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# Validity of Meaningful Practical Activity Sheets for Basic Electronics Material on Voltage and Current Divider Circuits Based on Project Based Learning

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## ABSTRACT
*Every learning process, both theory and practice, needs to implement meaningful learning. This also applies to students. Ideally, students are expected to carry out meaningful practicums, namely carrying out practicums by understanding the theory underlying the practicum, each step taken in the practicum, and being able to connect the results of the practicum with real implementation in everyday life. The reality in the field, in the implementation of basic electronics practicums, students only carry out practicums mechanically according to the instructions without understanding the theoretical concepts underlying the steps and have not been able to link the results of the practicum with its implementation in the real world. Voltage divider and current divider circuits are basic electronics theories with familiar implementations in everyday life with various uses in electronic devices. Efforts to solve this problem are to carry out practicums by applying the PjBL model which is synergized with meaningful learning. The steps of the learning activities are outlined in the meaningful practicum activity sheet (meningfull practice) basic electronics based on project based learning on voltage and current divider circuits. Before the practicum activity sheet is used in learning, its validity needs to be tested so that the activity sheet used by students later is a valid activity sheet. This research is a Research and Development (R&D) research with the ADDIE development model which is implemented in three stages, namely Analysis, Design, Development. This research is intended for Physics Education students of KH University. A. Wahab Hasbullah who are or have taken basic electronics courses, both theory and practice. In general, the Meaningful Practical Activity Sheet (Meningfull Practice) Basic Electronics Material Voltage and Current Divider Circuits Based on Project Based Learning is declared valid and can be used after being revised according to the validator's input.*

***Keywords**: Practical, Basic Electronics; PjBL; Meaningful Learning.*

## INTRODUCTION
Meaningful learning is the process of connecting new information with relevant concepts in a person's cognitive structure (Suardi in Marbun & Silalahi, 2024). Meaningful learning helps create a more meaningful learning experience and meets the psychological and emotional needs of students (Khoerunnisa, et al., 2024). Meaningful learning is a learning process where new information is connected to the structure of understanding possessed by students in the learning process (Hafidzoh, et al., 2023). Based on an understanding of meaningful learning, every learning process, both theory and practice, needs to apply meaningful learning. This also applies to students. Ideally, students are expected to carry out meaningful practicums, namely carrying out practicums by understanding the theory underlying the practicum, every step taken in the practicum, and being able to connect the results of the practicum with real implementation in everyday life. In reality, students only carry out practicums mechanically according to the instructions without understanding the theoretical concepts underlying these steps and have not been able to link the results of the practicum with their implementation in the real world. This is known when carrying out practicums individually, students have difficulty carrying out practicums according to the practicum instructions. Setyowati, et al (2024) in their research entitled "Synergy of Project Based Learning and Meaningful Learning to Improve Mathematics Learning Outcomes" concluded that the synergy of project based learning and meaningful learning has a positive impact on teachers and students, including students

being enthusiastic in participating in mathematics learning, students' creativity is awakened by the existence of projects that they have to work on, increasing the ability to organize groups because students must be able to organize the division of tasks so that the project can be completed properly, fostering a competitive spirit among students to become the best group, and learning is more meaningful and provides deep meaning for students and teachers. Sitompul & Nababan (2022) in their research entitled "Implementation of Meaningful Learning Through the Project Based Learning (PJBL) Method on Class XI Procedure Text Material" concluded that the Project Based Learning (PjBL) Method can implement meaningful learning on class XI procedure text material. This is because the PjBL method which emphasizes the construction of knowledge to produce a final product has synergy with the procedure text material in the form of steps to produce the final product. In its application, it can be seen that the application of the PjBL method also increases student activity which includes activities in the cognitive (head), affective (heart), and psychomotor (hand) domains. Learning activities with the PjBL model when synergized with meaningful learning will produce the syntax below :

**Table 1.** Synergy of PjBL and Meaningful Learning (Setyowati, N., & Mawardi, M., 2018)

| Project Based Learning Syntax (George Lucas Educational Foundation, in Setyowati, N., & Mawardi, M., 2018) | Meaningful Learning (Mulyasa, in Setyowati, N., & Mawardi, M., 2018) | Synergy of Project Based Learning and Meaningful Learning |
|---|---|---|
| 1. Determine basic questions<br>2. Prepare project planning<br>3. Prepare schedule<br>4. Monitor students and project progress<br>5. Assess results<br>6. Evaluate experience | 1. Warming up – Apperception<br>2. Exploration<br>3. Consolidation<br>4. Formation of attitudes and behavior<br>5. Formative assessment | 1. Warming up – Apperception – Determine basic questions.<br>2. Developing project planning – Exploration – Consolidation.<br>3. Developing a schedule.<br>4. Formation of attitudes and behavior in project work – monitoring students and project progress.<br>5. Assessing results.<br>6. Evaluation of experience.<br>7. Formative assessment |

These learning steps can be adapted in basic electronics practicum activities with the hope that students can carry out the practicum meaningfully, namely consciously carrying out each stage of the practicum and understanding the underlying theory. Basic electronics theories are the foundation of understanding in further electronics learning. As prospective Physics teachers, Physics education students are required to understand them and their implementations. Voltage divider and current divider circuits are basic electronics theories with familiar implementations in everyday life. Voltage divider circuits can be used for biasing transistors, producing DC voltages whose values are not provided by standard batteries, sensor configurations for comparator circuits, as the first stage circuit in wireless optical telecommunications systems (Fuada, et al., 2022). Some examples of the application of current dividers in the world of electronics include adjusting the brightness of LEDs by controlling the current flowing through the LEDs, converting sensor signals into signals that can be processed by microcontrollers or other devices, selecting paths in serial communication such as I2C or SPI, selecting communication paths between several devices connected in a circuit.

Learning about current and voltage divider circuits requires students to understand the concepts of Ohm's law and Kirchoff's law so that at the same time students must reconstruct their understanding of the electronics material that has been obtained in the basic Physics course. If we return to the problems found in the field, the effort to solve the problem is to carry out practicums by applying the PjBL model which is synergized with meaningful learning. The steps of the learning activities are outlined in the meaningful practicum activity sheet (meningfull practice) of basic electronics on voltage and current divider circuits based on project based learning. Before the practicum activity sheet is used in learning, its validity needs to be tested so that the activity sheet used by students later is a valid activity sheet.

## METHOD

This research is a Research and Development (R&D) study with the ADDIE development model consisting of five steps, namely Analysis, Design, Development, Implementation and Evaluation. The analysis stage is carried out by analyzing problems and needs in the field. The problem found is that students carry out practicums mechanically following the steps in the practicum instructions without understanding the underlying theories. The design stage is carried out by designing solutions to solve problems found in the field. The solution that is expected to solve these problems is to develop a practicum activity sheet that applies the PjBL model synergized with meaningful learning. At this stage, the draft design of the practicum activity sheet begins to be prepared. The development stage is carried out by developing the product that will be used. At this stage, a practicum activity sheet is made according to the design and validation is carried out by experts to test the validity of the practicum activity sheet. This research was carried out until the Development stage because the validity test was carried out at this stage. This research is intended for Physics Education students at KH University. A. Wahab Hasbullah who are or have taken basic electronics courses, both theory and practicum.

The validity data of the practicum activity sheet being developed was obtained using a validation sheet filled out by two experts with a background in Physics Education lecturers. The validation data that had been obtained was tested for reliability using the equation (Atika, 2022)

$$PA = \left(1 - \frac{A - B}{A + B}\right) \times 100\%$$

This study uses Percentage of Agreement (PA) where A is the first validator's assessment score while B is the second validator's assessment score. Atika (2022) states that if the percentage of agreement is equal to 75% or more, the instrument can be said to be reliable. Validation data analysis was carried out using qualitative descriptive methods, namely by averaging the scores of each component. The score results were matched with the criteria as in Table 2 (Kohar, S., et al., 2017).

**Table 2.** Validation Score Categories (Kohar, S., et al., 2017)

| Score | Category | Conclusion |
|---|---|---|
| 1,00 ≤SV ≤1,69 | Not Good | not feasible, cannot be used yet and still requires consultation |
| 1,70 ≤SV≤ 2,59 | Deficient | less suitable, can be used with greater revision |
| 2,60 ≤SV≤3,59 | Good | decent, can be used with minor revisions |
| 3,60 ≤SV≤4,00 | Very good | suitable, can be used without revision |

## RESULT AND DISCUSSION

### Result

The validation results carried out by two experts can be seen in table 3.

**Table 3.** Validation Results

| Number | Components | $\overline{V_1}$ | $\overline{V_2}$ | $\overline{V}$ | Kategori |
|---|---|---|---|---|---|
| I | Content eligibility components | 3,70 | 3,50 | 3,60 | VERY GOOD |
| II | Linguistic components | 3,73 | 3,56 | 3,65 | VERY GOOD |
| III | Presentation components | 3,50 | 3,52 | 3,51 | GOOD |
| **Reliability** | | **95.80%** | | | |

### Discussion

Based on the validation results data of the student practicum activity sheets that have been developed in table 3, the validation results carried out by two validators are declared reliable because they have a reliability of 95.8%. In accordance with Borich's statement (Atika, 2022), the instrument is said to be reliable if PA≥75%. The feasibility component of the contents of the practicum activity sheet gets an average score of 3.60, the language component gets an average score of 3.65, and the presentation component gets an average score of 3.51. So that overall the BAS that was developed is categorized as

good and can be used with minor revisions, especially for typos. The practicum activity sheet that has been validated is revised according to the validator's suggestions and can be used in learning activities.

## CONCLUSIONS

In general, the Meaningful Practical Activity Sheet (Meningfull Practice) for Basic Electronics on Voltage and Current Divider Circuits Based on Project Based Learning is declared valid and can be used after being revised according to the validator's input.

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