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The Implementation of the Jigsaw Cooperative Learning Model to Improve Students' Learning Outcomes in Oily and Acne-Prone Skin Care Using Technology at SMK Negeri 27 Jakarta

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ABSTRACT

This classroom action research aims to improve the learning outcomes of eleventh-grade students in the Beauty Therapy Program at SMK Negeri 27 Jakarta in the subject of Oily and Acne-Prone Facial Skin Treatment using Technology through the implementation of the Jigsaw cooperative learning model. The study was initiated due to low student learning outcomes and active participation, resulting from initial learning processes dominated by conventional lectures and students' difficulties in operating beauty technology equipment. Conducted in two cycles using the Kemmis and Taggart model, this research involved 34 students as research subjects. The results demonstrated a significant, gradual improvement in learning outcomes across three main domains from pre-cycle to Cycle I and Cycle II. The students' average cognitive score increased from 74.15 (pre-cycle) to 80.74 (Cycle I) and reached 87.91 in Cycle II, with the classical completeness percentage rising sharply from 70.59% to 97.06% by the end of the final cycle. This improvement was also accompanied by positive developments in the affective domain, which showed strengthened discipline, responsibility, and teamwork, as well as in the psychomotor domain, which demonstrated enhanced operational skills in using electrical beauty devices (such as high frequency and galvanic) in accordance with Standard Operating Procedures (SOP). In conclusion, the implementation of the Jigsaw cooperative learning model is effective in optimizing active participation and enhancing the quality of student learning outcomes.

1. Introduction

Along The rapid advancement of technology and industry has expanded into various sectors, including formal and vocational education, through the integration of curricula that are adaptive to modern aesthetic technologies. Higher education institutions and vocational secondary schools have begun incorporating technology-based learning media into sub-competencies related to acne-prone facial skin care and skin anatomy analysis to ensure that graduates are capable of operating advanced technological equipment such as lasers, LED phototherapy devices, and digital diagnostic instruments (Megasari, 2025). Consequently, technology is no longer merely a supporting tool in aesthetic clinics but has become a fundamental pillar of beauty education curricula in response to the increasing industrial demand for scientific validation and technological efficiency (Mardin, 2025).

The rapid growth of the technology-based beauty market has created an urgent need for a workforce possessing specialized technical competencies. The global Beauty Tech market is projected to grow at a compound annual growth rate (CAGR) of 17.9% through 2030, requiring beauty practitioners not only to master conventional manual techniques but also to become proficient in operating devices utilizing electrical currents and wave-based technologies (Biyimba, 2024). These competencies are increasingly important because the effectiveness of skincare products can be

significantly enhanced when combined with technological interventions. However, such practices require a comprehensive understanding of skin anatomy and equipment safety parameters to minimize the risk of malpractice (Gold, 2023). Therefore, proficiency in beauty technology has become a fundamental requirement rather than merely an added value for skilled professionals, including vocational high school students preparing to enter the beauty industry.

SMK Negeri 27 Jakarta, strategically located at Jl. Dr. Sutomo No. 1, Pasar Baru, Sawah Besar District, Central Jakarta, is one of the vocational institutions responding to these contemporary challenges. As one of Jakarta's pioneer vocational schools with a long-established history, it offers several competitive study programs, including the Beauty Expertise Program. Within this program, students receive specialized instruction in oily and acne-prone facial skin care integrated with modern aesthetic technologies, including vacuum suction, frimator, and high-frequency devices. Through mastery of these aesthetic technologies, SMK Negeri 27 Jakarta is committed to producing graduates who possess professional competencies and are adaptable to technological developments in beauty education.

Ideally, skin care instruction in vocational high schools should align with curriculum competencies that emphasize active student participation. Innovative learning models such as Problem-Based Learning (PBL) and Project-Based Learning (PjBL) have been shown to significantly improve students' critical thinking skills and psychomotor competencies in managing complex facial skin conditions. Likewise, the Discovery Learning approach enables students to independently identify solutions to oily and acne-prone skin problems through systematic clinical observation (Syarifuddin, 2024). At SMK Negeri 27 Jakarta, these approaches have been implemented through a combination of group discussions, interactive lectures, and practical simulations conducted in the beauty laboratory. According to the learning outcomes established for Phase F, students are expected to master facial skin treatment using both basic and emerging technologies (trend technology), as well as the appropriate use of cosmetic products and beauty equipment according to different skin types, conditions, and disorders.

As a vocational education institution, vocational high schools are expected to produce work-ready graduates through the integration of adequate facilities, effective educational management, and industry-relevant curricula. The success of vocational education depends largely on the availability of up-to-date learning facilities and instructional media that meet industrial standards. Furthermore, innovative teaching methods supported by professional teachers acting as learning facilitators are essential in preparing graduates with competencies and technical skills recognized by the beauty industry.

However, classroom implementation has not yet fully reflected these ideal curriculum standards. Based on classroom observations in the subject Oily and Acne-Prone Skin Care Using Technology at SMK Negeri 27 Jakarta, instruction has generally been conducted effectively through conventional classroom lectures that provide students with theoretical foundations. Nevertheless, considering the highly technical nature of the subject and its reliance on electrical beauty equipment, greater emphasis on interactive learning is required. Although Project-Based Learning (PjBL) has previously been implemented, the introduction of the Jigsaw cooperative learning model is expected to strengthen students' understanding of both theoretical concepts and practical skills while promoting more equitable mastery of competencies and increasing active classroom participation.

This gap in instructional quality is reflected in students' learning outcomes. Based on an interview with Mrs. Eni, the teacher responsible for the Oily and Acne-Prone Skin Care Using Technology course, approximately 70% of students achieved scores above the Minimum Mastery Criterion (KKM), while the remaining 30% obtained scores close to or only meeting the minimum passing standard. These findings indicate that learning outcomes have not yet reached the level of professional competence expected by the beauty industry. Without the implementation of more interactive and effective instructional strategies, SMK Negeri 27 Jakarta may encounter difficulties in achieving its objective of producing graduates who are fully competent in beauty technology.

Several previous studies have investigated instructional strategies aimed at improving student learning outcomes. Jayahartwan (2022) conducted classroom action research involving Grade XII Automotive Engineering students at SMK Negeri 3 Tabanan to improve learning outcomes in the

maintenance of automotive lighting electrical systems through the Problem-Based Learning (PBL) model. The findings demonstrated substantial improvements, with theoretical achievement increasing by 30% and practical competence by 31% from Cycle I to Cycle III. The implementation of PBL successfully shifted learning from a teacher-centered to a student-centered approach, encouraging students to engage actively in investigation, critical thinking, and collaborative problem-solving using electrical system simulation panels. Students' positive perceptions of the learning process also increased, reaching 90.1% by the conclusion of the study.

Similarly, Santoso (2020) reported that the implementation of the Jigsaw cooperative learning model significantly improved instructional quality in vocational high schools. The literature review revealed that the Jigsaw method increased student participation by an average of 21.9% and improved learning outcomes by an average of 18.82%. These findings suggest that shifting from conventional teacher-centered instruction to a student-centered learning environment through expert groups and home groups enables students to develop deeper conceptual understanding and stronger collaborative skills.

Despite its demonstrated effectiveness, the Jigsaw cooperative learning model has not previously been implemented in the competency of Oily and Acne-Prone Skin Care Using Technology at SMK Negeri 27 Jakarta. Consequently, students' opportunities to construct knowledge collaboratively have not been fully optimized. Therefore, this study seeks to pioneer the implementation of the Jigsaw learning model in this subject area with the expectation of transforming classroom learning dynamics and making a significant contribution to improving students' learning outcomes that have not yet consistently met the expected standards. Based on this background, the present study is entitled "The Implementation of the Jigsaw Cooperative Learning Model to Improve Students' Learning Outcomes in Oily and Acne-Prone Skin Care Using Technology at SMK Negeri 27 Jakarta."

2. Research Design and Methodology

This study employed a Classroom Action Research (CAR) design using the Kemmis and McTaggart model, which consists of four cyclical stages: planning, action, observation, and reflection. The research was conducted at SMK Negeri 27 Jakarta during the 2025/2026 academic year in the subject Oily and Acne-Prone Skin Care Using Technology. The participants were one class of Grade XI Beauty and Spa students selected through purposive sampling because they demonstrated learning outcomes that had not yet reached the expected level of mastery.

The study was implemented in two action cycles, with each cycle consisting of two learning meetings. The instructional intervention involved the implementation of the Jigsaw Cooperative Learning Model. Students were first assigned to heterogeneous home groups and subsequently reorganized into expert groups to discuss designated learning topics. After completing discussions within the expert groups, students returned to their home groups to teach and share the acquired knowledge. Learning activities concluded with classroom discussions, practical demonstrations, and formative assessments to evaluate students' cognitive understanding and practical competencies.

Data were collected using observation sheets, cognitive achievement tests, practical performance assessments, and documentation. Observation sheets were used to evaluate students' participation, collaboration, and engagement throughout the learning process. Cognitive learning outcomes were measured through written tests administered at the end of each cycle, whereas practical competencies were assessed using performance rubrics based on established competency standards for oily and acne-prone skin care using beauty technology. Documentation, including photographs and learning records, was used to support the research findings.

The collected data were analyzed using descriptive quantitative and qualitative approaches. Quantitative data were analyzed by calculating the average learning scores and the percentage of students achieving the Minimum Mastery Criterion (MMC). Improvements in learning outcomes between the pre-action stage, Cycle I, and Cycle II were compared to determine the effectiveness of the Jigsaw Cooperative Learning Model. Qualitative data obtained from classroom observations and field notes were analyzed descriptively to evaluate changes in students' learning participation, collaborative skills, and classroom interactions during the implementation of the intervention. The success criterion

of this study was achieved when at least 80% of students attained the Minimum Mastery Criterion and demonstrated improved learning participation throughout the instructional process.

3. Findings and Discussion

3.1. Findings

Respondent Characteristics

This classroom action research was conducted to examine the implementation of the Jigsaw Cooperative Learning Model in improving students' learning outcomes in the Oily and Acne-Prone Skin Care Using Technology course among Grade XI students of the Beauty and Spa Program at SMK Negeri 27 Jakarta. The implementation of the learning model was based on preliminary observations indicating that the instructional process was predominantly teacher-centered, relying mainly on lecture-based instruction. Consequently, students' participation during classroom activities was relatively low, which negatively affected their learning outcomes across the cognitive, affective, and psychomotor domains. Therefore, the Jigsaw Cooperative Learning Model was implemented as an instructional intervention to enhance both the quality of the learning process and students' learning outcomes.

The research was conducted collaboratively between the subject teacher and the researcher. The subject teacher acted as the practitioner responsible for implementing the instructional intervention, while the researcher served as an observer, monitoring the teaching and learning process, recording the activities of both the teacher and students, documenting classroom activities, and conducting reflective discussions with the teacher at the end of each cycle. This collaborative approach ensured that the intervention was implemented under authentic classroom conditions.

The participants consisted of 34 Grade XI students enrolled in the Beauty and Spa Program. The study was carried out in two action cycles, with each cycle comprising two instructional meetings. Each cycle followed the four stages of Classroom Action Research: planning, action, observation, and reflection. Research data were collected using learning achievement tests to assess students' cognitive outcomes, observation sheets to evaluate affective performance, and practical assessment rubrics to measure psychomotor competencies.

The Minimum Mastery Criterion (MMC) for the Oily and Acne-Prone Skin Care Using Technology course was set at 75. The intervention was considered successful when at least 82% of the students achieved the MMC and demonstrated improvements in cognitive, affective, and psychomotor learning outcomes compared with the pre-cycle condition. Classical learning mastery was calculated using the following formula (Arikunto, 2019):

$$\text{Classical Learning Mastery} = \frac{\text{Number of Students Achieving the MMC}}{\text{Total Number of Students}} \times 100\%$$

The research findings are presented sequentially, beginning with the pre-cycle condition, followed by the implementation and outcomes of Cycle I and Cycle II, and concluding with the overall results of the intervention as the basis for the discussion.

Pre-Cycle Condition

The initial condition was identified through classroom observations conducted before the intervention, interviews with the subject teacher, and an analysis of students' learning outcomes in the Oily and Acne-Prone Skin Care Using Technology course. The pre-cycle stage was intended to provide a comprehensive description of the learning process before the implementation of the Jigsaw Cooperative Learning Model.

Classroom observations revealed that instruction was predominantly delivered through lectures, question-and-answer sessions, and individual assignments. The teacher explained the learning materials while students mainly listened, took notes, and completed exercises individually. Student-to-student interaction remained relatively limited, resulting in minimal opportunities for discussion and collaborative learning. Consequently, only a small number of students actively asked questions or expressed their opinions, whereas most remained passive throughout the learning process.

During lessons on oily and acne-prone skin care using beauty technology, several students were unable to accurately explain the functions of technological devices such as the high-frequency unit, galvanic machine, vapozone, frimator, and vacuum suction equipment. In addition, some students experienced difficulties in determining the correct sequence of treatment procedures, applying sanitation principles, and observing occupational health and safety standards during practical activities. These findings indicate that both conceptual understanding and practical competencies required further improvement.

The results of the pre-cycle achievement test showed that 24 out of 34 students (70.59%) achieved the Minimum Mastery Criterion (MMC) of 75, while the remaining 10 students (29.41%) scored below the required standard. The mean pre-cycle score was 74.15, with the highest score of 84 and the lowest score of 63. These findings indicate that the initial learning outcomes had not yet met the research success criteria, as the classical learning mastery rate reached only 70.59%, whereas the target established in this study was at least 82% of students achieving the MMC.

Furthermore, classroom observations indicated that students' participation in discussions, confidence in expressing ideas, collaborative skills, and practical competence in operating beauty technology equipment remained below expectations. Most students tended to depend on the teacher or more active classmates for explanations, resulting in unequal participation during the learning process.

Based on these findings, an instructional intervention was considered necessary to increase students' engagement in classroom learning, provide opportunities for collaborative knowledge sharing, and foster both individual and group responsibility. Therefore, the Jigsaw Cooperative Learning Model was implemented as an alternative instructional strategy to improve students' cognitive, affective, and psychomotor learning outcomes.

As presented in Table 1, most students obtained scores within the ranges of 75–79 and 80–84. However, 10 students still scored below the Minimum Mastery Criterion (MMC). These findings indicate that students' initial cognitive achievement had not yet been evenly distributed, and the classical learning mastery had not met the predetermined success criterion of the study.

Classroom observations conducted during the pre-cycle stage revealed that students generally assumed a passive role as recipients of information. Throughout the learning process, classroom questioning, opinion sharing, and discussions were dominated by only a few students, while most students mainly listened to the teacher's explanations and relied on their classmates' responses. During practical sessions, several students experienced difficulties in explaining the functions of beauty technology equipment, determining the correct sequence of treatment procedures, and applying sanitation principles and occupational safety standards appropriately.

These observations indicate that the learning problems identified during the pre-cycle stage were reflected not only in students' cognitive achievement but also in their limited classroom participation, collaborative skills, and practical competencies. Therefore, an instructional intervention was required to promote active student engagement through collaborative discussions, teamwork, and individual accountability. Based on these findings, the Jigsaw Cooperative Learning Model was implemented as an alternative instructional strategy to improve students' cognitive, affective, and psychomotor learning outcomes in the subsequent research cycles.

Cylce I

Planning Phase

The planning phase of Cycle I was developed based on the reflection of the pre-cycle findings, which indicated that students' learning outcomes had not yet met the predetermined success criteria. Classroom observations also revealed that instruction was still predominantly lecture-based, resulting in limited student participation in discussions, questioning, and expressing opinions. Therefore, the researcher and the subject teacher collaboratively designed an instructional intervention by implementing the Jigsaw Cooperative Learning Model to encourage students to actively construct knowledge, collaborate with peers, and assume responsibility for their learning.

The planning process began with coordination between the researcher and the subject teacher to prepare the instructional materials required for the implementation of the intervention. The

instructional resources included a teaching module, Student Worksheets (LKPD), learning media consisting of PowerPoint presentations and instructional videos demonstrating the use of beauty technology equipment, color-coded cards for assigning students to expert groups, teacher and student observation sheets, affective and psychomotor assessment rubrics, and the Cycle I post-test. All instructional materials were developed in accordance with the learning objectives outlined in the research methodology.

The instructional content in Cycle I focused on developing students' understanding of the fundamental concepts of oily and acne-prone skin care using beauty technology. The learning materials covered the characteristics of oily and acne-prone skin, factors contributing to acne development, the functions of beauty technology equipment—including high-frequency, galvanic, vapozone, frimator, and vacuum suction devices—and the basic procedures for technology-assisted facial skin treatment in accordance with sanitation and occupational safety standards.

Before the learning activities began, students were assigned to heterogeneous home groups based on their pre-cycle learning achievement, classroom participation, and communication skills. Each group consisted of four to five students to promote balanced interaction and collaboration throughout the learning process. Subsequently, each student received a color-coded card indicating membership in a specific expert group, where they studied a designated subtopic. After completing discussions within their expert groups, students returned to their respective home groups to explain the material to their peers, ensuring that all group members developed a comprehensive understanding of the entire lesson.

Assessment in Cycle I was conducted to evaluate students' learning outcomes in the cognitive, affective, and psychomotor domains. Cognitive achievement was measured through a post-test consisting of multiple-choice and short-answer questions aligned with the learning objectives. The affective domain was assessed through classroom observations focusing on students' discipline, responsibility, cooperation, confidence in expressing opinions, and respect for their peers' viewpoints. Meanwhile, psychomotor performance was evaluated using a practical assessment rubric that measured students' ability to prepare equipment and materials, apply sanitation and occupational safety procedures, identify skin conditions, select appropriate beauty technology equipment, and perform a simulation of oily and acne-prone skin care procedures according to the prescribed operational standards.

Assessment in Cycle I was conducted to evaluate the extent to which the predetermined learning outcome targets were achieved, as presented in Table 2. The assessment covered three learning domains: cognitive, affective, and psychomotor. Cognitive achievement was measured using a post-test consisting of multiple-choice and short-answer questions aligned with the learning objectives. The affective domain was assessed through classroom observations focusing on students' discipline, responsibility, cooperation, confidence in expressing opinions, and respect for their peers' viewpoints. Meanwhile, psychomotor performance was evaluated based on students' ability to prepare equipment and materials, apply sanitation and occupational safety procedures, identify skin conditions, select appropriate beauty technology equipment, and perform simulations of oily and acne-prone skin care procedures according to the prescribed operational standards.

Through the implementation of the Jigsaw Cooperative Learning Model, students were expected to demonstrate improved learning outcomes compared with the pre-cycle condition across the cognitive, affective, and psychomotor domains. In addition to improving academic achievement, the intervention in Cycle I was designed to increase students' active participation in group discussions, confidence in expressing ideas, responsibility for group tasks, and collaborative skills throughout the learning process.

Figure 1. Expert Group Discussion Activities During Cycle I, Meeting 1

Cycle I – Meeting 2

The second meeting was conducted on Wednesday, May 20, 2026, and lasted for 3 × 45 minutes. The lesson began with a review of the material covered during the first meeting. The teacher asked several review questions to reinforce students' understanding of the concepts discussed in the previous expert group activities. Subsequently, the teacher presented instructional media consisting of a PowerPoint presentation and demonstration videos illustrating the operation of beauty technology equipment, including the high-frequency, galvanic, vapozone, frimator, and vacuum suction devices. Students were instructed to observe the function of each device, the correct operating procedures, and the occupational safety precautions that must be followed throughout the skin treatment process.

Figure 2. Practical Simulation of Beauty Technology Equipment Operation

After the observation activity, students returned to their home groups to complete a case study assigned by the teacher. Each group was required to analyze a case involving oily and acne-prone facial skin, identify the most appropriate beauty technology equipment, determine the correct sequence of treatment procedures, and justify their selection of the equipment. Throughout the activity, the teacher circulated among the groups to provide guidance and clarify students' responses, while the researcher observed students' learning activities using the prepared observation instruments.

The next stage involved a guided practical simulation of beauty technology equipment. The teacher first demonstrated how to prepare the equipment and materials, perform equipment sanitation, inspect the equipment before use, and carry out the treatment procedures according to the established standard operating procedures. Subsequently, students performed the practical simulation in turns within their respective groups. Classroom observations indicated that most students were able to follow the practical procedures satisfactorily. However, several students still experienced difficulty distinguishing between the functions of the high-frequency and galvanic devices. In addition, some students required further guidance when explaining the correct sequence of operating beauty technology equipment.

At the end of the lesson, the teacher administered the Cycle I post-test to evaluate students' mastery of the learning materials. The assessment consisted of multiple-choice and short-answer questions developed in accordance with the predetermined learning objectives. After all students had completed the test, the teacher and students conducted a brief reflection on the learning process.

Most students reported that the Jigsaw Cooperative Learning Model helped them understand the material more effectively because it provided opportunities for discussion and peer teaching within their groups. Nevertheless, several students admitted that they still lacked confidence when explaining the assigned material as members of the expert groups in front of their classmates.

Cycle II

Planning

Phase The planning phase of Cycle II was developed based on the reflection of the implementation of Cycle I. The results of Cycle I indicated improvements in students' learning outcomes compared with the pre-cycle condition. However, these improvements had not yet fully achieved the predetermined success criteria, and several weaknesses were still identified during the learning process.

Based on the reflection of Cycle I, several students still lacked confidence when explaining the learning materials to members of their home groups. In addition, their ability to accurately explain the functions of beauty technology equipment and to perform treatment procedures according to the Standard Operating Procedures (SOPs) required further improvement. Classroom observations also revealed that some students continued to depend on more active peers during group discussions, resulting in unequal participation among group members.

Therefore, the instructional intervention in Cycle II focused on refining the learning process by improving discussion strategies, increasing teacher guidance, reinforcing concepts that students had not yet fully understood, and optimizing practical learning activities to provide more equitable learning opportunities for all students. These improvements were expected to enhance students' cognitive, affective, and psychomotor learning outcomes and enable the study to achieve its predetermined success criteria by the end of Cycle II.

During the planning stage, the researcher and the subject teacher collaboratively designed instructional improvements based on the reflection results of Cycle I. These improvements included the revision of the teaching module, the development of case-based Student Worksheets (LKPD), individual task cards, Standard Operating Procedure (SOP) checklists for practical activities, teacher and student observation sheets, affective and psychomotor assessment rubrics, and the Cycle II post-test. All instructional materials were designed to address the shortcomings identified in Cycle I, thereby helping students better understand the learning materials, participate more actively in discussions, and apply theoretical concepts during practical activities.

The instructional content in Cycle II emphasized the application of oily and acne-prone skin care concepts through case study analysis. Students were required not only to explain the characteristics of different skin conditions and the functions of beauty technology equipment but also to select appropriate equipment based on specific skin conditions, justify their choices, perform treatment procedures systematically, and evaluate the treatment outcomes in accordance with sanitation principles and occupational safety standards.

Students remained in the same home groups established during Cycle I to maintain the collaborative relationships that had already been developed. Each student also rejoined the same expert group corresponding to their assigned subtopic. Furthermore, students who had demonstrated strong mastery of the material during Cycle I were assigned the role of peer tutors to assist classmates who continued to experience difficulties in understanding the learning materials or practical procedures. The peer tutors served only as learning facilitators, while the teacher remained responsible for ensuring the accuracy of the concepts and procedures learned by the students.

Cycle II – Meeting 1

The first meeting of Cycle II began with introductory activities, including greetings, a prayer, attendance checking, and an apperception activity. The teacher presented a general reflection on the implementation of Cycle I and encouraged students to become more confident in participating in discussions and explaining learning materials to members of their groups. The teacher also explained that the primary objective of Cycle II was to strengthen students' conceptual understanding and improve their ability to apply the concepts during practical learning activities.

Students then rejoined the same home groups formed during Cycle I. Each student received an individual task card requiring them to summarize the key concepts of the assigned material, provide

an example of its application to a case study, and formulate one discussion question to be shared with members of their home group. This strategy was implemented to ensure that every student assumed

equal responsibility and actively contributed to the collaborative learning process.

Figure 3. Apperception Activity and Presentation of the Learning Objectives

Within the expert groups, students discussed case studies related to the treatment of oily and acne-prone facial skin using beauty technology equipment. The teacher facilitated the discussions by posing guiding questions that encouraged students to analyze skin conditions, select the appropriate technological equipment, develop treatment procedures, and explain sanitation and occupational safety considerations. After completing the expert group discussions, students returned to their respective home groups and took turns presenting their findings to their peers. Compared with Cycle I, students demonstrated greater confidence in explaining the learning materials and participated more actively by responding to their classmates' presentations.

Cycle II – Meeting 2

The second meeting focused on integrated practical activities and the evaluation of students' learning outcomes. The lesson began with the teacher reviewing the procedures for technology-assisted treatment of oily and acne-prone facial skin and reminding students of the importance of sanitation, occupational safety, and the correct operation of beauty technology equipment.

Each group then carried out a practical simulation based on the assigned case study. Students prepared the necessary equipment and materials, identified the client's skin condition, selected the appropriate beauty technology device, explained the operating procedures, and performed the treatment simulation according to the Standard Operating Procedures (SOPs). Throughout the activity, the teacher provided guidance and constructive feedback, while the researcher observed students' participation and practical performance using the prepared assessment rubrics.

Figure 4. Peer Tutoring Activity

Classroom observations indicated that students were better prepared to perform the practical activities than they had been during Cycle I. Most students were able to explain the functions of beauty technology equipment accurately, determine the correct sequence of treatment procedures, and maintain proper sanitation in the work area more effectively. The implementation of peer tutoring also supported students who continued to experience learning difficulties, resulting in more active and balanced group discussions.

At the end of the lesson, the teacher administered the Cycle II post-test to evaluate students' learning outcomes following the implementation of all instructional improvements. A brief reflection session was then conducted involving both the teacher and the students. Most students reported that the use of individual task cards, case-based learning activities, and Standard Operating Procedure (SOP) checklists helped them understand the relationship between theoretical concepts and practical applications more systematically. The teacher concluded by emphasizing that successful treatment of oily and acne-prone facial skin using beauty technology depends not only on conceptual understanding but also on professional attitudes, collaborative skills, and the ability to operate beauty technology equipment accurately and safely.

Based on the improvement in students' average learning outcomes, the mean score increased by 13.76 points from the pre-cycle condition to Cycle II. Furthermore, the N-Gain analysis yielded a value of 0.53, which falls within the moderate improvement category. These findings indicate that the Jigsaw Cooperative Learning Model had a positive effect on improving students' learning outcomes, particularly in enhancing their understanding of the concepts and practical application of technology-assisted treatment for oily and acne-prone facial skin.

3.2 Discussion

The findings of this study indicate that the implementation of the Jigsaw Cooperative Learning Model effectively improved students' learning outcomes in the Oily and Acne-Prone Skin Care Using Technology course. Improvements were observed across the cognitive, affective, and psychomotor domains throughout the implementation of the intervention, from the pre-cycle stage to Cycle I and Cycle II. The Jigsaw learning model provided every student with the opportunity to actively engage in learning the assigned material, participate in collaborative discussions, and take responsibility for explaining the content to members of their home groups. Consequently, the learning process became more active, collaborative, and student-centered.

Improvement in Cognitive Learning Outcomes

The findings of this study indicate that the implementation of the Jigsaw Cooperative Learning Model effectively improved students' cognitive learning outcomes in the Oily and Acne-Prone Skin Care Using Technology course. This improvement was reflected in the progressive increase in the average cognitive scores, from 74.15 in the pre-cycle stage to 80.74 in Cycle I and 87.91 in Cycle II. Similarly, the percentage of classical learning mastery increased from 70.59% in the pre-cycle stage to 79.41% in Cycle I and reached 94.12% in Cycle II, exceeding the predetermined success criterion requiring at least 82% of students to achieve the Minimum Mastery Criterion (MMC). These findings demonstrate that the Jigsaw Cooperative Learning Model effectively enhanced students' conceptual understanding through a more active and collaborative learning process.

The improvement in cognitive achievement is consistent with the characteristics of the Jigsaw Cooperative Learning Model discussed in the literature. In this model, each student is responsible for mastering a specific portion of the learning material within an expert group before returning to the home group to explain the content to their peers. This learning process encourages students to read, analyze, discuss, organize information, and reconstruct concepts using their own words. Consequently, students strengthen their conceptual understanding because they do not merely receive information from the teacher but actively construct knowledge through interaction, discussion, and peer teaching. As a result, learning becomes more meaningful than in conventional lecture-based instruction.

The instructional improvements introduced in Cycle II also contributed to the enhancement of students' cognitive achievement. Based on the reflection of Cycle I, several instructional strategies were refined through the use of case-based Student Worksheets (LKPD), individual task cards, Standard Operating Procedure (SOP) checklists, and peer tutoring for students who still experienced learning

difficulties. These strategies enabled students to connect theoretical concepts with their practical application in the treatment of oily and acne-prone facial skin, thereby improving their understanding of the functions of beauty technology equipment, treatment procedures, and sanitation and occupational safety principles.

These findings are consistent with the study conducted by Baqi Nurul Hakkurahmy (2023), which reported that the Jigsaw Cooperative Learning Model improved students' learning outcomes and classroom engagement by promoting shared responsibility within learning groups. Similarly, Handayani (2022) found that the Jigsaw model enhanced students' conceptual understanding by providing opportunities for discussion, peer explanation, and constructive feedback. The consistency of the present findings with previous research suggests that the Jigsaw Cooperative Learning Model is particularly effective in vocational education, where students are expected to master theoretical concepts while simultaneously developing practical competencies.

Overall, the improvement in cognitive learning outcomes was reflected not only in higher test scores and increased learning mastery but also in students' enhanced ability to understand concepts, analyze case studies, and explain learning materials to their peers. Therefore, the implementation of the Jigsaw Cooperative Learning Model made a significant contribution to improving the quality of instruction in the Oily and Acne-Prone Skin Care Using Technology course.

Improvement in Students' Attitudes and Participation

The implementation of the Jigsaw Cooperative Learning Model also had a positive impact on students' attitudes and classroom participation. Classroom observations indicated that students' affective performance improved progressively, increasing from 62.40% during the pre-cycle stage to 79.40% in Cycle I and 90.80% in Cycle II. These improvements indicate that students became more disciplined, responsible for completing assigned tasks, actively involved in discussions, more confident in expressing their ideas, and more capable of collaborating effectively with their group members.

These positive changes occurred because every student was assigned responsibility for mastering specific learning materials within the expert groups. After developing expertise in their assigned topics, students returned to their home groups to explain the material to their peers. This peer teaching process encouraged students to communicate more confidently, improve their interpersonal communication skills, and develop a stronger sense of responsibility for the success of their groups. These observations are consistent with classroom findings showing progressively greater student engagement throughout the implementation of the intervention.

The increase in students' participation was further supported by the instructional improvements introduced in Cycle II, including the use of individual task cards, Standard Operating Procedure (SOP) checklists, and peer tutoring. These strategies ensured that all students had opportunities to participate actively, preventing classroom discussions from being dominated by only a few individuals. Students who had been relatively passive during Cycle I became more willing to ask questions, provide responses, and explain discussion outcomes to their peers. Consequently, the classroom atmosphere became more communicative, collaborative, and student-centered.

These findings demonstrate that improvements in learning outcomes extended beyond the cognitive domain and were accompanied by significant developments in students' learning attitudes. This result is consistent with the fundamental principles of the Jigsaw Cooperative Learning Model, which emphasize individual accountability, group collaboration, and positive interdependence among group members. The findings also support previous studies by Baqi Nurul Hakkurahmy (2023), who reported improvements in students' learning activities through the implementation of the Jigsaw model, and Handayani (2022), who concluded that the model enhances students' participation and conceptual understanding through collaborative group discussions. Therefore, the Jigsaw Cooperative Learning Model effectively improved students' attitudes, participation, and engagement throughout the learning process in the Oily and Acne-Prone Skin Care Using Technology course.

Improvement in Psychomotor Skills

The findings further indicate that the implementation of the Jigsaw Cooperative Learning Model significantly improved students' psychomotor skills in the Oily and Acne-Prone Skin Care Using Technology course. Practical performance progressively increased from 59.50% during the pre-cycle stage to 78.83% in Cycle I and 90.17% in Cycle II. These improvements demonstrate that students

became increasingly capable of performing practical procedures according to the established standards, including preparing equipment and materials, applying sanitation and occupational safety procedures, selecting appropriate beauty technology equipment, and performing treatment procedures systematically.

The improvement in psychomotor performance is closely associated with the collaborative characteristics of the Jigsaw learning model, which actively engages students throughout the learning process. After mastering the assigned learning materials within the expert groups, students returned to their home groups to teach their peers. This peer teaching process reinforced conceptual understanding and increased students' readiness to apply theoretical knowledge during practical activities. Consequently, learning extended beyond theoretical mastery by providing meaningful opportunities for students to develop practical competencies through direct experience.

The instructional refinements introduced in Cycle II also contributed substantially to improving students' practical skills. Based on the reflection of Cycle I, the teacher incorporated case-based Student Worksheets (LKPD), Standard Operating Procedure (SOP) checklists, and peer tutoring to help students understand each stage of the practical procedures more systematically. The teacher also repeated demonstrations of procedures that students frequently performed incorrectly and provided immediate feedback throughout the practical sessions. These improvements enabled students to correct errors in operating beauty technology equipment, applying sanitation procedures, and performing treatment techniques, leading to higher levels of practical competence by the end of Cycle II.

These findings are consistent with the theoretical framework of the Jigsaw Cooperative Learning Model, which proposes that learning becomes more meaningful when students actively construct knowledge through discussion, collaboration, and information sharing. In vocational education, this process is particularly important because practical competencies are acquired not only through teacher explanations but also through opportunities to observe, practice, and receive immediate feedback during authentic learning experiences.

The present findings are also supported by the study conducted by Baqi Nurul Hakkurahmy (2023), which concluded that the Jigsaw Cooperative Learning Model improved students' practical skills and learning outcomes through collaborative discussions and individual responsibility within learning groups. Similarly, Handayani (2022) reported that the Jigsaw model enhanced students' practical competencies by providing opportunities for collaborative learning while simultaneously applying theoretical knowledge in practical activities. The consistency of these findings suggests that the Jigsaw Cooperative Learning Model is highly effective in vocational education, where students are expected to achieve a balance between conceptual understanding and practical skill development.

Overall, the improvement in students' psychomotor skills was reflected not only in higher practical assessment scores but also in their increased ability to perform treatment procedures according to the Standard Operating Procedures (SOPs), operate beauty technology equipment accurately, and consistently apply sanitation and occupational safety principles throughout the treatment process. Therefore, the implementation of the Jigsaw Cooperative Learning Model made a substantial contribution to the achievement of students' practical competencies in the Oily and Acne-Prone Skin Care Using Technology course.

4. Conclusion

This classroom action research demonstrated that the implementation of the Jigsaw Cooperative Learning Model effectively improved students' learning outcomes in the Oily and Acne-Prone Skin Care Using Technology course at SMK Negeri 27 Jakarta. The improvements were consistently observed across the cognitive, affective, and psychomotor domains throughout the two action cycles. In the cognitive domain, students' average achievement increased from 74.15 in the pre-cycle stage to 80.74 in Cycle I and 87.91 in Cycle II. Likewise, the percentage of classical learning mastery improved substantially from 70.59% to 85.29%, and finally to 97.06%, exceeding the predetermined success criterion of 82%. These findings indicate that the Jigsaw model effectively enhanced students' conceptual understanding through collaborative learning, peer teaching, and active participation.

Students also demonstrated significant improvement in the affective domain. The average affective performance increased from 62.40% in the pre-cycle stage to 79.40% in Cycle I and 90.80% in Cycle II. The implementation of the Jigsaw model fostered greater discipline, responsibility, confidence in expressing ideas, collaboration, and respect for peers' opinions, creating a more active and student-centered learning environment. Similarly, students' psychomotor performance improved considerably, with practical competency scores increasing from 59.50% during the pre-cycle stage to 78.83% in Cycle I and 90.17% in Cycle II. Students demonstrated greater proficiency in preparing equipment and materials, applying sanitation and occupational safety procedures, selecting appropriate beauty technology equipment, performing treatment procedures according to the Standard Operating Procedures (SOPs), and evaluating treatment outcomes. The integration of peer tutoring, case-based learning activities, and structured practical guidance contributed substantially to these improvements.

Overall, the findings suggest that the Jigsaw Cooperative Learning Model is an effective instructional strategy for vocational education, particularly for subjects that require the integration of conceptual knowledge and practical skills. The model promotes active learning, collaborative problem-solving, and individual accountability while simultaneously enhancing students' cognitive achievement, professional attitudes, and practical competencies.

Statement on the Use of Generative Artificial Intelligence(AI)

During the preparation of this manuscript, the authors used generative artificial intelligence (AI) tools solely to support the scientific writing process. Specifically, Grammarly was used to improve grammar, language quality, readability, and writing clarity. The AI tools were not used to generate research ideas, analyze data, interpret findings, or draw scientific conclusions. All study design, data collection, analysis, interpretation of results, and conclusions were conducted and verified entirely by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the content presented in this manuscript.

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