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# THE DEVELOPMENT OF THE COURSE MODULE OF MANUFACTURING ENGINEERING DRAWING FOR VOCATIONAL STUDENTS

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**ABSTRACT**

This research developed a learning modules that fit the curriculum and determine the level of eligibility to be applied in learning of Manufacturing Drawing Engineering. This research applied a Research & Development methode with the 4D model from Thiagaradjan, that are Define, Design, Develop, and Disseminate. The developed course module was validated by material and media experts which is presented using Likert scale. The results of the validation from the lecturers as material experts scored 3,33 in very feasible category, the validation from the lecturers as media experts scored 3,35 in very feasible category, the validation from the teachers as material experts scored 3,04 in feasible category, and the validation from teachers as media experts scored 3,35 in very feasible category. Products that have been developed and revised were tested on 30 students of XI class in Mechanical Engineering department of SMK Negeri 3 Yogyakarta by distributing evaluation questionnaires to find out the responses of students. The product got a score 3,58 from the students in very feasible category. The module received a very feasible evaluation from lecturers as a material and media experts, teachers as a media experts, and students. The module received a feasible evaluation from teachers as a material experts.

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## INTRODUCTION

Education in the development era of science and technology is an important need for humans because it plays a role as a determinant of the human resources quality. Law of the Republic of Indonesia number 20 of 2003 concerning the National Education System chapter 2 article 3 states that national education is organized to develop character and abilities, as well as superior national civilization, aimed at developing the potential of students to be faithful and pious, have noble character, be healthy, knowledgeable, capable, creative, independent, as well as being a democratic and responsible citizen. Sujana (2019) stated that education is an effort to help students move towards a more humane and better civilization, both physically and mentally. Education is carried out to help students prepare themselves

to face future demands, such as work demands, by forming of discipline, responsibility, mutual respect and mutual cooperation attitudes (Gafurov, 2021). Education also functions to form a good and strong background in students, as well as bringing out the natural intelligence that students have (Muzyka et al., 2021).

The world of education will never be separated from learning. Learning is the process of changing individuals and groups in a better direction through interaction with fellow individuals and the environment based on teaching and training. This goal can be obtained by there is a learning process. This is in accordance with what was conveyed by Setiawati (2018) that learning is seeking information or new knowledge of something already exist in nature. This goal can be obtained by there is a learning process. Suyarova et al. (2020) stated that education aims to shape the character of individuals who differentiate them from other individuals by providing training and teaching.

Arifin (2012) explained that learning is a process experienced by individuals to learn. The teacher must provide a process creative and not learning boring. Meanwhile, students must have high motivation to follow learning. Under these conditions, students can easily understand a variety of teaching materials. According to Suroto (2015), activities learning is an activity within the framework implement an institution's curriculum education to make an impact to students to achieve goals predetermined learning.

Prasetyo (2016) presented that technical drawings is a combined scientific discipline between theory and practice. Preda (2020) stated that Technical drawing is material that involves image visualization equipment such as computers in learning and forms discussion situations between students and teachers in relation to guiding and observing. In learning theory, often a visual presentation is needed in order to students more easily understand the material. Examples of material that requires deep visualization the delivery is a projected image and cut, both projection and cut type, presentation and production. Therefore, the method of delivery must be made attractive possible.

Based on an interview with one of the teachers Manufacturing Drawing Engineering at SMK Negeri 3 Yogyakarta, the learning way which had been used is a conventional way by using powerpoint presentation and discussion. When the teacher gives the material using powerpoint, students tend to be passive. Often there are several students who lagging behind in understanding the material and force teacher to repeat the material and interfere with the learning process of students other. In practice, students have difficulty when practicing in accordance with the materials provided been studied. Some of them have been forgotten regarding the material that has been explained and ask the teacher to explain the material again. This is very influential independent assignment time so often students cannot complete assignments.

A product development is needed that can help students' learning, one of which is a module. According to Yunita et al. (2014), A module is a form of teaching material or learning tool that is arranged regularly so that users can learn independently wherever and whenever. Setiyadi et al. (2017)

also argues that modules are teaching materials that have been designed systematically and adapted to a particular curriculum and are presented in the form of the smallest learning units so that they can be studied independently within a certain time period . The lesson materials listed in the module help the students can be more independent. With the module, the students are encouraged to study the materials, not only listening the teacher. The students are able to learn outside the class.

From the description above, research is needed to develop a product in the form of a module that is suitable for use in learning at SMK Negeri 3 Yogyakarta. The modules that have been developed can help students if they experience difficulties in learning and can help find solutions to problems.

## METHOD

This research was carried out using a Research and Development model to create or develop a product, either a new product or a pre-existing product, so that it can be accounted for (Aeni et al., 2019), in this case a 4D model which consists of 4 steps, include Define, Design, Develop and Disseminate was performed.(Prastyawati et al., 2015). SMK Negeri 3 Yogyakarta was chosen as the research and development site. The targets in this research include material and media experts, as well as students from class XI of the Department of Mechanical Engineering at SMK Negeri 3 Yogyakarta. Material experts consist of 1 lecturer in Mechanical Engineering Education FT UNY and 1 teacher in Mechanical Engineering department SMK Negeri 3 Yogyakarta. Media experts consisted of 1 lecturer of Mechanical Engineering Education FT UNY and 1 teacher of Mechanical Engineering department SMK Negeri 3 Yogyakarta.

The 4-D development procedure can be seen in Figure 1 (Thiagarajan et al., 1974).

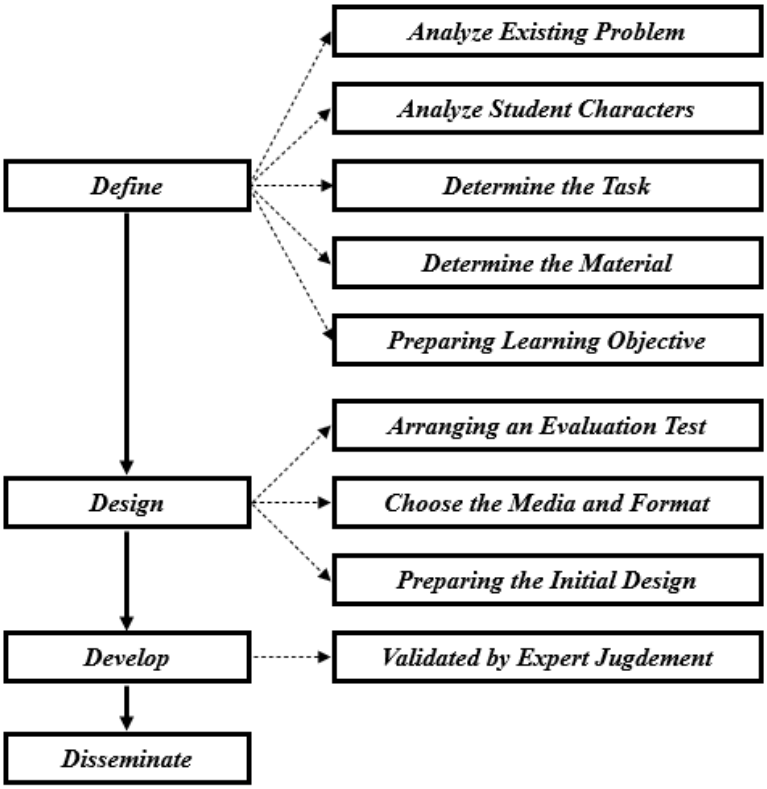


Figure 1. The 4-D Development Procedure

The first stage carried out by researches is define where the researches analyze existing problem, analyze students characters, determine the tasks that will be given, determine the material that will be included, and prepare learning objectives. The second stage carried out by the researches is design where the researches arranges an evaluation test, choose the media, choose the format, and prepares the initial design of the module. The third stage carried out by researches is development where the module was validated by material and media experts, as well as assessed by students as users. The fourth stage carried out by reserches is dissemination where the module which has been revised according to the input of experts and students as users will disseminate its use to teachers and students in the Mechanical Engineering Department of SMKN 3 Yogyakarta.

Data collection was carried out by interviews and questionnaires. Interviews with SMKN 3 Yogyakarta teachers as resource persons were carried out in a structured manner to collect data regarding the curriculum used, learning objectives and material emphasized, as well as learning activities in class. Interviews were conducted directly at the school. Meanwhile, questionnaires are used to carry out validation given by material and media experts. Questionnaires are also given to students as potential users of the module to assess the module.

The instruments used for data collection were interview instruments, experts validation instruments, and students assessment instruments. Interview instrument consists of a list of questions for the interviewee. Expert validation instrument consists of instrument of validation for material and media experts. Instrument of validation for material experts consists of a grid that covers several aspects,

namely contents, language, presentation, and benefit. Instrument of validation for media experts consists of a grid that covers several aspects, namely appearance, content, consistency, and graphics. Assessment instrument for students consists of a grid that covers several aspects, namely content, language, graphics, and benefits which later the assessment instrument was given to 30 class XI TP students. Questionnaire was arranged on a Likert scale with a 4 point scale, namely very disagree, disagree, agree, and very agree.

The data analysis technique used is a simple descriptive analysis technique. The data obtained through distributing questionnaires to material experts, media experts and students is still in the form of quantitative data so that it will later be interpreted in the form of qualitative data. Qualitative interpretation is carried out by assigning each score obtained to a category. Table 1 is a division of categories based on the range of scores that have been calculated using reference from Umar (2002).

Table 1. Distribution of Eligibility Categories

| Score Range | Category |
|---|---|
| $3{,}25 < \bar{x} \leq 4$ | Very Feasible |
| $2{,}5 < \bar{x} \leq 3{,}25$ | Feasible |
| $1{,}75 < \bar{x} \leq 2{,}5$ | Not Feasible |
| $1 < \bar{x} \leq 1{,}75$ | Very Not Feasible |

## RESULTS AND DISCUSSION

### Result of Module Development

The research and development that has been carried out to date has resulted in a product in the form of a module with a 4D model development and published in A4 size print form. The cover of the module was designed using the Corel Draw X5 application with a dominant color of gray with the addition of black and white in several parts. The cover of the module also contains images of parts from a machine as an indication of the identity of the scope of the module. The module consists of a cover page, foreword, table of contents, materials and bibliography. The material in the module consists of 8 chapters where each chapter contains the chapter title, learning objectives, concept maps, materials, and assignments that students can use to practice. The material in the module is prepared according to the curriculum implemented in the school and also adapted to the syllabus used by the teacher.

The development of this module is structured through several stages, the first is define. At this stage, researchers carry out analysis activities which include analysis of existing problems, analysis of student character, determining the tasks to be given, determining the material to be included, and preparing learning objectives. The second stage is design. At this stage, researchers carry out activities that include preparing an outline of the material, selecting media and module formats, and preparing an initial module design. The initial preparation of this module includes making the front and back cover, making a concept map, making chapter pages, preparing the material layout, arranging images for the material, and making a table of contents. The third stage is develop. At this stage, researchers carry out

activities that include validation processes from experts and assessments from students. Expert validation is carried out by material experts and media experts. Validation of material experts was carried out by lecturers from Department of Mechanical Engineering Education, FT UNY and teachers from Department of Mechanical Engineering at SMK Negeri 3 Yogyakarta.

**Validation Results from Material Expert Lecturers**

The validation results from material expert lecturers can be seen in Table 2.

Table 2. Material Expert Lecturer Validation Results

| Aspect | Final Score | Category |
|---|---|---|
| Content | 3,44 | Very Feasible |
| Language | 3,20 | Feasible |
| Presentation | 3,20 | Feasible |
| Benefit | 3,40 | Very Feasible |
| Average | 3,33 | Very Feasible |

The highest score is in the content aspect with a value of 3.44 and gets a very feasible category, and the lowest score is in the language and presentation aspect with a value of 3.20 and gets a feasible category. From the data above, it can be concluded that according to the material expert lecturer, the module is very feasible to use but must be improved in terms of language and presentation.

**Validation Results from Media Expert Lecturers**

The validation results from media expert lecturers can be seen in Table 3.

Table 3. Media Expert Lecturer Validation Results

| Aspect | Final Score | Category |
|---|---|---|
| Appearance | 3,28 | Very Feasible |
| Content | 3,50 | Very Feasible |
| Consistency | 3,33 | Very Feasible |
| Graphic | 3,33 | Very Feasible |
| Average | 3,33 | Very Feasible |

The highest score is in the content aspect with a score of 3.50 and gets a very feasible category, and the lowest score is in the appearance aspect with a score of 3.28 and gets a very feasible category. From the data above, it can be concluded that according to media expert lecturers, the module is very feasible to use but must be improved in terms of appearance.

**Validation Results from Material Expert Teachers**

The validation results from material expert teachers can be seen in Table 4.

Table 4. Material Expert Teacher Validation Results

| Aspect | Final Score | Category |
|---|---|---|
| Content | 3,00 | Feasible |

| | | |
|---|---|---|
| Language | 3,00 | Feasible |
| Presentation | 3,20 | Feasible |
| Graphic | 3,00 | Feasible |
| Average | 3,04 | Feasible |

The highest score is in the presentation aspect with a score of 3.20 and gets a feasible category, and the lowest score is in the content, language and graphic aspects with a score of 3,00 and gets a feasible category. From the data, it can be concluded that according to material expert teachers, module is feasible to use but must be improved in every aspect because has not reached the very feasible category.

**Validation Results from Media Expert Teachers**

The validation results from media expert teachers can be seen in Table 5.

Table 5. Media Expert Teacher Validation Results

| Aspect | Final Score | Category |
|---|---|---|
| Appearance | 3,57 | Very Feasible |
| Content | 3,00 | Feasible |
| Consistency | 3,33 | Very Feasible |
| Graphic | 3,33 | Very Feasible |
| Average | 3,35 | Very Feasible |

The highest score is in the appearance aspect with a score of 3,57 and gets a very feasible category, and the lowest score is in the content aspect with a score of 3,00 and gets a feasible category. From the data above, it can be concluded that according to media expert teachers, the module is very feasible to use but must be improved in terms of content.

**Student Assessment Results**

The next process is module assessment. Module assessment process was carried out by 30 class XI students in Mechanical Engineering Department at SMK Negeri 3 Yogyakarta as users. Recapitulation of student assessment results can be seen in Table 6.

Table 6. Student Assessment Results

| Aspect | Final Score | Category |
|---|---|---|
| Content | 3,63 | Very Feasible |
| Language | 3,46 | Very Feasible |
| Graphic | 3,57 | Very Feasible |
| Benefit | 3,57 | Very Feasible |
| Average | 3,58 | Very Feasible |

The highest score is in the content aspect with a score of 3.63 and gets a very feasible category, and the lowest score is in the language aspect with a score of 3.46 and gets a very feasible category. From the data above, it can be concluded that according to students as users, the module is very feasible for use.

The fourth stage is dissemination. At this stage, the researcher publishes the module in printed form and then reproduces it according to the target school that will be used as a place for disseminating the module. However, before publication, the researcher first revised the module according to input from experts and students as potential users, starting from the cover to the contents of the module.

## CONCLUSION

The developed module was carried out using a 4D model, printed in A4 size with the dominant color on the cover design being gray with the addition of black and white on some of the inside parts. The module consists of a cover page, foreword, table of contents, materials and bibliography. The material contained in the module is arranged into 8 chapters where each chapter contains the chapter title, learning objectives, concept maps, materials, and assignments that students can use to practice. The content of the module material is prepared by adapting the curriculum implemented in the school and also adapting to the syllabus used by the teacher. The material has also been adapted to the practical learning tools used in class. The module received a very feasible evaluation from lecturers as a material and media experts, teachers as a media experts, and students. The module received a feasible evaluation from teachers as a material experts. For researchers who will develop learning media at SMK Negeri 3 Yogyakarta, it is necessary to develop learning media for class XII for the 3D Manufacturing Drawing Engineering subject because there is no handbook. In addition, it is necessary to carry out further testing up to the learning stage in order to determine the contribution of using the module to the students independent learning progress.

## REFERENCES

Aeni, S., Sutrisno., & Mushafanah, Q. (2019). Pengembangan Media KOPER (Kotak Permainan) pada Tema 7 Kebersamaan. *Jurnal Penelitian dan Pengembangan Pendidikan*, 3(3), 159-165. https://doi.org/10.23887/jppp.v3i3.18158

Arifin, Z. (2012). *Evaluasi Pembelajaran (Rev Ed.)*. Remaja Rosdakarya.

Gafurov, N. M. (2021). Educational Unity and Student Development in the Process of Physical Education. *International Journal on Economics, Finance, and Sustainable Development, 3*(3), 162-167. https://dx.doi.org/10.31149/ijefsd.v3i3.1470

Muzyka, O., Lopatiuk, Y., Belinska, T., Belozerskaya, A., & Shvets, I. (2021). Modern Aesthetic Education and its Further Directions. *Linguistics and Culture Review, 5*(S4), 12-21. https://dx.doi.org/10.21744/lingcure.v5nS4.1537

Prasetyo, W. H. (2016). Pengembangan Media Pembelajaran Gambar Teknik untuk Siswa Kelas X di SMK Negeri 2 Wonosari. *Jurnal Pendidikan Vokasional Teknik Mesin*, 4(4), 253-260. https://doi.org/10.21831/teknik%20mesin.v4i4.5080

Prastyawati, L. & Hanum, F. (2015). Pengembangan Model Pembelajaran Multikultural Berbasis Proyek di SMA. *Jurnal Pendidikan IPS*, 2(1), 21-29. https://dx.doi.org/10.21831/hsjpi.v2i1.4600

Preda, A. (2020). A New Teaching Method of Improving Capacity of Visualisation and Understanding of Future Mechanical Engineers. *Technium Social Sciences Journal, 3,* 162-166. https://dx.doi.org/10.47577/tssj.v3i1.97

Setiawati, S. M. (2018). Telaah Teoritis: Apa Itu Belajar?. *Jurnal Bimbingan dan Konseling FKIP UNIPA*, 35(1), 31-46. https://doi.org/10.36456/helper.vol35.no1.a1458

Setiyadi, M. W., Ismail., & Gani, H. A. (2017). Pengembangan Modul Pembelajaran Biologi Berbasis Pendekatan Saintifik untuk Meningkatkan Hasil Belajar Siswa. *Journal of Education Science and Technology*, 3(2), 102-112. https://doi.org/10.26858/est.v3i2.3468

State Secretary of the Republic of Indonesia. (2003). *Law number 20 of 2003 Concerning the National Education System*. Indonesian Government. https://peraturan.bpk.go.id/Home/Details/43920/uu-no-20-tahun-2003

Sujana, I. W. C. (2019). Fungsi dan Tujuan Pendidikan Indonesia. *Jurnal Pendidikan Dasar*, 4(1), 29-39. https://doi.org/10.25078/aw.v4i1.927

Suroto. (2015). Penggunaan Model Pembelajaran *Explicit Instruction* dengan *Trainer PLC* untuk Meningkatkan Prestasi Belajar Merakit Sistem PLC. *Jurnal Pendidikan Teknologi dan Kejuruan*, 22(3), 316-323. https://doi.org/10.21831/jptk.v22i3.6838

Suyarova, S. E., Ravshanova, N. K., Yakubova, l. G., & Abdullaeva, S. S. (2020). Enriching the Quality of Education in Uzbekistan and Strengthening the Legal Framework. *International Journal on Economics, Finance, and Sustainable Development, 2*(11), 7-9. https://dx.doi.org/10.31149/ijefsd.v2i11.794

Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). *Instructional Development for Training Teachers of Expectional Childres*. University of Minnesota.

Umar, H. (2002). *Metode Penelitian dalam Aplikasi Pemasaran*. Gramedia Pustaka Utama.

Yunita, I. E., & Hakim, L. (2014). Pengembangan Modul Berbasis Pembelajaran Kontekstual Bermuatan Karakter pada Materi Jurnal Khusus. *Jurnal Pendidikan Akuntansi*, 2(1), 1-6. https://ejournal.unesa.ac.id/index.php/jpak/article/view/32727/29498