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ENHANCING HAIRCUTTING SKILLS THROUGH PROJECT-BASED LEARNING: A SURVEY STUDY IN BEAUTY EDUCATION STUDENTS

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Abstract. The beauty education sector faces challenges in effectively developing practical skills, particularly in areas like haircutting, which are essential for students' professional competence. This study aims to explore the impact of Project-Based Learning (PjBL) on enhancing haircutting skills among undergraduate beauty education students. A quantitative explanatory research design was employed, examining the relationship between students' perceptions of PjBL and four dimensions of haircutting performance: progress over time, smoothness of movements, impact of tool transitions, and timing. Data were collected using a structured questionnaire with a five-point Likert scale and analysed through Structural Equation Modelling with Partial Least Squares (SEM-PLS). The results revealed strong internal consistency and convergent validity in the measurement model. Analysis of the structural model demonstrated that PjBL positively influenced all skill dimensions, with the most notable impact on smoothness of movements and timing. These findings underscore the value of PjBL in fostering both cognitive and psychomotor skills in vocational education. This study contributes to the literature by highlighting the benefits of experiential learning and collaboration in developing professional competencies within the beauty education field.

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INTRODUCTION

Beauty education plays a crucial role in preparing learners for the rapidly evolving dynamics of the beauty industry (Huang et al., 2009; Sahoo et al., 2024). Practical skills such as hair cutting, styling, and effective client communication are essential for success in this field (Apriyani, 2018). Beyond mastering basic techniques, learners must also be able to interact with clients, manage time effectively under pressure, and maintain high-quality standards in diverse environments (Cauchi & Falzon, 2023). Therefore, innovative and effective teaching approaches are needed to support the development of these practical skills in ways that align with industry demands.

One such approach that has been shown to enhance both hard and soft skills is Project-based Learning (PjBL). PjBL focuses on real-world projects, where learners engage in problem-solving, collaboration, and the practical application of knowledge (Elfeky et al., 2025; Hamidani et al., 2025; Morsy et al., 2024; Yanes-Luis et al., 2025). It encourages critical thinking, creativity, and teamwork, essential in completing tasks that reflect real-world scenarios. In beauty education, PjBL offers learners the chance to practice hair cutting skills in authentic settings, enhancing both their technical expertise and interpersonal abilities (Arlianty, 2018).

The implementation of PjBL in beauty education offers significant benefits, particularly in developing technical and social skills. Through PjBL, learners practice hair cutting techniques, communicate with clients, and collaborate with peers (de la Torre-Neches et al., 2020; Thi Van Pham & Huu Tran, 2021; Yam & Rossini, 2010). Collaboration, a vital skill in the beauty industry, is fostered as learners work together with clients and colleagues. Moreover, the critical and creative thinking nurtured in PjBL prepares learners to address challenges in styling and cutting techniques tailored to individual client needs.

Despite the promising potential of PjBL, there remains a notable research gap in its application to practical skills development, particularly in beauty education and hair cutting. Most

PjBL research has focused on fields like engineering or natural sciences (Chhabra & Gawande, 2025; Hamidani et al., 2025; Yanes-Luis et al., 2025), with limited attention to creative industries such as beauty (Markula & Aksela, 2022; Pan, 2013; Webster et al., 2022). Consequently, studies that explore how PjBL enhances practical skills like hair cutting are scarce. This research aims to fill this gap by examining how PjBL can be effectively applied to improve practical hair cutting skills in beauty education.

The novelty of this study lies in its exploration of real-world projects where learners collaborate with clients or mannequins to practice hair cutting. This approach not only enhances technical skills but also provides opportunities for learners to develop essential social skills required in the beauty industry. By focusing on teamwork, client interaction, and real-world challenges, this research contributes to a deeper understanding of how PjBL can prepare students for professional careers in beauty.

This study is highly relevant to beauty education as it offers insights into a teaching method that integrates academic achievement with the development of practical, industry-specific skills. Additionally, the research presents a novel approach that aligns with the current needs of the beauty industry, providing educational institutions with strategies to improve learning quality and the skillsets of beauty education students.

The purpose of this study is to investigate how PjBL can be applied in beauty education to enhance learners' practical skills in hair cutting. Through this research, it is expected that new practices will emerge that align better with industry demands, offering valuable insights that can be incorporated into beauty education curricula worldwide.

RESEARCH METHODS

This study employed a quantitative explanatory research design using a survey approach to examine the structural relationships between PjBL and learners' haircutting skills. The research aimed to explain the predictive influence of learners' perceptions of PjBL on multiple dimensions of haircutting performance, including progress over time, smoothness of movements, management of tool transitions, and timing. Since the study sought to test theoretically grounded relationships among latent variables rather than manipulate instructional conditions, the research was conducted after the learning experience had naturally occurred in the instructional setting.

The research participants consisted of undergraduate students enrolled in the Beauty Education program who had completed haircutting instruction delivered through PjBL. Given that all students in the cohort had experienced the same instructional model, a census sampling technique was applied, whereby the entire population of eligible learners was included as the research sample. This approach ensured comprehensive coverage of the population and minimized potential sampling bias.

The study involved one exogenous latent variable, namely learners' perceptions of PjBL, and four endogenous latent variables representing haircutting skills, namely progress over time, smoothness of movements, impact of tool transitions, and timing. Learners' perceptions of PjBL were measured using a structured questionnaire based on a five-point Likert scale ranging from strongly disagree to strongly agree. The questionnaire items were developed and adapted from established frameworks in previous studies addressing PjBL design, implementation, and learner engagement (Amashi et al., 2024; Son & Penry, 2022). The measurement of haircutting skills focused on psychomotor and procedural performance aspects, including movement fluency, temporal efficiency, coordination during tool transitions, and perceived skill progression, drawing on prior empirical research on motor skill development in professional haircutting contexts (Dellai et al., 2025).

Data analysis was conducted using Structural Equation Modelling with Partial Least Squares (SEM-PLS), as this technique is particularly appropriate for predictive research models, complex latent constructs, and studies with relatively limited sample sizes. The analysis proceeded in two stages. First, the measurement model was evaluated to assess the reliability and validity of the research instruments. Internal consistency reliability was examined using Cronbach's alpha, with values exceeding 0.70 considered acceptable. Convergent validity was

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assessed through outer loading values, and indicators with loading factors greater than 0.70 were retained in the model, in accordance with established SEM-PLS criteria (Hair et al., 2019). Second, the structural model was evaluated to examine the magnitude and significance of the hypothesized relationships between PjBL and each dimension of haircutting skills. Path coefficients were estimated to determine the strength and direction of the relationships, while statistical significance was tested using a bootstrapping procedure, with t-values greater than 1.96 indicating significance at the 0.05 level.

Throughout the research process, ethical considerations were strictly observed. All participants were informed of the research objectives, the voluntary nature of their participation, and their right to withdraw from the study at any time without penalty. Informed consent was obtained prior to data collection, and participants were assured that their responses would remain anonymous and confidential. All data collected in this study were used solely for academic and research purposes.

RESULTS AND DISCUSSION

The obtained data was analysed using PLS-SEM with the help of SEMinR software (Hair et al., 2021). The testing process was conducted in three stages: internal consistency reliability, convergent validity, and discriminant validity. The results of these tests are presented as follows.

Internal Consistency Reliability

Internal consistency reliability analysis was performed to assess the consistency of the constructs used to measure learners' perceptions of PjBL and the various dimensions of haircutting skills. This analysis aimed to determine how consistently the items within each construct reflect the same underlying concept, ensuring the reliability of the collected data. In this study, Cronbach's alpha was used to evaluate the internal consistency of the scales, a standard measure for assessing the reliability of multi-item instruments. The results of the reliability analysis are presented in the Table 1.

Table 1. Testing internal consistency reliability

Variable	Cronbach Alpha	Result
PjBL	0,8181	Very Good
Progress over time	0,7593	Very Good
Smoothness of movements	0,8525	Very Good
The impact of tool transitions	0,8098	Very Good
Timing	0,7305	Very Good

The results of the analysis as shown on Table 1 indicated that all constructs demonstrated very good internal consistency, with Cronbach's alpha values ranging from 0.7305 to 0.8525. Specifically, PjBL (0.8181), progress over time (0.7593), smoothness of movements (0.8525), the impact of tool transitions (0.8098), and timing (0.7305) all exceeded the commonly accepted threshold of 0.70, confirming the reliability of the measurement scales used in this study.

Convergent Validity

Validity testing was carried out to determine how well each indicator measures the intended concept within the measurement model. In this study, convergent validity was evaluated using the outer loading values from the Structural Equation Modelling with Partial Least Squares (SEM-PLS) approach. These values indicate the strength of the relationship between each indicator and its associated construct. Indicators with higher outer loadings suggest that the items explain a significant portion of the variance in the underlying construct, confirming the suitability of the measurement model. The results of this validity test, based on the outer loading values, are shown in Table 2.

Based on Table 2, all indicators demonstrated strong convergent validity, with outer loadings exceeding the commonly accepted threshold of 0.70. Specifically, the PjBL construct had loadings ranging from 0.8313 to 0.8926, progress over time from 0.7251 to 0.8274, smoothness of movements from 0.7504 to 0.8615, the impact of tool transitions from 0.8087 to 0.8790, and timing from 0.8510 to 0.9192. These findings confirm that the measurement indicators effectively capture the intended constructs, supporting the robustness and

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appropriateness of the measurement model used in this study.

Table 2. Testing convergent validity

Variable	Indicator	Loading Factor
PjBL	PjBL 2	0,8313
	PjBL4	0,8422
	PjBL6	0,8926
Progress over time	Proov1	0,7377
	Proov2	0,8274
	Proov3	0,7319
	Proov4	0,7251
Smoothness of movements	Smomo1	0,7504
	Smomo2	0,7751
	Smomo3	0,8033
	Smomo4	0,7714
	Smomo5	0,8615
The impact of tool transitions	Totran1	0,8087
	Totran2	0,8640
	Totran3	0,8790
Timing	Timing1	0,9192
	Timing5	0,8510

Discriminant Validity

In this study, the relationships among variables related to PjBL, Progress Over Time, Smoothness of Movements, The Impact of Tool Transitions, and Timing were examined. To assess how these variables are distinct from each other, a correlation analysis was conducted to determine the strength and direction of their relationships. Table 3 presents the correlation coefficients, illustrating how these variables are related and providing a clearer understanding of their interactions within the context of the study.

Tabel 3. Testing discriminant validity

Variables	1	2	3	4	5
PjBL	0,8558	0,4359	0,7950	0,3771	0,7203
Progress overtime	0,4359	0,7567	0,4664	0,7269	0,3473
Smoothness of movements	0,7950	0,4664	0,7933	0,4293	0,7338
The impact of tool transition	0,3771	0,7269	0,4293	0,8511	0,3491
Timing	0,7203	0,3473	0,7338	0,3491	0,8857

The correlation coefficients presented in Table 3 provide insight into how these variables interact. For example, PjBL shows a strong positive correlation with smoothness of movements (0.7950) and a moderate correlation with timing (0.7203), indicating that higher perceptions of PjBL are associated with better performance in these dimensions. Additionally, smoothness of movements and timing are highly correlated (0.7338), suggesting that improvements in movement coordination are closely tied to better time management. The impact of tool transitions exhibits a moderate correlation with progress over time (0.7269) and smoothness of movements (0.4293), indicating that smoother tool transitions contribute to overall skill development. The relatively lower correlations between the variables, such as between timing and the impact of tool transitions (0.3491), suggest that while these constructs are related, they capture distinct aspects of the learners' skillset, confirming their discriminant validity.

Evaluation of Structural Model

This study used SEMinR to test the structural model (Hair et al., 2021). A bootstrapping procedure with 1000 iterations was performed to test the influence between constructs. Figure 1 shows the result of the PLS-SEM analysis.

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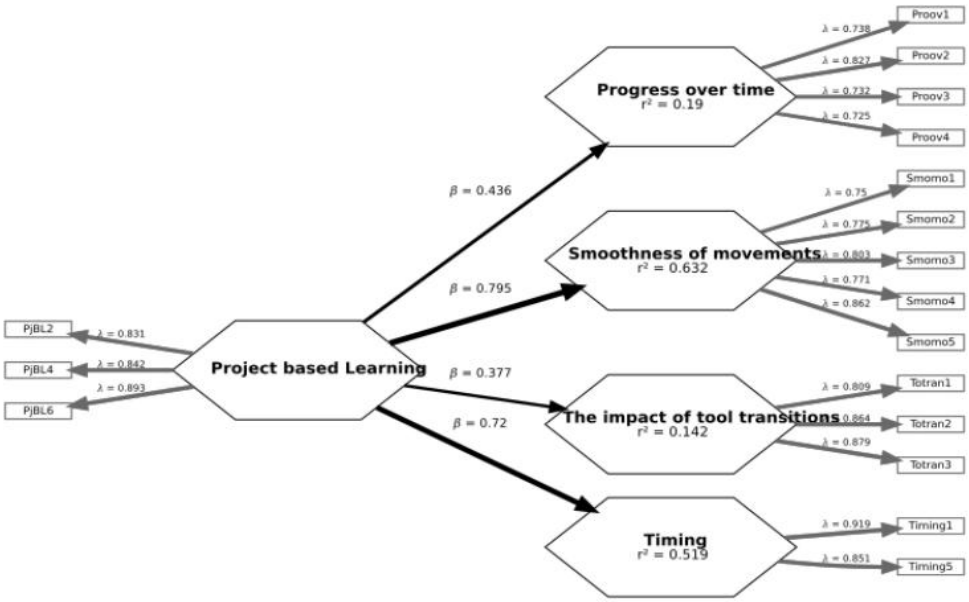

Figure 1. Structural model testing

The structural model was tested to evaluate its explanatory power. Adjusted R^2 indicates the extent to which the predictor variables explain the variance in the constructs. According to (Marcoulides, 1998), the validity of a model is classified based on R^2 scores into three categories: substantial (0.67), moderate (0.33), and weak (0.19). The full results of the testing are presented in Table 4.

Tabel 4. Result of R-Square Testing

Dependent	R-Square	R-Square Adjusted	Status
Progress over time	0,1900	0,1796	Weak
Smoothness of movements	0,6320	0,6273	Moderate
The impact of tool transitions	0,1422	0,1312	Weak
Timing	0,5188	0,5126	Moderate

Hypothesis Test Result

Hypothesis testing was conducted to examine the significance and strength of the proposed causal relationships between PjBL and the various dimensions of learners' haircutting skills. Using the bootstrapping procedure in SEM-PLS, the analysis evaluated the path coefficients (original sample values), standard deviations, and t-statistics to determine whether the hypothesized relationships were statistically significant. A t-value greater than 1.96 was used as the criterion for significance at the 0.05 level. The results of the hypothesis testing are summarized in Table 5.

Table 5. Hypothesis test

Hipotesis	Original Sample	Standard Deviation	T-Test	Status
PjBL → Progress over time	0,4359	0,1085	4,0187	Significant
PjBL → Smoothness of movements	0,7950	0,0443	17,9423	Significant
PjBL → The impact of tool transitions	0,3771	0,1353	2,7865	Significant
PjBL → Timing	0,7203	0,0602	11,9560	Significant

The results of the hypothesis tests conducted in this study reveal significant relationships between PjBL and several important outcome variables: Progress Over Time, Smoothness of Movements, The Impact of Tool Transitions, and Timing. These findings contribute valuable insights into the effectiveness of PJBL as a pedagogical approach and provide further support to existing literature on the topic. The analysis demonstrates how PJBL can foster key skills essential for students' academic and professional growth.

In examining the impact of PjBL on Progress Over Time, the hypothesis test revealed an

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original sample value of 0.4359, a standard deviation of 0.1085, and a t-test value of 4.0187, which signifies a moderate yet significant relationship. This result is consistent with research by Brown (2022), Liu et al. (2022), Pfennig & Siegeris (2025), Wu (2024), and Zhang et al. (2023), who found that PJBL encourages self-regulated learning and reflective practices, leading to better student awareness of their progress. Similarly, Čavić et al. (2023) and Nasir et al. (2024) emphasized that PJBL promotes metacognitive awareness, enabling students to track and evaluate their own learning journey. Furthermore, studies by Akthar et al. (2025), Cifrian et al. (2020), and Zhang & Ma (2023) have argued that PJBL enhances students' ability to assess their progress, thereby contributing to long-term academic success. These findings corroborate the idea that PJBL fosters continuous reflection, allowing students to identify areas of improvement and take ownership of their learning.

Regarding the effect of PJBL on Smoothness of Movements, the hypothesis test revealed a very strong positive relationship with an original sample value of 0.7950 and a t-test value of 17.9423. This result strongly aligns with previous research that highlights the role of hands-on learning in improving motor skills. For instance, in a study by Aliriad et al. (2023) and Muji et al. (2025), it was found that students engaged in PJBL exhibited significantly improved motor skills, particularly in settings where coordination and physical tasks were involved. Similarly, research by Moroșanu et al. (2024), and Sailema-Lalaleo & Páez-Quinde (2023) emphasizes the importance of experiential learning in enhancing physical coordination. Moreover, findings by Zhang et al. (2023) underscore that PJBL fosters both cognitive and motor skills, as students learn through physical engagement and active participation in real-world tasks. The strong effect size in this study further supports the idea that PJBL is highly effective in improving motor coordination and smoothness of movements, skills that are crucial for real-world problem-solving scenarios.

The hypothesis examining the impact of PjBL on tool transitions produced an original sample value of 0.3771 and a t-test value of 2.7865, indicating a moderate yet significant relationship. This result is consistent with research by Ferreira et al. (2020) and Warke & Kukker (2023), who noted that PJBL helps students develop the skills necessary to manage transitions between different tools and resources. Further supporting this, research by Ferreira et al. (2020) and Hussein (2021) demonstrates that PJBL environments, which require the use of multiple tools, help students become more adaptable and better at handling transitions. Additionally, studies by Mezak & Papak (2020) and Yulianti (2024) indicate that PJBL facilitates the development of problem-solving skills, including the ability to navigate complex environments where various tools and resources are involved. While the effect size is smaller than the other variables, this finding underscores the importance of PJBL in helping students acquire practical skills that are vital for successful tool management in real-world applications.

Finally, the hypothesis testing the effect of PjBL on Timing yielded an original sample value of 0.7203, a t-test value of 11.9560, and a standard deviation of 0.0602, showing a significant positive relationship. This result aligns with findings from various studies on time management in project-based environments. Research by Santoso et al. (2021) highlights that PJBL promotes time management skills by requiring students to meet deadlines and manage multiple tasks simultaneously. Additionally, studies by Günzel & Brehm (2024) shows that PJBL encourages students to plan and execute tasks efficiently, leading to improved time management. The significant effect size observed in this study is in line with the research by Santoso et al. (2021), which found that PJBL enhances students' ability to manage their time effectively while working on complex projects. These findings reinforce the idea that PJBL not only enhances students' cognitive skills but also helps them develop practical, life-long skills, such as effective time management.

Overall, the findings from this study contribute to the growing body of research that underscores the effectiveness of PjBL in fostering essential skills among students. The results align with the works of several scholars, including Cifrian et al. (2020), Ferreira et al. (2020), Günzel & Brehm (2024), Sailema-Lalaleo & Páez-Quinde (2023), Santoso et al. (2021), and Warke & Kukker (2023), who have demonstrated the positive impact of PJBL on students'

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cognitive, motor, and practical skills. By enhancing students' ability to track their progress, improve coordination, manage tool transitions, and manage their time effectively, PJBL prepares students for real-world challenges. This study builds on existing literature by providing empirical evidence that supports the significant benefits of PJBL in developing both cognitive and practical skills.

While the findings are promising, it is important to acknowledge certain limitations. The sample size and scope of the study may limit the generalizability of the results, and future research could explore larger and more diverse populations to validate these findings. Moreover, as the study relied on self-reported data, further research incorporating objective performance measures would enhance the robustness of the conclusions. Future studies could also explore the long-term effects of PJBL on these skills and investigate its impact in various disciplines and educational settings.

In terms of practical implications, the results suggest that educators should consider integrating PjBL into their curriculum to enhance students' progress tracking, motor coordination, adaptability in tool transitions, and time management. These skills are essential for students' success both academically and professionally. For future research, investigating the role of digital tools in facilitating transitions between tasks and improving time management in PJBL environments would be valuable. Furthermore, examining the impact of PJBL on different student populations and across various disciplines could provide deeper insights into its effectiveness.

CONCLUSION AND SUGGESTIONS

This study underscores the significant role of Project-based Learning (PjBL) in enhancing learners' haircutting skills within beauty education. The core finding of this research is that PjBL effectively supports the development of both procedural and psychomotor skills in learners, as evidenced by improvements in movement smoothness, tool transition management, and timing accuracy over time. These results highlight the pedagogical strength of PjBL in fostering complex skill integration, which is crucial for professional competency in the field of haircutting.

The implications of this study are far-reaching for vocational education, particularly in disciplines where hands-on skills are paramount. By providing an authentic learning environment, PjBL encourages greater learner engagement, facilitates the quality of practice, and supports the integration of theoretical knowledge with real-world application. The findings suggest that incorporating PjBL into vocational training programs can significantly elevate the skill levels of students, equipping them with the competencies necessary for professional success.

Looking forward, future research could explore the long-term effects of PjBL on skill retention and career performance in beauty education. Additionally, comparative studies between different pedagogical approaches could further clarify how PjBL aligns with or surpasses other teaching methods in vocational settings. Furthermore, examining the impact of PjBL in other areas of vocational education, beyond beauty training, could broaden our understanding of its applicability and effectiveness in skill-based learning environments.

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