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NEEDS ANALYSIS FOR GENIALLY-ASSISTED PROJECT-BASED STUDENT WORKSHEETS IN LIGHT VEHICLE ENGINEERING VOCATIONAL SCHOOLS

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Abstract

This study aims to analyze the need for the development of Genially-assisted project-based Student Worksheets for Light Vehicle Engineering subjects at Vocational High Schools in Tegal Regency. The study used a quantitative descriptive approach involving 8 teachers and 24 grade XI students from eight Vocational High Schools with Light Vehicle Engineering expertise. Data were collected through expert-validated needs questionnaires and analyzed using quantitative descriptive techniques in the form of averages and categories of needs. The results showed that teachers' needs for the development of Genially-assisted project-based Student Worksheets obtained an average score of 3.82 on a scale of 4.00 with a very high category, while students' needs obtained an average score of 3.79 with a very high category. Teachers assessed that learning was still dominated by lecture methods and needed interactive digital teaching materials to increase student engagement and support project-based learning. Meanwhile, students showed a high need for learning media containing videos, animations, interactive quizzes, and flexible access through digital devices to help understand the drum brake system material. These findings indicate that Genially's project-based student worksheet development has the potential to be an innovative solution to support more active, contextual, and interactive vocational learning, while also supporting student independence. This research is limited to analyzing the needs of Tegal Regency, so further research is needed to test the effectiveness of the developed student worksheet in a broader context and sample.

Keywords: Automotive Engineering; Genially; Interactive Student Worksheets; Needs Analysis; Project-Based Learning; Vocational High School (*SMK*)

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INTRODUCTION | مقدمة

The development of digital technology and the implementation of the Independent Curriculum (Curriculum *Merdeka*) are driving a paradigm shift in vocational high schools toward more active, contextual, and student-centered learning. In the context of vocational education and training (VET), teachers are not only required to master the material but also to design learning that enables students to learn more independently with the support of digital tools. Recent studies indicate that VET teachers still often combine active methods and lectures, while the use of online tools has not yet become mainstream practice; therefore, the need for pedagogical and digital transformation in vocational high schools is growing (Noguera et al., 2024; Suyatmo et al., 2025).

In the Light Vehicle Engineering subject, learning generally still uses conventional teaching materials in the form of textbooks and printed worksheets, which are dominated by theoretical

explanations and static images. This condition makes it difficult for students to understand procedural and mechanical material, particularly in drum brake systems, which require dynamic visualization of work processes. The use of less varied teaching materials also impacts low student engagement in learning and limited opportunities for independent learning (Wahyu et al., 2025). However, vocational learning ideally provides learning experiences that are contextual, applicable, and close to real-world conditions in the industrial world (Surti et al., 2022).

This situation indicates that the main problem lies not only in the availability of teaching materials, but also in the fit between the learning format and the demands of independent learning. Teachers still tend to be the primary source of information, while students often passively receive material without sufficient space to explore knowledge independently. This situation impacts students' low learning independence, even though this ability is a crucial competency in the implementation of the Independent Curriculum. Learning independence relates not only to the ability to complete assignments but also to students' ability to organize, control, and evaluate their own learning process (Mejeh & Held, 2022). Research in vocational schools also shows that SRL develops better when the learning environment is designed to support it, and other studies confirm that project-based learning can foster stronger SRL behaviors when accompanied by adequate scaffolding (Mejeh & Held, 2022; Wu, 2024).

To address these challenges, project-based learning (PjBL) has become a relevant approach for vocational schools. This learning model provides students with opportunities to learn through hands-on experience, problem-solving, and project activities related to real-life situations. Empirically, PjBL has also been shown to increase student engagement, critical thinking skills, and responsibility for the learning process (Surti et al., 2022). Furthermore, project-based learning is considered effective in enhancing students' collaborative skills and creativity in vocational education (Lesman et al., 2023). Recent findings in vocational education also indicate that the project-based blended learning model can enhance student competence and team spirit, making the development of teaching materials integrated with a project approach increasingly relevant (Tan et al., 2025).

One form of teaching material that can support project-based learning is the Student Worksheets. In modern learning, Worksheet no longer functions solely as practice sheets but also as a medium that can guide students in exploring, solving problems, and reflecting on their independent learning (Mayasari et al., 2023). The development of digital Worksheet based on interactive multimedia is considered capable of increasing student engagement because it presents more visual, engaging, and flexible learning (Busono et al., 2025). In vocational learning, the use of interactive digital media also helps students understand procedural concepts that are difficult to explain solely through text and static images (Komarudin & Mukhadis, 2020; Setiyawan & Nurul Iman, 2026). One digital platform that has great potential in the development of interactive teaching materials is Genially. This platform allows teachers to develop multimedia-based learning media by combining text, images, videos, animations, quizzes, and other interactive elements in one attractive display. The use of Genially in learning has also been shown to increase student motivation and participation by providing a more interactive and contextual learning experience (Halawa et al., 2025). Genially in game-based learning can increase student motivation and learning outcomes when designed to meet their learning needs (Cabrera-Solano, 2022).

However, previous research indicates that the development of project-based digital worksheets in the automotive sector is still relatively limited. Most previous studies have focused on the use of interactive media to improve cognitive learning outcomes, while student learning

independence has not been a primary focus of research (Mejeh & Held, 2022; Surti et al., 2022). Other research indicates that the use of Genially in learning is generally only used as an interactive presentation medium and has not been systematically integrated with the Project-Based Learning approach in vocational education (Cabrera-Solano, 2022; Halawa et al., 2025). Furthermore, the development of digital teaching materials in vocational schools is still dominated by a demonstrative approach and does not fully provide space for exploration and reflection on independent learning for students (Mayasari et al., 2023). In line with this, recent studies in VET emphasize that the integration of digital tools still needs to be strengthened, while PBL research in vocational schools also still faces resource, time, and personnel constraints, meaning that what is still lacking is not just digital media, but also the design of teaching materials that truly integrate vocational needs, PjBL structures, and students' SRL targets (Noguera et al., 2024; Hufnagl & Annen, 2026).

Based on these conditions, there is a need to develop Genially-assisted project-based student worksheets designed in accordance with the characteristics of vocational learning and the demands of the Independent Curriculum. The integration of project-based learning and interactive digital media is expected to provide a more engaging and contextual learning experience and support the development of student learning independence. Furthermore, the development of project-based digital student worksheets can also be an alternative solution for teachers in creating more innovative and adaptive learning to developments in educational technology (Busono et al., 2025; Halawa et al., 2025). Therefore, this study uses a needs analysis to map the needs of teachers and students for project-based student worksheets assisted by Genially in the Light Vehicle Engineering subject at Vocational High Schools in Tegal Regency, as a basis for developing teaching materials that are more contextual, interactive, and aligned with the demands of the Independent Curriculum. Therefore, this study is guided by two questions: What are the perceptions of productive teachers from eight Vocational High Schools in Tegal Regency regarding the need for project-based student worksheets in the field of Light Vehicle Engineering? What learning conditions, worksheet usage experiences, learning difficulties, and worksheet characteristics do students need in project-based student worksheets for drum brake system material?.

METHOD | منهج

Research Design

This study uses quantitative descriptive research to analyze the need for Genially-assisted project-based Student Worksheets development for Light Vehicle Engineering subjects at vocational schools in Tegal Regency. The focus of the study is directed at identifying the needs of teachers and students for the development of project-based digital teaching materials.

A quantitative descriptive approach was used because the research aims to describe learning conditions, the use of teaching materials, the need for interactive learning media, and the need to develop project-based student worksheets in Light Vehicle Engineering learning. The research does not provide treatment or variable manipulation, but rather describes data based on actual conditions obtained from respondents through a research questionnaire (Sugiyono, 2022).

Research Participants

The study participants consisted of 24 students and eight Light Vehicle Engineering teachers from eight vocational schools in Tegal Regency. The students who served as

respondents were 11th-grade students who had studied drum brake systems, while the teachers involved were productive Light Vehicle Engineering teachers who were actively teaching during the current academic year.

The sampling technique used purposive sampling, which is a sampling technique based on certain considerations according to the research objectives (Sugiyono, 2022). This technique was chosen because the study requires respondents who have experience and are directly related to the use of teaching materials on the drum brake system material. The participant criteria include: (1) schools that provide expertise in Light Vehicle Engineering, (2) teachers who teach drum brake system material, and (3) students who have participated in learning about the material. Thus, the data obtained is expected to provide a relevant picture of the need for the development of student worksheets projects assisted by Genially in vocational learning.

Research Instruments

The research instrument, a questionnaire on teacher and student needs, was validated through logical validity using expert judgment techniques before being used in data collection. Validation was conducted to ensure the statement items matched the research indicators, ensure the clarity of the instructions, ensure the language was appropriate for the respondents' level, and ensure wording accuracy to avoid ambiguous interpretations. Aspects assessed in the validation sheet included content, language, and writing.

Table 1. Expert Validation of Research Instruments

Validation Aspects	Validation Indicator
Content Validation	Compliance of the questionnaire with the indicators
	Clarity of instructions for completing the questionnaire
	Suitability of the questionnaire to school level and grade level
Language and Writing	The language used in the questionnaire conforms to Indonesian language rules.
	The statement is clear and does not give rise to multiple interpretations.
	The language used is simple and easy to understand

Source: (Subhaktiyasa, 2024; Zayrin et al., 2025).

Based on the expert validation results, both instruments designed for the Teacher Needs Analysis for the Development of Project-Based Student Worksheets in the Light Vehicle Engineering Subject and the Analysis of Student Needs were declared highly valid. Using a 1 to 4 Likert scale, the student needs questionnaire obtained an average score of 3.79, while the teacher needs questionnaire obtained an average score of 3.86. Both scores fall into the very high category (highly valid). These results indicate that the statement items are highly consistent with the intended indicators, appropriate in content, clear in language, and easy to understand. Consequently, both instruments were deemed suitable for data collection without requiring major revisions.

The student questionnaire instrument contains several indicators, namely: (1) experience using student worksheets in learning, (2) difficulty understanding drum brake system material, (3) need for interactive learning media, (4) interest in project-based learning, and (5) need for digital features in student worksheets. The teacher questionnaire includes indicators related to the use of teaching materials, implementation of project-based learning, need for digital media, and obstacles to learning in the classroom. The outline of the teacher needs analysis instrument is presented in Table 2.

Table 2. Teacher Needs Analysis Instrument Grid

Variable	Indicator
Learning Conditions	Learning model used Student engagement in learning
Use of Student Worksheets	Implementation of student worksheets in learning Suitability of student worksheets with student needs
Learning Obstacles	Student difficulties in understanding material Limitations of learning media
Project-Based Learning	Implementation of Project-Based Learning Necessity for project-based student worksheets
Digital Media	Use of digital media Necessity for interactive media Necessity for video and animation
Genially Student Worksheet Development	Necessity for interactive quizzes Necessity for flexible access
Learning Independence	Support of student worksheets toward independent learning Importance of innovative teaching materials

Source: (Mayasari et al., 2023; Noguera et al., 2024)

The grid of the student needs analysis instrument is presented in Table 3.

Table 3. Student Needs Analysis Instrument Grid

Variable	Indicator
Learning Experience	Interest in Light Vehicle Engineering (TKR) learning Engagement in the learning process
Use of Student Worksheets	Implementation of student worksheets in learning Ease of understanding the student worksheets
Learning Difficulties	Difficulty in understanding drum brake systems Difficulty in understanding static images
Learning Media	Interest in digital media Interest in video and animation
Project-Based Learning	Interest in project activities Involvement in project-based tasks
Need for Digital Student Worksheets	Need for interactive student worksheets Need for interactive quizzes Need for flexible learning access
Learning Independence	Self-directed learning ability Role of digital media in independent learning

Source: (Halawa et al., 2025; Mejeh & Held, 2022).

Data Collection Technique

Research data was collected through a questionnaire using Google Forms. The use of Google Forms was chosen to facilitate distribution of the instrument to respondents from several different schools and to simplify the data documentation process. The questionnaire was used to obtain data on student and teacher needs for the development of project-based digital student worksheets.

The questionnaire assessment used a four-level Likert scale: strongly agree, agree, disagree, and strongly disagree. This scale was then converted into categories of level of agreement and level of need according to the guidelines used in the study.

Data Analysis Techniques

The questionnaire data were analyzed using quantitative descriptive techniques by calculating the average score and percentage for each statement item. The questionnaire scores were analyzed descriptively by calculating the average value for each indicator using the following formula:

$$\bar{X} = \frac{f}{N}$$

Information:

$\bar{X}$ = average; f = number of scores obtained; N = maximum score

The average value obtained was then converted into categories of need levels consisting of very low, low, high, and very high. The category determination was based on a Likert scale of 1–4 with interval divisions obtained from the difference between the maximum and minimum scores divided by the number of categories. The classification of need levels based on the average score is presented in Table 4 below.

Table 4. Categories of Need Levels Based on Likert Scale (1–4)

Average Score Range	Need Level Category
3,26 – 4,00	Very High
2,51 – 3,25	High
1,76 – 2,50	Low
1,00 – 1,75	Very Low

Source: (Widoyoko, 2019, p.243).

RESULT نتائج

The results of this study present a needs analysis for the development of Student Worksheets for projects assisted by Genially in the Light Vehicle Engineering subject at vocational schools in Tegal Regency. The needs analysis was conducted to identify learning conditions, the use of teaching materials, learning constraints, and the needs of teachers and students for interactive digital learning media that support project-based learning on drum brake systems. The research data were obtained through questionnaires with teachers and students from the eight vocational schools that were the research locations.

Teacher Needs Analysis for the Development of Project-Based Student Worksheets in the Light Vehicle Engineering Subject

To determine teachers' needs for project-based student worksheets development in Light Vehicle Engineering, researchers distributed questionnaires to productive teachers from eight vocational high schools in Tegal Regency. The summary results of the teacher needs analysis questionnaire are presented in the following table 5.

Table 5. Recapitulation of teacher needs analysis questionnaire in the use of project-based worksheets in the Light Vehicle Engineering subject

No	Variable	Average	Category
1	Learning Conditions	3.75	Very High
2	Use of Student Worksheets	3.75	Very High
3	Learning Obstacles	3.75	Very High
4	Project-Based Learning	3.88	Very High
5	Digital Media	3.88	Very High
6	Genially Student Worksheet Development	3.88	Very High
7	Learning Independence	3.82	Very High
	Total Average Score	3.82	Very High

Based on the results of the teacher needs analysis in Table 5, it can be seen that all indicators are in the very high category with a total average of 3.82. Descriptively, this indicates that the need for project-based student worksheet development is indeed very strong and evenly distributed across almost all aspects measured. In other words, the data does not indicate a partial need or one that appears only in one particular section, but rather shows a consistent awareness among teachers that learning Light Vehicle Engineering still requires innovation that is more appropriate to the characteristics of the material and students.

For the learning conditions variable, the learning model used and student engagement indicators both averaged 3.75. This data indicates that learning is still dominated by lecture methods and does not sufficiently encourage student engagement. The relationship between the variables and their indicators indicates that the teacher-centered learning conditions result in low student participation in the learning process. Critically, this condition demonstrates a mismatch between the demands of vocational learning, which should be practical and participatory, and learning practices that are still largely one-way.

For the variables of use of student worksheets and learning obstacles, the data also supported previous findings. The indicators of implementation of student worksheets in learning and suitability of student worksheets with student needs each scored 3.75, indicating that the student worksheets used were not yet effective or engaging learning tools. This is in line with the indicators of student difficulties in understanding the material and limitations of learning media, which also scored 3.75. It appears that learning obstacles stem not only from abstract material but also from media that do not help students fully understand the working concept of the drum brake system. This means that the existing student worksheets do not function as a support for understanding, but are still merely a supplement to learning.

Furthermore, for the project-based learning, digital media, genially student worksheet development, and learning independence variables, all indicators scored 3.88, except for the importance of innovative teaching materials indicator, which scored 3.75. This indicates that teachers strongly agree with the need for project-based learning implementation, the use of digital media, videos, animations, interactive quizzes, and flexible access through digital devices. Critically, higher scores on these indicators indicate a strong orientation toward more active, visual, and independent learning. Support for Genially-based worksheet development also confirms that teachers view interactive media as having greater potential in improving conceptual understanding, student engagement, and learning independence. Thus, the results of this study not only illustrate the technical need for new teaching materials but also demonstrate a more fundamental pedagogical need: the need for a transformation from conventional learning to more participatory, contextual, and project-based learning.

Analysis of Student Needs for the development of project-based worksheets in the Light Vehicle Engineering subject

A student needs analysis was conducted to determine learning conditions, student worksheet usage experiences, learning difficulties, and student needs for interactive learning media in the Light Vehicle Engineering subject. Furthermore, this analysis aimed to identify the characteristics of project-based worksheet that align with students' learning needs and interests in the drum brake system material. The summary results of the student needs analysis questionnaire are presented in Table 6 below.

Table 6. Recapitulation of the student needs analysis questionnaire in the use of project-based worksheet in the Light Vehicle Engineering subject

No	Variable	Average	Category
1	Learning Experience	3.77	Very High
2	Use of Student Worksheets	3.73	Very High
3	Learning Difficulties	3.79	Very High
4	Learning Media	3.83	Very High
5	Project-Based Learning	3.79	Very High
6	Need for Digital Student Worksheets	3.82	Very High
7	Learning Independence	3.81	Very High
	Total Average Score	3.79	Very High

Based on table 6, the analysis of students' needs in the use of project-based worksheets in the Light Vehicle Engineering subject is in the very high category with a total average of 3.79. Critically, this finding indicates that students' needs for the development of project-based worksheets are not needs that arise partially, but rather needs that are quite strong and evenly distributed across almost all measured indicators. In the context of descriptive quantitative research, this pattern confirms that students' perceptions of learning, media, and teaching materials show a consistent tendency: they need learning tools that are more directed, contextual, and support practical activities in the Light Vehicle Engineering subject.

The learning media variable received the highest score, 3.83. This indicates that students perceive the learning media currently used as insufficient to meet their learning needs, particularly for material requiring both conceptual understanding and procedural skills. A high score on this indicator reinforces the argument that project-based student worksheets have the potential to be a more relevant medium because they can present tasks, work steps, and problem-solving in a more concrete manner. Similarly, the need for digital student worksheets (3.82) was also very high, indicating a strong push toward more practical, accessible, and student-centered learning materials. This means that the need extends beyond the content of the student worksheets to a format that supports flexibility and clarity in learning.

The learning independence variable scored 3.81, indicating that students need learning materials that can help them learn more independently, rather than solely relying on teacher explanations. In vocational learning, independence is crucial because students are required to understand work steps, follow instructions, and complete assignments systematically. Project-based student worksheets are relevant because they encourage students to learn through activities, organize work steps, and produce tangible products or solutions. Meanwhile, the learning difficulties and project-based learning variables both scored 3.79. This indicates that students' learning difficulties are still quite pronounced, and at the same time, they consider a project-based approach to be an appropriate form of learning to address these needs. In other words, learning difficulties do not stand alone but are closely related to the need for more applicable learning models.

The learning experience variable scored 3.77, while the use of student worksheets was the lowest, although still in the very high category with a score of 3.73. Critically, these two indicators signal that previous learning experiences and the use of existing worksheets are not yet optimal in supporting student learning. The lowest score for worksheet use indicates that there is clear room for improvement in the design, content, and strategies for utilizing worksheets in the classroom. Thus, although all indicators are in the very high category, this data still shows a gap in needs that is actually an important basis for the development of project-based worksheets. In conclusion, student needs are not only high in general, but also strongest in the aspects of learning media, digitalization of worksheets, and support for independent learning, so that the development of project-based worksheets is very feasible in the Light Vehicle Engineering subject.

DISCUSSION | مناقشة

The results of the study indicate that the objectives of the needs analysis have been achieved, with both teachers and students rating the need for project-based worksheet development for drum brake systems as very high. Substantively, this indicates that the existing worksheets are insufficient to meet the demands of procedural, visual, and applied TKR learning. These results align with Zhang and Ma (2023) who demonstrated that project-based learning has

a positive impact on learning outcomes, affective attitudes, and thinking skills, particularly in the fields of engineering and technology. Wang et al. (2025) also emphasized that PBL strengthens cognitive and practical skills, although its implementation still requires planned facilitation.

Comparing teacher and student data reveals very similar needs, but with slightly different emphases. While the teachers' overall score (3.82) was slightly higher than the students' (3.79), this difference is small and cannot be interpreted as substantive, as the study only presents descriptive statistics. Teachers emphasized the need to shift from lectures to active learning, while students emphasized their interest in digital media, animated videos, access via mobile phones/laptops, and support for independent learning. This suggests that the developed worksheets should not simply be "digital," but should be designed as project-based worksheets that truly guide learning activities, contain clear work steps, and provide space for exploration and reflection. This finding is in line with the study by Rahmayani and Atmazaki (2025) on interactive E- Worksheets based on Live-Worksheets, Nenggala et al. (2024) on PBL-based e-student worksheets, and Mualidiyah et al. (2025) which showed that well-designed electronic worksheets can improve science process skills and critical thinking.

The high scores across all scores should be interpreted with caution, as the data come from a self-report Likert-based questionnaire. In this context, highly positive responses may be influenced by social desirability, acquiescence, or the tendency to conform to the researcher's expectations. Setiawati et al. (2024) explain that self-report questionnaires are prone to social bias, and that anonymity and clear instructions can help mitigate this. Erčulj and Šulc (2025) also emphasize that leading questions can increase acquiescence bias and social desirability bias. Therefore, the “very high” scores in this study are best understood as a strong indication of need, not as sole evidence that all aspects are equally urgent without confirmation from classroom observations, in-depth interviews, or more rigorous comparative analysis.

In terms of implications, the developed Worksheets should have more specific features than simply being digital. Based on findings on teacher and student needs, the ideal student worksheets should include a structured project flow, step-by-step work instructions, dynamic illustrations or animations to explain the mechanism of the drum brake system, interactive quizzes, discussion and reflection space, and flexible access via mobile devices. This design is supported by research by Afni and Bektiningsih (2024) on Genially media that improves learning outcomes, Ardyagarani and Fitrihidajati (2025) on valid and practical E- Worksheets, and a study of REPIDS-based digital worksheets by (Mualidiyah et al., 2025). Thus, the results of this study not only confirm the need but also point to the character of Worksheets, which must be contextual, multimodal, interactive, and support independent learning in complex vocational material.

CONCLUSSION | خاتمة

This study answers two research questions by demonstrating that both productive teachers (mean = 3.82) and students (mean = 3.79) in the Light Vehicle Engineering Department at a Vocational High School in Tegal Regency indicated a very high need for Genial-assisted project-based student worksheets. These findings suggest that current teaching materials do not fully support procedural understanding, project-based activities, and self-directed learning in teaching drum brake systems. Practically, this implies that vocational teaching material developers should design digital worksheets that integrate competency-based project steps, clear practical instructions, dynamic visualizations, interactive assessments, and features accessible via mobile devices to better support vocational learning. Future research should test the effectiveness of

the developed worksheets through quasi-experimental studies focusing on self-directed learning and practical competencies, and through design-based research to refine implementation in broader vocational contexts.

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