

Development of media learning practice welding pipe position vertical axis (2G) with Gas Metal Arc Welding process (GMAW) in senior high school

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Abstract. This research develops old media by creating new media. The reason, because of the improper application of the pipeline welding procedure that caused misconceptions of learners, his assumption of piping can be rotated and shifted. With the new media will minimize the problem. The practical media device helps weld the vertical axis position pipe (2G) with GMAW process, the weld pipe dimension is at least two to four inches. Standard procedure, fixed pipe, incendiary rotator in the same direction or counter clockwise. Mechanization and automation of pipe welding produces high productivity, because the weld bead is better. The results of this study indicate the effectiveness of pipe welding systems and practices with indicators of students able to master the welding of pipes with and without the media mentioned above.

1. Introduction

SMK Negeri 6 Kota Serang Banten Province has used vertical axis pipe (2G) welding medium with GMAW process, but its work process is still not relevant to the standard concept, because the pipe is rotated, causing misconceptions of learners. Therefore, the authors develop the media to be more effective and hope can improve the competence of pipe welding learners.

2. Literature review

2.1. Development of learning media

The word "medium" comes from the Latin "medium" meaning "mediator" or "introduction" [1]. Furthermore, the media in learning is a communication channel that carries messages with instructional purpose [2]. The use of teaching media can help the achievement of student learning success [3].

Learning media is one form of technology utilization in the world of education useful in learning. Learning media serves to equip teachers in improving their effectiveness in the classroom.

Educators have revealed that effective use of media and educational technology is better than long explanations, as it is more instructive and meaningful [4]. Learning media affect a person in learning, the effect on psychology, non-verbal form communication, in the form of technical means [5].

Principles of learning media development. First, procedural and instructional. Second, as an independent student learning resource, media is not enriching. Third, the developers of instructional media consider the potential and the characteristics of the media itself as a material for making learning media. Fourth, the principle of material truth and attractiveness.



Media design in education can solve complex problems of education, as a quality concept with four important indicator criteria, namely: Relevance, Validity, Practice, and Effectiveness.

2.2. *Learning media development concepts*

The concept of developing learning media welding the vertical axis pipe positioning (2G) with the GMA process. The standard procedure of pipe welding of the pipe position should not be rotated. With the development of these media, learners are expected to master the practice of welding the pipe position manually and with enhancements as a medium of learning practice.

2.3. *Welding pipe practice vertical axis position (2G) with GMAW process at senior high school*

Learning media welding practice of vertical axis position pipe (2G) with GMAW process [6]. The welding of the circular path in the 2G position pipe practiced in the Senior High School is the welding of a circular path clockwise and counter-clockwise, the pipe connection with the 2G vacuum positioning pipe with the GMAW process, the process manually and with the aid of the pipe welding medium.

3. Research methods

Research method of development with 4-D model (define, design, develop, and disseminate). Participants of this research are teachers, technicians and students of class XII TPL-1 and 2 welding techniques SMKN 6 Serang city in the even semester of the academic year 2017/2018.

The population is three teachers, two welding technicians, 30 students each class XII TPL-1 and 2 welding techniques SMKN 6 Serang City. The samples are three teachers, two welding technicians, each of the 10 best students of class XII TPL-1 and 2. The development of this data retrieval instrument: Interviews, and Tests.

3.1. *Data analysis*

After the test, the counting of multiple choice test results with the rights only method. Minimum Exhaustiveness Criterion 75,00, formula of calculation:

$$\text{student scores} = \frac{\text{Student score}}{\text{Maximum score}} \times 100 \quad (1)$$

After data collected, data processing with quantitative descriptive analysis techniques. Furthermore, the determination of the average value of the ability of learners with the formula [7]:

$$x = \frac{\sum x}{N} \quad (2)$$

Information:

x = Mean
 $\sum x$ = Total score
 N = Total data

4. Findings and discussions

4.1. *Findings*

Misconceptions of learners against the position of welded pipe, pipe rotated or shifted or fixed when welding pipe vertical axis position (2G). Results of student analysis: The old media has not matched the characteristics (characteristics, abilities and experience) of the students, because the operation is not in accordance with the standard of API 1104.

Learning media for welding practice of vertical axis position pipe (2G) with GMAW process are GMAW 3 Phase transformer 2T and 4T, CO₂ gas tube, new medium of pipe welding, soft steel pipe 4 inch in diameter 3 mm thick, GMAW wire with diameter 0,8 mm, anti-spray paste, pliers, Digital camera, and Personal Protective Equipment.



Figure 1. Installing instructional media.

New media sections: Rail, Nozzle holder, DC Adapter, Action Camera, and Smartphone / Laptop.

4.2. Discussion

- Student misconceptions about pipe positioning on old media usage are minimized by new media.
- Preparation of the driving speed control mechanism; 2) Testing the driving speed mechanism; 3) Installation of visual control system and digital image processing; 4) Experimental installation of visual control applications and digital imagery; and 5) Pipe welding process.
- The addition of power supply cable length from two meters to three meters, tooth wheel lubrication and pulley with grease, 4T mode operation on GMAW transformer.

5. Research data analysis

5.1. Research findings

5.1.1. *Data value of knowledge test.* Below is presented table of the result of knowledge or cognitive assessment of learners after the use of new learning media.

	Score of TPL-1	Score of TPL-2
N Valid	30	30
Mean	82.2000	82.0833
Median	82.5000	82.5000
Mode	80.00	82.50
Std. Deviation	3.96450	3.88872
Variance	15.717	15.122
Range	15.00	15.00
Minimum	75.00	75.00
Maximum	90.00	90.00
Sum	2466.00	2462.50

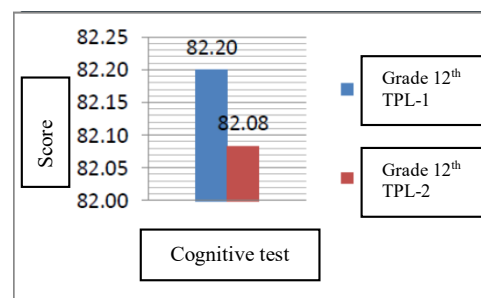


Figure 2. Graph of average score of cognitive test.

Based on graph 4, it is known that the average value difference between class XII TPL-1 and 2 is 0.12 where the average value of class XII TPL-1 is greater than the average value of TPL-2 class.

5.2. Discussion of research data analysis results

The result of assessment after using the media tool of welding practice of vertical axis position pipe (2G) obtained the average value of class XII TPL-1 of 82.20 with the highest value of 90.00 and the lowest 75.00, while class XII TPL-2 after using the device Practical learning media has an average grade value XII TPL-2 of 82.08 with a high of 90.00 and a low of 75.00. With the obtained average it can be seen that the development of students' skills after using the media tool learning practice of welding pipes that have been developed.

6. Conclusions, implications and recommendations

6.1. Conclusion

The conclusions of this study are:

- The results of the definitions indicate a student misconception about the position of the pipe when welded.
- Design results in the form of drawing of learning media practice of welding practice of vertical axis position pipe (2G) with GMAW process.
- The result of development of instructional media of welding practice of vertical axis position pipe (2G) with validated GMAW process.
- The results of dissemination show the results of post media assessment with the average score of 82.20 students for class XII TPL-1 and 82.08 class XII TPL-2.

6.2. Implications

- Learning media welding practice of vertical axis position pipe (2G) with GMAW process has been able to improve student competence,
- Learning media have been able to minimize student misconceptions about rotation and shift of pipe position on welding of vertical axis position pipe (2G) with GMAW process.

6.3. Recommendations

- The practice welding practitioner of the vertical axis position pipe (2G) with the GMAW process is recommended using the old learning medium only for cutting and pipe-feeding,
- The welding technician is able to help the teacher prepare the welding device of the vertical axis position pipe (2G) with the GMAW process that has been developed.
- Students welding techniques can use welding learning learning media that has been developed,
- The principal issues a policy of teacher creativity development in the manufacture or development of weld learning practice media and / or other competencies.

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