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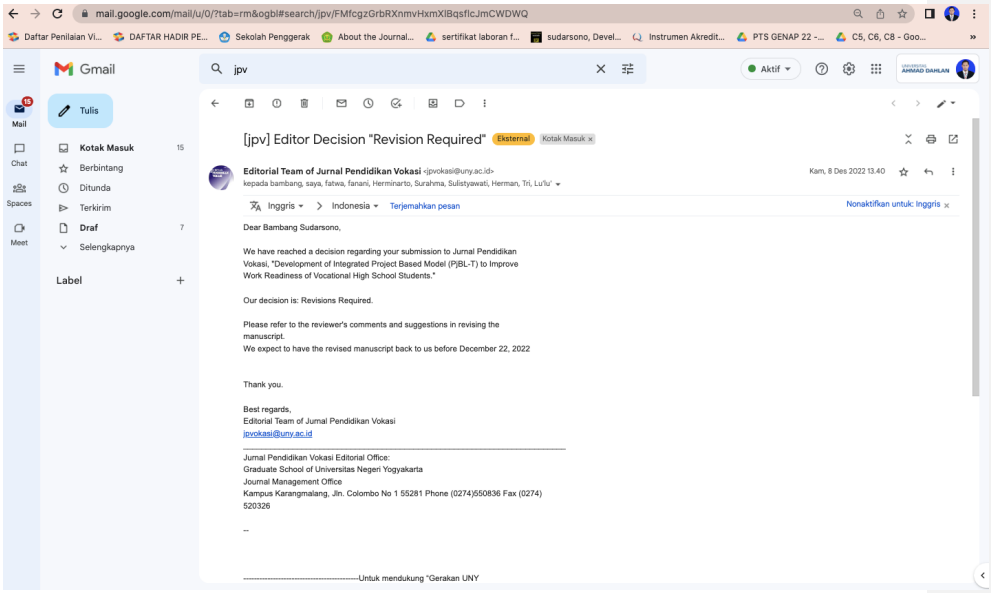


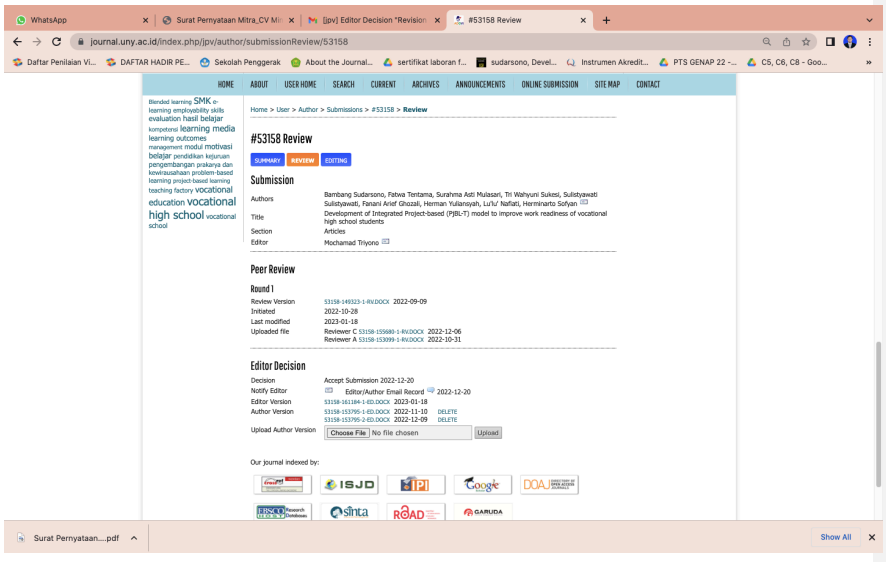


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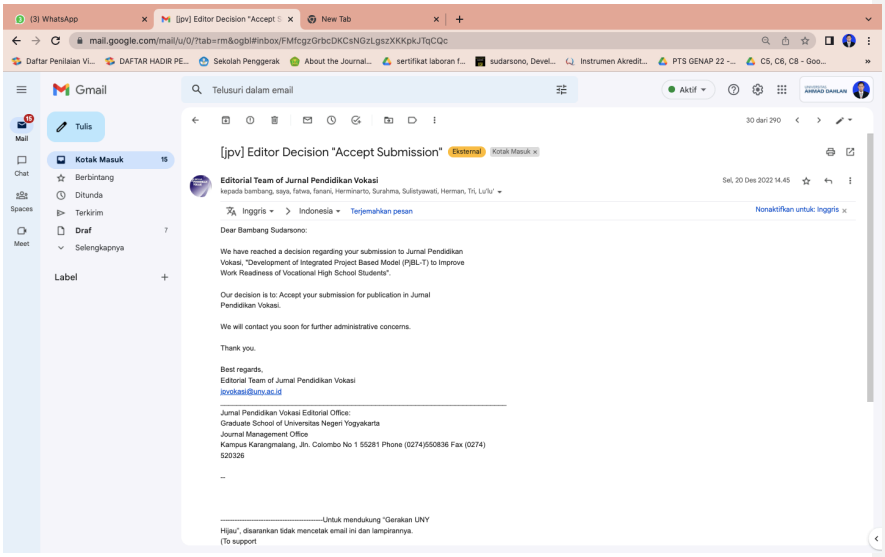

[jpv] Editor Decision "Accept Submission"

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Dear Bambang Sudarsono:

We have reached a decision regarding your submission to Jurnal Pendidikan Vokasi, "Development of Integrated Project Based Model (PjBL-T) to Improve Work Readiness of Vocational High School Students".

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We will contact you soon for further administrative concerns.

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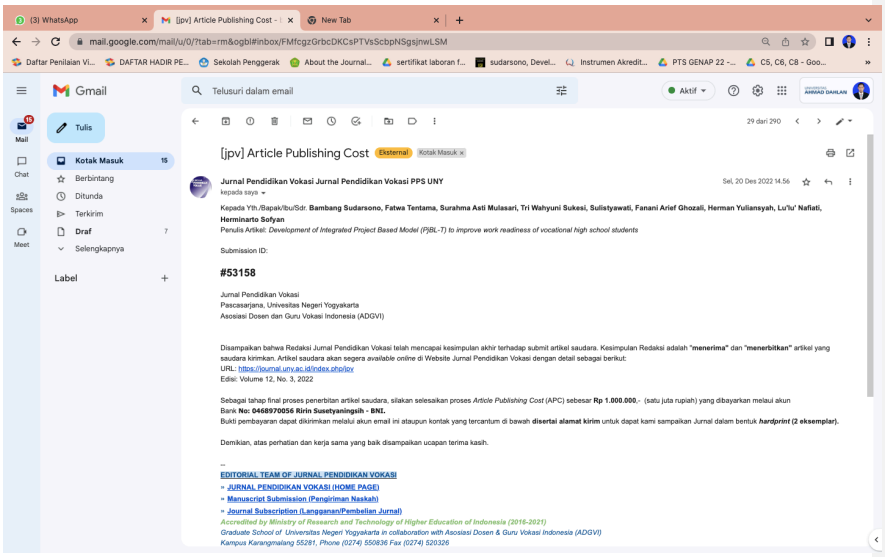

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# Development of Integrated Project Based Model (PjBL-T) to Improve Work Readiness of Vocational High School Students

**Bambang Sudarsono[1*], Fatwa Tentama[1], Surahma Asti Mulasari[1] , Tri Wahyuni Sukesi[1], Sulistyawati[1], Fanani Arief Ghozali[1], Herman Yuliansyah[1], Lu'lu' Nafiati[1] , Herminarto Sofyan[2]**
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ABSTRACT

In the last ten years, the highest unemployment rate is from vocational high school (SMK) graduates. The high unemployment rate for SMK is caused by the low work readiness of SMK students to enter the world of work. The purpose of this study was to develop an Integrated Project Based Learning or (PjBL-T) learning model and measure the effectiveness of the PjBL-T model in improving the work readiness of vocational students. The design of this research is research and development that adopts the stages of Richey and Klein's research. This research was carried out in three stages of research, namely: the stage of model development, internal validation and external validation. The research subjects used were 10 vocational school teachers, 10 industrial practitioners and 54 students of Automotive Engineering Vocational High School Muhammadiyah 2 Tempel. The research object used was SMK Muhammadiyah 2 Tempel, Otomotif Jogjakarta Center (OJC) Auto Service, Barokah Auto Service, Astra Daihatsu Armada and Gadjah Mada Auto Service. Data collection techniques used were focus group discussions (FGD), questionnaires and practice assessment sheets. Data were analyzed descriptively. The PjBL-T model is feasible and can be applied according to the learning objectives. The effectiveness of increasing students' work readiness which was tested limited and expanded increased very well with a score of 3.27.



**Commented [L1]:** Pilih penyataan sebagai latar belakang yang lebih rasional dan nyata

**Commented [L2]:** Pernyataan ini tidak sepenuhnya benar: Pengangguran SMK 12,7%, SMA 7,9% disimpulkan 12,7%>7,9%. Dilupakan bahwa rasio SMK:SMA = 70:30. 12,7/70 < 7,9/30. Pengangguran lulusan SMK tidak semata-mata disebabkan oleh rendahnya work readiness lulusan. Bisa disebabkan oleh ketidak tersediaan lapangan kerja juga.

**Commented [L3]:** Bukan research tetapi model

## INTRODUCTION

Vocational High School (SMK) is a secondary education provider whose role is to form skilled and ready-to-work human resources (Setiaji et al., 2020)(Maghfiroh et al., 2019). Vocational High Schools prepare their students to become competent and productive individuals so that when they graduate they are expected to be able to compete for work or fill job vacancies in the industry and become independent entrepreneurs in accordance with their competencies (Fathoni et al., 2019)(Sudarsono, Dahlan, et al., 2022). However, the Central Statistics Agency (BPS) released data that the workforce of vocational high school graduates (SMK) occupied the highest open unemployment rate (TPT) in February 2022, which was 10.38%. The high unemployment rate for SMK is caused by the low work readiness of SMK students to enter the world of work/business/industry (Wibowo & Munadi, 2019)(Afandi & Sentot Wijanarka, 2019). Work readiness is having the skills, knowledge, understanding and personality that makes a person able to get the job that will be chosen, so that he becomes satisfied and finally achieves success (Spöttl & Windelband, 2021)(Schröder, 2019). The high unemployment rate is not because students are unskilled, or unable to do work, but because of an imbalance between attitudes, knowledge and skills in these vocational students (Ernawati, 2021)(Misbah et al., 2020)(Li & Pilz, 2021). Low work readiness has an impact on low self-confidence, lack of effort and willingness to enter the world of work. Individuals who have low job readiness are more difficult to enter the world of work or get a job (Hasanah et al., 2017)(Hermanto & Sholikah, 2019)(Permata et al., 2021).

Efforts have been made by SMK organizers to improve the work readiness of SMK students. Improvements in learning models, learning methods, curriculum and completeness of learning infrastructure have been carried out as a solution to increase the work readiness of SMK students(Erlinda et al., 2021)(Prianto et al., 2020)(Calero López & Rodríguez-López, 2020)(Cindy et al., 2022). However, in reality, these efforts have not been optimal in solving the problem of high unemployment. Vocational High Schools need real industry participation to jointly prepare students' attitudes, knowledge and skills competencies to match the criteria for the competency needs of the industrial world(Khoerunnisa et al., 2020)(Wahyuni, 2021)(Sudarsono, Tentama, et al., 2022)(Gustiar et al., 2021). Thus, to improve work readiness, the competencies mastered by vocational students need to be clearly formulated and adapted to the needs of today's industrial world(Azizah et al., 2019)(Ernawati, 2021). The formulation of competencies is based on the principle of relevance and consistency between the preparation, implementation and evaluation of learning so that needs analysis, task analysis, competency analysis, and assessment procedures are needed by the industrial world[24][25][26]. Learning in vocational schools requires the determination of minimum competency standards that must be mastered by students and their success can be measured according to industry criteria(Baitullah & Wagiran, 2019)(Sugiartiningsih et al., 2019)(Rumondang et al., 2019).

The main key to achieving job readiness is the participation of the industrial world in applying competency standards of attitudes, knowledge and skills in the learning process in SMK(Lawitta et al., 2017)(Syamsuri et al., 2020)(Sudarsono, 2020). The learning model that is currently being emphasized and applied to vocational education is Project Based Learning (PjBL)(Kusumaningrum & Djukri, 2016)(Mulyadi, 2016). The PjBL model is a learning model that is expected to stimulate the achievement of competency attitudes, knowledge, and skills of SMK students by using projects as learning media(Azizah et al., 2019). Assessment lies in the activities, analysis, manufacture, and presentation of products in the form of designs, works and technology(Wu & Wu, 2020)(Potvin et al., 2021). The stages of PjBL can be seen in Figure 1.

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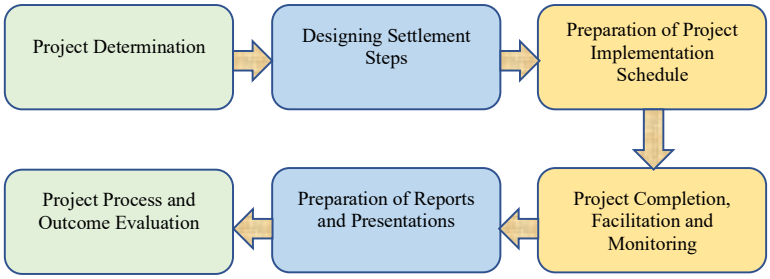


Figure 1. Stages of the Project Based Learning (PjBL)

**Commented [L5]:** Penegmbangan Model PjBL-T harus diawali dengan paparan exiting condition. Kelemahan ec dipaparkan, Lalu apa solusinya sehingga PjBL-T menjadi pilihan pengembangan.

Model According to previous studies, in practice the PjBL model appears to have weaknesses. The weakness of the PjBL model lies in the participation of the industry. The PjBL model is still carried out by teachers without involving industry, so that the achievement of competence is also not optimal(Parrado-Martínez & Sánchez-Andújar, 2020)(Goyal et al., 2022)(Gomez-del Rio & Rodriguez, 2022). Therefore, an industrial integrated PjBL model which is abbreviated as PjBL-T is needed. The PjBL-T model has the same stages as PjBL, only the preparation, implementation and evaluation are integrated with the needs of the industrial world and involve industry practitioners. The PjBL model which is integrated with the industrial world is expected to increase the work readiness of SMK students

## RESEARCH METHOD.

The research model design used is the Research and Development (R&D) model from Richey and Klein (2009: 8), which is divided into three stages of development: (1) model development; (2) internal validation; and (3) external validation.

**Commented [L6]:** Model konseptual harusnya dikembangkan secara filosofi teoritik yang kuat, Bukan pragmatis atas pendapat Guru dan praktisi Industri. Ini bisa bias!!!
Judgment Model Pembelajaran seharusnya dilakukan oleh ahli Pembelajaran TVET, Bukan ahli Media dan ahli kontent. Istilah Material Expert kurang tepat. Subject Expert

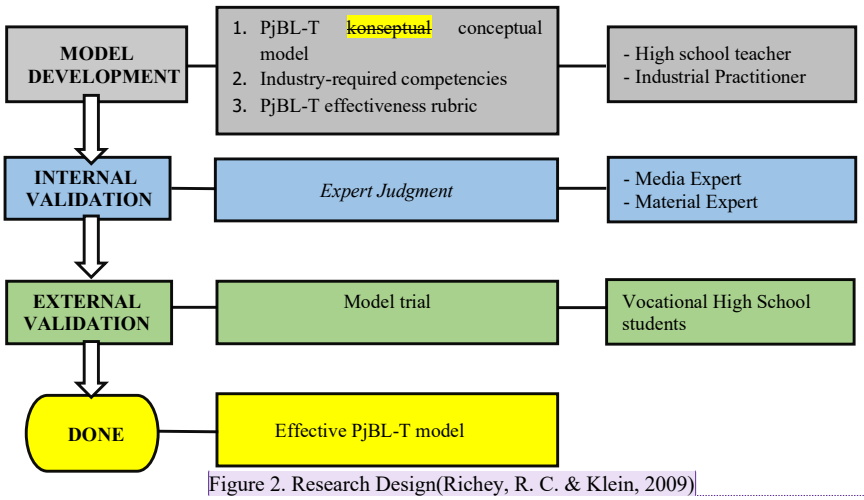


Figure 2. Research Design(Richey, R. C. & Klein, 2009)

**Commented [L7]:** Flow yang BENAR: Model Konseptual → Model Hipotetik → Uji coba → Revisi → Model Implementatif

This research is divided into three stages. First, the stage of model development which aims to produce a conceptual PjBL-T model and a tool for measuring the effectiveness of the PjBL-T model. The research subjects used were vocational and industrial teachers. Second, the internal validation stage

which aims to measure the feasibility of the PjBL-T model. The research subjects used were media and material experts. Third, the external validation stage which aims to measure the effectiveness of the PjBL-T model in improving the work readiness of SM students. The research subjects used were students of class XI Automotive Engineering SMK Muhammadiyah 2 Tempel with a total of 54 students. Based on considerations about the pandemic condition, the sample used was 25 students with purposive sampling technique. Data collection techniques at the model development stage used Focus Group Discussion (FGD) activities with interview sheet instruments. The internal validation stage uses an expert assessment questionnaire, while the external validation uses a work readiness assessment rubric.

Table 1. Focus Group Discussion (FGD) Grid

| Question | Item |
|---|---|
| Industry participation in the learning process in SMK | 1 |
| What competencies are needed by the industry and possessed by SMK graduates? | 2 |
| A learning model that is in line with industry expectations | 3.4 |
| What are the stages and technical implementation? | 5 |

Table 2. Model Validation Questionnaire Grid

| Question | Item |
|---|---|
| Suitability with learning objectives | 1,2,3 |
| Ease of implementation | 4,5,6 |
| Measuring power of learning objectives | 7.8 |
| The effectiveness of the model in solving problems | 9.10 |

Table 3. Job Readiness Assessment Criteria

| **Rating Norms** | **Score Range** | **Criteria** |
|---|---|---|
| $X \geq \mu + 1.\beta$ | X ≥ 3,00 | SB |
| $\mu + 1.\beta > X \geq \mu$ | 3,00 > X ≥ 2,50 | B |
| $\mu > X \geq \mu - 1.\beta$ | 2,50 > X ≥ 2,00 | K |
| $X < \mu - 1\beta$ | X< 2,00 | T |

(Mardapi, 2008)
Notes:
Very Good (SB); Good (B); Poor (K); Not Good (T)
Information:
μ : the average overall score of students in one class
: (max score + minimum score)
β : standard deviation of overall score
: 1/6 (max score - minimum score)
X : score achieved by students

## RESULT AND DISCUSSION

### Results

The first stage in this research is the stage of developing the PjBL-T model. The development of the PjBL-T model was carried out with two FGD activities. The first FGD aimed to dig up information on the learning model that has been implemented in SMK with 5 participants from industry and Automotive Engineering SMK teachers. The results of the first FGD can be concluded that: 1) the learning model in SMK so far still depends entirely on the teacher; 2) the competencies required by the industry to support student work readiness include: attitudes (initiative, responsibility and cooperation); knowledge of the field of work and skills (process and timeliness of workmanship). 3) The learning model needed by teachers and industry is a project-based learning model with industry participation in the learning stages.

The second FGD activity was carried out with 8 participants from industry and vocational teachers. The second FGD aims to explore the PjBL-T conceptual model which will then be determined technically for its implementation. The results of the second FGD can be seen in Figure 3

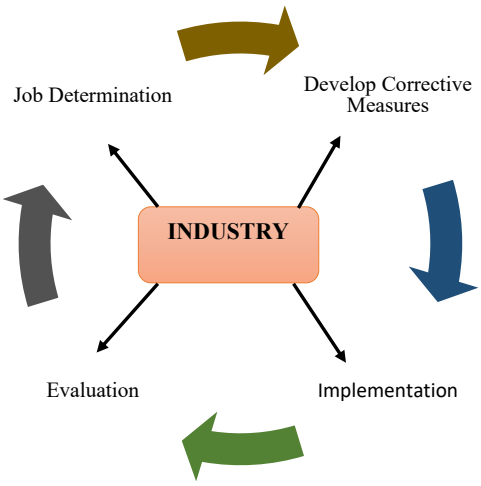


Figure 3. Conceptual PjBL-T Model

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The second stage in this research is the internal validation stage. The internal validation stage includes activities that aim to obtain input from material experts and media experts related to the PjBL-T conceptual model from the results of the model development stages and the rubric for assessing the effectiveness of the model. From the results of internal validation, the results obtained are that: (1) The PjBL-T model developed is in accordance with the learning objectives. (2) The suitability of the stages of the PjBL-T model in accordance with the learning objectives. (2) The PjBL-T model is easy to apply and implement by teachers and vocational students. (3) The application of the PjBL-T Model in accordance with the stages of the model can improve student competence. (4) The implementation of the PjBL-T Model which is carried out with industrial support can solve problems related to student work readiness. Expert input related to the rubric of vocational students' work readiness includes additions and subtractions of aspects. The initiative attitude aspect is omitted because it can be represented by the responsibility attitude aspect. While the skill aspect is added to the aspect of using practical tools.

Regarding the PjBL-T model, the stages of the PjBL-T model received several inputs from experts/internal validators. The wishes include: (1) the PjBL-T model must involve practitioners before preparation or called pre-learning which aims to provide a common perception between teachers and industry. (2) The PjBL-T model will be optimally successful if the industry submits industry criteria at the assessment stage. After the internal validation stage, the PjBL-T model is called the hypothetical PjBL-T model. The hypothetical PjBL-T model, the stages of the hypothetical PjBL-T model and the work readiness assessment rubric can be seen in Figure 4 and Table 4.

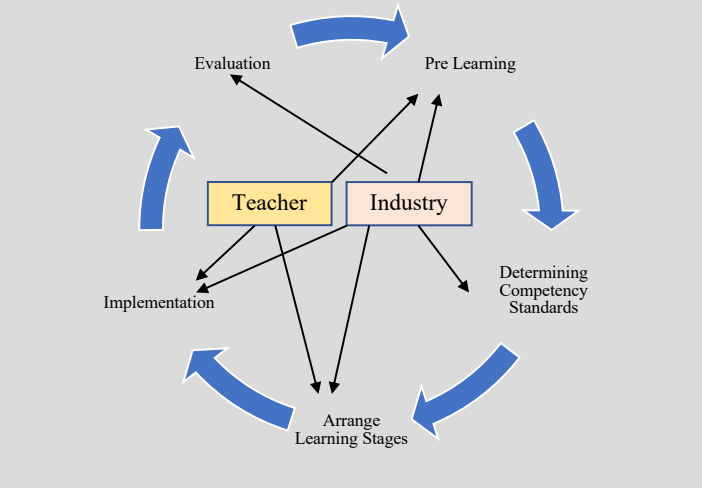


Figure 4. Hypothetical PjBL-T Model

Table 4. Stages of Hypothetical PjBL-T Model

| Stages | Activity Description |
|---|---|
| Pre Learning | Teachers and Industrial Instructors hold meetings to align learning objectives and prerequisites (materials, infrastructure, and time) |
| Determining Competency Standards | Teachers and Industrial Instructors discuss to determine the desired competency targets/standards according to industry criteria |
| Arrange Learning Stages | Teachers and Industrial Instructors arrange together the stages of learning that are in accordance with the learning objectives |
| Implementation | Students work on all stages of the worksheet and make notes if there are steps that are lacking and difficult to apply. The notes will be discussed with industry instructors in the form of a report |
| Evaluation | Examiners are industrial instructors.<br>The exam is divided into two parts, namely the exam to measure the knowledge aspect and the exam to measure the skill aspect. The knowledge aspect is measured by asking questions related to the understanding of measuring tools and materials as well as the field of work prior to the implementation of the work skills exam |

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Table 5. Work Readiness Assessment Rubric of the PjBL-T Model

| Competency Aspect | Score | Assessment Rubric |
|---|---|---|
| Responsibility | 4 | Completely completed without guidance |
| | 3 | Completely completed with guidance |
| | 2 | Not all work is done |
| | 1 | Not executing |
| Cooperation | 4 | Help each other in work without guidance |
| | 3 | Help each other in work with guidance |
| | 2 | Occasionally ask for help with friends without guidance |
| | 1 | Individualist |
| Knowledge | 4 | Understand and be able to explain the field of work without guidance |
| | 3 | Understand and be able to explain the field of work with guidance |
| | 2 | Some understand and are able to explain the field of work without guidance |

| | | |
|---|---|---|
| | 1 | Can't understand and can't explain. |
| Work Process | 4 | Able to work with procedures according to standard operating procedures (SOP) without guidance. |
| | 3 | Able to work with procedures according to standard operating procedures (SOP) with guidance. |
| | 2 | Some are able to work with procedures according to standard operating procedures (SOPs). |
| | 1 | Not doing |
| Punctuality | 4 | Get the job done right and finish early |
| | 3 | Completing work correctly and on time |
| | 2 | Completing work correctly and not on time |
| | 1 | Completing work outside the correct criteria. |
| Use of Practical Tools | 4 | Choose and use practice tools correctly without guidance |
| | 3 | Choose and use practice tools properly with guidance |
| | 2 | Able to choose but unable to use practical tools properly without guidance |
| | 1 | Unable to select and use practice tools |

To obtain data from instruments that have been tested and are able to measure the data of vocational school readiness assessment instruments. Then the validity and reliability tests were carried out using the Aiken's V coefficient and Cronbach's Alpha formula. The results of validity and reliability can be seen in table 6 and table 7.

Table 6. Content Validity Calculation Results

| **Instrument Items** | **Validity** |
|---|---|
| Responsibility | high |
| Cooperation | high |
| Knowledge | high |
| Work Process | high |
| Punctuality | high |
| Use of Practical Tools | high |

Table 7. Reliability Test

| **Alpha Cronbach** | **N items** |
|---|---|
| 0.876 | 6 |

From the above calculations, it can be concluded that the work readiness assessment instrument has high validity and reliability so that it is feasible and can be used as an instrument for collecting student work readiness data.

The third research stage is external validation by testing the PjBL-T model. The trial was carried out in a limited trial and an expanded trial. The limited trial aims to collect initial data regarding the effectiveness of the PjBL-T model in improving students' work readiness. The limited trial material was electric arc welding which was carried out by 10 students. The results of the effectiveness of the PjBL-T model at the limited trial stage can be seen in the table 8.

Table 8. Limited Trial Results

| **Competence** | **Competency Aspect** | **Score (f)** Average |
|---|---|---|
| Attitude | Responsibility | 1.3 |
| | Cooperation | 1.8 |
| Knowledge | Field of work | 1.9 |
| Skills | Work Process | 1.9 |
| | Punctuality | 1.5 |
| | Use of Practical Tools | 2.1 |
| Average Total Score | | 1.75 |

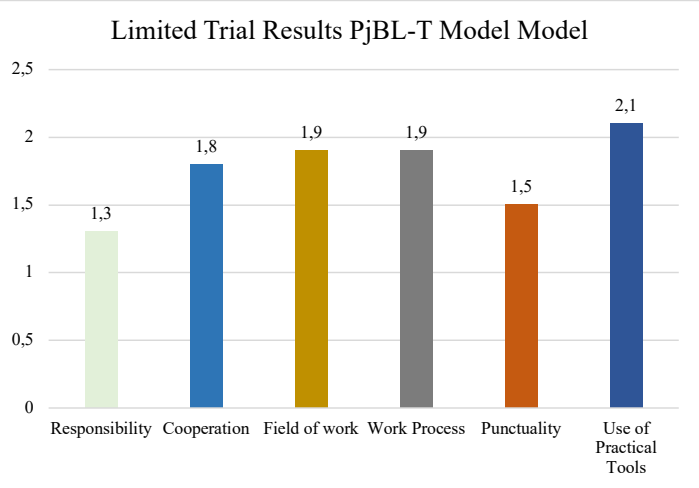


Figure 5. Limited Trial Results

After the limited trial, the researcher evaluated the implementation of the limited trial and obtained the results that although the results of the assessment of student work readiness in the limited trial obtained an average score of 1.75 with the Not Good (TB) category, the PjBL-T model could be implemented well by teachers, industrial instructors. and students. There are several notes related to the implementation of the PjBL-T model, namely: (1) Students are still not actively participating in the stages of the PjBL-T model. (2) The industrial instructor asks 1 student to help. (3) The assessment is not optimal because students are not used to being accompanied by other people. The results of the limited trial notes were evaluated and improved and then the expanded trial phase was carried out with 25 student subjects. The results of the expanded trial can be seen in Table 9 and Figure 6.

Table 9. Extended Trial Results

| **Competence** | **Competency Aspect** | **Score (f)** Average |
|---|---|---|
| Attitude | Responsibility | 2.96 |
| | Cooperation | 3.32 |
| Knowledge | Field of work | 3.32 |
| Skills | Work Process | 3.08 |
| | Punctuality | 3.4 |
| | Use of Practical Tools | 3.52 |
| Average Total Score | | 3.27 |

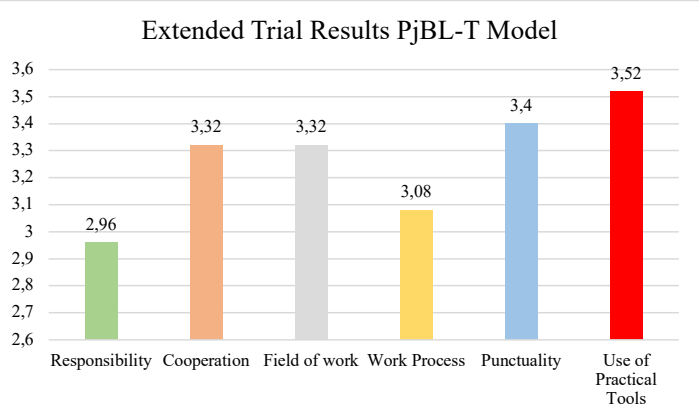


Figure 6. Extended Trial Results

Overall, the comparison of the results of the limited and expanded trials can be seen in Figure 7.

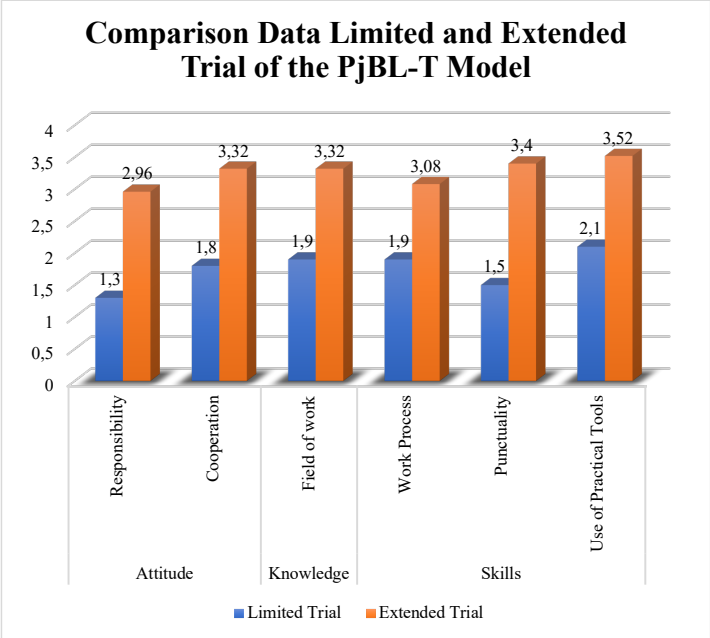


Figure 7. Comparison Data Limited and Extended Trial of the PjBL-T Model

After the pilot was expanded, researchers, teachers and industry instructors together reflected on the results of the expanded pilot implementation. The results of the assessment of student work readiness in the expanded trial obtained an average score of 3.27 in the Very Good (SB) category. The results of the assessment of student work readiness increased from the results of the limited trial and the expanded trial. The results of the reflection concluded that there were no problems and the implementation of learning using the PjBL-T model. The stages of the work readiness assessment model and rubric have not changed/revised so that the hypothetical PjBL-T model is a used learning model and is ready to be applied to improve the work readiness of vocational students.

**Discussion**

The PjBL-T model is a development of the Project Based Learning (PjBL) model which has been widely applied to the learning process. The goals and benefits of both models are the same, namely increasing student competence. The similarity lies in the learning media in the form of objects, designs and work products. While the difference lies in the actors of learning and the process of industrial participation in all stages of learning. The stages of the PjBL-T model include: pre-learning, determining competency standards, compiling learning stages, implementation and assessment. Dwi Agus Sudjimat stated that Project based learning with an industrial partnership strategy succeeded in increasing the job readiness of SMK students by referring to three stages of learning. These stages include pre-PjBL, PjBL with simple projects, and models with real or complex projects. Evaluation includes the assessment of processes and products by industry. The implementation of industrial integrated PjBL can shape the character of the 21st century workforce which is developed and integrated into the implementation of the PjBL-T model (Sudjimat et al., 2020). Ramesh ddk and Maximilian ddk stated that project-based learning with industry partnerships can provide students with up-to-date/renewable work readiness. The prerequisites are the need for a common vision, understanding goals, learning design courses, demand for skills for the world of work and an agreed-upon competency outcome between teachers and industry(Kuppuswamy & Mhakure, 2020)(Zarte & Pechmann, 2020). Muhammad Khair Noordin and Gary Van who stated that industrial integrated PjBL is suitable to be applied at the vocational education level and is able to increase students' work readiness. Industry-integrated PjBL can provide competencies with work experience and problem solving from industrial instructors (Noordin & Nabil, 2011)(Pan et al., 2021).

The PjBL-T model which was applied in two stages of testing proved capable of improving aspects of attitude competence (cooperation and responsibility), knowledge (field of work) and skills (processing, punctuality and use of practical tools) so that it had an impact on increasing student work readiness. Larisa Dunai and Thao Quoc Tran who stated that PjBL integrated the development of industrial technology projects. A well-implemented industrial integrated PjBL model can encourage students to achieve project planning skills, collaboration, responsibility, critical thinking, administrative knowledge and problem solving skills (Dunai et al., 2017)(Tran & Tran, 2020). Vila stated that the industry-integrated Project-Based Learning (PBL) is a suitable learning approach to provide a learning experience that facilitates the development of Industry 4.0 skills and competencies. A well-applied model can improve students' attitudes, knowledge and skills competence (Vila et al., 2017). Anita Habók added that project-based methods with industrial integration are preferred among teachers. Teachers only act as facilitators and provide motivation and transmission of values central to student work from industry (Habók & Nagy, 2016).

The PjBL-T model in its implementation has several obstacles that have been summarized from the results of limited trials and expanded trials. The bottleneck of the PjBL-T model lies in the enthusiasm and participation of the industry. So that a sustainable partnership program is needed with a mutually beneficial agreement between SMK and industry. Nur Shafiekah Sapan and Astarina stated that PjBL-T has been able to equip students with work-related skills, and with completing projects. Students can improve soft skills, especially in communication and self-confidence. Agreements and partnership programs with industry are needed so that the sustainability of the program continues (Sapan et al., 2020)(Astarina et al., 2020).

## CONCLUSION

The PjBL-T model which was developed in three stages of research is a learning model that is expected by vocational school administrators in overcoming the problem of work readiness of vocational students. The PjBL-T model that was developed is in accordance with the learning objectives, is easy to implement and has effectiveness in increasing the work readiness of vocational students. Attitude work readiness competence which includes aspects of cooperation competence and responsibility. Knowledge competence which includes aspects of competence in the field of work. Skill competencies which include aspects of workmanship process competence, timeliness and the use of practical tools can improve very well in the two stages of the trial.

**Commented [L10]:** Mengapa menggunakan Administrator. Dalam kesimpulan mestinya meresume Sintak PjBL-T efektif membangun work readiness. Istilah Skill competencies janggal tidak ada dalam TVET

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