



Developing a Career Guidance Model Project-Based Learning Assisted by Peer Assessment to Enhance Gen Z's Career Maturity

Florencia Valentine Tandirerung¹, Rita Eka Izzaty², Dina Gasong³, Nur Sholihin²

¹Faculty of Education, Yogyakarta State University, Indonesia

²Yogyakarta State University, Indonesia

³Christian University of Indonesia

E-mail: florenciavalentine.2022@student.uny.ac.id



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Abstract

This study aimed to develop a project-based learning and peer assessment career guidance model that is feasible, practical, and effective in enhancing the career maturity of Generation Z students. The study employed a Research and Development (R&D) approach using the ADDIE model. It was conducted at SMK Kristen Pelangi Makale, Tana Toraja, involving Grade 11 Heavy Equipment Engineering students. Participants included 2 students in the individual trial, 10 in the small-group trial, and 135 in the field trial (80 experimental and 55 control). Feasibility and practicality were evaluated using expert and student questionnaires, while effectiveness was measured using a validated career maturity instrument (validity = 92.09%; Cronbach's Alpha = 0.910). Data were analyzed using descriptive statistics, N-Gain, paired samples t-test, and Wilcoxon Signed-Rank Test. The model was rated highly feasible by model experts (87.69%) and subject-matter experts (91.67%). Practicality was also high across the individual (87.78%), small-group (86.67%), and field trials (87.19%). Effectiveness testing showed a moderate N-Gain (0.60), significant improvement in the small-group trial ($p = 0.002$), and significant improvement in the experimental group ($p < 0.001$), whereas the control group showed no significant change ($p = 0.065$). The developed model provides an active, contextual, and effective career guidance approach that enhances the career maturity of Generation Z students.

Introduction

Generation Z is becoming the dominant workforce worldwide and represents the largest demographic group in Indonesia (Putra & Dewi, 2025; Sulistyorini et al., 2024). Consequently, preparing Generation Z for future careers has become a national priority. One of the most important aspects of career preparation is career maturity, which refers to an individual's ability to understand themselves, plan their future, explore career opportunities, and make realistic career decisions.

Despite its importance, the career maturity of Indonesian Generation Z remains relatively low (Fahadayna et al., 2025; Kurniawan & Sya'roni, 2025; Sadalia et al., 2026; Basid & Nisya, 2024). National employment statistics, together with the increasing prevalence of job hopping, early resignation, and career switching, indicate that many young people still experience uncertainty in making career decisions and lack clear career goals (Tetteh et al., 2021; Saraiva & Nogueiro, 2025; Dancy, 2023; Guo, 2025).

Career guidance and counseling services in schools therefore play a strategic role in helping students develop career maturity (Ismail et al., 2018; Darwin et al., 2025; Nadila & Mukhlis, 2025). These services assist students in understanding their potential, recognizing career

opportunities, and preparing for future educational or occupational pathways, particularly during the senior secondary education stage when career decisions become increasingly specific.

Interviews with guidance and counseling teachers from several senior high schools and vocational schools revealed that current career guidance is still dominated by information delivery, such as introducing occupations and educational pathways. Although useful, this approach pays limited attention to broader aspects of career maturity, including career planning, decision making, and realistic career attitudes (Ghazali et al., 2024; Okolie et al., 2020; Lent & Brown, 2020). Teachers also reported that administrative responsibilities restrict the implementation of more comprehensive career guidance services.

Previous studies support these findings by showing that school career guidance mainly improves students' knowledge of careers, interests, and talents but has not substantially enhanced overall career maturity (Rada et al., 2026; Falco & Steen, 2018; Wang & Wang, 2025). Many students continue to experience uncertainty in career planning, struggle to align their interests and abilities with career opportunities, and lack confidence in making career decisions.

These conditions indicate the need for a career guidance model that extends beyond information provision (Bakke et al., 2018; Hooley & Rice, 2019). Career guidance should integrate self-understanding, career exploration, decision making, and reflection while accommodating the learning characteristics of Generation Z, including experiential learning and active participation (Puspitasari et al., 2025; Maree, 2025; Bhardwaj et al., 2025).

Several instructional approaches have been applied in career guidance, including experiential learning, inquiry-based learning, discovery learning, and problem-based learning (Rafiq et al., 2023; Ismanto & Budiman, 2026; Vorsah & Oginni, 2025; Fauzi & Respati, 2021). Although each offers certain advantages, they also present limitations related to measurable outcomes, learner independence, implementation complexity, or excessive cognitive demands.

Among these approaches, project-based learning offers the most comprehensive potential because it integrates authentic experiences, structured activities, problem solving, and decision making while producing tangible learning outcomes. Previous studies have shown that project-based learning effectively develops competencies closely related to career maturity, making it an appropriate foundation for career guidance.

Nevertheless, project-based learning can be further strengthened through peer assessment (Wang et al., 2023; Zhang & Hwang, 2023). Unlike teacher assessment or self-assessment, peer assessment encourages discussion, collaboration, feedback exchange, and critical reflection. These processes enhance self-awareness, reflective thinking, and self-regulation, which are important components supporting career maturity.

Previous research has demonstrated the effectiveness of project-based learning combined with peer assessment in improving problem-solving, collaboration, critical thinking, motivation, confidence, and learning outcomes across academic disciplines. However, its application has remained largely limited to classroom subjects, leaving its potential in non-academic contexts, particularly career guidance, insufficiently explored.

Developing a project-based learning and peer assessment career guidance model therefore requires systematic validation to ensure its quality (Sukacké et al., 2022; Rahayu et al., 2020; Rocha et al., 2025). According to educational product development principles, the model should demonstrate feasibility, practicality, and effectiveness before it can be recommended

for implementation. The proposed model was designed through a sequence of interconnected project activities targeting all dimensions of career maturity.

Based on the need for a more transformative career guidance approach, this study develops and evaluates a project-based learning career guidance model supported by peer assessment for Generation Z students. Unlike previous studies, the model is specifically designed for senior high school and vocational school students, addresses career maturity comprehensively, and provides structured learning activities aligned with the characteristics and developmental needs of Generation Z.

Methods

Development Model

This study employed the Research and Development (R&D) method to develop and evaluate a career guidance model based on project-based learning supported by peer assessment. Research and Development is a research method designed to produce an educational product and examine its effectiveness before implementation (Sugiyono, 2013). In this study, the developed product was a career guidance model intended to enhance the career maturity of Generation Z students through structured project-based learning activities integrated with peer assessment. The development process adopted the ADDIE instructional design framework, which consists of five sequential phases: Analyze, Design, Develop, Implement, and Evaluate (Branch, 2009). In educational research, the ADDIE framework provides a systematic approach to designing learning experiences that are structured, purposeful, and effective. Each phase contributes to ensuring that the developed model is grounded in learners' needs, supported by valid learning materials, implemented appropriately, and continuously refined through evaluation. Consequently, the resulting career guidance model is expected to be more relevant, practical, and capable of producing meaningful educational outcomes.

During the Analyze phase, the study focused on identifying the causes of performance gaps and determining the learning objectives and students' needs related to career maturity. The Design phase involved specifying the competencies to be achieved and establishing appropriate evaluation strategies for the developed model. Subsequently, the Develop phase was dedicated to producing and validating all learning materials, guidance activities, and supporting media required for implementation. In the Implement phase, the learning environment was prepared, and students participated in the application of the developed career guidance model. Finally, the Evaluate phase examined both the quality of the product and the implementation process through continuous evaluation conducted before, during, and after the intervention. The ADDIE framework was selected because it provides flexibility throughout the development process while emphasizing continuous evaluation and iterative improvement. This characteristic enabled the researchers to revise and refine the career guidance model based on evaluation results and stakeholder feedback at each stage of development, thereby ensuring that the final model effectively addressed students' career guidance needs and aligned with the objectives of the study.

Development Procedures

The development procedure adopted from the ADDIE model generally has five main stages starting from analysis, design, development, implementation and the final stage of evaluation.

Product Trial Design

The product trial was designed to collect empirical data as the basis for evaluating the feasibility, practicality, and effectiveness of the developed project-based learning career

guidance model supported by peer assessment. The evaluation process was conducted progressively to ensure that the model met the required quality standards before being implemented on a larger scale. Following the ADDIE development framework (Branch, 2009), the product underwent three stages of testing, namely individual trials, small-group trials, and field trials, allowing the researchers to refine the model through continuous feedback and evaluation.

The individual trial served as the initial evaluation stage and was conducted with two Grade 11 students from the Heavy Equipment Engineering program at SMK Kristen Pelangi Tana Toraja. This stage aimed to examine the clarity of the instructions, the sequence of learning activities, and students' initial responses to both the project-based learning activities and the peer assessment procedures. The trial was implemented over three meetings using the developed career guidance model. Upon completion of all activities, the participants completed a practicality questionnaire evaluating the ease of use, clarity of the procedures, and overall implementation of the model. The findings from this stage enabled the researchers to identify technical issues, students' level of understanding, and the suitability of the project workflow for fostering career maturity, providing a basis for revising the product before broader implementation.

Following the revisions made after the individual trial, a small-group trial was conducted with ten Grade 11 students. Similar to the previous stage, the trial was implemented over three meetings using the developed project-based learning career guidance model supported by peer assessment. This phase aimed to evaluate the practicality of the model in a group learning environment while identifying potential challenges that might arise during its implementation. After completing the learning activities, the participants completed a practicality questionnaire assessing the ease of implementation, the clarity of the learning procedures, and the overall applicability of the model. Feedback collected during this stage was used to further refine the product prior to large-scale implementation.

The field trial was conducted after the product had been revised based on the results of the individual and small-group trials. This stage involved 135 Grade 11 students from SMK Kristen Pelangi Tana Toraja and employed a quasi-experimental pre-test–post-test control group design. The participants were divided into an experimental group consisting of 80 students from three classes and a control group consisting of 55 students from two classes. Both groups completed a career maturity pre-test before receiving the intervention. The experimental group participated in three sessions using the developed project-based learning career guidance model integrated with peer assessment, whereas the control group received conventional career guidance through lecture-based instruction, which represented the standard practice implemented at the school. At the end of the intervention, both groups completed a post-test to measure changes in career maturity, while students in the experimental group also completed a practicality questionnaire. Throughout the implementation, the guidance sessions in both groups were delivered by the respective school counselors in each class. The results of the field trial were subsequently used to evaluate the practicality and effectiveness of the developed model in improving students' career maturity.

The participants involved in the product trials were Grade 11 Heavy Equipment Engineering students at SMK Kristen Pelangi Tana Toraja. The individual trial involved two students, while the small-group trial involved ten students. For the field trial, a sample of 135 students was selected from a population of 208 students using the Slovin formula with a 5% margin of error. The selected sample was divided into an experimental group consisting of 80 students and a control group consisting of 55 students. The experimental group comprised students from

Classes XI TAB 4 (22 students), XI TAB 5 (33 students), and XI TAB 6 (25 students), whereas the control group consisted of students from Classes XI TAB 1 (32 students) and XI TAB 7 (23 students). Both groups completed the career maturity scale as pre-test and post-test instruments to assess changes in career maturity following the intervention.

Data Collection Techniques and Research Instruments

Data in this study were collected through observation, interviews, and questionnaires. Observation and interviews were conducted to identify and understand the factors influencing the career maturity of students at SMK Kristen Pelangi Tana Toraja. These preliminary data collection techniques also provided information regarding the implementation of career guidance services and the needs of Generation Z students. Questionnaires were subsequently administered to obtain participants' evaluations of the feasibility, practicality, and effectiveness of the developed project-based learning career guidance model supported by peer assessment. The effectiveness of the model was further assessed by comparing students' career maturity scores before and after the intervention through pre-test and post-test measurements.

The primary research instrument consisted of structured questionnaires developed to evaluate different aspects of the study. Following Sugiyono (2013), the instruments were designed to measure the research variables systematically and were classified into three categories according to the participants' roles: instruments for model experts, subject-matter experts, and student participants. The expert instruments were intended to assess the quality of the developed model, whereas the student instruments were used to measure career maturity and the practicality of the developed guidance model.

The model expert questionnaire was developed to evaluate the feasibility of the project-based learning career guidance model supported by peer assessment. The instrument examined three major dimensions, including the theoretical and empirical foundations of the model, the quality of the model design, and the expected outcomes of its implementation. The assessment focused on the clarity of the development rationale, theoretical foundation, instructional syntax, innovation, supporting materials, and the model's potential to improve career maturity, create engaging guidance activities, strengthen group dynamics, and facilitate meaningful learning experiences.

The subject-matter expert questionnaire was designed to evaluate the quality and appropriateness of the instructional content incorporated into the developed model. The assessment covered four dimensions: relevance, organization, evaluation, and language. These dimensions examined the alignment of the learning materials with the objectives of the model, the completeness and organization of the content, the suitability of the evaluation procedures, and the clarity and accuracy of the language used throughout the instructional materials.

The student questionnaire was developed to measure career maturity based on Super's theory of career maturity. The instrument consisted of indicators representing six dimensions: career planning, career exploration, decision making, world-of-work information, knowledge of the preferred career group, and realism. These dimensions collectively measured students' abilities to establish career goals, explore career opportunities, gather occupational information, evaluate career alternatives, understand their preferred career fields, and make realistic career decisions. Initially, the questionnaire contained 43 items, which were later subjected to validity and reliability testing before being administered during the field trial.

In addition to the career maturity scale, a practicality questionnaire was administered to evaluate students' perceptions of the developed model. Consistent with Cimperman et al. (2016) concept of practicality, the questionnaire measured the extent to which the model was

easy to understand, simple to implement, and beneficial for users. The instrument assessed three dimensions: usability, including the clarity of instructions and learning procedures; feasibility, referring to the smooth implementation of the learning activities in authentic classroom settings; and usefulness, reflecting the model's contribution to students' self-understanding, career development, learning engagement, and the added value of peer assessment. The practicality questionnaire was administered during both the small-group trial and the field trial to obtain students' evaluations of the developed model.

Instrument Validity and Reliability

The validity of the research instruments was established through content validity using expert judgment. Content validity was employed to ensure that each instrument accurately represented the theoretical constructs intended to be measured. Experts from the Department of Guidance and Counseling at Universitas Negeri Yogyakarta evaluated every item according to its relevance to the underlying theoretical framework and provided recommendations regarding its suitability for use, the need for revision, or its appropriateness for research purposes. The level of content validity was calculated using the percentage of the total expert score relative to the maximum possible score. The evaluation produced a feasibility percentage of 92.09%, indicating that the instruments were highly feasible according to Arikunto's (2013) criteria, although several items were revised based on the experts' recommendations before implementation.

Following expert validation, the instrument underwent internal consistency testing using the Pearson Product-Moment correlation to determine the validity of each questionnaire item. The analysis was conducted with IBM SPSS Statistics Version 32 using responses from 55 participants. Item validity was determined by comparing the calculated correlation coefficient with the critical value of 0.266 at the 5% significance level. Of the initial 43 items, 35 items demonstrated correlation coefficients above the required threshold and were therefore retained, while eight items failed to meet the validity criterion and were excluded from subsequent data collection.

The reliability of the final instrument was evaluated using Cronbach's Alpha to examine its internal consistency. Reliability testing was performed on the 35 validated items using IBM SPSS Statistics Version 32. The analysis yielded a Cronbach's Alpha coefficient of 0.910, which falls within the very high reliability category according to Guilford's classification. This result indicates that the instrument possesses excellent internal consistency and is sufficiently reliable to be used as a data collection instrument for measuring students' career maturity throughout the study.

Data Analysis Techniques

Data analysis techniques are aimed at answering the problem formulation and/or testing the formulated hypotheses (Sugiyono, 2019). In this study, the data analysis technique used was quantitative descriptive analysis, which describes the feasibility, practicality, and effectiveness of the project-based learning career guidance model supported by peer assessment. Data analysis was conducted after data was obtained from all research subjects, including model and material experts, as well as research subjects. Data analysis was conducted by converting the scores obtained from the model and material experts and research subjects to determine the model's acceptability and usability, particularly in career guidance services.

Results and Discussion

Develop

After the design stage produces a comprehensive career guidance model design, the development stage is carried out to turn the design into a real, validated and tested product. This stage includes a series of systematic processes, starting from validation by experts to direct trials with students. to ensure that the model developed meets quality standards in terms of theory, material and practicality of use in the field.

Expert Model Validation Results

Expert model validation was carried out by Guidance and Counseling lecturers at Yogyakarta State University (UNY) who have expertise in the field of model development and counseling guidance services. The purpose of this validation is to ensure that the career guidance model developed is in accordance with the theoretical basis used, especially Donald E. Super's career development theory. The following are the model validation results calculated using the validity percentage formula:

$$V_M = \frac{57}{65} \times 100\% = 87,69\%$$

The expert's assessment of the model's feasibility was 87.69%. This result categorized as highly feasible, as the feasibility score was >81%. Based on the validation feedback, the model expert stated that this model could be used with an important caveat: strengthening the nuances of Guidance and Counseling in the project implementation. This feedback emphasized that although project-based learning is a common strategy used in academic learning, its use in career guidance requires a unique guidance and counseling approach, one that focuses on student development, is reflective, and considers the affective and personal dynamics of each individual throughout the project process.

Material Expert Validation Results

Material expert validation was also conducted by a UNY Guidance and Counseling lecturer, focusing on ensuring that the material contained in this career guidance model aligns with the career development needs of Gen Z students, is relevant to their level of understanding, and meets the expected content standards for career guidance services.

The material validation results were calculated using the following validity percentage formula:

$$V_M = \frac{55}{60} \times 100\% = 91,67\%$$

Based on the validity coefficient categorization used, 91.67% falls into the Very Adequate category. These results indicate that the material developed in this career guidance model meets the expected content quality standards, both in terms of the depth and accuracy of career information, its alignment with the six aspects of Super's career maturity, and its relevance to the characteristics and needs of Gen Z students in vocational high schools.

Individual Trial Results

An individual trial was conducted on two purposively selected Grade XI TAB 2 students. The purpose of this trial was to determine whether the developed model met theoretical standards and its ease of use when implemented on a limited scale. This trial generated two types of data: model practicality data and effectiveness data through pretest-posttest measurements of career maturity.

Individual Practicality Test Results

Table 1. Model Practicality Test Results in Individual Trials

No.	Initials	Class	Practicality Score	Maximum Score
1	O	Grade 11 Heavy Equipment Engineering (XI TAB 2)	41	45
2	LB	Grade 11 Heavy Equipment Engineering (XI TAB 2)	38	45
Total			79	90
Percentage			87.78%	
Category			Highly Practical	

The practicality test results showed a percentage of 87.78%, which falls into the Very Practical category. This result indicates that both students considered this career guidance model easy to understand, easy to follow, and did not cause confusion during implementation, both in terms of project instructions, peer assessment mechanisms, and the flow of each guidance session.

Career Maturity Pretest-Posttest Results for Individual Trial

Table 2. Individual Career Maturity Pretest-Posttest Results

No.	Initials	Class	Pre-test	Post-test	Gain Score	N-Gain	Category
1	O	Grade 11 Heavy Equipment Engineering (XI TAB 2)	115	134	19	0.54	Moderate
2	LB	Grade 11 Heavy Equipment Engineering (XI TAB 2)	125	150	25	1.00	High
Mean						0.60	Moderate

The pretest-posttest results showed that both students experienced an increase in their career maturity scores after participating in this career guidance model. The average N-Gain score was 0.60, falling within the 0.3–0.7 range, which is considered moderate.

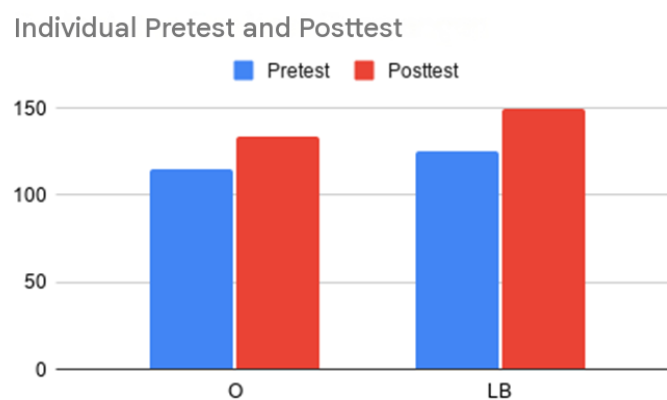


Figure 1. Individual Pretest-Posttest Graph

Nevertheless, LB students achieved an N-Gain score of 1.00, which is considered high, while O students achieved 0.54, which is in the medium category. These results provide a positive initial indication that the developed career guidance model has the potential to be effective in improving students' career maturity and warrant further testing on a larger scale.

Small Group Trial Results

After the individual trials yielded adequate results, development continued with a small group trial involving 10 grade XI TAB 3 students. The purpose of this trial was to determine whether the model could function well and be easy to use when implemented in a group setting that more closely approximates real classroom conditions, including the dynamics of interactions between students in the project-based learning process supported by peer assessment.

Small Group Practicality Test Results

Table 3. Results of the Model Practicality Test in the Small Group Trial

No.	Initials	Class	Practicality Score	Maximum Score
1	GK	Grade 11 Heavy Equipment Engineering (XI TAB 3)	27	45
2	YM	Grade 11 Heavy Equipment Engineering (XI TAB 3)	45	45
3	DT	Grade 11 Heavy Equipment Engineering (XI TAB 3)	45	45
4	JK	Grade 11 Heavy Equipment Engineering (XI TAB 3)	44	45
5	W	Grade 11 Heavy Equipment Engineering (XI TAB 3)	41	45
6	ASKP	Grade 11 Heavy Equipment Engineering (XI TAB 3)	40	45
7	ETA	Grade 11 Heavy Equipment Engineering (XI TAB 3)	36	45
8	P	Grade 11 Heavy Equipment Engineering (XI TAB 3)	44	45
9	M	Grade 11 Heavy Equipment Engineering (XI TAB 3)	30	45
10	RA	Grade 11 Heavy Equipment Engineering (XI TAB 3)	38	45
Total			390	450
Percentage			86.67%	
Category			Highly Practical	

The results of the practicality test in small groups showed an average percentage of 86.67%, which falls into the Very Practical category. Overall, all students rated this model as easy to follow and understand. There was a reasonable variation in scores among students, with the highest score being 45 and the lowest being 27, reflecting differences in individual experiences and perceptions in following the model. This variation served as evaluation material for refining the model's implementation instructions to make them more inclusive and understandable for all students from diverse backgrounds.

Career Maturity Pretest-Posttest Results from Small Group Trial

Table 4. Career Maturity Pretest-Posttest Results from Small Group Trial

No.	Initials	Class	Pre-test	Post-test	Gain Score	N-Gain	Category
1	GK	Grade 11 Heavy Equipment Engineering (XI TAB 3)	99	106	7	0.19	Low
2	YM	Grade 11 Heavy Equipment Engineering (XI TAB 3)	109	116	7	0.26	Low
3	DT	Grade 11 Heavy Equipment Engineering (XI TAB 3)	108	110	2	0.07	Low
4	JK	Grade 11 Heavy Equipment Engineering (XI TAB 3)	113	120	7	0.30	Moderate
5	W	Grade 11 Heavy Equipment Engineering (XI TAB 3)	133	135	2	0.67	Moderate
6	ASKP	Grade 11 Heavy Equipment Engineering (XI TAB 3)	127	128	1	0.11	Low
7	ETA	Grade 11 Heavy Equipment Engineering (XI TAB 3)	119	131	12	0.71	High
8	P	Grade 11 Heavy Equipment Engineering (XI TAB 3)	117	136	19	1.00	High
9	M	Grade 11 Heavy Equipment Engineering (XI TAB 3)	114	129	15	0.68	Moderate
10	RA	Grade 11 Heavy Equipment Engineering (XI TAB 3)	102	110	8	0.24	Low
Mean						0.42	Moderate

In the small-group trial, pretest-posttest results showed that all students experienced an increase in career maturity scores after participating in the career guidance model, with an average N-Gain of 0.42, within the range of 0.3–0.7, and categorized as moderate. There was considerable variation in N-Gain among students, ranging from 0.07 to 1.00, indicating that student responses to this model varied according to their initial conditions and level of individual involvement in the learning process.

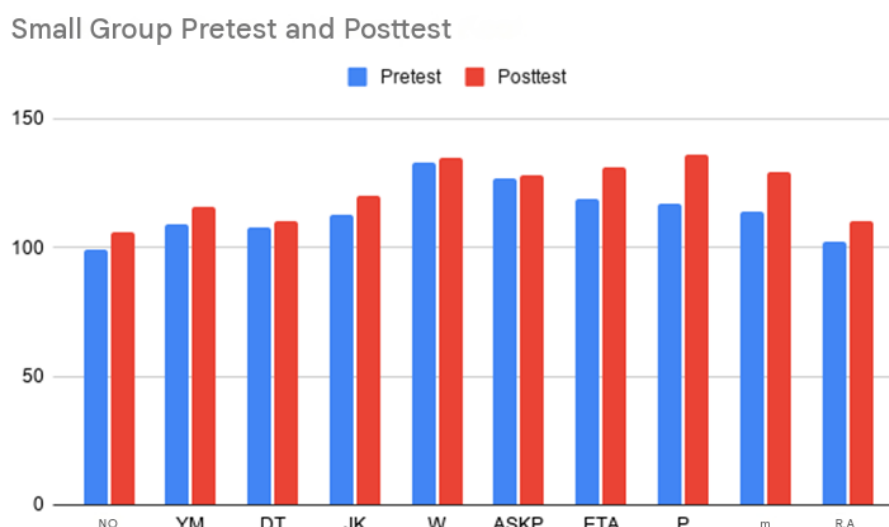


Figure 2. Small-Group Pretest-Posttest Graph

Overall, the results of this small-group trial provide evidence supporting the model's effectiveness in improving students' career maturity on a more representative scale. The average N-Gain value, which is in the moderate category, aligns with the results of the individual trials and strengthens the belief that this project-based learning career guidance model with peer assessment is feasible for wider implementation in the next phase.

Small-Group Statistical Analysis

To test the significance of the improvement in career maturity in the small-group trial, a series of statistical analyses were conducted, including descriptive analysis, normality tests, and paired-samples t-tests.

Table 5. Small-Group Descriptive Analysis

Variable	N	Range	Minimum	Maximum	Mean	Standard Deviation	Variance
Pre-test	10	34	99	133	114.10	10.514	99.490
Post-test	10	30	106	136	122.10	11.130	111.490

The descriptive analysis results showed that the average career maturity score of students increased from 114.10 in the pre-test to 122.10 in the post-test, with a mean difference of 8.00 points. The range of scores in the post-test (30) was smaller than in the pre-test (34), indicating a convergence of scores toward a higher level after participating in the career guidance model. The standard deviation also increased slightly from 10.514 to 11.130, reflecting a reasonable variation in improvement responses among students.

Before conducting the comparative test, data normality was tested using the Shapiro-Wilk method, given the small sample size ($n = 10$). The Shapiro-Wilk test was chosen because it is more sensitive and appropriate for small sample sizes ($n < 50$).

Table 6. Small Group Normality Test

	Statistic	df	Sig.
Pretest	.973	10	.916
Posttest	.910	10	.282

Based on the Shapiro-Wilk test results, the significance value for the pre-test data was 0.916 and for the post-test data, 0.282. Both are above 0.05. Therefore, the pre-test and post-test data were normally distributed. These results meet the normality assumption required for conducting a paired samples t-test in the next step. Because the data were normally distributed, the difference in pre-test and post-test scores was tested using a paired samples t-test to determine whether the increase in career maturity was statistically significant.

Table 7. Results of the Paired Samples T-Test for the Small Group Trial

	Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig
				Lower	Upper			
<i>Pre - Post</i>	-8.000	5.869	1.856	-12198,00	-3802,000	-4311,0000	9	0.002

The results of the paired samples t-test showed a t value of -4.311 with df = 9 and a significance value of 0.002. Since the significance value of $0.002 < 0.05$, there is a significant difference between students' career maturity scores before and after participating in the project-based learning career guidance model assisted by peer assessment. The negative mean difference value (-8.000) confirms a positive direction of change, namely that the post-test scores were higher than the pre-test scores. Overall, the statistical analysis results of the small group trials provide three mutually supportive conclusions: (1) there was an average increase in career maturity scores of 8.00 points from pre-test to post-test; (2) this increase is in the moderate category based on the average N-Gain value of 0.42; and (3) this increase is proven statistically significant with $p = 0.002 < 0.05$. These three findings reinforce that the career guidance model developed is effective in increasing students' career maturity, and is worthy of being continued to the implementation stage on a larger scale.

Implement

The implementation phase was conducted after the career guidance model had been validated by experts and demonstrated high practicality and effectiveness through individual and small group trials. A field trial involving 135 Grade 11 Heavy Equipment Engineering students at SMK Kristen Pelangi Tana Toraja was carried out, with 80 students assigned to the experimental group and 55 to the control group. The experimental group received career guidance using the developed project based learning model supported by peer assessment, while the control group participated in conventional lecture based career guidance with different instructional content. The implementation consisted of three consecutive sessions conducted on May 11 to 13, 2026, following a standardized procedure across all experimental classes. During the first session, students developed a visual career vision (Dream Job) through self exploration and career information gathering using Canva mind maps, followed by structured peer assessment. In the second session, students transformed their career aspirations into a structured career roadmap outlining educational pathways, training, internships, certifications, and early career plans, which was again evaluated through peer assessment and reflection. The final session focused on developing a professional curriculum vitae and portfolio by integrating the outputs of the previous activities into a practical career document using Canva templates. Each meeting concluded with peer assessment and guided reflection, allowing students to receive constructive feedback while strengthening career planning, self awareness, and career decision making skills under authentic classroom conditions.

Evaluate

Evaluation is the fifth and final stage in the ADDIE development model. Branch (2009) defines evaluation as the process of determining the alignment between established objectives and achieved results, carried out systematically to assess the quality, effectiveness, and impact of the product or program being developed. In this study, evaluation was conducted during the field trial implementation stage, encompassing an assessment of the model's practicality and measuring its effectiveness through a comparison of pretest-posttest data from the experimental group participating in the project-based learning career guidance model with peer assessment, and from the control group participating in other career guidance services.

Data Distribution

The field trial involved 135 students divided into an experimental group and a control group. The experimental group consisted of 80 students from three classes, while the control group consisted of 55 students from two classes. The distribution of students in each group can be seen in the following graph and diagram.

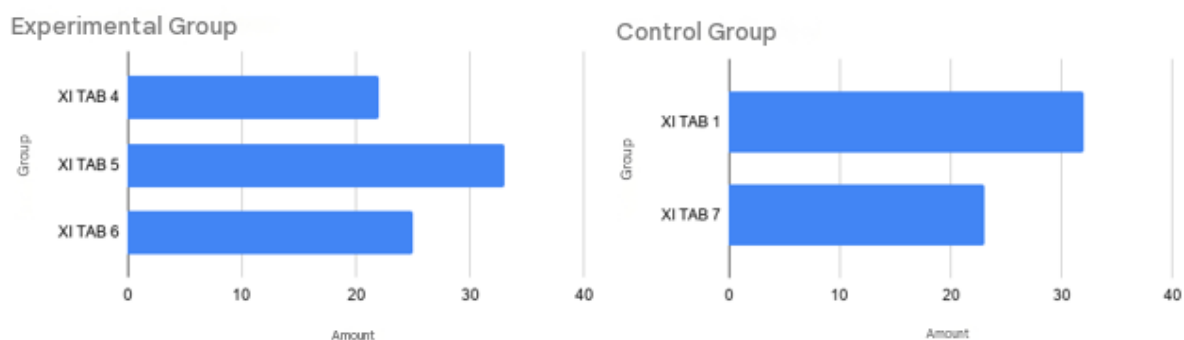


Figure 3. Field Trial Data Distribution Graph

The distribution of students in the experimental group field trial was spread across three classes: 22 students in Grade 11 4, 25 students in Grade 11 6, and 33 students in Grade 11 5. The control group consisted of 55 students spread across two classes: 23 students in Grade 11 7 and 32 students in Grade 11 1. Proportionally, the experimental group represented 59% and the control group 41% of the total 135 students involved in the field trial.

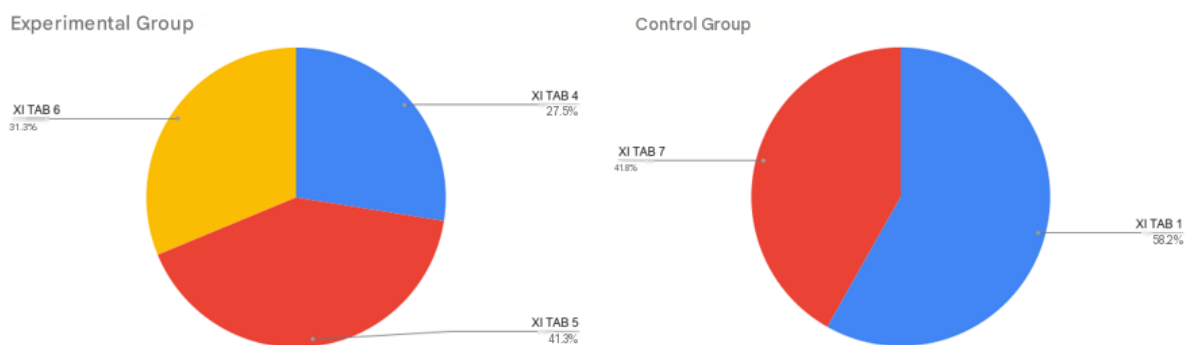


Figure 4. Field Trial Data Distribution Diagram

Based on this distribution, the sample size was deemed adequate and representative of the population of 11th grade TAB students. Although the two groups were not identical in size, the difference was not significant, namely 80 compared to 55. The implementation of the project-based learning model assisted by peer assessment in the experimental group took place in three

different classes with varying numbers of participants, ranging from 22 to 33 students per class. This variation in numbers provides a richer picture of the model's flexibility in adapting to different class sizes.

Model Practicality Analysis

The model's practicality assessment during the implementation phase was conducted by all 80 students in the experimental group after attending the three career guidance model meetings. The results of the practicality assessment are summarized in the following table.

Table 8. Results of the Model Practicality Test in the Field Trial

Indicator	Value
Mean Score	39.24
Maximum Score	45
Percentage	87.19%
Category	Highly Practical

The practicality percentage of 87.19% in the field trial demonstrated good consistency when compared to the practicality results from the individual and small group trials. In the individual trial, the practicality percentage reached 87.78%, while in the small group trial, it reached 86.67%. All three results consistently fell into the Very Practical category, with relatively stable percentages in the 86–88% range, as shown in the following comparison table.

These practicality percentages indicate that the project-based learning career guidance model with peer assessment was successfully implemented in each trial. During implementation, students were able to participate in each project-based learning activity and provide peer assessments. Therefore, the consistency of practicality results across all trial stages indicates that the developed career guidance model has a stable level of practicality and is independent of the scale of the group implemented. These results strengthen the model's practicality for broader implementation.

Descriptive Analysis

To obtain an initial overview of the development of students' career maturity before and after the model implementation, a descriptive analysis was conducted on the pretest and posttest data for both groups. The following graph presents a visual comparison of the average scores of the two groups.

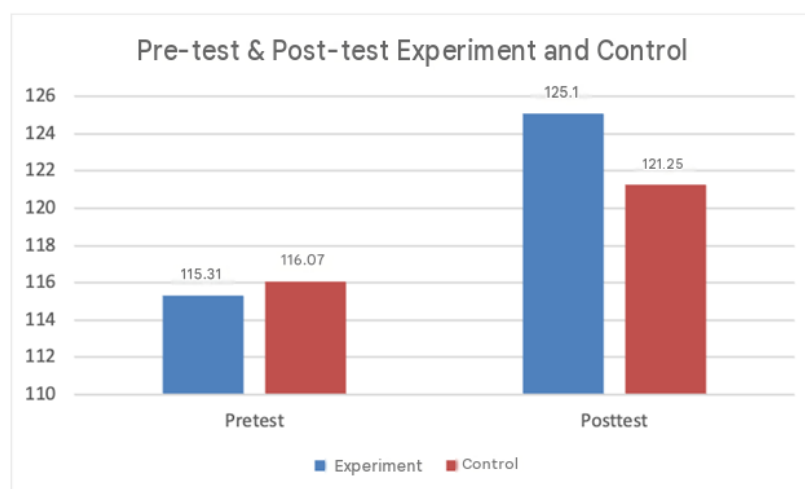


Figure 5. Field Trial Pretest-Posttest Comparison Graph

The graph above shows that both groups experienced an increase in career maturity scores from pre-test to post-test. However, the increase in the experimental group, at 9.79 points, was consistently higher than the control group's 5.18 points, even though the initial conditions of both groups were relatively comparable.

Table 9. Descriptive Analysis of Field Trial Pretest-Posttest Scores

Variable	N	Range	Minimum	Maximum	Mean	Standard Deviation	Variance
Experimental Group Pre-test	80	59	93	152	115.31	9.134	82.3898
Experimental Group Post-test	80	55	102	157	125.10	11.006	119.6150
Control Group Pre-test	55	57	93	150	116.07	13.584	181.1583
Control Group Post-test	55	70	91	161	121.25	15.686	241.5716

Based on the descriptive analysis table, the average pre-test scores of both groups were nearly equal. In the experimental group, the average pre-test score was 115.31 and the control group 116.07, indicating that the initial career maturity of the two groups before the treatment did not differ significantly. After implementation, the average post-test score of the experimental group increased to 125.10, while the control group's score increased to 121.25. In addition to the average score, the standard deviation and variance of the two groups should also be noted. In the control group, the post-test standard deviation, at 15.686, was significantly greater than that of the experimental group, at 11.006. These results indicate that the increase in career maturity in the control group was more uneven among students. In contrast, the experimental group showed a more homogeneous distribution of scores, reflecting that the project-based learning career guidance model supported by peer assessment not only increased the average career maturity but also encouraged more equitable improvement among all students.

Normality Test Analysis

Before conducting further comparative testing, a normality test was first conducted on the pre-test and post-test data in both groups to ensure that parametric statistical assumptions were met. Given that the sample size for each group was 80 for the experimental group and 55 for the control group (<100), the normality test was conducted using the Shapiro-Wilk method.

Table 10. Results of the Normality Test for Field Trial Data

Variable	Group	Statistic	df	Sig.
Pre-test	Experimental	0.964	80	0.023
	Control	0.951	55	0.025
Post-test	Experimental	0.970	80	0.055
	Control	0.943	55	0.011

The Shapiro-Wilk test results table shows that most of the data demonstrated significance values below 0.05, except for the post-test data for the experimental group, which obtained a significance value of 0.055 (>0.05). The normality test yielded a significance value of 0.023 for the experimental pre-test, 0.025 for the control pre-test, 0.055 for the experimental post-test, and 0.011 for the control post-test. Because most of the data had significance values <0.05, the data were not normally distributed. Therefore, the analysis continued using a non-parametric test.

Wilcoxon Signed-Rank Test Analysis

Because the data were not normally distributed, the model effectiveness analysis continued using the non-parametric Wilcoxon Signed-Rank Test to test the significance of the increase in career maturity scores from pre-test to post-test in each group.

Table 11. Wilcoxon Signed-Rank Test Results for Field Trial Data

Group	Z	Asymp. Sig. (2-tailed)	Interpretation
Experimental (Post-test – Pre-test)	-7.435	< 0.001	Significant
Control (Post-test – Pre-test)	-1.845	0.065	Not Significant

The Wilcoxon test results for the experimental group showed a Z value of -7.435 with a significance value of <0.001, which is below the threshold of 0.05. These results indicate a significant increase in students' career maturity scores after participating in the project-based learning career guidance model assisted by peer assessment. Conversely, the Wilcoxon test results for the control group showed a Z value of -1.845 with a significance value of 0.065 > 0.05. Thus, it can be concluded that the developed model was effective in improving the career maturity of students in the experimental group.

Product Revision

Branch (2009) defines revision as the process of identifying and correcting discrepancies that arise at each stage. This revision process is carried out iteratively, with each feedback loop producing an improved version of the model, until a final product is obtained that is valid, practical, and effective for full implementation. Therefore, input and notes obtained from expert validators and from direct trials with students became the primary materials used to gradually and continuously refine the career guidance model. During the development stage, several inputs were obtained from two primary sources: expert model validators and users, namely guidance counselors. Based on this input, product revisions were made (Sofiana, A., & Basuki, 2021; Haling et al., 2023; Nahdhiah et al., 2024).

Product Revision: Expert Model

Model Expert Product Revision

The validator provided two main inputs regarding the developed project-based learning career guidance model assisted by peer assessment. These inputs were substantive and aimed at comprehensively strengthening the model, as follows: (1) "The model should not only focus on material for classroom services (classical) but rather on a comprehensive model, from conceptual translation (rationale) to design formulation, competency of career guidance and counseling service implementers, and material presented in a specific design."; (2) "The PBL context needs to be adapted within the guidance and counseling service framework so that the development focus will be on understanding, accommodation, and actions that students need to develop." Based on input from the model expert validator, revisions were made to four main sections of the model: (1) Model Description, expanded to provide a complete overview of the service system; (2) Theoretical Foundation of Project-Based Learning, adapted to the guidance and counseling framework, with an orientation toward understanding, accommodation, and action; (3) Model Components, enriched with sub-components of Guidance and Counseling Teacher Competencies; and (4) Implementation Procedures, supplemented with a table of Project-Based Learning syntax adaptations to Career Guidance and Counseling. This revision aims to strengthen the model so that it serves not merely as a guide for classical guidance materials, but as a comprehensive, replicable career guidance service system firmly rooted in the conceptual framework of guidance and counseling.

Product Revision: Small Group Trial

The product revision was conducted based on the results of a small group trial involving 10 students. Based on the questionnaire results, students generally rated the model in the "Practical" to "Very Practical" categories. However, there were aspects that received relatively lower scores than others, namely the feasibility aspect (implementation or smooth implementation), which served as the basis for product revision and refinement. Several students gave relatively lower scores related to implementation time and challenges in following activities according to procedures. These results indicate that some students still experience challenges in optimally participating in the activities, particularly regarding sufficient implementation time and the smoothness of the activity stages. Product revisions focused on simplifying the material and adjusting the media used for implementing the activities. This simplification was achieved by reducing the amount of material discussed in the first meeting to optimize project time allocation. Additionally, adjustments were made by providing printed project worksheets to address network and technology issues during the activities. These revisions are expected to improve the smooth implementation of the model, make it easier for students to participate in the activities, and make the learning process more effective during the field trial phase.

Final Product Review

The final product evaluation demonstrates that the project-based learning career guidance model supported by peer assessment is highly feasible, practical, and effective in improving the career maturity of Generation Z students. The model is theoretically grounded in Super's Career Development Theory, the principles of project-based learning, and peer assessment, ensuring strong conceptual validity. Expert validation further confirmed its high feasibility, with scores of 87.69% from model experts and 91.67% from subject matter experts, indicating that the model is appropriate for implementation in school career guidance services. The model also demonstrated a high level of practicality across all implementation stages. Practicality testing produced consistently high scores, including 87.78% in the individual trial, 86.67% in the small-group trial, and 87.19% in the field trial. These findings indicate that the model is easy for both school counselors and students to understand and implement. Its project-based activities, combined with structured peer assessment, encourage active participation, meaningful learning experiences, and reflective feedback while remaining adaptable to different classroom conditions. Evidence of effectiveness was consistently observed throughout the evaluation process. The individual trial yielded a moderate N-Gain score of 0.60, the small-group trial showed a significant improvement ($p = 0.002$), and the field trial confirmed a significant increase in career maturity for the experimental group ($p < 0.001$), whereas the control group showed no significant improvement. These results indicate that integrating project-based learning with peer assessment provides authentic learning experiences that strengthen career exploration, planning, decision making, self-reflection, and readiness for future employment, making the model an innovative and evidence-based approach to career guidance for Generation Z students.

Research Limitations

This research has several limitations that need to be considered in interpreting the significance of this model from the research results. The research subjects used only came from the Heavy Equipment Engineering department so that the characteristics of the students involved tended to be homogeneous. This condition causes students' career exploration to focus more on certain areas of work, especially heavy equipment operators and mechanics. As a result, project activities ranging from identifying dream careers, creating a career roadmap, to compiling a

CV/portfolio do not yet reflect a broader exploration of various career fields. Apart from that, the number of subjects in the experimental group and the control group was not comparable, namely 80 students in the experimental group and 55 students in the control group. The difference in numbers is influenced by the limited availability of classes that can be used during the research process. Research limitations can also be seen in the relatively short duration of research implementation so that researchers have not been able to monitor the development of students' career maturity in the long term after implementing the project-based learning career guidance model assisted by peer assessment. Therefore, the results of this study are still limited to measuring changes in career maturity after treatment is given and do not show the sustainability of the model's impact over a longer period of time. Regarding time, this limitation also affects the results of implementing peer assessment in this research. Basically, peer assessment is designed to help students understand the learning process, personal development, and career maturity progress experienced during project work. However, in practice students tend to focus more on assessing the final results of the project rather than reflecting on the process that has been undertaken. Limited implementation time means that students' opportunities to discuss and provide feedback in more depth are still not optimal.

Conclusion

This study successfully developed a project-based learning career guidance model supported by peer assessment to enhance the career maturity of Generation Z vocational high school students using the ADDIE development framework. The model integrates project-based learning activities with peer assessment to facilitate self-exploration, career planning, understanding of the world of work, and career decision-making. The findings demonstrated that the developed model achieved a very high level of feasibility, with expert validation scores of 87.69% from model experts and 91.67% from subject-matter experts, indicating that it is theoretically sound and suitable for implementation. The model also demonstrated very high practicality, as reflected by practicality scores of 87.78% in the individual trial, 86.67% in the small-group trial, and 87.19% in the field trial, confirming that it is easy to understand and implement while meeting the learning characteristics of Generation Z students. Furthermore, the model proved to be effective in improving students' career maturity, as evidenced by a moderate N-gain score (0.60) in the individual trial and significant improvements in both the small-group trial ($p = 0.002$) and the field trial (Wilcoxon, $p = 0.001$). The developed model provides a feasible, practical, and effective alternative for career guidance services aimed at strengthening the career maturity of Generation Z students.

Suggestion

The project-based learning career guidance model, supported by peer assessment, can be utilized by guidance counselors as an alternative career guidance service that is more active, contextual, and tailored to the characteristics of Gen Z. Guidance counselors are advised to adapt project themes to the characteristics of their majors and the needs of their students to enable broader and more in-depth career exploration. In its implementation, guidance counselors need to provide adequate support throughout the project process, particularly during the self-reflection and peer assessment stages. This is crucial so that students focus not only on the final outcome of the project but also on the process of personal and career development experienced during the project. Schools are also advised to support the implementation of the model by providing adequate service time, supporting facilities, and collaboration with the workplace or professional practitioners to ensure students' career learning experiences are more authentic and relevant to the needs of the workplace.

Dissemination and Further Product Development

The results of this research can be disseminated through guidance and counseling teacher forums, guidance and counseling teacher training, educational seminars, and scientific publications for use by other schools. Furthermore, the model can be developed into a digital-based career guidance service guide, better aligning it with the characteristics of Gen Z, who are close to technology. Further development is recommended with a wider range of research subjects, both from different majors and educational levels, to broaden students' career exploration. Future research can also test the model's long-term effectiveness to monitor the ongoing development of students' career maturity. The development of peer assessment mechanisms needs to be enhanced so that students not only assess project outcomes but also provide more in-depth reflection on the process, development, and career skills of their peers. This can be achieved through additional discussion time, more structured reflection guides, and the use of supporting digital media in the peer assessment process.

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