Developing Module of Conventional Vehicle Fuel Systems

M Arif, Sukaswanto, B S Nugraha and A Fatah
Department of Automotive Engineering Education, Universitas Negeri Yogyakarta, Indonesia
E-mail: benisetyanugraha@ymail.com

Abstract. This study aims to (1) produce a Grade XI Conventional Fuel System Module Product at SMK Muh 1 Bambanglipuro; (2) validate the feasibility of a conventional fuel system module in SMK Muh 1 Bambanglipuro. This study is a research and development (R & D), conducted at SMK Muh 1 Bambanglipuro. The approach refer to the ADDIE model consists of 5 stages; (1) analysis; (2) design; (3) development; (4) implementation; (5) evaluations. Module design validation consists of two aspects: material validation and media validation. The study involved 24 students of Grade XI of Light Vehicle Engineering (LVE) class as the product users. Data collection is carried out using a questionnaire. The data analysis technique is descriptive quantitative, confirmed to the feasibility scale table. After validation and some revisions, the final product of the module packed in 21 x 14.8 cm paper size, consists of 81 pages. The feasibility assessment of the module product score is 78.34%, considered as very feasible.

1. Introduction
Educating the nation's life is one of the goals of the Indonesia as a developing country, as stated in the Preamble to the 1945 Constitution. According to Education has a significant role in preparing qualified and competent human resources (HR) to be able to support the progress of the nation so that it can overcome the challenges of globalisation in the era of the Asean Economic Community (AEC).

The development of the world of education in Vocational High Schools (SMK) is always related to the development of the curriculum which is always updated along with the development of technology and knowledge. The current curriculum applied in Indonesia is the 2013 year curriculum, namely Kurikulum Tingkat Satuan Pendidikan (KTSP). The implementation of the KTSP curriculum show the Indonesian government willingness on improving the education quality especially SMK graduates quality.

The quality of SMK graduates can be said to be good if the learning process is also going well. The implementation of the learning process is influenced by several factors, including curriculum, school management, teaching staff, the learning process, facilities and infrastructure, tools and materials, and the school environment. The learning process is something that needs to be considered in the implementation of a school institution ranging from elementary schools (SD) to tertiary institutions (PT). SMK is one of the school institutions that requires attention in the learning process, considering that SMK has a special purpose, namely to prepare students or prospective graduates who are ready to work in a particular field in accordance with their respective competence of expertise. Automotive Light Vehicle Engineering (TKRO) is a competency expertise in the field of automotive
engineering that emphasizes expertise in the field of mastery of repair and maintenance of light vehicles. The competency of light vehicle engineering expertise prepares students to work in the field of light vehicle maintenance and repair services in the business/industrial world.

SMK Muhamadiyah 1 Bambanglipuro is a vocational school that has 5 expertise programs, namely Agribusiness Processing of Agricultural Products (APHP), Software Engineering (TRPL), Motorcycle Engineering and Business (TBSM), Multimedia Engineering and Automotive Light Vehicle Engineering (TKRO). Each department has supporting subjects to achieve competent and professional graduates in order to be able to compete when entering the work field. In order to improve student competence, especially in the field of engine maintenance, there are several subjects, one of which is the subject of Light Vehicle Engine Maintenance (PMKR).

2. Methodology

The study method is Research and Development (R & D). According to Mulyatiningsih (2011: 145) there are so many development products of education such as: models, learning media, text books or references, modules, evaluation tools and learning tools. This study aims to develop instructional media products. This study uses the ADDIE development model. According to Mulyatiningsih (2011: 183) ADDIE stands for Analysis, Design, Development, Delivery and Evaluations. This approach model more complete than the 4D model, can be used for various forms of product development such as learning strategies, learning methods, media and teaching materials, etc.

This study aims to develop a learning module as the final product. The developed module will be assessed to media experts, material experts, linguists, educators and students as respondents to learning media. This learning module aimed be used in the learning process of Conventional Fuel Systems.

2.1 Time and Place of Research

This research was conducted in November 2019, at SMK Muh 1 Bambanglipuro which is located at Jl. Samas Km. 2,3 Sumbermulyo, Bambanglipuro, Bantul, Special Region of Yogyakarta.

2.2 Research Target

Research target/respondents of this study were lecturers of material experts, lecturers of media experts and students of SMK Muhammadyah 1 Bambanglipuro class XI of light vehicle engineering. Lecturers of media experts and material experts act as validators while students are respondents in product trials.

2.3 Development Process

The study development process divided into several stages; starting by a pre-research where at this stage, the author conducting an observation as a basis for research; preparation of modules as the learning material, module validation by media experts and material experts. Revise the product according to the advice of each expert. Research is the next stage that researchers do by distributing questionnaires to respondents to fill out a questionnaire. Evaluating research results is the final research process. Data collection method in this research was closed type questionnaires, where the answers are provided and the respondents are asked to provide answers to the questions according to the actual situation. Respondents involved in data collection were lecturers (material and media experts) and students as the module users. The experts and users feedback is used as the basis for making improvements in terms of material and media of the product being developed.

2.4 Research Instruments

The instruments consist of three types of questionnaires tailored to the validator. The arrangement of the instrument measurement scale on the questionnaire used a Likert scale model. The Likert scale is a psychometric scale commonly used in questionnaires (Mulyatiningsih, 2013: 29). There are four alternative answers: strongly agree, agree, neutral and disagree. The highest score is 4 with the alternative answer is very good (very good), and the lowest score is on number 1 with the alternative answer disagree (not good). The questionnaire is a questionnaire for media experts, a questionnaire
for material experts, and a questionnaire for students. The instrument grid developed by the researcher refers to the criteria for assessing the feasibility of the learning module according to BNSP (2008). The instrument for media experts contains module suitability seen from the aspects of the module language and module characteristics.

Table 1. The Module Language and Module Characteristics

| No | Assessment Aspects          | Indicator                      |
|----|-----------------------------|--------------------------------|
| 1  | Graphics                    | Module Size                    |
| 2  | Appearance Feasibility      | Module Cover Design            |
| 3  | Completeness of Modules     | Module Content Design          |

The instrument for material experts contains the suitability of the module to reveal the material quality of the module.

Table 2. Material Quality of The Module

| No | Assessment Aspects          | Indicator                           |
|----|-----------------------------|-------------------------------------|
| 1  | Content eligibility         | Suitability of material with SK and KD |
|    |                             | Material accuracy                   |
|    |                             | Encourage curiosity                 |
| 2  | Serving Feasibility         | Presentation technique              |
|    |                             | Serving support                     |
|    |                             | Presentation of learning            |
| 3  | Language                    | Straightforward                     |
|    |                             | Compliance with language rules      |

Response sheets for students contain module suitability seen from the aspects of module attractiveness and module benefits.

Table 3. The Aspects of Module Attractiveness and Module Benefits

| No | Assessment Indicators |
|----|-----------------------|
| 1  | Interest              |
| 2  | Theory                |
| 3  | Language              |

2.5 Data Analysis

The percentage descriptive data is applied to analysis the data, a technique by giving a score on the choice of questions which are also described in the form of sentences or assessment categories. The percentage descriptive analysis technique was performed using descriptive statistics.

Qualitative data regarding the module quality were obtained in the form of criticism, suggestion and revisions from material and media experts during the validation process for the improvement of the module development. Quantitative data were obtained through numerical data from questionnaires in the form of scores/answers about product quality from material and media, as well as data feasibility trials on students.

The quantitative data collected through questionnaires were analyzed descriptively by percentage. The process of calculating the percentage is carried out by dividing the observed score by the expected score, then multiplying it by one hundred percent (Sugiyono, 2015: 133), as in the following equation:

\[
\text{Feasibility Percentage} (\%) = \frac{\text{Observed Score}}{\text{Expected Score}} \times 100\%
\]
Since the percentage of data that has been calculated is the percentage of feasibility formula, the feasibility of developed module in this development research can be classified into four feasibility categories using the Likert scale according to Arikunto (1993: 208). The percentage level of eligibility as shown in the table 4.

Table 4. Feasibility Level

| Percentage of Achievement | Score Value | Interpretation     |
|---------------------------|-------------|--------------------|
| 76 – 100%                 | 4           | Very Worth it      |
| 56 – 75%                  | 3           | Well worth it      |
| 40 – 55%                  | 2           | Not worth it       |
| 0 – 39%                   | 1           | Not feasible       |

3. Result

This research and development was carried out at SMK Muh 1 Bambanglipuro, Bantul, Yogyakarta with 24 students as the test subjects of class XI A Light Vehicle Engineering to determine the feasibility of using modules. It is hoped that the development of this book can improve the quality of learning so that it is more optimal, especially in theory learning. This research was developed using the modified research and development stage of Sugiyono. There are 8 stages of development conducted in this study, they are: (1) potential and problems; (2) data collection; (3) module design; (4) module validation; (5) module revision; (6) module feasibility test; (7) final revision of the module; and (8) finished module. The result of this research and development is a conventional fuel system module for class XI.

This research is conducted to develop and determine the feasibility a Grade XI Conventional Fuel System Module at SMK Muh 1 Bambanglipuro. This module contains learning theory of conventional fuel systems. Learning theory contains basic competencies, learning objectives, learning materials and evaluation questions.

Based on its presentation, this module includes a learning module, which is a module that contains material descriptions of certain subjects that are systematically arranged and have been selected based on certain objectives. The module is made using A5 paper (148 x 210 mm) with a paper weight of 80 grams. The module is typed using the Arial font type with a standard font size of 11 and a spacing of 1.5. The module consists of 81 pages.

The results of the assessment of the conventional fuel system module material expert: (1) the content feasibility aspect obtains an eligibility percentage of 77.78%, (2) the presentation feasibility aspect obtains an eligibility percentage of 71.4%, (3) the language aspect obtained an eligibility percentage of 68.75%. Overall, the book products made by researchers received an assessment of material feasibility from material experts by 72.64% with the criteria of "Eligible".
Suggestions and comments from material experts both from the results of evaluation data and consultations conducted between researchers and material experts then the next step is to revise the program according to suggestions. Revisions made according to material expert advice include:
1. Adding material to learning activities 1.
2. Improvements to the preface.

![Image](image1.png)

**Picture 2. Assessment by Media Expert**

The results of the assessment of media experts on the conventional fuel system module above can be seen that the assessment of media experts in terms of (1) the graphic aspect obtains a module feasibility percentage of 75% (2) the display feasibility aspect obtains an appropriate percentage of 82.14%, (3) the completeness aspect modules obtain an eligibility percentage of 75%. Overall, the module products made by researchers received an assessment of media feasibility from media experts by 77.38% with the criteria of "Very Appropriate".

Revision of media experts is carried out based on suggestions and comments from media experts on the data validated by media experts and consultations between researchers and media experts. The revisions included:
1. Improvements in chapter 1.
2. Adding pictures to learning activities 1.
3. Improvements to the bibliography.

![Image](image2.png)

**Picture 3. Module Feasibility**

Based on the research data score using the Likert scale to test the feasibility of books by 24 students (respondents) obtained by filling out a questionnaire, it can be seen that the book feasibility assessment in terms of (1) the aspect of interest obtains an eligibility percentage of 77.95%, (2) the material aspect obtains the percentage of feasibility is 75.15%, and (3) the language aspect gets the percentage of the feasibility of 81.94%. Overall, the book products made by researchers received an assessment of the feasibility of students by 78.34% with the criteria "Very Appropriate".

4. **Conclusion**
Research conclusions: 1. Conventional fuel system module products for class XI contain: front cover, preface, glossarium, table of contents, list of pictures, chapter 1, chapter 2, chapter 3, bibliography,
and back cover. Chapter 1: descriptions, prerequisites, instructions for using modules, basic competencies, and learning objectives. Chapter 2 contains learning activities which include: learning objectives, material descriptions, material summaries, and formative tests along with answer keys to measure student understanding in each learning activity. Chapter 3: evaluation sections which contains questions and answers that are used to determine students’ understanding in understanding the material of conventional fuel systems. The developed module size is 21 x 14.8 cm with a thickness of 9 mm which consists of 81 sheets. 2. The feasibility of the developed module for Grade XI at SMK Muh 1 Bambanglipuro in terms of material validation by material experts obtains a feasibility percentage of 72.64% (feasible), from media validation by media experts a percentage of 77.4% (very feasible), and from the feasibility test of the module product by 24 students got a percentage of 78.34% (very feasible). Overall assessments by material and media experts, and student trials of the developed module obtained a percentage of 76.26% so that the conventional fuel system module developed by the researcher is very suitable for use as a learning medium in the subject of light vehicle engine maintenance in the TKR class at SMK Muh 1 Bambanglipuro.

Based on the research results, conclusions and limitations above, the suggestions given in this study are:

1. Teachers can utilize and use module media developed by researchers as a medium of learning in theoretical and practical learning so that learning is more varied and directed.
2. It is recommended for Grade XI students of TKR class at SMK Muh 1 Bambanglipuro, to own the learning module as a learning resource both at school and to study independently at home.

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