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Development of Teaching Factory Model to Enhance Creativity of Students in the Home Economics Department of the Faculty of Engineering, UNM, Indonesia

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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

The research aims to (1) develop an appropriate 6M teaching factory model for practical learning in the Department of Family Welfare Education, Faculty of Engineering, Universitas Negeri Makassar with a concentration in Cosmetology, (2) produce a 6M teaching factory model that is valid, practical, and effective for practical learning in the Department of Family Welfare Education, Faculty of Engineering, Universitas Negeri Makassar with a concentration in Cosmetology. This study is an R & D (Research and Development)-based development research. The subjects used were 20 students from the Cosmetology concentration. The development method adapted in this study is derived from the Borg and Gall Model, which includes three main stages, namely: preliminary study covering field surveys, document analysis, and theoretical considerations; the design phase

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involving the creation of a teaching factory model draft and the improvement of the model; and the experimental phase that includes initial inspection, large-scale testing, and final refinement of the product. The results of this research are the creation of a teaching factory learning model called the TEFA 6M, along with operational tools including the TEFA 6M model book, Syllabus, modules, jobsheet, and LPPO. This model is designed to strengthen the practical abilities of students. The TEFA 6M model is divided into seven phases in one round, starting from pre-order, pre-production, production, post-production, packaging, to order delivery. One TEFA 6M model cycle combines soft skill and hard skill activities. The implementation of this model uses a block and rotating system and is concluded with a competency assessment. The developed TEFA 6M model has been validated by experts, revised, and tested on both small and large scales.

Based on the t-test results, it is known that the Sig. (2-tailed) value of 0.000 is smaller than the probability of 0.05, so it can be concluded that there is a difference in test results between the experimental class posttest and the control class posttest. Furthermore, for the average score of the experimental group, a score of 78.38 was obtained, and 42.36 in the control group; thus, the 6M Teaching Factory Learning Model can be said to be effective in the experimental class in improving student competencies in the Facial Makeup Techniques course.

The research indicates that the TEFA-6M model has met the standard of validity. Based on the evaluations carried out, it is known that this teaching approach is practical, in terms of management abilities by the lecturer, and effective, as seen from the level of student activity, student reactions to the functionality and implementation of the model, and from test results that assess task completion.

Keywords: Learning model; teaching factory; cosmetology.

1. INTRODUCTION

Education is a vital element in producing skilled individuals who play a role in the development of a nation. Through the educational process, a generation of successors who contribute positively to the country can be formed, and they are expected to demonstrate their competencies at a global level [1]. Education is a key element in supporting the progress of a country, becoming a benchmark to measure the level of advancement and development of a nation. As one important factor, the progress of a nation is also involved in efforts to improve the quality of Human Resources, which ultimately has a significant impact on the educational system [2]. Efforts to improve must be planned systematically and implemented through appropriate methods to ensure that the workforce created is of quality, has relevant abilities, and can compete on the international stage [3].

However, in its implementation, there are still many challenges faced in the world of education, especially in the PKK department [4]. One of the main challenges is how to enhance student creativity in the teaching-learning process in this department. Currently, prospective teachers studying in the PKK department are required to have high creativity to become professional educators in their field. However, in reality, not all students are able to develop their creativity in the teaching process. This can lead to their inability to adapt to real-world demands and incapability to compete in the global world [5]. To overcome this challenge, it is necessary to develop a Teaching Factory model in the PKK department. The development of the Teaching Factory model in the PKK department aims to increase student creativity in the teaching-learning process and prepare them to be competent, innovative generations ready to face the challenges of today's education world [6]. The presence of this Teaching Factory model is expected to provide a positive contribution to the development of small and medium industries both locally and globally.

The teaching factory model is industrial learning that becomes the goal of the teaching and learning process in higher education [1]. With guided industrial learning, students can experience the actual industrial atmosphere and gain experience in the entrepreneurial world [7]. By implementing apprenticeship learning, the learning process is designed in such a way that it resembles the actual industrial atmosphere. Here, students have the opportunity to be directly involved in practical industrial activities [8].

Through the development of the Teaching Factory model, PKK department students can be directly involved in industrial activities related to their field of expertise [9]. They can learn directly from industry practitioners, develop technical and creative skills in the PKK field, as well as expand networks and relationships with industry

professionals. [8] The Teaching Factory model also allows students to apply the knowledge they learn in class to real-world situations, such as designing and developing innovative products, solving problems in production processes, and gaining practical experience in business management [2]. Thus, the Teaching Factory model can provide a more holistic and contextual learning experience that will enhance the creativity of students in the PKK department [10].

In addition, the Teaching Factory model can also help students develop an entrepreneurial spirit. In the development of the Teaching Factory model in the PKK department, it will involve collaboration between universities and industry [6]. In this collaboration, the industry can provide input and guidance to universities in developing a curriculum relevant to current industry needs [11].

The Teaching Factory (TEFA) is a learning concept in a real environment to bridge the competency gap between industry needs and school knowledge [3]. Innovative and practical productive learning techniques are teaching concepts guided by student management in learning to meet industry needs [8]. In the context of the PKK department, the Teaching Factory model increases student creativity by giving them the opportunity to be directly involved in industrial activities related to their field of expertise [9]. In addition, this model also encourages students to think creatively in designing products and solving problems that arise in the production process [10].

Thus, the development of the Teaching Factory model in the PKK department can increase student creativity through direct experience in the industry, the application of knowledge in the real world, and creative thinking in producing innovation [8].

Teaching factory learning based on production units is highly beneficial as an experience that can train the entrepreneurial spirit of students. The goal is to train and facilitate students to be able to optimize their talents and interests [9]. Its principles aim to make students independent by instilling an entrepreneurial mindset, so that they have the motivation to advance, enhance creativity as well as innovation, and also have a high commitment [12]. This helps in boosting the entrepreneurial spirit among students who fall into the high category.

Thus, the Teaching Factory model in the PKK department can act as an effective vehicle for developing students' entrepreneurial abilities and encouraging creativity in designing innovative products [13]. The implementation of the Teaching Factory model in the PKK department can provide significant benefits in enhancing student creativity [9].

2. METHODS

The research conducted used the Research & Development (R & D) method. This study implemented a development framework designed by Borg and Gall in 1983. The research stages in the R&D model referred to include the following steps: (1) Collection of research and information (2) Planning (3) Development of the initial form of the product (4) Initial field testing (5) Major product revision (6) Main field testing (7) Operational product revision (8) Operational field testing (9) Final product revision (10) Dissemination and application.

Next, from the ten stages proposed by Borg and Gall, this study was limited to the first seven stages due to cost and time considerations. Therefore, the division into three phases was carried out, which included the preliminary study phase, the study development phase, and the testing phase. In the preliminary study phase, the researchers conducted face-to-face sessions with students to introduce the Teaching Factory model, collect information and analysis of needs, as well as challenges faced in developing entrepreneurship skills of students in the Family Welfare Education department. In the study development phase, the researchers formulated steps to develop the Teaching Factory model considering the information collected from the preliminary study phase. In the testing phase, the researchers implemented the developed Teaching Factory model into the implementation of lectures in the Family Welfare Education department and involved students in practical activities and the development of innovative products. By employing the R&D research and development method, the researchers developed the Teaching Factory model in the Family Welfare Education department by involving students in a learning process that includes practical activities, product development, as well as reflection and evaluation.

The product testing being designed aimed to collect information that played a role in establishing quality standards for products. The

detailed steps for testing the educational method are as follows: (a) determination of a location for initial testing; (b) carrying out initial testing by involving five participants; (c) assessment and evaluation of initial testing results according to established standards; (d) refining the educational method to obtain an optimal version ready for testing with more participants. Then (e) the implementation of broader testing with the involvement of 20 participants; (f) assessment and evaluation of large-scale testing results according to set standards; (e) conclusions from large-scale testing that provide an overview of the effectiveness of the refined method, useful information for further product refinement, and adjustments required in the next stage (product completion). At this stage, testing the practicality and effectiveness of applying the method in a teaching and learning environment will be conducted, resulting in a final design of the teaching factory educational method ready for use in actual teaching.

Data in this study were collected through interview techniques. An interview guide was prepared that covered a series of questions to be reflected on by respondents through direct interviews. The validation collection method from experts was conducted by distributing the draft learning model that had been created to them for evaluation, criticism, and suggestions. Responses from these experts were recorded through the available validation form. Procedures for obtaining data about teaching methods applied by teachers during teaching sessions were taken through observations using observation forms that had been revised based on constructive feedback from validators. These observations were directed at lecturers while teaching and covered every aspect during the learning cycle, from the beginning to the end of the session.

Information about student activities during educational sessions was collected through observation processes using a special recording format for student activities that had been evaluated and refined by a validator. Observers were instructed to note down categories of activities frequently carried out by students. Meanwhile, student feedback on teaching methods in the beauty lab which implements the teaching factory concept was collected utilizing a questionnaire that had been modified based on the advice of experts. This questionnaire was then distributed to all students who were the focus of the research after all teaching activities had been completed.

Information on the performance of learners in completing orders or products was obtained through practical tests on participants. This assessment was measured based on elements or sub-elements in skill achievement. Evaluation and tests applied emphasized aspects of skills and professional attitudes developed together by lecturers and researchers and had been refined after receiving valid input from experts and practitioners.

Data collection tools used for this research included interaction guidelines aimed at obtaining information or data directly from the interviewed individuals through a series of questions. These guidelines were applied during interaction sessions with teachers of the courses and students during the initial phase of the study.

Teaching factory validation sheets were used to assess the quality of a learning method through the perspectives of validators. In the validation process, validators would provide ratings for each part of the learning method, including guidebooks, lesson plans, modules, job sheets, work assessment sheets, as well as evaluative devices for managing the teaching factory. The results from this validation would provide crucial data on the adequacy of components existing within the designed learning method. This data was then utilized to improve and enhance the method. The assessment criteria were divided into four levels: not valid with a score of 1, fairly valid with a score of 2, valid with a score of 3, and very valid with a score of 4.

In this research, two types of observation sheets were used: first, the teaching management observation sheet; second, the student activity observation sheet. The teaching management course observation sheet was applied to collect information on the teacher's competence in managing class using the teaching factory approach. Information about teacher capability was obtained through monitoring carried out by two observers who marked the appropriate choice on the sheet based on the continuity of the set activities in the lesson plan. Evaluation criteria for course management were divided into five levels, namely unsatisfactory (score = 1), less satisfactory (score = 2), adequate (score = 3), satisfactory (score = 4), and very satisfactory (score = 5).

This tool was used to collect information on student activities during the learning process. Data collected from this tool would be considered when refining the learning model design. On the observation form, observers marked the prepared columns with a check mark (□) based on the implementation of activities according to the lesson plan. There were four assessment criteria for student activities, which included inactive (score = 1), fairly active (score = 2), active (score = 3), and very active (score = 4).

This questionnaire aimed to gather data regarding student responses to the teaching factory learning method applied in the educational process. Students were asked to state their agreement or disagreement, assess the goodness or badness, and clarity or obscurity of the material while providing reasons for their answers to clarify their views. This questionnaire was given at the end of the learning session, covering student responses to the legitimized learning model, as well as the teaching process itself.

The Order Processing Test was a tool used to assess the skills and work attitudes of students in the field of cosmetology. This tool evaluated how well students could perform tasks and create products, which is an essential part of the learning standards in the teaching factory environment. This assessment tool was created through collaboration between instructors and researchers. It aimed to produce valid and effective measures of success. The assessment for this test was based on the achievement of student competencies, with a score range between 70 to 100.

The data collected through the said equipment was then examined through quantitative descriptive analysis. The purpose of this review was to determine the validity, effectiveness, and ease of use of the teaching factory learning model in the Family Welfare Education department, with a special focus on Cosmetology. The following is presented about the validity, practicality, and effectiveness data analysis.

Expert-validated data were examined by taking into account the inputs, responses, and recommendations given by the validators. Findings from this review process were used as a reference for improving the design of the teaching model. The stages carried out in analyzing this validity data included calculating the average V score obtained from the combination of V1 and V2 (with V1 being the score from the first validator, and V2 being the score from the second validator). The V score was then transformed into a range of validity.

The aspects assessed consisted of the purposes, instructions, materials, and language. The educational instruments deemed valid must meet two main conditions, which include: (1) The V score for each element in the Semester Learning Plan, teaching factory guidebook, Module, job sheet, order performance assessment sheet, and teaching factory management evaluation device must at least fall into the "adequate" category; (2) The total V score for all elements must fall into the "valid" category.
The evaluation of the success of the educational method was strengthened by research findings data containing several success factors, namely (1) evaluation of the work outcome (product) from the students, (2) student activity in the learning process, and (3) student feedback on learning materials. Therefore, the data analysis activities for these three components are as follows:

2.1 Analysis of Order Performance Assessment Results

The evaluation of the students' performance in completing orders or products was based on determined competence standards, with a rating scale ranging from 0 to 100. The ability of students was regarded as "satisfactory" if at least 80% of them achieved an average score of more than 74 on each aspect or part of the assessment provided. This means at least 80% of students must score no less than 75 on the same scale.

2.2 Analysis of Student Responses

The procedure for evaluating how students react to a teaching method includes the following steps:

1. Measuring the number of students showing a positive response based on the tested aspect and then calculating the response rate percentage.
2. Selecting a category for positive responses from students by comparing the percentage obtained with the already determined criteria.

3. If the analysis shows that the feedback from students does not yet reflect something positive, a revision of the already designed teaching model will be made.

2.3 Analysis of Student Activity Data

Based on observations at each meeting, the median value is calculated from each assessment criterion found in the students. The value is then converted into the range of student activity categories. The student learning activity is considered successful if the values at each meeting in the trial at least reach the active category. The evaluation of students' learning activities became the basis for modifying the educational product that had been carried out during the development process. Further, if the three aspects, which include: success in achieving competence, positive feedback from students, and classification of students in the active category are met, then the learning model can be said to be effective.

3. RESULTS AND DISCUSSION

In the study conducted, the development of the teaching factory model was built on the adaptation of the Borg and Gall model, which contained ten steps. However, the researcher decided to complete only up to the seventh step, considering the efficiency of time and funding. The process was divided into three main parts: the initial stage which included field studies, document assessment, and theoretical concept analysis; the development stage which included the drafting of the initial design of the teaching factory model, the creation of the model, and validation by experts; and finally the testing phase that involved small-scale testing that led to revisions, followed by broader testing for the refinement of the final model.

3.1 Preliminary Study Phase

At this stage, the goal was to determine and define the critical criteria to be used in building the learning factory model, which includes field research, document evaluation, and theoretical analysis.

3.2 Field Study

Observations on educational activities in the field of Cosmetology at the Department of Family Welfare Education, Faculty of Engineering, Makassar State University indicated that the use of beautician labs as a tool to enhance students' practical skills had not been optimized. Phenomena occurring in the field revealed several problems, namely: (1) a teaching method that was too teacher-dominated made students tend to act passively, resulting in a level of boredom and hindering them from developing creativity during the learning process, (2) the curriculum in the classroom that had not been integrated with practices in make-up laboratories made practical activities only carried out by lecturers, and did not simulate real-work conditions for students, (3) the absence of a well-designed organization structure to manage academic activities and the use of laboratory equipment, leading to practical activities that were not properly scheduled and not efficient, (4) an evaluation system carried out by lecturers focusing on competency graduation standards alone, ignoring extra skill aspects such as collaboration and decision making, which could result in inadequate preparation that only knows how to face exams, (5) diversity in student learning behavior required lecturers to overcome difficulties in delivering material, (6) campus environmental conditions that did not support block learning systems posed challenges for lecturers to create a coherent and ongoing learning experience.

3.3 Document Analysis

Documents related to cosmetology learning in the cosmetology department highlighted several key aspects. The learning outcomes for graduates of the cosmetology program included knowledge and attitude. Students in the cosmetology program were expected to have in-depth knowledge of theoretical concepts, principles, techniques, and basic aesthetic knowledge of beauty. This includes a strong understanding of various types of beauty products, ingredients used in make-up, as well as the ability to identify and choose products that suit individual needs.

In addition, students were also expected to have strong practical skills in applying different make-up techniques, including daily make-up, special event make-up, and theater or stage make-up. They needed to understand how to use make-up tools properly and safely, as well as have the ability to create looks that match various styles and preferences.

Besides knowledge and practical skill aspects, attitude was also very important in cosmetology

learning. Students were expected to have a professional attitude that included good work ethics, effective communication skills with clients, and the ability to work in a team. They should also have precision and creativity in expressing themselves through make-up, as well as a willingness to continue learning and developing their skills throughout their careers in the beauty industry.

This learning document covered a comprehensive curriculum designed to encompass all these aspects, including theoretical teaching, practicals, and field experience. Regular evaluation was also necessary to ensure that students achieve the set learning objectives and to provide constructive feedback so they can continue to improve their skills and knowledge. The results of the observations can be summarized as follows: (1) the aspect of attitude is arranged sequentially from the levels of acceptance, interaction, appreciation, assimilation, to application, (2) the knowledge aspect adopts the categorization of Bloom's taxonomy version by Anderson, in which the evolution of student intellectual capacity starts from the knowing (remember), understanding, applying, analyzing, evaluating, to creating stage, (3) in the context of abstract skills, achievement is directed through the Dyer scale that varies from observation, asking, experimenting, associative thinking, presenting, to creating, (4) the development of practical skills follows the Simpson scale which includes the levels of perception, readiness, imitation, movement habituation, expertise, movement becoming automatic, the final stage of original movement.

3.4 Theoretical Analysis

It has been previously emphasized that to analyze theories in education, reviewing literature related to the evolution of the teaching factory model becomes important. Literature studies covered constructivist learning theory, the PBET (Production Based Education and Training) model from ATMI Solo, the six-step teaching factory model (TF-6M), the concept of teaching factory from the GIZ-SED TVET program, and its implementation in the Cosmetology specialization of the Family Welfare Education department at Makassar State University. The results of this study revealed several conclusions that could be integrated into the theoretical foundation when designing the teaching factory model, including: (1) the goal of the constructivist approach is to produce individuals capable of critical thinking in solving problems, (2) learning must be designed in such a way as to facilitate the construction of knowledge and skills by students. Problem-solving activities are increasingly carried out through group work that studies practical daily issues, (3) students are expected to be proactive in finding learning methods that are effective for themselves, with lecturers acting as mediators and facilitators who encourage a conducive environment for knowledge formation, (4) the ATMI Solo model combines dual system elements with training that focuses on the application of competencies at the workplace called CBT (Competency Based Training), or PBET. This method enhances the dual system by integrating the work environment as part of the learning process, creating a market-oriented method, (5) the TF-6M model that has six steps in its cycle has proven to increase the basic and additional competencies of students in productive subjects, (6) the implementation method of the teaching factory introduced by GIZ SED-TVET details important stages in implementing the teaching factory model, which requires the application of CBT and PBET first. This is relevant because many TVET institutions in Indonesia are not yet fully ready to apply the teaching factory directly, and (7) the arrangement of the teaching factory in the Cosmetology specialization at Makassar State University is divided into individual production units that play a role in each specialization, which encourages the production of various goods to attract market interest.

3.5 Study Development Phase

At this stage, activities carried out included the development of the teaching factory construction model and refining the teaching factory model itself. In addition, this stage also involved validation of the operational devices of the model and various research instruments, namely: teacher competence in managing learning, student activity instrument, student response instrument, and an instrument to assess work order performance.

3.6 Compiling the Teaching Factory Model Construct

The activities carried out at this stage included determining the operational devices of the model, and developing the conceptual framework of the model, as the basis for creating the learning

Table 1. Learning levels table measured with material focus

No	Learning Level	Material
1	Level 1 CBT	Theoretical focus of basic knowledge
2	Level 2 CBT	Focus on applying basic knowledge
3	Level 3 PBET	Focus on applying competencies to produce products
4	Level 4 PBET	Focus on the application of competencies on efficiency, for the fulfillment of internal needs
5	Level 5 TF	The focus of competency application emphasis on innovation, for the fulfillment of external needs

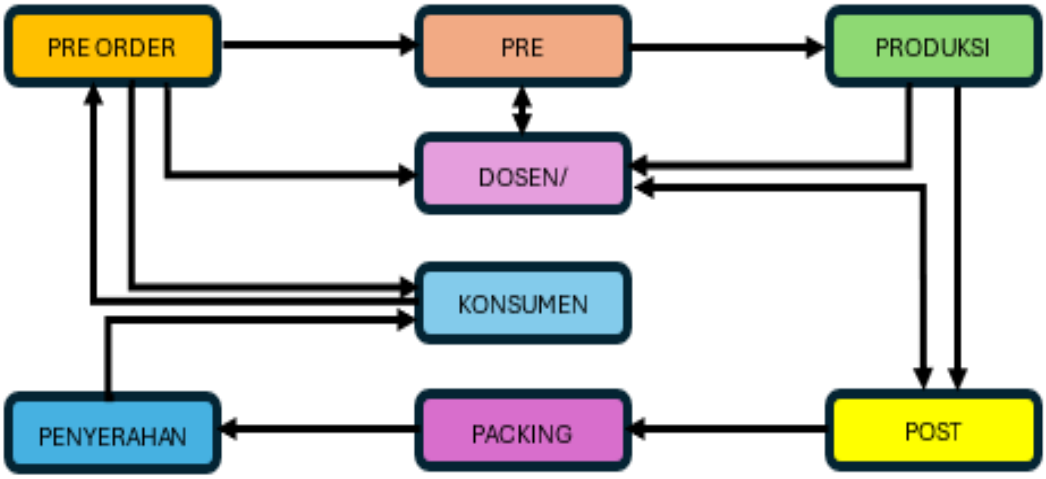

Fig. 1. TEFA 6M model scheme

design in this research. The construct of the teaching factory model consisted of several operational devices, namely, the teaching factory model book, the Semester Learning Plan (RPS), the learning module, job sheets, and the order performance assessment sheet.

Preliminary research indicated that most schools were not able to directly adopt the teaching factory approach, and certain learning models were only suitable for specific competencies or learning materials. Therefore, as part of the strategy to implement the teaching factory model in the Cosmetology concentration of the Family Welfare Education department at the Faculty of Engineering of Makassar State University, a structured teaching factory model with five learning levels was proposed. This structure aimed to progressively lead to the full application of the teaching factory model. Starting with the Competency Based Training (CBT) model (levels 1 and 2), continuing to the Production Based Education and Training (PBET) model (levels 3 and 4), and culminating in the teaching factory model (level 5). The intended learning levels are outlined in Table 1.

These learning levels were then identified to determine the learning level, taking into account the scope of the material and the taxonomy domain of cosmetology learning. The fact that the industry conditions generally were not supportive of the implementation of industry internships, even less well-executed. Therefore, a pattern or learning model was needed that could prevent a mismatch between the industry and the educational world, especially in cosmetology. Thus, the researcher compiled the construct of the six-step teaching factory model (TEFA-6M), which was implemented in one learning cycle. The six steps included pre-order, pre-production, production, post-production, packaging, and delivery or handover of order. Each of these learning steps functioned to improve the soft skills and hard skills of students.

3.7 Developing the Teaching Factory Model

The activities carried out at this stage included: designing the six-step teaching factory model (TEFA-6M), compiling the TEFA-6M model book.

From the scheme in Fig. 1, the parts of the process and the TEFA 6M model can be explained as follows:

1. Initial Ordering: In this phase, activities primarily focus on communication, where the students, acting as staff workers, listen to order requests and then must promptly respond regarding their readiness to complete the requested work. In this process, the students are expected to firmly adhere to their commitment regarding the task completion time. It is also important for them to consult with the instructor, who acts as an advisor, to discuss the order that has been received.
2. Pre-Production: In this phase, the students in their role as workers will prepare and design ideas or concepts, and also check and arrange the necessary equipment before starting the production process.
3. Production: In this step, the students who act as workers begin to execute orders by actively taking pictures, ensuring suitable composition and lighting. During the production process, students are required to follow the applicable procedures and maintain occupational safety standards.
4. Post-production: In this stage, the students classify the various captured photos, which will be further refined (retouched) using image editing software, with the goal of achieving an aesthetically pleasing and customer or orderer's expectations meeting final output.
5. Packaging: This stage involves the packaging process, where the processed results are then quality checked by an assessor/consultant.
6. Order Delivery: This process involves communicative interaction. The order is handed over by the students to the employer. It is important for the students to be certain that the order will be accepted by the employer, provided that all the criteria and agreed-upon times set during the pre-order stage have been met.

3.8 Teaching Factory 6-Step Model Book (TEFA 6M)

The TEFA 6M model book is created to facilitate users in implementing the TEFA 6M model. The TEFA 6M model book explains the teaching factory learning model, teaching factory application, teaching factory components, products, jobsheets, monitoring, and evaluation for the subject of digital photo composition, operational device model, strategies and procedures for implementing the TEFA 6M model in the Makeup Artistry concentration of the Family Welfare Education Department at the Faculty of Engineering of Universitas Negeri Makassar, as well as the advantages of the TEFA 6M model.

3.9 Semester Learning Plan (RPS)

The Learning Implementation Plan (RPP) is designed with two forms of learning activities, namely TEFA 6M learning. TEFA 6M is implemented to focus on the application of innovation in meeting external needs.

To ensure that the TEFA 6M operational model has validity, ease of use, and effectiveness, there need to be assessment tools to measure the performance of this device. The tools created include validity assessment tools, pragmatic assessment tools, and effectiveness assessment tools.

Here are the series of assessment tools used: (1) TEFA 6M Textbook Evaluation Format, (2) Semester Program Learning Plan Evaluation Format, (3) Learning Modules Evaluation Format, (4) Worksheet Evaluation Format, (5) Teacher Performance Observation in Teaching Evaluation Format, (6) Student Response Questionnaire Evaluation Format, (7) Student Activity Observation Sheet Evaluation Format, (8) Work Result Assessment Sheet (LPPO) Evaluation Format.

The instrument to assess practicality is the Observation Sheet for Lecturers' Ability in Managing Learning. Instruments to assess effectiveness include: (1) Observation Sheet of Student Activities, (2) Student Reaction Questionnaire, (3) Order Execution Assessment Sheet (LPPO). The design of these instruments entirely covers aspects of instructions, language, content, and activity scope.

3.10 Validation of Operational Device Model and Quality Assessment Instrument

After completing the initial version design of the operational device for the TEFA 6M model, the researchers then tested the validity of the device and research tools designed by involving expert opinions. This evaluation from specialists is aimed at checking the accuracy of the Semester Learning Plan (RPS), TEFA 6M Guidebook, Module, Worksheet, LPPO, and Research

Measurement Tool. This inspection includes consistency of format, language use, content, underlying theory, as well as relevance and benefits explained in the validation sheet. Findings from this expert evaluation were then used as a reference to modify and enhance the initial version of the device.

1. Operational Device Model Validation and Revision

The activity of assessing the operational device model began by providing the operational device model and the assessment sheet to two experts. The validation and revision process took place once. Below are the details of revisions to the initial product of the operational device model.

- TEFA 6M Model Book Validation and Revision

According to the overall review of the validation sheet for the TEFA 6M model book, the first validator thought the book was suitable for use but required minor improvements on layout design and corrections in the use of conjunctions in some places. On the other hand, the second validator felt that the TEFA 6M model book was appropriate for actual trial implementation without the need for changes.

- RPS Validation and Revision

After thoroughly reviewing the RPS document, both validators agreed that the RPS met the criteria and could be directly applied in field trials without any need for improvements.

- Learning Module Validation and Revision

After thoroughly evaluating this learning module, both validators – validator one and two agreed that this module was appropriate and could be directly applied in field trials without the need for changes. However, validator two emphasized the importance of writing references for images sourced from the internet in the module.

- Jobsheet Validation and Revision

After thoroughly evaluating the jobsheet verification sheet, both validators agreed that the jobsheet met the criteria and was ready for field testing without the need for changes.

- Order Execution Assessment Sheet (LPPO) Validation and Revision

Based on the general review of the LPPO validation sheet, validator 1 and validator 2 stated that the LPPO was suitable for field trial use without revisions. Validator 2 suggested separating the assessment component page from the grading rubric page. The expert assessment description of the TEFA 6M Model Book, RPS, Module, Jobsheet, and LPPO is depicted in the respective Table 2.

Based on Table 2, it can be concluded that the Validation of TEFA 6M Model Book obtained an overall average score of 4, in the aspect of book format an average score of 4 was obtained and in the aspect of content an average score of 4 was obtained, in the theoretical support aspect an average score of 4 was obtained, in the TEFA 6M model structure aspect an average score of 4 was obtained and in the language aspect an average score of 4 was obtained, hence it is included in the very valid criteria from the perspective of (1) determining the type of product being developed is a priority for resolving existing problems, (2) the type of product developed can contribute and meet the needs of the educational world, (3) product development is the right solution to solve problems, (4) the product developed can increase the efficiency and effectiveness of education implementation, (5) product development is within the researcher's capability in terms of manpower, thought, cost, and time.

Based on Table 2, the assessment of TEFA 6M Model Book Validation on the diagram can be known:

Based on Table 3, it can be concluded that the Validation module has an overall average score of 3.91, with an average score for the book format aspect of 4, an average content aspect score of 4, and an average score for the language aspect of 4, thus falling within the criteria of being very valid.

Based on Table 3, the assessment of the Validation module can be seen in the diagram:

Based on Table 4, it can be concluded that the Validation Jobsheet obtained an average overall score of 3.91, in the aspect of format an average score of 4 was obtained, and in the aspect of content an average score of 4, and in the language aspect, an average score of 4 was obtained thus falling into the very valid criteria.

Based on Table 4, the Validation Jobsheet assessment can be seen in the diagram:

Table 2. Recapitulation of TEFA 6M Model Book Validation Results

Assessed Aspects	Validator		Average	Category
	V1	V2		
Book Format	4	4	4	Very Valid
Others	4	4	4	Very Valid
Supporting Theories	4	4	4	Very Valid
TEFA 6M Model Structure	4	4	4	Very Valid
Language	4	4	4	Very Valid
Overall Average			4	Very Valid

Source: Data Processing Results, 2024

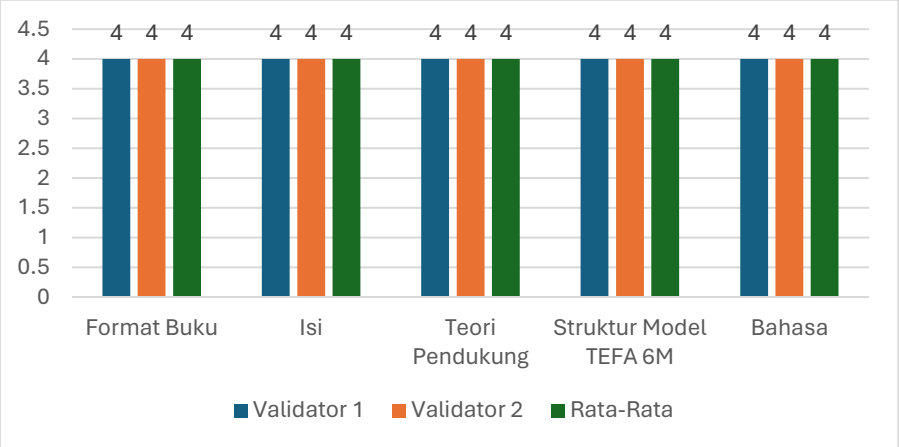

Fig. 2. Histogram of TEFA 6M Model Book Validation Results

Table 3. Recapitulation of module validation results

Assessed Aspects	Validator		Average	Category
	V1	V2		
Format	4	4	4	Very Valid
Language	4	3,5	3,75	Very Valid
Others	4	4	4	Very Valid
Overall Average			3,91	Very Valid

Source: Processed Data, 2024

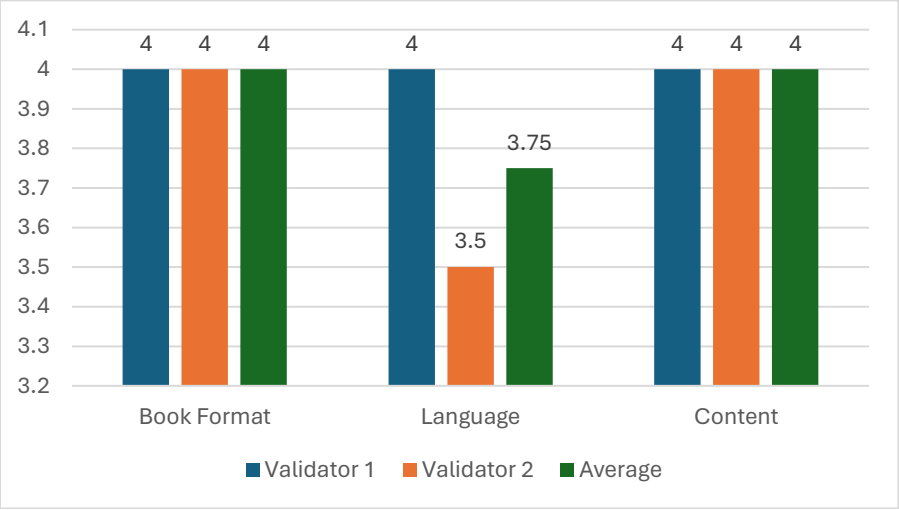

Fig. 3. Histogram of module validation results

Table 4. Recapitulation of job sheet validation results

Assessed Aspects	Validator		Average	Category
	V1	V2		
Format	4	4	4	Very Valid
Language	4	4	4	Very Valid
Isi	4	4	4	Very Valid
Overall Average			4	Very Valid

Source: Processed Data Results, 2024

Others

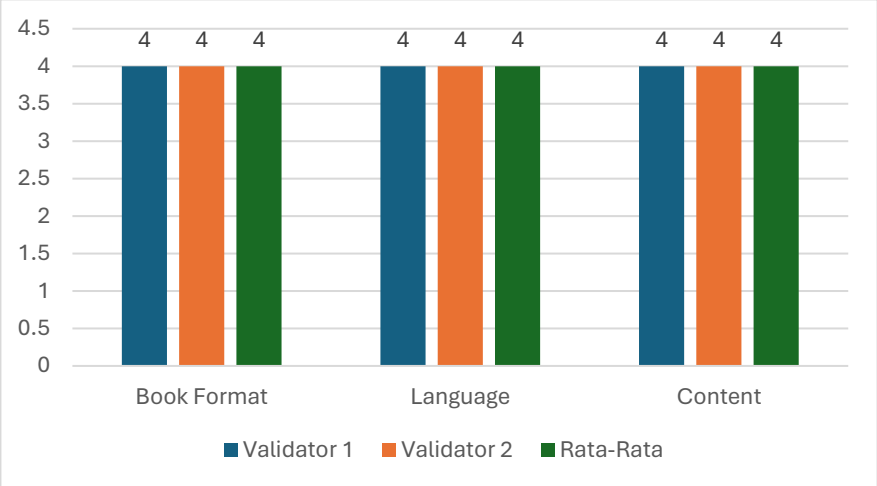

Fig. 4. Histogram of module validation results

Table 5. Recapitulation of LPPO validation results

Assessed Aspects	Validator		Average	Category
	V1	V2		
Format	4	4	4	Very Valid
Bahasa	4	4	4	Very Valid
Isi	4	4	4	Very Valid
Overall Average			4	Very Valid

Source: Data Processing Results, 2024

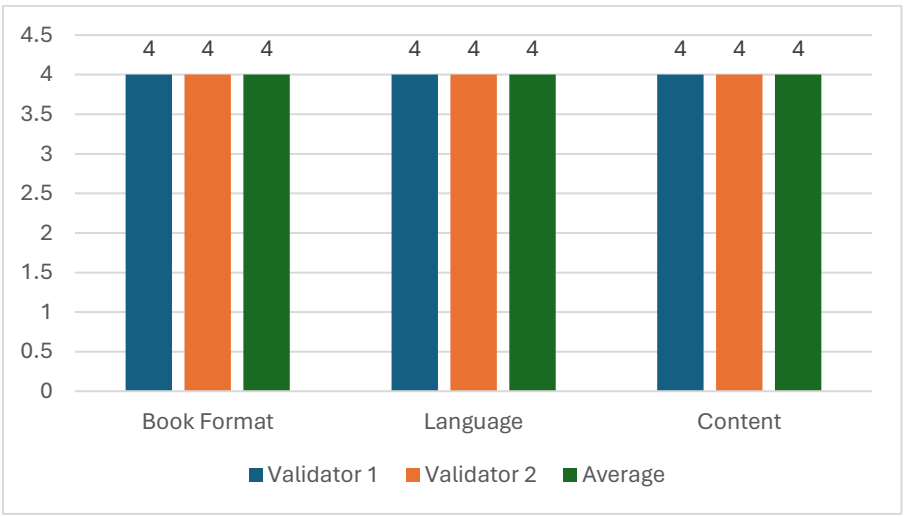

Fig. 5. Histogram of LPPO validation results

Table 6. Recapitulation of RPS validation results

Assessed Aspects	Validator		Average	Category
	V1	V2		
CPMK	4	4	4	Very Valid
Indicator	4	4	4	Very Valid
Equipment	4	4	4	Very Valid
Material	4	4	4	Very Valid
Scenario	4	4	4	Very Valid
Assesmen	4	4	4	Very Valid
Language	4	4	4	Very Valid
Overall Average			4	Very Valid

Source: Processed Data, 2024

Based on Table 5, it can be concluded that the validation of LPPO obtained an overall average score of 4, with an average score of 4 obtained for the format aspect, an average score of 4 obtained for the content aspect, and an average score of 4 obtained for the language aspect, thus falling into the category of very valid.

Based on Table 5, the assessment of LPPO Validation can be seen in the diagram:

Based on Table 6, it can be concluded that the RPS Validation obtained an overall average score of 4, in the aspect of CPMK an average score of 4 was obtained, in the aspect of Indicators an average score of 4 was obtained, in the aspect of Completeness an average score of 4 was obtained, in the Material aspect an average score of 4 was obtained, in the Scenario aspect an average score of 4 was obtained, in the Assessment aspect a score of 4 was obtained and in the Language aspect an average score of 4 was obtained, thus falling into the category of highly valid.

Based on Table 6 the RPS Validation assessment on the diagram can be seen:

1. Validation and Revision of Instruments

The validation of research instrument assessment began by providing the research instrument along with the assessment sheet to two experts for evaluation and to provide feedback or suggestions as a reference for revision. Generally, the validation and revision process occurred once. Below are the revision details of the research instrument.

2. Validation and Revision of the Teacher's Learning Management Observation Sheet

Validator 1 and validator 2 stated that, in general, the teacher's learning management observation sheet is suitable for field trial usage without revision.

3. Validation and Revision of the Student Activities Observation Sheet

Validator 1 stated that the student activities observation sheet is suitable for use with minor revisions, and validator 2 stated that the student activities observation sheet is suitable for field trial usage without revision.

4. Validation and Revision of the Student Response Questionnaire

Validator 1 stated that the student response questionnaire is fit for field trial without revision, and Validator 2 stated it is fit for use with minor revisions on the number of questions. Validator 2 recommended reducing the number of questions so that the respondents do not feel overwhelmed when answering, which can result in not achieving the purpose of the student response questionnaire.

Description of the expert assessment results on the research instruments consisting of observation sheets of lecturers' ability to manage learning, observation sheets of student activities, and questionnaires on student responses are depicted in Table 7.

Based on the validity analysis results of the instruments, it can be concluded that the research instruments that have been developed which consist of an observation sheet on teachers' ability to manage learning with an average of 4, an observation sheet on students' activities with an average of 4, and a questionnaire on students' responses with an average of 4, are suitable to be used at the research stage in the "very valid" category.

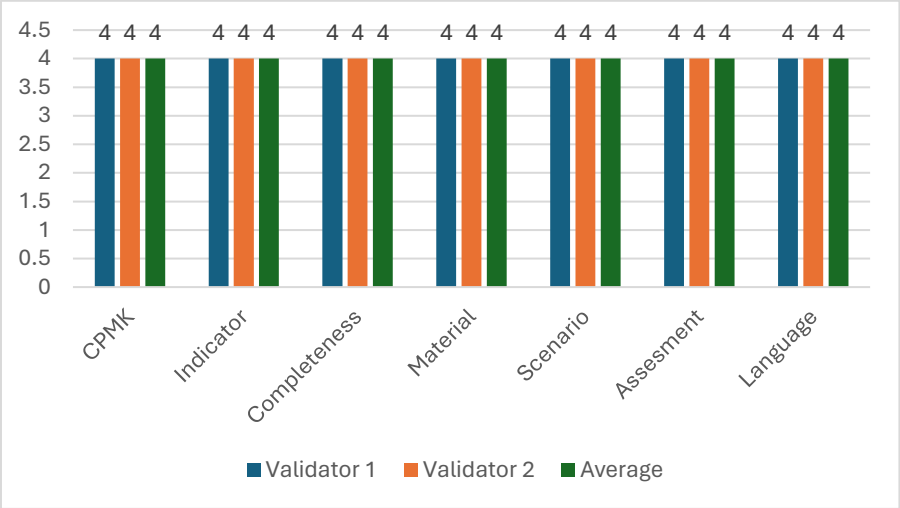

Fig. 6. RPS validation result histogram

Table 7. Expert assessment results of research instruments

Instruments	Indicator	Valuation	Category
Observation Sheet	Hint Aspect	4	Very Valid
Lecturer Ability	Aspects of Learning Activities and	4	Very Valid
Managing Learning	Classroom Atmosphere.		
	Language Aspect		
		4	Very Valid
Average		4	Very Valid
Observation Sheet	Hint Aspect	4	Very Valid
Participant Activities	Aspects of Activity Coverage	4	Very Valid
Educate	Learners		
	Language Aspect	4	Very Valid
Average		4	Very Valid
Response Questionnaire	Hint Aspect	4	Very Valid
Learners	Aspects of Student Response	4	Very Valid
	Coverage		
	Language Aspect	4	Very Valid
Average		4	Very Valid

Source: Data processing results, 2024

The trial phase is conducted involving subjects. Research instrument data is collected and analyzed. This trial is specifically carried out to determine the suitability of the objectives of the operational device of the TEFA 6M model being developed. The field trial is conducted through two trial stages, namely a small-scale trial and a large-scale trial.

The small-scale trial is carried out involving five subjects. The trial subjects are the students of the Makeup Concentration in the Family Welfare Education Department of the Faculty of Engineering at Makassar State University, who are randomly selected to evaluate the TEFA 6M learning model and will be observed by two observers. The small-scale trial is carried out specifically to understand the suitability of objectives, namely, evaluating teachers' abilities to manage learning using the TEFA 6M learning model procedures, and the response of students to the operational device of the TEFA 6M model and its implementation. The analysis results from the small-scale trial become input material for revising the initial product. The following are the findings from the small-scale trial:

The ability of a lecturer to manage learning is one of the important factors that determine the success of the teaching and learning process in higher education. Aspects related to the lecturers' ability to manage learning include

planning teaching materials, implementing effective teaching methods, managing the pace of learning, utilizing technology in the learning process, as well as the ability to evaluate and provide constructive feedback to students.

Starting from the planning stage, lecturers are required to prepare materials that are not only relevant to the curriculum, but also interesting and capable of sparking curiosity and creativity in students. In this regard, lecturers need to anticipate the various characteristics of students as well as dynamics within the classroom. They must be able to adjust the material to the diverse conditions of the students, whether in terms of educational background, interests, or different learning styles.

Furthermore, the teaching methods implemented by the lecturers need to be designed to be effective and interactive. The use of group discussions, case studies, or simulations is some examples of methods that can increase student participation during the learning process. Lecturers can also utilize various educational media, such as multimedia presentations, educational games, or online learning platforms to make the material livelier and easier to understand.

Then, the pacing of the learning process is very important so that all students can follow along well without feeling rushed or, on the contrary, bored because the material is too slow. Lecturers must be able to gauge how fast or slow the material is presented, while ensuring that all students understand the concepts being taught.

The use of technology in learning should not be overlooked either. Lecturers must be skilled in utilizing the available technological tools, such as educational software, online learning applications, and other digital resources that can aid in the teaching process and provide an engaging experience for students.

Lastly, the lecturer’s ability to evaluate students and provide feedback is crucial. A good evaluation not only measures academic achievements, but also helps students identify strengths and areas that need improvement. The feedback given should be constructive, encourage students to keep developing, and be expressed in a way that respects their efforts.

By considering all these aspects, lecturers will not only be able to manage learning more effectively but will also significantly contribute to a satisfactory learning experience for students. The success of a lecturer in managing learning is inseparable from the ongoing commitment to professional development and dedication to ensuring that each student can achieve their full potential.

An instrument in the form of a lecturer observation sheet is applied in this activity to evaluate the implementation of each learning phase and the effectiveness of learning management by the lecturer. If all the steps of learning are satisfied and the management reaches at least an adequate category, then it can be concluded that the TEFA 6M model has been successfully applied in the learning process. The results of the observation of the lecturer's ability to manage learning are presented in Table 8.

According to the data listed in Table 8, it is evident from the observations made by two observers that the lecturers' performance in managing the teaching and learning process is considered good. The average score from all observed aspects is 4.1 in the initial two learning sessions. In the following two sessions that used the TEFA 6M method, the overall average score decreased to 3.7. Based on the positive results of this initial trial, which are in the good category, the next course of action is to improve these results in a larger-scale trial. Some improvements are still being made for use in the large-scale trial phase. For more information, see the data from the analysis of teachers' ability to manage learning in the small-scale trial.

3.11 Student Response

The questionnaire is a tool used to gather information about students' responses to the materials and operational processes of a model. This questionnaire was given to students after they participated in all learning activities during a small-scale trial that lasted for four sessions. During this period, all participants from this small-scale trial, which included five students from the Beauty Studies department, provided their evaluation of the operational materials of the TEFA 6M model and its implementation by providing responses to the aspects presented in the questionnaire. The following is the description of the student response results presented in Table 9.

Table 8. Results of analysis of teacher's ability to manage learning in small scale trial

No.	Assessed aspects	Observers		Total	Information
		Average P.1	Average P.2	Average P1&P2	
Learning Activities					
1	Initial Activities	4,9	4,7	4,8	Excellent
2	Core Activities	3,6	3,6	3,6	Good
3	Final Activities	3,9	4	3,9	Good
Overall Aspects				4,1	Good
TEFA 6M Learning Activities					
1	Preparatory Activities	3	3	3	Good enough
2	Initial Activities	4,1	4,1	4,1	Good
3	Core Activities	3,8	3,9	3,9	Good
4	Final Activities	3,9	4	3,9	Good
Overall Aspects				3,7	Good

Table 9. Description of student response results to model material and learning implementation in the small-scale trial

No	Aspects responded to	Student Response	
		Negative Average (%)	Positive Average (%)
1	Response to Modules	13,3	86,7
2	Response towards Jobsheet	16,7	83,3
3	Response towards lecturer	20	80
4	Response towards Learning Implementation	20	80

Table 10. Analysis results of teachers' ability to manage learning in a large-scale trial

No.	Assessed aspects	Observers		Total	Information
		Average P.1	Average P.2	Average P1&P2	
Learning Activities					
1	Initial Activities	4,8	4,7	4,8	Excellent
2	Core Activities	3,7	3,6	3,6	Good
3	Final Activities	4,2	4	4,1	Good
Overall Aspects				4,2	Good
TEFA 6M Learning Activities					
1	Preparatory Activities	3,3	3,5	3,4	Good enough
2	Initial Activities	4,1	3,9	4	Good
3	Core Activities	3,8	3,8	3,8	Good
4	Final Activities	4,8	4,4	4,6	Excellent
Overall Aspects				3,9	Good

Based on Table 9, it can be seen that the average response of students towards each operational device of the model and its implementation is positive, with a percentage of positive responses to the module at 86.7%, the job sheet at 83.3%, instructors at 80%, and the implementation of learning at 80%. From these findings, it can be concluded that the students' response is "positive" towards the operational devices of the TEFA 6M model and its implementation. Although the overall average shows that more than 80% of the students responded positively to the operational devices of the model and its implementation, some of them still require improvement for the next trial, which is a large-scale trial.

Based on Table 9, it can be seen that the average response of the students towards each operational device of the model and its implementation is positive, with a percentage of positive responses to the module at 86.7%, the

job sheet at 83.3%, lecturers at 80%, and the implementation of learning at 80%. From these findings, it can be concluded that the students' response is "positive" towards the operational devices of the TEFA 6M model and its implementation. Although the total average shows that more than 80% of students responded positively to the operational devices of the model and its implementation, some still need improvements for subsequent trials, namely large-scale trials to be conducted, and lecturers must be able to implement at least in the sufficiently good category, it can then be said that the TEF-7P learning model has been realized in teaching. The data from the observation of the teachers' ability to manage learning can be seen in Table 10.

Based on the results obtained in Table 10, it was found that the teachers' capacity in managing educational activities received a score of 4.2, which reflects that the performance of the teachers in conducting learning sessions is classified as 'good'. As for the management of TEFA 6M learning activities by lecturers, a score of 3.9 was recorded, which also falls within the 'good' classification. Based on the observed results, which indicate that the teachers possess good performance in learning management, it is confirmed that the learning instruments used have successfully met the 'practical' criteria.

3.12 Effectiveness Analysis

a) Description of Observation Results of Student Activities

Data on student activities were obtained through the use of observation forms. Twenty students were observed during six meeting sessions. Complete information from observations of student activities was recorded during this time. The technique of observing students was carried out every five minutes by filling out forms that had been prepared for this purpose. The description of the observation results on student activities is presented in Table 11.

Based on the student activity analysis table, the average score achieved is 3.29, which falls within the "active" classification. This indicates that the student activity has met the established observation criteria, signifying that they have successfully implemented the learning practice of beauty makeup using the TEFA 6M model framework effectively.

b) Description of Learner Response Results

The learner response results were obtained using a learner response questionnaire, which was given to 20 learners after participating in a beauty makeup learning activity using the TEFA 6M instructional model. The description of the learner response results is presented in Table 12.

Based on the data collected in Table 12, it is evident that over 80% of students provided favorable feedback regarding every aspect of the learning tools and their implementation. The details of the favorable feedback from the large-scale testing include: 90% for the module, 86.7% for the job sheet, 81% for the lecturers, and 85% for the implementation of educational activities using the TEFA 6M method. Therefore, it is concluded that students show a "positive" response to the TEFA 6M learning method.

Table 11. Results of observation of student activities

No	Observation Aspect	Average	Information
Activities			
	Initial Activities	3,8	Very Active
	Core Activities	3	Active
	Final Activities	3,4	Active
Average		3,4	Active
TEFA 6M Activities			
	Preparatory Activities	3	Active
	Initial Activities (Pre-order, pre-production)	3,35	Active
	Core Activities (Production, Post-production, Packaging, Order Delivery)	3,2	Active
	Final Activities	3,2	Active
Average		3,19	Active
Overall Aspects		3,29	Active

Table 12. Description of learner response results to the device model and implementation of learning in the large-scale trial

No	Aspects responded to	Student Response	
		Negative Average (%)	Positive Average (%)
1	Response to Modules	10	90
2	Response to Jobsheet	15,8	86,7
3	Response to lecturer	19	81
4	Response to Learning Implementation	15	85

Table 13. Frequency distribution and percentage of task scores for order processing work

Predicate	Value Order	Frequency (f)	Percentage (%)
A	91 < x ≤ 100	4	20
B	83 < x ≤ 90	8	40
C	75 < x ≤ 82	5	25
D	68 < x ≤ 74	2	10
E	x ≤ 67	1	5
		20	100

Table 14. Results paired sample ttest

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post Test Experiment	83,21	35	5,781	,977
	Post Test Control	64,34	35	3,714	,628

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Post Test Experiment & Post Test Control	35	,212	,223

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Post Test Experiment - Post Test Control	18,877	6,175	1,044	16,756	20,999	18,085	34	,000

c) Description of Test Assessment Results for Order Processing Work

This assessment was obtained through the use of a task assessment form. The test evaluation was carried out by observing the work process of the participants while completing the task. Table 13 displays the descriptive analysis results of the task performed. The descriptive analysis results of the assessment scores for order processing tasks can be seen in Table 13.

From Table 13 displayed, it is clear that in the assessment of order execution by students, 4 students received an A with a percentage of 20%, 8 students achieved a B with a percentage

of 40%, 5 students were awarded a C with a percentage of 25%, 2 students obtained a D with a percentage of 10%, and 1 student got an E with a percentage of 5%. The analysis carried out shows that out of 17 students or 85%, they have met the success criteria for the achievement of the established competencies, by obtaining a minimum average score of 75 from each element in the assessment. The student competency achievement in processing orders is considered "good", considering they have reached the minimum proficiency threshold set at 80%.

The analysis of the learning impact was conducted to see the effectiveness of the product that has been validated by experts in a makeup course learning process. As previously mentioned, the learning impact test of this product was carried out on 30 students who enrolled in the makeup course. The subjects of this study were given a pre-test before participating in the learning activities with the developed media and took a post-test after each practice session. In this impact test, effectiveness was measured by determining the significance of the difference between the average test scores of the control group (pre-test) and (post-test) and the experimental group (pre-test) and (post-test) in each session using the t-test.

Testing for effectiveness was conducted using the paired sample t-test. This test was carried out to compare the averages of two unrelated classes (two independent samples). The results of the paired sample t-test analysis can be seen in Table 14 as follows.

Based on the results of the paired sample t-test, it is known that the Sig. (2-tailed) value of 0.000 is smaller than the probability of 0.05. Based on this test, it is declared that the t difference in test results between experimental class 2 and control class 2. From the average test results above, it is known that the average score of the experimental class is 78.38 and the control class obtained an average score of 42.36. Therefore, it can be understood that the average attainment of the experimental class with the implementation of TEFA 6M in Beauty Studies is included in the interpretation of effectiveness, which is effective.

4. CONCLUSION

The process of developing the teaching factory learning model in the Department of Family Welfare Education, Faculty of Engineering, Makassar State University, Cosmetology Concentration consists of three main stages. Detailed as follows:

1. As a first step in research focused on the development of a teaching factory-based learning model, particularly for practical learning in cosmetology laboratories, there are several critical stages that must be passed. One of the earliest and most crucial stages is the preliminary study phase. This stage is divided into three main parts that are interconnected and significantly contribute to gathering initial information needed.

- First Stage: Field Study

During the field study stage, researchers investigate and observe directly the practices occurring in the field, especially in the cosmetology laboratory. This activity includes confirmation of preparations, workflow, and interactions taking place on site. Researchers take notes on how current practical learning is implemented, identifying gaps or potential improvements. For example, the researcher may note how instructors teach makeup techniques or find out what types of tools and materials are used. Researchers may also conduct interviews with learners, educators, or even alumni, to get views from various perspectives.

- Second Stage: Document Analysis

fter collecting data from direct observation, researchers proceed to document analysis. In this step, official documents such as curricula, lesson plans, to previous educational reports, are used as information sources. Researchers delve deeper to find the educational standards applied, policies related to the cosmetology laboratory, and the implementation of existing learning models. This document analysis can provide a better context and understanding of the existing cosmetology education structure and how teaching factory can be integrated into it.

- Third Stage: Theory Analysis

Finally, in theory analysis, researchers study and apply relevant educational theories to support the development process of the learning model. This theory analysis involves reviewing existing literature, which covers theories on practical learning, pedagogy, competency-based learning, and others specific to cosmetology. The purpose

of this stage is to find the theoretical framework that will become the basis of the new learning model. This analytical approach also helps in identifying learning strategies that have been successfully used in other fields that might be adopted or modified for practical learning in the cosmetology laboratory.

Combining the results of these three preliminary study stages, researchers will have a rich and structured information base, which is invaluable in designing and developing a suitable teaching factory learning model. The developed model is expected to improve the quality of practical learning, prepare students with relevant and applicable skills, and ensure alignment with the evolving needs of the cosmetology industry.

2. The development process consists of: (1) the concept formation phase of the teaching factory model. This step continues from the previously obtained results, formulating the basic concept of the teaching factory model suitable for practical application in the multimedia laboratory, later known as TEFA 6M model (Pre-Ordering, Pre-Production, Production, Post-Production, Packaging, Order Delivery). The framework of the TEFA 6M model is divided into 5 levels based on the characteristics of KD/lesson materials on digital photo composition, with each level moving closer to the application of the TEFA 6M model itself. (2) further development stage of the teaching factory model. In this phase, the design scheme of the TEFA 6M model and its operational equipment including the TEFA 6M model book, RPS, Modules, Jobsheets, and LPPO are realized, referring to the previously designed concept. (3) validation stage, where two experts provide suggestions for minor revisions to the operational device model as a preliminary product. c) Trial phase involves: (1) small-scale trials. Following up on the validation results with revisions to the TEFA 6M model, a field test is conducted involving certain subjects. The results of this trial provide feedback that leads to changes or improvements to the TEFA 6M model. (2) larger-scale trials. Involving more subjects, revisions from the previous trial are tested again. Findings from this stage give an overview of the effectiveness of the TEFA 6M learning model, but still require revision to perfect the TEFA 6M model as a final result.

The 6-step TEFA teaching factory learning model, specifically designed for practicum sessions in the Department of Family Welfare Education, Faculty of Engineering, Makassar State University, specialized in Cosmetology, has proven valid based on the evaluation of two experts. In addition, it is practical in application due to the teachers' skills in administering learning with the TEFA 6M framework, and effective when looking at student activities, their responses, and the success of achieving competencies expected by students.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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