overall Aspect Percentage	86%	Highly Practical	80%	Practical

Table 10. Recapitulation of assessment results for designs created by subjects

Blended Learning Design Procedure with a Focus on Soft Skills	Assessment Categories	
	Small Group Testing	Field Testing
Formulating learning outcomes	Poor	Very Good
Mapping and organizing content	Very Good	Very Good
Designing learning activities	Good	Very Good
Formulating learning tasks	Poor	Good
Designing assessment strategies	Good	Very Good

Table 11. Recapitulation of subjects' response in designing the learning

Observed Aspects	Small Group Testing		Field Testing	
	Overall Average Percentage	Criteria	Overall Average Percentage	Criteria
Relative advantages	81%	Positive	76%	Positive
Suitability to needs	93%	Highly Positive	81%	Highly Positive
Level of complexity	82%	Highly Positive	84%	Highly Positive
Level of observable capabilities	90%	Highly Positive	82%	Positive
Level of tested capabilities	84%	Positive	77%	Positive
Overall Aspect Percentage	86%	Highly Positive	80%	Positive

The effectiveness data evaluation results based on the assessment of the design prepared by the subjects, the subjects' response in designing the learning, and the data on the impact of the blended learning design structure with a focus on soft skills on the subjects' knowledge and new skills. The assessment results of the design prepared by the subjects are presented in Table 10 as follows.

The results of the subjects' response in designing the learning are presented in Table 11 as follows.

The data on the impact of the blended learning design structure with a focus on soft skills on participants' knowledge and new skills were obtained from an open-ended questionnaire using a qualitative approach. Overall, the blended learning design with a focus on soft skills provided new knowledge and skills for the subjects, and they were able to effectively apply this knowledge because the existing guidelines did not clearly explain blended learning.

Based on the above-described semi-summative assessment results, it is evident that the blended learning design with a focus on soft skills in mathematics education at the higher education level met the criteria of validity, practicality, and effectiveness. In other words, a high-quality blended learning design with a focus on soft

skills in mathematics education at the higher education level has been achieved.

3.2 Discussion

The first set of data was obtained from students' perceptions of their learning experiences during the COVID-19 pandemic and limited face-to-face instruction, including synchronous, asynchronous, or blended learning approaches. Preliminary research findings from a student survey indicated that students had poorer social interactions in asynchronous learning compared to blended learning due to the lack of face-to-face interaction with peers and instructors. Caspi et al. [10] suggested in their research that some students are very shy and feel more comfortable and engaged in asynchronous learning compared to face-to-face settings.

Data related to faculty needs were collected by comparing ideal conditions, such as faculty knowledge and skills in designing soft skills-oriented blended learning in mathematics education at the higher education level. This included knowledge about blended learning, formulating learning outcomes, mapping and organizing content, designing learning activities, teaching, social and cognitive presence, and integrating soft skills in the learning process. Bell et al. [11] and Wang & Huang [12] emphasized that innovative blended learning approaches have gained attention in higher education institutions due to their flexibility and increased access to a larger number of students. Several pedagogical design recommendations for blended learning include redesigning activities to promote active learning [13], ensuring equal participation [12], and providing adequate guidelines [13].

The development of the conceptual framework in this study aimed to create a design guide for faculty in designing soft skills-oriented blended learning in higher education. According to Gustafson, Kent, and Branch [5], a model serves as a guide and should represent a simplified representation of the form, process, and function of complex physical and conceptual phenomena. The first procedure involved formulating learning outcomes. Consistent with the research findings of So & Bonk [1], they recommended that learning objectives serve as the primary reference in designing blended learning to determine relevant combinations, when to implement online and face-to-face learning, and how integration can achieve those learning objectives. The second procedure involved mapping and organizing learning materials. This aligns with Wiley's [14] principle of developing learning objects, which should be fragmented and aligned in sequence. According to Arbaugh, Bangert, and Cleveland-Innes [15], instructional design is influenced by the subject matter being taught. The third procedure involved designing synchronous and asynchronous learning activities. Ideally, effective e-learning programs should incorporate both asynchronous and synchronous learning activities [16]. The combination of synchronous and asynchronous learning, as suggested by Hastie, Hung, Chen, and Kinshuk [15], has been found to enhance the quality of student-student and student-instructor interactions, promote expansion and increased student engagement, and improve learning outcomes. The fourth procedure involved formulating learning activities using the Community of Inquiry framework with a focus on soft skills. The Community of Inquiry (CoI) framework developed by Garrison, Anderson, and Archer [17] represents a learning community that emphasizes free inquiry, where participants gain complete learning experiences that include the discussed concepts and inquiry processes. The framework is based on the collaborative constructivist educational perspective, integrating the reconstruction of personal experiences and social collaboration. The application of soft skills in the learning process involves six soft skills, namely collaboration, oral communication, self-actualization, independence, time management, and creative and critical thinking skills for problem-solving. The activities designed to incorporate soft skills in the learning process drew on research findings from Williams & Reid [18], Tan & Tang [19], Dmitrienko et al. [20], Sofian et al. [21], Mailool et al. [22], and Fabriz et al. [23]. The fifth procedure involved designing assessment strategies. According to Nurdin [24], the teaching and learning process begins with planning, followed by implementation, and ends with assessment. Therefore, assessment is an integral part of the teaching and learning process and a key component of the curriculum.

4. CONCLUSIONS AND SUGGESTIONS

The development of the soft skills-oriented blended learning design for mathematics education at the higher education level consists of five procedures: (1) formulating learning outcomes; (2) mapping and organizing learning materials; (3) designing synchronous and asynchronous learning activities; (4) formulating

learning activities using the Community of Inquiry framework with a focus on soft skills; and (5) designing assessment strategies. This study has produced a soft skills-oriented blended learning design that meets the criteria of validity, practicality, and effectiveness, making it a viable alternative for faculty in higher education to implement in designing soft skills-oriented blended learning. For widespread implementation, it is suggested that educational practitioners develop supporting documents such as learning modules that align with the components of each procedure in the soft skills-oriented blended learning design.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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