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ARTICLE

The Effect of 4C Skills on the Work Readiness of Beauty Vocational School Students in the Mamminasata Region

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Abstract
This study investigates the extent to which collaboration, communication, creativity, and critical thinking skills influence the work readiness of beauty vocational students in the Mamminasata region. An associative quantitative research design was employed, and data were collected from 101 students enrolled in three public vocational schools using validated Likert-scale questionnaires. The dataset was analyzed through descriptive statistics, classical assumption tests, and simple and multiple linear regression analyses. The results demonstrate that all four components of the 4C framework significantly contribute to students' work readiness. Communication emerged as the strongest predictor ($\beta = 0.417$; $R^2 = 0.514$), followed by critical thinking ($\beta = 0.244$; $R^2 = 0.401$), collaboration ($\beta = 0.238$; $R^2 = 0.261$), and creativity ($\beta = 0.232$; $R^2 = 0.099$). The simultaneous model accounted for 64.8% of the variance in work readiness ($R^2 = 0.648$; $F = 44.267$; $p < 0.001$), indicating a substantial cumulative influence of the four skills. These findings underscore the pivotal role of 4C competencies in enhancing vocational students' preparedness to meet contemporary industry demands. The study highlights the imperative for integrating 4C-oriented instructional strategies into vocational education to strengthen the alignment between school-based learning and the competency standards required in the beauty sector. The results provide empirical evidence that may inform curriculum development, pedagogical decision-making, and policy initiatives aimed at improving graduates' transition into the workforce.

Keywords: 4C Skills, Communication, Work Readiness, Vocational Education, Beauty Program.

1. Introduction

Increasingly intense competition in the modern workplace requires all graduates, including those from vocational education, to possess skills that are aligned with the demands of 21st-century industries. Mastery of critical thinking, creativity, communication, and collaboration—collectively referred to as 4C skills—constitutes a key determinant in shaping graduates' work readiness [1, 2, 3]. The application of 4C Skills not only encourages students' cognitive abilities but also shapes

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the professional character needed in the industrial world, including the beauty sector. According to [4, 5], in addition to evaluating technical talents, businesses also prioritize soft skills like critical thinking, teamwork, and communication when hiring new employees.

Vocational education plays a strategic role in preparing graduates who are ready to work through practice based learning and soft skills development [6, 7]. In this context, key competencies such as creativity, collaboration, and communication are an important part of curriculum development in vocational high schools [8, 9]. Vocational education in the field of beauty requires a high level of technical and non-technical skills. However, most beauty teachers still tend to teach students to imitate, resulting in students' work lacking creativity and critical thinking [10]. This indicates that the learning process in vocational schools in the field of beauty needs to be directed towards improving thinking and innovation skills in order to increase the competitiveness of graduates.

Previous studies indicate that transpersonal qualities such as self-acceptance, personal drive, and effective communication play a meaningful role in shaping vocational students' preparedness for entering the workforce [7, 11]. Work readiness is influenced not only by technical proficiency but also by a range of non-technical attributes, including adaptability, professional ethics, teamwork, and the ability to address problems across diverse occupational contexts [6, 12, 13]. Furthermore, [14] emphasize that communication and teamwork constitute core competencies for vocational students, as these skills directly affect their performance in dynamic industrial environments. Such competencies enable students to collaborate effectively, respond to workplace challenges, and meet organizational expectations. In the beauty sector, the importance of these abilities is even more pronounced, given that service-oriented work requires frequent interaction with clients, sensitivity to customer needs, and close cooperation among colleagues to ensure consistent service quality [15]. Collectively, this body of evidence underscores the need for vocational education to integrate technical and interpersonal skill development in a balanced and systematic manner to better support students' transition into professional roles.

Other studies have shown that 21st-century education must prioritize the development of communication, collaboration, creativity, and critical thinking skills as core components of vocational learning [1, 3, 16]. A growing body of research demonstrates that instructional approaches such as discovery learning, cooperative learning, and problem-based learning can enhance students' collaboration and communication abilities [17][18, 19]. Improvements in critical thinking skills have also been found to correlate with stronger teamwork and higher levels of work readiness [20, 21]. Accordingly, the reinforcement of 4C skills within vocational education serves a dual function: advancing students' academic competencies while simultaneously strengthening their preparedness for the world of work.

Several international studies highlight that the application of 4C Skills is a determining factor for successful learning in various fields. [22, 23] explain that experiential learning and design thinking approaches have been proven to improve students' critical thinking, creativity, and self-efficacy. In the digital context, collaboration and communication skills are also increasingly important because the world of work now demands the ability to work across spaces and technologies [12, 24]. [25] show that quality improvement programs that integrate work readiness modules successfully improve students' oral, written, and digital communication skills, which ultimately leads to increased work readiness. The same point is also conveyed by [26], who emphasize the importance of improving scientific communication competencies in supporting work readiness in STEM fields. Meanwhile, [23] remind us that professional communication often does not receive sufficient attention in formal education, even though it is one of the main indicators of work readiness.

In the context of vocational education in Indonesia, various studies indicate the need to update teaching approaches to suit the needs of Industry 4.0. [27] emphasize that vocational training must

be continuously updated to improve the competitiveness of graduates. [28] assert that vocational technology competencies and digital work skills including creativity and digital collaboration play an important role in work readiness in the digital era. In addition, [29] show that creativity is an important element in building an entrepreneurial orientation and readiness to face changes in the job market. Similar findings were also reported by [30, 31], who stated that mastery of 21st century skills is a determining factor for graduates in facing the challenges of the Fourth Industrial Revolution.

In the field of technical and service education, [32] highlight the importance of integrating language and communication skills (LCS) into technical content so that students are able to communicate professionally. [3] also emphasize that vocational school teachers in Indonesia need pedagogical support and relevant learning resources to integrate 4C skills into the science and vocational curriculum. Support from teachers and parents also influences the success of learning in vocational secondary education [33]. Thus, learning in vocational schools, including in the field, needs to be directed towards improving soft skills and collaborative learning approaches so that students are able to face the dynamic world of work [1, 8].

However, there is still a gap in the implementation of 4C based learning in vocational schools, especially in the field of beauty. A study by [10] shows that students' creativity is still limited because teachers tend to focus on uniform results. In fact, the field of beauty requires a high level of innovation and creativity so that graduates can adapt to industry trends. This condition is also evident in the Mamminasata region, a metropolitan area that includes Makassar, Maros, Gowa, and Takalar, which has rapid growth potential in the beauty industry. However, this has not been matched by the optimal readiness of vocational school graduates in the beauty field. This gap indicates that strengthening 21st century skills through innovative vocational learning models is an urgent need for vocational schools in the region [7, 34].

Based on this gap, this study aims to analyze the influence of 4C skills which consist of collaboration, communication, creativity, and critical thinking on the work readiness of vocational high school students in the beauty industry in the Mamminasata region. This study poses the following research questions: (1) How do the 4C skills describe the work readiness of beauty students in public vocational high schools in the Mamminasata region? (2) Does collaboration skill influence work readiness? (3) Does communication skill influence work readiness? (4) Does creativity skill influence work readiness? (5) Does critical thinking skill influence work readiness? and (6) Do 4C skills simultaneously influence the work readiness of beauty students in public vocational high schools in the Mamminasata region?

As a quantitative hypothesis, this study predicts that:

1. H_1: There is a positive influence between collaboration skills (X_1) and work readiness (Y).
2. H_2: There is a positive influence between communication skills (X_2) and work readiness (Y).
3. H_3: There is a positive influence between creativity skills (X_3) and work readiness (Y).
4. H_4: There is a positive influence between critical thinking skills (X_4) and work readiness (Y).
5. H_5: There is a simultaneous positive influence between collaboration, communication, creativity, and critical thinking skills on the work readiness of beauty students in public vocational schools in the Mamminasata region.

This study is expected to contribute theoretically and practically to the development of vocational education, particularly in the integration of 21st century skills into the beauty curriculum. In addition, the results of this study can be used as a basis for education policymakers to strengthen practice based learning strategies and soft skills development to produce graduates who are ready to compete in the modern world of work.

2. Methods

2.1 Research design

This study employs an associative quantitative research design to examine the relationships between collaboration, communication, creativity, and critical thinking skills toward students' work readiness in vocational education, both partially and simultaneously. In research methodology, Associative Design is seen as relevant for analyzing empirical relationships between variables in a real context [35]. This view is in line with [36] who explains that quantitative education is used when research wants to improve construction relationships through numerical measurement and statistical analysis. Therefore, this design is considered appropriate for identifying relationship patterns between 4C skills and students' work readiness in the vocational school context. (Figure 1)

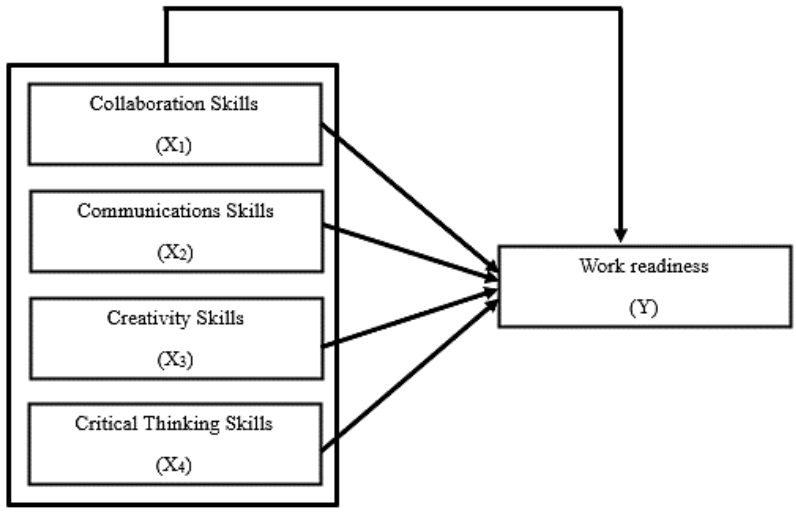

Figure 1. Conceptual Model of the Study.

2.2 Research setting

This study was conducted from June to August 2025 in three public vocational schools in the Mamminasata area that offer specialized programs in beauty and cosmetology, namely SMK Negeri 2 Gowa, SMK Negeri 6 Makassar, and SMK Negeri 8 Makassar. Prior to data collection, the researcher obtained formal permission from each institution through approval letters issued by the school principals and coordinating teachers of the beauty program. The permission was granted after the researcher provided an explanation of the study's objectives, data collection procedures, and the measures taken to ensure the confidentiality and ethical handling of student information.

2.3 Participants

The population of this study comprised 134 Grade XI students enrolled in the Beauty Care Expertise Program across three state vocational high schools in the Mamminasata region. From this population, a sample of 101 students was selected using purposive sampling, with the sample size determined through the Slovin formula at a 5% margin of error. All participants were female students aged 16–17 years who were actively engaged in laboratory-based practice with real clients and had not yet undertaken industry internships, which are scheduled for Grade XII under the national vocational curriculum.

2.4 Research Procedures

The research followed a set of structured steps to ensure that the data collected were accurate and suitable for analysis. The process began with the development of the research instrument, which was constructed based on indicators of communication, collaboration, critical thinking, and creativity. The initial draft was reviewed by two experts in vocational education, who assessed the clarity, relevance, and alignment of each item with the intended constructs.

Once the expert review was completed, the instrument underwent empirical testing. The validity of each item was examined through item–total correlation, and only the items that met the established validity criteria were retained. Reliability testing was then conducted using Cronbach's Alpha to confirm that the instrument demonstrated adequate internal consistency.

Following the validation and reliability procedures, the researcher arranged the data collection schedule in coordination with the administrations of the participating vocational schools. The questionnaires were distributed during students' laboratory practice sessions, with both the research team and classroom teachers supervising the process to ensure that students understood the instructions and completed the forms independently.

After all responses had been collected, the data were reviewed, coded, and verified to minimize entry errors and ensure completeness. The verified dataset was then entered into SPSS for statistical analysis. The analytical procedures included descriptive statistics, normality testing, individual regression analyses for each component of the 4C skills, and multiple regression analysis to examine their combined influence on students' work readiness.

2.5 Instruments

The instrument used was a Likert scale questionnaire that produced four independent variables collaboration, communication, creativity, and critical and one dependent variable, namely work performance. Content validity was assessed by two experts in vocational education, both of whom have extensive experience in curriculum development, assessment design, and competency based training in the beauty and cosmetology field. The validators evaluated nine items using a five-point validity scale. All items were classified in the "agree" category (D = 9; A = 0; B = 0; C = 0), resulting in a content validity index of V_i = **1.00** , which exceeds the minimum threshold of 0.75. This indicates that the instrument demonstrates strong content validity. Minor suggestions from the experts such as refining wording and adjusting the response scale were incorporated to enhance clarity before the instrument was administered.

Item validity was examined using the Pearson product–moment correlation with data from 31 Grade X cosmetology students. The critical r-value at df = 29 and α = 0.05 was 0.355. All items showed $r_{\text{count}} \geq r_{\text{table}}$, indicating that every statement item met the minimum criterion for construct validity. These results confirm that the instrument satisfies both item-level and content validity requirements and is therefore appropriate for collecting accurate and quantifiable data.

A reliability test was then conducted to determine the consistency of the research instruments in measuring each variable. Reliability analysis in this study was performed using SPSS 25 with the Cronbach's Alpha method. An instrument is considered reliable when it attains a Cronbach's Alpha coefficient of at least 0.600.

Table 1. Instrument Reliability Test Results

Instrument Variable	Number Of Items	Alpha Cronbach	Description
Collaboration Skills	15	0,905	Reliable
Communication Skills	15	0,924	Reliable
Creativity Skills	15	0,912	Reliable

Critical Thinking Skills	15	0,887	Reliable
Work Readiness	15	0,957	Reliable

Based on the reliability test results presented in Table 1, all research variables demonstrated Cronbach's Alpha values above 0.60. Therefore, it can be concluded that the research instruments exhibit a strong level of reliability. This instrument, which integrates classical theoretical models with contemporary empirical evidence, provides a contextually reliable and robust tool for measuring 4C competence and job readiness among beauty vocational students in the Mamminasata region.

2.6 Data Collection Techniques

Data were collected using a structured Likert scale questionnaire consisting of 75 items, covering four independent variables collaboration, communication, creativity, and critical thinking and one dependent variable, work readiness. Before administration, the instrument had undergone validity and reliability testing to ensure its appropriateness for use.

Table 2. Instrument Specification Table

Variable	Indicator	Item Numbers
Collaboration (X_1)	1. Working collaboratively in groups	1–3
	2. Appreciating differing opinions	4–5
	3. Sharing responsibilities	6–9
	4.Providing team support	10–12
	5. Resolving conflicts positively	13–15
Communication (X_2)	1. Conveying ideas verbally	1–4
	2. Active listening	5–7
	3. Written communication clarity	8–9
	4. Adjusting communication style	10–12
	5. Giving and receiving feedback	13–15
Creativity (X_3)	1. Generating new ideas	1–2
	2. Developing or modifying ideas	3–6
	3. Viewing problems from multiple perspectives	7–8
	4. Using imagination	9–11
	5. Flexibility in challenges	12–15
Critical Thinking (X_4)	1. Identifying problems	1–3
	2. Evaluating information	4–5
	3. Drawing conclusions	6–8
	4. Evidence-based decision making	9–12
	5. Formulating alternative solutions	13–15
Work Readiness (Y)	1. Mastery of technical skills	1–4
	2. Work commitment	5–7
	3. Independent and teamwork ability	8–9

	4. Initiative and proactive attitude	10–13
	5. Professional communication ability	14–15

The questionnaire was administered online using Google Forms, and the survey link was distributed through the official class communication channels used by each school. Participants completed the instrument independently using their personal devices. Before accessing the questionnaire, students were presented with an information and consent page explaining the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses. Consent was obtained electronically by clicking the "Agree/Continue" button.

A name field was included solely for verification purposes, and participants were informed that any identifying information would remain confidential and would not be used in data analysis. Students were allowed to complete the questionnaire at their own pace to ensure adequate time to read and understand each item.

After all responses were submitted, the dataset was downloaded from Google Forms, checked for completeness, and verified prior to coding. The final dataset was then prepared for statistical analysis using SPSS.

2.7 Data Analysis

The data analysis in this study began with descriptive statistics to provide an overview of students' 4C competency levels and their work readiness. In addition to descriptive analysis, inferential statistical procedures were employed using both simple and multiple regression analyses to examine the influence of each 4C component individually and collectively on work readiness. Before estimating the regression models, several assumption tests were conducted. The normality test indicated that the residuals were normally distributed. The linearity test confirmed that each 4C component had a linear relationship with work readiness. The multicollinearity test showed that the tolerance and VIF values met the required standards, indicating that the independent variables did not exhibit multicollinearity issues. The heteroscedasticity test demonstrated that the residuals were evenly distributed, indicating that the model was free from heteroscedasticity.

After all assumptions were satisfied, simple linear regression was used to analyze the effect of each 4C component communication, collaboration, critical thinking, and creativity on work readiness. These analyses were also employed to test the partial hypotheses. Multiple linear regression was then applied to examine the combined influence of the four components. The t-test was used to determine the significance of each independent variable, while the F-test assessed the overall significance of the model. The R^2 value was calculated to determine how much of the variation in work readiness could be explained by the four 4C components. All analyses were conducted using SPSS.

3. Results and Discussion

3.1 Results

3.1.1 Descriptive Statistics

This study examines the effect of 4C skills (Collaboration, Communication, Creativity, and Critical Thinking) on the job readiness of beauty care vocational students in the Mamminasata region. Data were collected from 101 students through questionnaires and analyzed using descriptive statistics and inferential analysis including simple and multiple linear regression.

Descriptive analysis was conducted to provide an overview of the 4C skills and job readiness of students enrolled in the Beauty Care Expertise Program at public vocational schools in the Mamminasata region. The results of this analysis illustrate the general tendencies of students' collaboration, communication, creativity, and critical thinking skills, as well as their overall level of readiness to enter the workplace.

Table 3. Descriptive Statistics Summary Of Research Variables

Variable	Mean	Median	Mode	Std. Deviation	Min	Max
Collaboration	51.07	51.00	47	4.653	39	60
Communication	49.73	50.00	43	5.394	34	60
Creativity	47.15	47.00	43	5.377	30	56
Critical Thinking	52.11	52.00	52	4.243	43	60
Work Readiness	48.50	48.00	47	4.021	38	58

The results showed that critical thinking has the highest average value (52.11), followed by collaboration (51.07), communication (49.73), and creativity (47.15). Critical thinking also showed the most homogeneous distribution with the smallest standard deviation (4.243), indicating a relatively consistent critical thinking ability among students. Work readiness showed an average of 48.50 with a relatively small standard deviation (4.021), indicating that overall students have adequate work readiness with a fairly uniform distribution.

Table 4. Distribution of 4C Skills Categories.

Category	Collaboration	Communication	Creativity	Critical Thinking
	f (%)	f (%)	f (%)	f (%)
Very High	97 (96%)	85 (84.1%)	68 (67.3%)	97 (96%)
High	4 (4%)	14 (13.9%)	29 (28.7%)	4 (4%)
Low	0	2 (2%)	4 (4%)	0
Very Low	0	0	0	0
Total	101 (100%)	101 (100%)	101 (100%)	101 (100%)

The distribution of the 4C skills indicates that collaboration is predominantly positioned in the very high category, with 97 students (96%), while 4 students (4%) fall into the high category. No respondents were classified as low or very low in this domain. Communication skills similarly show a strong concentration in the upper categories, with 85 students (84.1%) in the very high category, 14 students (13.9%) in the high category, and 2 students (2%) in the low category. Creativity demonstrates a wider spread, with 68 students (67.3%) classified as very high, 29 students (28.7%) as high, and 4 students (4%) as low. Critical thinking presents the most favorable pattern, with 97 students (96%) in the very high category and 4 students (4%) in the high category. Overall, the distribution reflects strong competency across all four skill areas, although creativity shows greater variability compared to the other components.

Table 5. Distribution of Categories of Work Readiness.

Category	Interval	Frequency	percentage
Very High	45 60	87	86.1%
High	38 44	14	13.9%
Low	30 37	0	0
Very Low	15 29	0	0
Total		101	100%

The distribution of work readiness revealed that 87 students (86.1%) were in the very high category, while 14 students (13.9%) were in the high category. There are no students who are classified as

low or very low. These findings suggest that the majority of students show a strong degree of readiness to enter the workforce in the beauty industry. Despite the high concentration in the upper categories, student attendance in the higher categories indicates that there is still potential for further improvement to ensure consistently optimal readiness across all learners.

3.1.2 Assumption Testing

The normality test was conducted to ensure that the distribution of the research data met the assumptions required for parametric analysis. This step was performed before running the regression procedures to confirm that the residuals followed a normal distribution.

Table 6. Normality Test (Kolmogorov–Smirnov).

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		101
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2.38249469
Most Extreme Differences	Absolute	.052
	Positive	.042
	Negative	-.052
Test Statistic		.052
Asymp. Sig. (2-tailed)		.200c,d
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		
d. This is a lower bound of the true significance.		

The normality of the residuals was examined using the Kolmogorov–Smirnov test. The analysis produced an Asymp. Sig. value of 0.200, which is greater than the threshold of 0.05. This result indicates that the residuals follow a normal distribution. Due to meeting the normality assumption, the regression analyses could be appropriately continued.

3.1.3 Regression Results

Table 7. Simple regression test results

Independent Variable	R	R^2	Adjusted R^2	Std. Error	Regression Equation
Collaboration (X_1)	0.511	0.261	0.253	3.474	$Y = 25.955 + 0.441X_1$
Communication (X_2)	0.717	0.514	0.509	2.817	$Y = 21.917 + 0.535X_2$
Creativity (X_3)	0.314	0.099	0.089	3.837	$Y = 37.432 + 0.235X_3$
Critical Thinking (X_4)	0.633	0.401	0.395	3.127	$Y = 17.216 + 0.600X_4$

Table 8. Regression Coefficients for Individual Variables

Variable	Unstandardized B	Std. Error	Standardized Beta	t value	Sig.	Decision
Collaboration	0.441	0.075	0.511	5.912	0.000	H_1 Accepted
Communication	0.535	0.052	0.717	10.238	0.000	H_1 Accepted
Creativity	0.235	0.071	0.314	3.290	0.001	H_1 Accepted
Critical Thinking	0.600	0.074	0.633	8.145	0.000	H_1 Accepted

The analysis demonstrated that collaboration has a positive and significant influence on students' work readiness. The regression coefficient (B = 0.441) and the contribution value ($R^2 = 0.261$) indicate

that stronger collaborative abilities are associated with higher levels of preparedness for professional responsibilities in the beauty industry. Students who are able to work effectively in teams, coordinate service tasks, and engage in constructive interpersonal interactions tend to show better readiness for workplace demands.

Communication emerged as the strongest predictor of work readiness. The contribution of this variable ($R^2 = 0.514$) reflects its dominant role in vocational beauty education, where learners must communicate clearly with clients, explain procedures, and interact professionally during service delivery. The regression coefficient (B = 0.535) confirms that improvements in communication skills substantially enhance students' readiness to perform in real work environments.

Creativity was also found to have a positive, though relatively modest, effect on work readiness. With a contribution of 9.9% ($R^2 = 0.099$), creativity plays a supportive role in helping students adapt to varied service situations and develop innovative approaches to beauty practices. The regression coefficient (B = 0.235) shows that higher creativity levels still contribute to improved readiness, although the effect is weaker compared to collaboration, communication, and critical thinking.

Critical thinking demonstrated a strong influence on work readiness, contributing 40.1% ($R^2 = 0.401$). This finding highlights the importance of analytical skills, decision-making ability, and problem-solving competence in vocational beauty contexts. The regression coefficient (B = 0.600) suggests that students with higher critical thinking skills are significantly more prepared to handle professional challenges, making this variable the second most influential factor after communication.

When considered collectively, the four components of 4C skills collaboration, communication, creativity, and critical thinking showed a positive and significant effect on work readiness. This indicates that the integration of cognitive, interpersonal, and creative competencies plays a crucial role in shaping students' preparedness to transition into the beauty industry workforce.

Table 9. Multiple Regression Results

Model Summary	Value
R	0.805
R Square	0.648
Adjusted R Square	0.634
Std. Error of the Estimate	2.434

Table 10. ANOVA test results (F test)

Sources Variation	Sum of Squares	df	Mean Square	F	Sig.
Regression	1048.684	4	262.171	44.267	0.000
Residual	568.564	96	5.923		
Total	1617.248	100			

Table 11. Multiple Regression Coefficients

Variable	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
Constanta	2.277	3.955		0.576	0.566		
Collaboration	0.206	0.061	0.238	3.381	0.001	0.738	1.355
Communication	0.311	0.061	0.417	5.131	0.000	0.554	1.806
Creativity	0.173	0.047	0.232	3.703	0.000	0.934	1.070
Critical Thinking	0.232	0.076	0.244	3.044	0.003	0.568	1.759
Multiple Regression Equation: $Y = 2.277 + 0.206X_1 + 0.311X_2 + 0.173X_3 + 0.232X_4$							

The results of regression analysis showed that the research model has a strong predictive ability. The value of coefficient of determination (R2) of 0.648 indicates that collaboration, communication, creativity, and critical thinking skills simultaneously contribute 64.8% to student work readiness, while the remaining 35.2% are influenced by other variables outside the research model. Simultaneous test through the calculated F value of 44.267 with a significance value of 0.000 < 0.05 confirms that the regression model used is significant and feasible to test the relationship between variables. Partially, all 4C skills were shown to have a positive and significant effect on job readiness ($p < 0.05$). Based on the value of the Beta coefficient, communication skills have the greatest influence on job readiness (0.417), followed by Critical Thinking (0.244), collaboration (0.238), and creativity (0.232). This, H_0 Rejected and H_1 is accepted, therefore, it can be concluded that 4C skills simultaneously and partially have a positive and significant effect on student work readiness.

Table 12. Summary of hypothesis test results

Hypothesis	Variable	R^2	Beta	t count	Sig.	Results
H_1	Collaboration → Work Readiness	0.261	0.511	5.912	0.000	Accepted
H_2	Communication → Work Readiness	0.514	0.717	10.238	0.000	Accepted
H_3	Creativity → Work Readiness	0.099	0.314	3.290	0.001	Accepted
H_4	Critical Thinking → Work Readiness	0.401	0.633	8.145	0.000	Accepted
H_5	4C Simultan → Work Readiness	0.648		F=44.267	0.000	Accepted

3.2 Discussion

3.2.1 Description of 4C Skills and Job Readiness

Descriptive analysis indicates that, overall, the 4C competencies of beauty vocational students in the Mamminasata region are at a good level. Critical thinking shows the highest mean score (52.11) with the most homogeneous distribution (SD = 4.243), suggesting that students have developed relatively consistent analytical and evaluative abilities. This finding is consistent with [37], who emphasize the central role of critical thinking in addressing contemporary workplace challenges. Similarly, [38] highlights that both critical and creative thinking contribute to improved learning outcomes and the development of adaptive professional behaviours.

Communication skills show an average of 49.73 with a considerable standard deviation (SD = 5.394), suggesting varied communication abilities among students. Such variation requires attention, as [39] notes that supportive and participatory learning environments are essential for improving communication confidence and interpersonal interaction in vocational settings.

Collaboration (M = 51.07) and creativity (M = 47.15) also show adequate development, although improvement is still needed. These findings align with [40], who report that problem based learning significantly strengthens collaboration, and [41], who emphasize the importance of creativity for competitiveness in modern industries.

Work readiness demonstrates an average score of 48.50 with a relatively small standard deviation (SD = 4.021), indicating that most students exhibit adequate readiness with consistent distribution. This aligns with [42], who highlight that mastery of 21st century competencies is central to shaping vocational graduates' preparedness for employment.

3.2.2 Influence of Individual 4C Skills on Job Readiness

1. **Collaboration Skills**
   Collaboration significantly influences work readiness (R^2 = 0.261; p = 0.000). Each one unit increase in collaboration raises work readiness by 0.441 units. This demonstrates that students who work well in teams, communicate effectively within groups, and share responsibilities tend to be better prepared for professional environments. These findings are in line with [43, 44], who emphasize the role of collaborative learning in shaping workplace relevant competencies.
2. **Communication Skills**
   Communication shows the strongest individual effect on work readiness (R^2 = 0.514; β= 0.717; B = 0.535; p = 0.000). Stronger communication competence enhances students' ability to convey information, clarify ideas, and interact professionally key components in beauty services. This supports findings by [41, 45], who highlight that communication is a core determinant of workplace success.
3. **Creativity Skills**
   Creativity has a significant but smaller effect on work readiness (R^2 = 0.099; B = 0.235; p = 0.001). Creativity remains crucial in the beauty industry, where trends evolve rapidly and innovation is essential. These findings align with [46], who show that creative and digital skills drive entrepreneurial readiness.
4. **Critical Thinking Skills**
   Critical thinking strongly influences work readiness (R^2 = 0.401; B = 0.600; p = 0.000). Students with stronger analytical and problem solving abilities demonstrate higher readiness for professional challenges. Studies by [47, 48, 49] consistently support the impact of critical thinking on academic and workplace performance.

3.2.3 Simultaneous Effect of 4C Skills on Job Readiness

Multiple regression analysis shows that all four competencies collectively influence work readiness (R = 0.648; R^2 = 0.648; F = 44.267; p = 0.000). This means that 64.8% of variance in work readiness is explained by collaboration, communication, creativity, and critical thinking. Communication emerges as the dominant predictor (β = 0.417), followed by critical thinking (β = 0.244), collaboration (β = 0.238), and creativity (β = 0.232). These findings reinforce prior studies [50, 51, 52] that emphasize the importance of integrated workplace competencies.

The combined development of the four 4C skills is essential, as each competency complements the others collaboration for teamwork, communication for clarity, creativity for innovation, and critical thinking for informed decision making. Together, they form a comprehensive competency profile that aligns with the demands of the modern beauty industry.

3.2.4 Implications

The findings of this study indicate that the four core competencies within the 4C framework—collaboration, communication, creativity, and critical thinking—play a significant role in shaping the job readiness of beauty vocational students in the Mamminasata region. The substantial influence of communication and critical thinking highlights the need for vocational institutions to design learning activities that closely replicate real client-service interactions, structured decision-making processes, and analytical problem-solving tasks. Such pedagogical approaches align with the authentic demands of the beauty service industry, where practitioners are required to communicate effectively, respond appropriately to client needs, and make timely, well-reasoned decisions.

Although collaboration and creativity contribute to a lesser extent, both competencies remain essential for supporting teamwork, coordination, innovation, and adaptability—attributes that are increasingly required in beauty-related occupations characterized by dynamic trends and collabora-

tive workflows. Overall, these findings underscore the importance of integrating 4C-based learning strategies more systematically across both classroom and practicum activities. Curriculum developers, teachers, and policymakers can draw on these insights to redesign instructional practices that more effectively align vocational training with industry expectations and the evolving conditions of the beauty sector.

3.2.5 Limitations

Some limitations must be recognized when interpreting the results of this study. First, the study was conducted solely in the beauty vocational school in Mamminasata. Vocational institutions in other regions may differ in terms of learning environments, teacher competencies, facilities, and industry partnerships, thus limiting generalization of findings outside of this specific geographic context.

Second, the study relied on questionnaire based instruments that captured students' reported behaviors and responses in client service situations. Although the instruments include indicators related to communication with clients, handling complaints, and demonstrating a professional attitude, these responses may not fully reflect the student's actual performance in the actual workplace environment. Professional settings typically involve higher pressures, more complex customer expectations, and operational demands that may differ from those encountered in school based practice.

Third, the analytical model examined only four competencies within the 4C framework. Other variables such as internship quality, teaching effectiveness, digital competence, previous work experience, or student motivation were not included in the analysis but may contribute to students' overall job readiness. These limitations provide important context for interpreting research results and for guiding the direction of future research.

3.2.6 Recommendations for Future Work

Future research may expand the participant base by involving vocational students from additional regions or different vocational fields, thereby improving generalization of findings. Researchers may also consider including additional predictors such as practical performance appraisals, the quality of internship experience, digital competencies, or broader soft skill dimensions to provide a more comprehensive account of the factors that influence job readiness.

Methodologically, future studies may benefit from adopting a blended method approach that combines quantitative analysis with qualitative insights from students, instructors, and industry practitioners. Longitudinal design can also offer valuable perspectives by tracking the development of 4C competencies over time and examining how these competencies affect students' transition from vocational education to the workforce.

Further research could explore the impact of stronger collaboration between vocational schools and industry partners. Improved school industry integration can also contribute to a more authentic learning experience and a better alignment between vocational training and the real demands of the beauty sector, ultimately strengthening students' readiness for employment.

4. Conclusion

The findings of this study demonstrate that students in the beauty care program at State Vocational Schools in the Mamminasata region possess generally strong 4C competencies and a favorable level of work readiness. Critical thinking emerged as the highest skill with an average score of (52.11), followed by collaboration (51.07), communication (49.73), and creativity (47.15). Work readiness also showed a positive outcome, with a mean score of 48.50, indicating that students have developed capabilities that align with the expectations of the beauty industry.

Regression analysis confirmed that each component of the 4C framework significantly contributes to work readiness. Collaboration accounted for 26.1%, communication provided the largest partial contribution at 51.4%, creativity contributed 9.9%, and critical thinking contributed 40.1%. When analyzed simultaneously, the four competencies produced an R^2 of 0.648, meaning that 64.8% of work readiness is explained by students' mastery of 4C skills, while 35.2% is shaped by factors beyond the model. In terms of predictive strength, communication exerted the greatest effect ($\beta = 0.417$), followed by critical thinking ($\beta = 0.244$), collaboration ($\beta = 0.238$), and creativity ($\beta = 0.232$). These findings highlight the particular relevance of communication and critical thinking for meeting professional standards in the beauty sector.

Overall, this study underscores the importance of integrating instructional practices that promote collaboration, communication, creativity, and critical thinking within vocational learning environments. Strengthening these competencies will contribute to the preparation of graduates who are not only technically skilled but also adaptive, confident, and ready to thrive in a dynamic industry landscape.

This study acknowledges several limitations. Although the questionnaire incorporated indicators reflecting students' actual performance during practical sessions—where they interacted directly with real clients in the school laboratory—the assessments were still conducted within a controlled educational environment. As a result, the findings may not fully capture the range and complexity of performance required in professional beauty industry settings. In addition, the study was limited to beauty care students in the Mamminasata region, which may affect the generalizability of the results. The analysis also focused exclusively on four components of the 4C competencies, while other potential determinants of work readiness—such as internship quality, learning climate, personal motivation, and external support—were not examined. Future research could incorporate additional variables, extend the scope to other vocational fields, or employ longitudinal and mixed-method designs to provide a more comprehensive understanding of work readiness within vocational education..

References

[1] I. Nurwulandari, S. Sajidan, D. Rochsantiningsih, and S. Sukarmin. "Optimisation of Critical Thinking, Creative Thinking, Collaboration, and Communication (4C) in the Micro Teaching Programme in the Department of Elementary School Teacher Education". In: *Ianna Journal of Interdisciplinary Studies* 6.2 (2024). DOI: 10.5281/zenodo.12740354.

[2] H. Herlinawati, M. Marwa, N. Ismail, Junaidi, L. O. Liza, and D. D. B. Situmorang. "The integration of 21st century skills in the curriculum of education". In: *Heliyon* 10 (2024). DOI: 10.1016/j.heliyon.2024.e35148.

[3] E. Haryani, W. W. Cobern, B. A.-S. Pleasants, and M. K. Fetters. "Analysis of Teachers' Resources for Integrating the Skills of Creativity and Innovation, Critical Thinking and Problem Solving, Collaboration, and Communication in Science Classroom". In: *Jurnal Pendidikan IPA Indonesia* 10.1 (2021), pp. 92–102. DOI: 10.15294/jpii.v10i1.27084.

[4] A. Ghafar. "Convergence between 21st Century Skills and Entrepreneurship Education in Higher Education Institutes". In: *International Journal of Higher Education* 9.1 (2020), pp. 218–229. DOI: 10.5430/ijhe.v9n1p218.

[5] T. T. Kiong et al. "Enhancing cosmetology students' communication skills in Malaysian upper secondary vocational education program". In: *International Journal of Evaluation and Research in Education* 11.1 (2022), pp. 260–271. DOI: 10.11591/ijere.v11i1.22285.

[6] S. Wu, J. Duan, and M. Luo. "Evaluating and analyzing student labor literacy in China's higher vocational education: an assessment model approach". In: *Frontiers in Education* (2024). DOI: 10.3389/feduc.2024.1361224.

[7] Harjono, D. G. Ramadhani, S. Haryani, I. Wicaksono, and I. Hestinasari. "Self-assessment instrument for measuring employability skills in chemistry vocational school students: A case study on Volta cell material topics". In: *Science Talks* 16 (2025), p. 100493. DOI: 10.1016/j.sctalk.2025.100493.

[8] S. Soenarto, Sugito, Suyanta, Siswantoyo, and Marwanti. "Vocational and Senior High School Professional Teachers in Industry 4.0". In: *Cakrawala Pendidikan* 39.3 (2020), pp. 655–665. DOI: 10.21831/cp.v39i3.32926.

[9] B. Thornhill-miller et al. "Creativity, Critical Thinking, Communication, and Collaboration: Assessment, Certification, and Promotion of 21st Century Skills for the Future of Work and Education". In: *Journal of Intelligence* (2023). DOI: 10.3390/jintelligence11030054.

[10] X. Li, C. Chen, and X. Kang. "Research on the cultivation of sustainable development ability of higher vocational students by creative thinking teaching method". In: *Frontiers in Education* (2022). DOI: 10.3389/fpsyg.2022.979913.

[11] L. Sánchez-Bolívar, A. Martínez-Martínez, F. Zurita-Ortega, and S. Escalante-González. "Programa de mejora competencial y psicosocioemocional del alumnado de formación profesional básica". In: *Educar* 59 (2023), pp. 489–504. DOI: 10.5565/rev/educar.1726.

[12] E. Van Laar, A. J. A. M. Van Deursen, J. A. G. M. Van Dijk, and J. De Haan. "Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers: A Systematic Literature Review". In: *SAGE Open* (2020). DOI: 10.1177/2158244019900176.

[13] W. D. Mulyono, A. W. Suparji, and G. A. Y. P. Adistana. "The influence of communication and teamwork skills on the work readiness of vocational high school students". In: *World Transactions on Engineering and Technology Education* 21.3 (2023).

[14] F. Panjaitan, R. Sinta, and J. Batubara. "Enhancing Vocational Education Through Collaborative Learning: A Pathway to Innovation and Industry Readiness". In: *Jurnal Pendidikan dan Konseling* 2.2 (2024), pp. 58–65.

[15] A. Q. Q. Harista, K. Rukun, and M. Giatman. "Efektivitas Pengembangan Modul Pembelajaran Berbasis E-Learning Pada Mata Kuliah". In: *Jurnal Ilmiah Pendidikan dan Pembelajaran* 4 (2020), pp. 151–162.

[16] E. W. Nasution and T. Ningsih. "Optimalisasi Manajemen Rantai Pasok dalam Agribisnis: Studi Kasus Produksi Kelapa Sawit di Negara Berkembang". In: *Tabela* 3.1 (2025). DOI: 10.56211/tabela.v3i1.753.

[17] T. Z. Ningsih et al. "Enhancing communication and collaboration skills through discovery, cooperative and problem-based learning models in Social Studies education". In: *Cogent Education* 12.1 (2025). DOI: 10.1080/2331186X.2025.2500110.

[18] J. Amani and S. T. Mkimbili. "Developing critical thinking skills among secondary schools students: The role of research project". In: *Thinking Skills and Creativity* 58 (2025), p. 101883. DOI: 10.1016/j.tsc.2025.101883.

[19] S. Dornemann and R. Grau. "Teamwork in higher education doesn't just happen: How an innovative online tool fosters students' collaboration and communication". In: *Proceedings of the 11th International Conference on Higher Education Advances*. 2025, pp. 1032–1039. DOI: 10.4995/HEAd25.2025.20061.

[20] C. Rodríguez-sabiote, E. M. Olmedo-moreno, and J. Expósito-López. "The effects of teamwork on critical thinking: A serial mediation analysis of the influence of work skills and educational motivation in secondary school students". In: *Thinking Skills and Creativity* 45 (2022), p. 101063. DOI: 10.1016/j.tsc.2022.101063.

[21] X. Song, A. Bakar, T. Sulaiman, and J. Joseph. "Effectiveness of online project-based learning on Chinese EFL learners' critical thinking skills and reading comprehension ability". In: *Thinking Skills and Creativity* 56 (2025), p. 101778. DOI: 10.1016/j.tsc.2025.101778.

[22] L. Kim, N. Imjai, A. Kaewjomnong, and K. Dowpiset. "Does experiential learning matter to strategic intuition skills of MBA students? Implications of diagnostic capabilities and critical

thinking skills". In: *The International Journal of Management Education* 23.2 (2025), p. 101138. DOI: 10.1016/j.ijme.2025.101138.

[23] E. Wittenberg et al. "Competency-based education for teaching the concept of communication". In: *Journal of Professional Nursing* 61 (2025), pp. 54–61. DOI: 10.1016/j.profnurs.2025.08.014.

[24] K. Raghunathan, L. Mckenna, and M. Peddle. "Baseline evaluation of nursing students' informatics competency for digital health practice: A descriptive exploratory study". In: *Digital Health* (2023). DOI: 10.1177/20552076231179051.

[25] S. A. Bosch and D. M. Rice. "An Evaluation of the Nunez Community College Quality Enhancement Program: Assessing the Impact of Embedded Conover Workplace Readiness Modules on Students' Work Readiness". In: *SAGE Open* (2024). DOI: 10.1177/21582440241251767.

[26] O. Hargie. *Skilled Interpersonal Communication Research, Theory and Practice*. Vol. 11. 1. 2022. DOI: 10.4324/9781003182269.

[27] W. Hsu and P. Chen. "The Influences of Service Quality and Individual Characteristics on Vocational Training Effectiveness". In: *Sustainability* 13.23 (2021). DOI: 10.3390/su132313207.

[28] N. Kholifah et al. "Unlocking workforce readiness through digital employability skills in vocational education Graduates: A PLS-SEM analysis based on human capital Theory". In: *Social Sciences and Humanities Open* 11.1 (2025), p. 101625. DOI: 10.1016/j.ssaho.2025.101625.

[29] Y. Shi, T. Yuan, R. Bell, and J. Wang. "Investigating the Relationship Between Creativity and Entrepreneurial Intention: The Moderating Role of Creativity in the Theory of Planned Behavior". In: *Frontiers in Psychology* 11 (2020), p. 1209. DOI: 10.3389/fpsyg.2020.01209.

[30] U. Azmi, Safrijal, and M. Rahmi. "Analysis of 4C Skills (Critical Thinking, Creativity and Innovation, Collaboration, and Communication) of Physics Education Students In Facing the Industrial Revolution 4.0". In: *Jurnal Penelitian Pendidikan IPA* 10.2 (2024), pp. 696–703. DOI: 10.29303/jppipa.v10i2.5584.

[31] P. A. Rukmi, M. S. Hayat, and M. Novita. "4Cs Skills in Ecology and Biodiversity Learning: A Study of Junior High School Students' Profiles in the Digital Era". In: *Unnes Science Education Journal* 14.1 (2025), pp. 99–109. DOI: 10.15294/usej.v13i1.19574.

[32] G. W. Collins and T. Spoelstra. "Integrating Language and Communication Skills into Engineering Education: A Conceptual Reference Model for Effective Collaboration and Learning". In: *Journal of Engineering Education Transformations* 39.2 (2025). DOI: 10.16920/jeet/2025/v39i2/25144.

[33] X. Peng, X. Sun, and Z. He. "Influence Mechanism of Teacher Support and Parent Support on the Academic Achievement of Secondary Vocational Students". In: *Frontiers in Psychology* 13 (2022), p. 863740. DOI: 10.3389/fpsyg.2022.863740.

[34] M. Poláková, J. Horváthová Suleimanová, P. Madzík, L. Copuš, I. Molnárová, and J. Polednová. "Soft skills and their importance in the labour market under the conditions of Industry 5.0". In: *Heliyon* 9.8 (2023). DOI: 10.1016/j.heliyon.2023.e18670.

[35] Sugiyono. *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. 2023.

[36] J. W. Creswell and J. D. Creswell. *Research Design Qualitative and Mixed Methods Approaches*. 2018. DOI: 10.4324/9781003381006-9.

[37] H. Azzahrah, U. Suherman, and M. F. Syahril. "Profil Keterampilan 4C Guru Bimbingan dan Konseling SMP di Kota Makassar: Implikasinya dalam Manajemen Bimbingan dan Konseling di Abad 21". In: *Guidance Journal of Ilmu Pendidikan, Psikologi, Bimbingan dan Konseling* 14.3 (2024), p. 690. DOI: 10.24127/gdn.v14i3.10119.

[38] E. W. Safitri, N. Hendracipta, and A. Syachruroji. "Keterampilan 4C Dalam Implementasi Model Project Based Learning". In: *Jurnal Pendidikan Amarta* 4 (2025), pp. 25–32.

[39] N. P. I. Permatasari. "Empowering the 4Cs-based English Speaking with Multi-voiced Classroom for IUP Students". In: *Journal Corner of Education, Linguistics and Literature* 5.1 (2025), pp. 65–81. DOI: 10.54012/jcell.v5i1.529.

[40] Sisrayanti, H. Maksum, Waskito, and E. Sabrina. "The Effect of the Problem-Based Learning Model on 21st Century Student Skills: A Meta-Analysis". In: *Indonesian Journal of Computer Science* 13.2 (2024), pp. 3706–3713. DOI: 10.33022/ijcs.v13i2.3849.

[41] N. Jalinus, S. Sukardi, R. E. Wulansari, Y. M. Heong, and T. T. Kiong. "Teaching activities for supporting students' 4cs skills development in vocational education". In: *Journal of Engineering Research and Lecturer* 2.2 (2023), pp. 70–79. DOI: 10.58712/jerel.v2i2.95.

[42] I. H. Asri, I. W. Lasmawan, and I. G. P. Suharta. "Kompetensi Abad 21 Sebagai Bekal Menghadapi Tantangan Masa Depan". In: *Kappa Journal* (2023).

[43] H. Kurniawan, R. Fitriany, R. F. Farid, and M. Mellisa. "Kepercayaan Diri dengan Kesiapan Kerja pada Siswa SMK X Berdomisili di Kota Padang". In: *Psyche 165 Journal* 16.3 (2023), pp. 125–130. DOI: 10.35134/jpsy165.v16i3.245.

[44] S. Ilma, M. H. I. Al-Muhdhar, F. Rohman, and M. Saptasari. "Promote collaboration skills during the COVID-19 pandemic through Predict-Observe-Explain-based Project (POEP) learning". In: *JPBI (Jurnal Pendidikan Biologi Indonesia)* 8.1 (2022), pp. 32–39. DOI: 10.22219/jpbi.v8i1.17622.

[45] F. P. Wijayanti, T. Rijanto, and L. Hidayati. "Pengaruh Praktik Kerja Industri dan Motivasi Kerja terhadap Hasil Belajar Siswa SMK Tata Kecantikan". In: *JIIP - Jurnal Ilmiah Ilmu Pendidikan* 8.8 (2025), pp. 10044–10051. DOI: 10.54371/jiip.v8i8.9154.

[46] B. Harsono and E. Karlina. "Pengaruh Kreativitas dan Pengetahuan Digital Ekonomi terhadap Minat Berwirausaha Mahasiswa Fakultas Ekonomi dan Bisnis Universitas Prof. Dr. Moestopo (Beragama)". In: *Jurnal Ekonomi dan Bisnis* 9.4 (2023), pp. 408–419.

[47] A. Wunasari, L. O. Kaharudin, and Nurmayanti. "Pengaruh Pembelajaran Berbasis Projek terhadap Kemampuan Bernalar Kritis". In: *Jurnal Basicedu* 7.5 (2023). DOI: 10.31004/basicedu.v7i5.5368.

[48] Arwaty, K. Mustamin, and A. Rahmah. "Effectiveness of Online Blended Learning and Critical Thinking Skills of Biology Students in Indonesia: Meta-Analysis Study". In: *Jurnal Penelitian Pendidikan IPA* 9.12 (2023), pp. 1284–1291. DOI: 10.29303/jppipa.v9i12.5761.

[49] V. Batdı, Ş. Elaldı, C. Özçelik, N. Semerci, and Ö. M. Özkaya. "Evaluation of the effectiveness of critical thinking training on critical thinking skills and academic achievement by using mixed-meta method". In: *Review of Education* 12.3 (2024), pp. 1–32. DOI: 10.1002/rev3.70001.

[50] N. H. Sholihah and A. Listiadi. "Pengaruh Kompetensi Kejuruan Akuntansi Dan Kematangan Vokasional Terhadap Kesiapan Kerja Melalui Intervening Self-Efficacy". In: *Jurnal Pendidikan Akuntansi Indonesia* 19 (2021), pp. 1–19.

[51] L. Lasut, E. P. Harjanti, and M. P. Novita. "Pelatihan Kesiapan Kerja untuk Meningkatkan Career Adaptability pada Siswa SMK di Kabupaten Temanggung". In: *Wacana Psikokultural* 2.1 (2024), pp. 32–39. DOI: 10.24246/jwp.v2i1.12086.

[52] Yohanes Martono Widagdo. "Program Pembelajaran Praktisi Dunia Kerja Industri Perhotelan Terhadap Kesiapan Kerja Siswa Program Keahlian Akuntansi di SMK Negeri 1 Wonogiri Kabupaten Wonogiri". In: *Abdimas Awang Long* 7.2 (2024), pp. 63–69. DOI: 10.56301/awal.v7i2.1229.