

PAPER • OPEN ACCESS

Development of interactive learning media in producing straight gears of milling subjects

To cite this article: D Rahdiyanta *et al* 2020 *J. Phys.: Conf. Ser.* **1446** 012011

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the [collection](#) - download the first chapter of every title for free.

Development of interactive learning media in producing straight gears of milling subjects

D Rahdiyanta*, H T Prasetya, and R Rezani

Department of Mechanical Engineering Education, Universitas Negeri Yogyakarta, Indonesia

*dwi_rahdiyanta@uny.ac.id

Abstract. This study aims to develop interactive learning media produce straight gears in subjects of milling machining. This type of research is research and development. Media development procedures include the identification stage, the design and development stage, the validation stage, user responses and the final product results. Data collection techniques are done by observation, interviews and questionnaires. Data analysis techniques using quantitative descriptive techniques. This research resulted in an interactive learning media produce straight gears at 284 MB in the form of files. *exe* which is equipped with images, video, audio and animation. Assessment of the appropriateness of interactive learning media produce straight gears from media experts get grades with very good categories, from material experts get assessments with good categories, from teachers get grades in very good categories, and from student responses get grades in very good categories.

1. Introduction

Vocational High School (VHS) is a form of formal education provider that is designed to produce human resources who are ready to work, skilled, and competent both in the industrial and business world. The Vocational School of Machining Engineering is prepared to equip students with the knowledge, skills and attitudes in the field of mechanical engineering to become personal professionals and certainly able to compete. This of course also needs support from schools in implementing learning arrangements in the context of real workplaces, meaning not only learning academically but also the importance of involvement from the workplace. Work-based learning (WBL) is one model that students are expected to be able to develop attitudes, knowledge, and skills from experience in two places, namely at school and at work/industry to gain real experience from the workplace [1]. This is relevant with the results of research conducted by Rahdiyanta, Nurhadiyanto, Munadi (2019) which concluded that the WBL learning process is more dominant in influencing students' readiness in machining practices [2].

Milling machining technique is a subject of theory and practice which is one of the competency skills that students must master. Theory is given to students as provisions in carrying out practice. One of the jobs in the subject of milling machining techniques is the manufacture of straight gears which are the basic jobs that students must do before entering more complex jobs.

The results of observations and interviews conducted on students of class XI Mechanical Engineering Department at SMK Ma'arif Salam obtained results that the process of delivering material is done using the lecture method and using a job sheet as the medium. Students feel that the delivery of



material is not interesting and difficult to understand, where it is seen from the enthusiasm and activeness of students in learning that tends to be low. The results of the interview with the subject teacher obtained information that students encountered obstacles in understanding the basic theory of making straight gears. The results of research conducted by Purwoko (2016) conclude that there is a positive and significant relationship between the understanding of the milling machining theory and the performance of the milling machining work practices [3].

Submission of materials with methods lectures tend to be less effective and make the students become bored, it is not in line with the pattern of teaching to the curriculum in 2013 centered on students where the requires students to be active, critical and based multimedia tool. Interactive learning media is expected to be able to make students motivated to learn their own materials provided in the media [4]. The advantage of developing learning media using multimedia is the ability to integrate text, graphics, animated images and videos [5]. One application that can be used for the development of interactive media is *Adobe Flash CS 6*, where this application has various advantages that support in making interactive learning media. These advantages are that it can create interactive buttons with a movie or other object, can make color transparency in a movie, can make animated changes from one form to another, can make animated movements by following a predetermined path, can be converted and published into several types include swf, html, gif, png, exe and mov, can process and create animations from bitmap objects, vector-based flash animation programs have flexibility in creating vector objects and are integrated with *Adobe Photoshop* and *Illustrator* [6].

Based on the description that has been explained before, it is necessary to develop interactive learning media produce straight gears on the subject of milling machining techniques and need to know related to their feasibility in learning. The use of interactive learning media is expected to help students in the learning process and can increase student interest and learning achievement.

2. Method

This research uses research and development with results in the form of interactive learning media products. This study uses a development model according to *Borg and Gall* that has been developed, covering several stages, namely the identification stage, the design and development stage, the validation stage, user responses and the final product results. The study was conducted at VHS of Ma'arif Salam in the 2018/2019 school year, the time of implementation in May 2019. The subjects in this study were media experts, material experts, teachers supporting milling machining engineering subjects, and 26 students of XI TM A class VHS of Ma'arif Salam. The object of this research is the development of interactive learning media produce straight gears suitable for use in learning milling machining techniques.

Data collection techniques used were observation, interviews and questionnaires. Observation unstructured done by observing the learning process of milling machining techniques. Interview respondents were teachers of milling machining subjects and a number of class XI TM A students. Questionnaires were used to determine the responses of media experts, material experts, teachers and students. The questionnaire uses a Likert scale with 4 alternative answers namely very good with a score of 4, good with a score of 3, poorly with a score of 2 and not good with a score of 1.

The data analysis technique used is quantitative descriptive. Percentages and average scores are used to determine the level of media developed. The determination of eligibility is calculated using equations 1 and 2.

$$\text{Percentage of Appropriateness} = \frac{\text{Score obtained}}{\text{Expected score}} \times 100\% \quad (1)$$

$$\text{Average score} = \frac{\text{Total score from questionnaire}}{\text{Number of respondents} \times \text{Number of instruments}} \quad (2)$$

The product appropriateness value is set at a minimum that is in good classification. Classification of the feasibility level of learning media using table 1.

Table 1. Classification of appropriateness

Value Interval	Percentage	Classification
> 3.25 to 4.00	> 81.25 to 100	Very good
> 2.50 to 3.25	> 62.50 to 81.25	Good
> 1.75 to 2.50	> 43.75 to 62.50	Poorly
1.00 to 1.75	25 to 43.75	Very not good

3. Result and Discussion

Development of interactive learning media in producing straight gears using the *Borg and Gall* development model has been developed includes several stages, namely the identification stage, the design and development stage, the validation stage, as well as user responses and final product results.

The identification idea stage is carried out to determine the target learning media needs, namely vocational students of the Department of Mechanical Engineering. The problem identification stage is done by observation and interview which are analyzed descriptively based on the study of relevant theories. The design and development stage is carried out by collecting material followed by making media designs through the creation of flowcharts and story boards where this is used as an illustration and reference in making media using the Adobe Flash CS 6 application.

The validation stage is the appropriateness assessment stage media by media experts based on two aspects, namely the display and aspects of media use as well as the stage of media appropriateness assessment by subject matter experts based on three aspects, namely the material quality, the content of the material aspects and aspects of learning strategies; as well as lesson teachers to assess the appropriateness and effectiveness of the media in learning.

Figure 1 illustrates that based on the assessment of media experts, the quality aspect of the display to get a mean score of 3.33 with a percentage of 83.33% which is included in the classification is very good and for the quality aspects of the use of the media to get a mean score of 3.1 with a percentage of 77.5%, which included in the classification good. The data analysis of the appropriateness of the overall media experts obtained a mean score of 3.24, with a percentage of 81% are included in either classification.

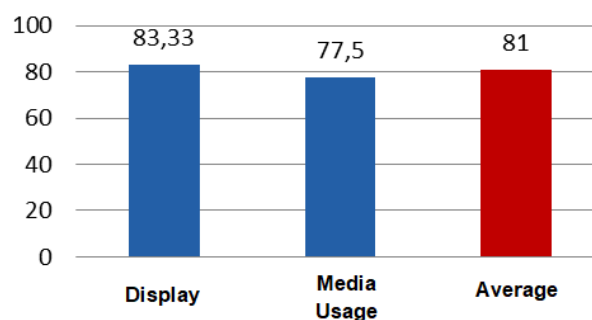


Figure 1. Chart of media expert appropriateness

Figure 2 illustrates that by assessing the appropriateness of materials experts, aspects of quality material to get a mean score of 3 with a percentage of 75% which is included in the good classification, aspects of the content of the material to get a mean score of 2.81 with a percentage of 70.45% which is included in the classification of good and to the quality of the aspects of the

learning strategy get a mean score of 3 with a percentage of 75% included in the good classification. Analysis of the appropriateness data from the material experts as a whole obtained a mean score of 2.9 with a percentage of 72.5% included in the good classification.

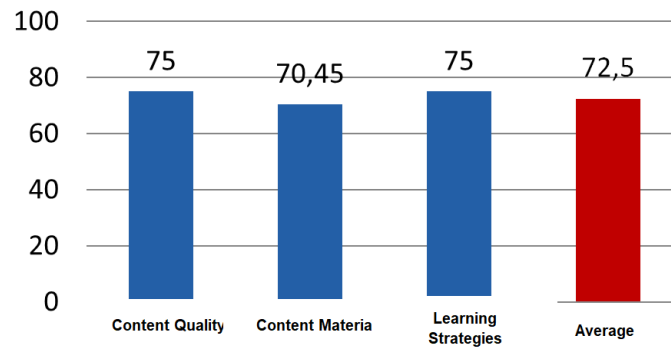


Figure 2. Chart of appropriateness of expert material

Figure 3 explains that based on the assessment of supporting teachers, the quality of the display aspect gets an average score of 3.8 with a percentage of 95% which is included in the classification is very good, for the quality aspects of the use of media get the average score of 3.9 with a percentage of 97.5% included in the classification very good, the aspect of material quality gets a mean score of 3.85 with a percentage of 96.43% which is included in the classification very good, the content aspect of the material gets a mean score of 3.81 with a percentage of 95.45% which is included in the very good classification and for the quality aspect learning strategies get a mean score of 4 with a percentage of 100% which is included in the classification very well. The data analysis of the appropriateness of the teacher obtained a mean score of 3.84 with a percentage of 96.1% which is included in the classification is very good.

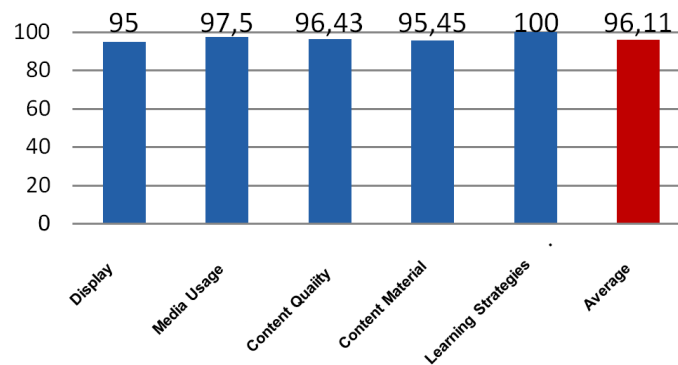


Figure 3. Chart of teacher appropriateness

The user evaluation of interactive learning media produce straight gears by students was carried out by 26 students of class XI MA in VHS of Ma'arif Salam. Assessment is based on 3 aspects, namely aspects of appearance, aspects of the material and aspects of learning. Assessment of the display aspects to get a mean score of 3.25 with a percentage of 81.47% which is included in the classification is very good, the material aspect ratings gain mean score of 3.29 with a percentage of 82.37% which is included in the classification is very good and the learning aspect to get the mean score 3.39 with a percentage of 84.94% were included in the classification is very good. Analysis of overall student assessment data obtained an average score of 3.30, with a percentage of 82.64% which is included in the classification is very good.

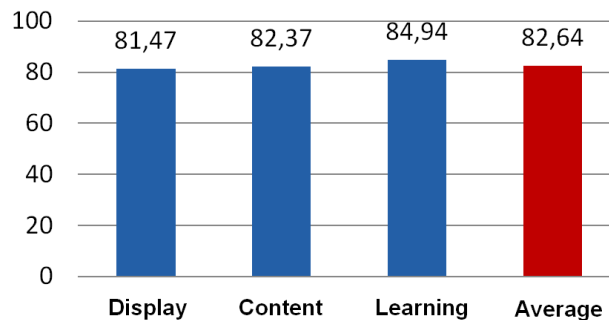


Figure 4. Student rating chart

Learning media that have been declared worthy are then tested in learning. Student responses are conducted to determine the usefulness of the media for students in learning. Student input is a reference for the improvement of the end of the media before it is distributed.

Table 2. Responses from students

Student's Name	Comments/Suggestions
A	The media is good but can be improved again
B	The appearance can be enhanced again, the background and color selection can be improved
C	Practice questions can be added more
D	The material is reproduced so students can understand more
E	Very interesting
F	-
G	-
H	The application is quite good, makes learning more enthusiastic
I	Submission of gear material is good
J	Very interesting
K	Very good
L	-
M	Great
N	Interesting, makes it easy for gears
O	Great
P	The sound is not loud enough
Q	-
R	Learning media using a PC is very interesting
S	Good
T	The sound is not loud enough
U	Videos can increase students' understanding of the process of making gears
V	The media is good but the video is shortened
W	It's appropriate to be used for teaching in class
X	The application is quite good
Y	-
Z	More helpful

4. Conclusion

Based on research and development that has been carried out produced an interactive learning media produce straight gears of 284 MB in the form of files *exe* which is equipped with images, video, audio and animation. Assessment of the appropriateness of interactive learning media produce straight gears from media experts get grades with very good categories, the appropriateness of material experts

to get assessments with good categories, teacher ratings get grades with very good categories, and student use responses get grades with very good categories.

References

- [1] Lynch R L and Harnish D 1998 Preparing pre-service teachers education students to used work-based strategies to improve instruction. In *Contextual teaching and learning: Preparing teachers to enhance student success in the workplace and beyond* (Columbus: OH: ERIC Dearing house on Adult, Career, and Vocational Education) pp. 127-158
- [2] Rahdiyanta D, Nurhadiyanto D, Munadi S 2019 *Int. J. of Instruction* **12** p 307
- [3] Purwoko R 2016 *J. Pendidikan Vokasional Teknik Mesin* **4** p 117
- [4] Suyitno 2016 *J. Pendidikan Teknologi dan Kejuruan* **23** p 101
- [5] Munir M 2014 *J. Pendidikan Teknologi dan Kejuruan* **22** p 184
- [6] Madcoms 2012 *Kupas Tuntas Adobe Flash CS6* (Yogyakarta: CV Andi Offset)