

Zerosicks, Health and Safety Electrical Module in Vocational Education Management

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Abstract: The research aims to: (1) develop training modules, (2) find out the feasibility level in terms of material aspect, (3) find out the feasibility level in terms of media aspect, (4) find out the response of the users regarding the developed electrical health and safety training modules based Zerosicks model. This research conduct with R&D approach consists of 4-D stages: define, design, develop, and disseminate. The subjects of this study were material experts, media experts and 35 students at Electrical Engineering Study Program, Yogyakarta State University. Research findings According to material expert 1, modules feasibility got 70.7% and categorized as "feasible" and categorized "highly feasible" for Material expert 2 with a percentage of 92.1%. Material expert 3 got 78.6% categorized as "feasible". According to media expert 1 got 81.5%. Media expert 2, is 86.5%, and media expert 3 with 93.5%. The last, assessment of user responses which included material and media aspects got 85.3% and 86.4% respectively, with both categorized "highly feasible". It's mean the electrical health and safety module based on Zerosicks with the android operation is originality highly feasible implemented in electrical vocational education management. The benefit of this module is using familiarity, generating creativity, and understanding quickly. Unsafe behaviour evaluation can be limited to this research.

1 INTRODUCTION

Along with the increasingly modern technological developments, electricity has an essential role in everyday life and Industry. Electricity has become a staple for some people as if it cannot live without electricity. Electricity has driven many of the tools that make life more comfortable. The increasing need for electricity is a reason for the need for a proper and safe electrical installation.

Electricity is vital in human life, but also a source of danger that may threaten human safety and security of the building and its contents. Various hazards caused by electricity include electrical shock, thermal effects, fires/ explosions and other electrical hazards. Electricity as a hazard has the potential to cause work accidents.

According to Buntarto (2015), occupational accidents are unexpected events and unwanted relating to employment, including disease because of the employment relationship. The cause of the work accident can be divided into groups: (1) Physical factors, namely unsafe working environment conditions, (2) Human factors, including (a) Lack of

knowledge and job skills, (b) bad attitude and work behaviour.

According to Amier (1996), there are three causes of work accidents: (1) unsafe act or unsafe act, contributes 85% of the cause of the accident; (2) unsafe condition, contributes 15% of the cause of the accident. Nur Hidayat and Indah Wahyuni (2016) argued that work accidents would result in losses. It should, therefore, be prevented, where possible, to be omitted or mitigated.

Based on data from BPJS employment mentioned, there are 101.367 cases of work accidents in 17.069 registered companies/ industries with the victim died of 2.382 people until November 2016. Meanwhile, the claims of the Ministry of Manpower in throughout the year 2017, the number of accidents that work recorded as many as 80.393 cases, down about 20.975 cases from last year (Republika.co.id). Although the number of work accidents in Indonesia is still high. The high number of work accidents in Indonesia shows the level of concern for health and safety is still low.

The fact that humans play a crucial role in accidents, vocational education management, and training is one way to improve occupational health

and safety in Indonesia. According to Suma' mur (1981), several ways can be used to improve occupational health and safety: (1) legislation, (2) supervision, (3) standardization, (4) research, (5) statistics, (6) vocational education management and training, (7) safety campaigns, (8) insurance.

According to Pellicer (2009), vocational education management and training factors are an essential issue for building occupational health and safety. The initial effort of the improvement starts from the teaching, explanation and socialization of the issues discussed. When a person has mastered the material, then attempts to improve attitudes can be more easily done.

The observations made by researchers with industries related to electrical safety found several problems, namely: (1) No source is available about the health and safety of systemically arranged electrical systems such as pocketbooks, manual, etc. (2) Awareness of the use of personal protective equipment in work related to electrical installation is also deficient. (3) No health and safety modules available. Electrical installation is indispensable for employees and for trainers as a practical learning media to use. Therefore, researchers intend to research the development of electrical safety module based on Zerosicks model, which is expected to be a part of the learning process in vocational education management and training activities in Industry. Electrical safety module can also be a source of non-training learning for people who work as well as people who will do safety work in the field of electrical installations. Zerosicks model is an approach to implement safety by hazard evaluation, risks observation, solution, integration in implementation, culture and climate conditioning, knowledge education management, and standardization procedure (Ismara and Prianto, 2016).

2 METHODOLOGY

This study uses research and development with a model of development (4-D) developed by S.Thiagarajan (1974). This study was conducted in Electrical Engineering Study Program, Yogyakarta State University from April to May 2018. The subjects of this study were material experts, media experts and 35 students at Electrical Engineering Study Program, Yogyakarta State University.

2.1 Procedure

The electrical health and safety android modules development procedure is done by referring to the 4-D model and POAC as a vocational education management approach in every step. The step consist of define, design, develop and disseminate. Define, this stage aims to define the requirements in the development of work health and safety work android modules on electrical installations. The define stage consists of 5 steps, namely preliminary analysis, analysis of training participants, task analysis, concept analysis and objective learning analysis. Design, this stage aims to start (draft 1) training android modules and work health of the installation to be developed. The design stage consists of 4 steps, namely 1) preparation of criteria test, 2) media selection, 3) election format, and 4) initial design. In the initial design step (draft 1), the android module is validated. Develop, this stage aims to produce android modules that have been revised based on input from experts. This stage includes two steps, namely: expert validation and development trials. Disseminate, this stage is the last in this study. Modules that have been tested feasibility disseminated on a broader scale. The purpose of this stage is to disseminate or distribute products that have been developed.

2.2 Data Collection Techniques

The data obtained in this study to assess the quality of the resulting android module to be eligible to be used as teaching materials. The data obtained in the form of quantitative and qualitative. Data collection techniques in this research using observation techniques and questionnaires. Observations were made to determine the availability of teaching materials and the things needed in the developed android modules. Questionnaires are used to determine the feasibility of the android module as teaching material and given to material experts, media experts and users. The questionnaire that is arranged using Likert with four scales. The alternative answer used in the questionnaire.

2.3 Data Analysis Techniques

Data analysis techniques in this study using descriptive statistics. According to Sugiyono (2015), Descriptive statistics are statistics used to analyze data by describing data that has been collected as is without intending to make conclusions that apply to the public or generalization. The determination of the

feasibility category of this module fills the Likert scale. Each answer from the respondent then converted into a number form.

3 RESULT AND DISCUSSION

The process of developing the training android module consists of several stages that must be implemented, namely, Define, Design, Development, and Disseminate. The stages are as follows.

3.1 Define

This stage aims to define product needs to be developed and identify the aspects underlying product development that is the android module of occupational health and safety (OHS) installation of electricity.

3.1.1 Front-end Analysis

The results of the initial analysis in the form of systematic reading sources such as pocketbooks, manuals, android modules and so on the health and safety of electrical installations, especially in the utilization of electric power installation not yet available. Training android module electrical installation is necessary for trainees and instructors as a practical learning media and relevant for use in the implementation of training.

3.1.2 Learner Analysis

Users of this training android module are instructors and participants of health and safety training of electrical installations. User characteristics are optimistic, visionary and excellent managerial skills. The vocational education management background of the user of the training android module is at least diploma (3 years) graduates of electrical engineering.

3.1.3 Task Analysis

The competency of training participants is compiled based on the practice of OHS electrical installation in Industry and SKKNI of occupational health and safety. Eight main tasks must be mastered by the training participants. The main task is described in 8 learning activities.

3.1.4 Specifying Instructional Objective

Learning objectives is made as to the basis for the preparation of training android modules. The

objective analysis that has been designed is then integrated into the training android module to be developed. The learning objective of the android module development can be seen in Table 1.

Table 1: Learning objectives.

No	Learning objectives
1.	Training participants can understand the basic concepts of occupational health and safety.
2.	Training participants can understand the potential danger of electricity utilization installation.
3.	Training participants can understand the accidents caused by electric power installation.
4.	Training participants can understand risk management.
5.	Training participants can understand hazard control.
6.	Training participants can understand hazard communication.
7.	Training participants can understand the OHS requirements of Electricity Utilization Installation.
8.	Training participants can understand First Aid in Accidents.

3.2 Design

The training android modules developed in this research is the work health and safety module of electrical installation. The design stage is done to compile the framework of training module contents that will be developed. The framework has been prepared to facilitate the development of the contents of the training android module. There are four steps in the stage, namely:

3.2.1 Criteria Testing

The preparation of the criteria test is used to develop the achievement criteria that the training participants must achieve after attending the training activities.

3.2.2 Media Selection

Media in the development of this training android module is the print media in the form of training android modules and worksheets, also can operate by android. Consideration of selected print media and operate by android because that is flexible and cost of procurement is relatively cheaper when compared with another type of media. The form of training android modules and worksheets can motivate the training participants to record the instructor's explanation so that the training participants more easily understand the contents of the material. The other advantages are more easily understanding, more

familiarity using, and more creativity generating, in term electrical safety matter.

3.2.3 Format Selection

Format selection refers to the literature review include:

- Consistency of each sheet format in the training android module to facilitate page search, the spacing between lines, shape and font size.
- The column format is adjusted to the paper size (A4), and the iconic symbol is easy to understand.
- The content of the material is designed coherently and systematically based on zerosicks model.
- The mindmap/ material coverage chart is inside the android module.
- The cover of the training android module is made with a combination of white, green, blue, grey and yellow as well as a selection of matching sizes and fonts.
- Design the header look, and footer made attractive with a blend of colours that match the cover of the training android module.
- The typeface used by Verdana with size ten is arranged proportionally between the title, subtitle and content of the training android module.
- The space between lines used is 1.5 for ease of readability or readability.
- We are using proportional spaces.

3.2.4 Draft

Preparation of training android modules by using the program Microsoft Word 2013 and Corel X7 through 3 stages of writing.

Cover. The front cover of the training module for the instructor presents the title of the training module, the name of the compiler, the name of the supervisor and the illustration drawing by the contents of the training module and given the health and safety logo and Yogyakarta State University logo on the lower right side. The back cover of the module for the instructor was given the writing of the Electrical Engineering Vocational education management of the Yogyakarta State University 2018 and the writing of the content of the module. The front cover of the module training workbook presents the title of the training module, the author's name, the name of the supervising lecturer and given the health and safety logo and Yogyakarta State University logo on the lower right side. The front cover is also equipped with a column for the name of the training participants and training participants.

Table of Contents. The table of contents displayed in the training android module contains the page title, introduction, table of contents, table list, list of images, coverage map, introduction, learning, evaluation, cover, glossary and bibliography.

Map/ Chart of Material Coverage. The mindmap/ chart of material coverage displays the chapter and subsections of the training android module.

Learning. Subtitle cover design contains learning number, subtitle name, safety logo and occupational health.

3.3 Develop

The development stage is generated by module product that has been validated by material experts and media experts. The development stage includes expert validation stages and development trials. Expert validation results are then used to revise the module to get a decent category.

3.3.1 Expert Appraisal

Instrument Validation. Questionnaires to be used in this study were tested for validity. Instrument validation in this research is conducted by expert judgment consisting of three expert lecturers from Electrical Engineering Vocational education management Study Program of Yogyakarta State University. The instrument validation results by the three experts stated that the questionnaire used in this development research was feasible to be used with improvement. Expert suggestion and comments are then used as the researcher to improve the questionnaire before being used to measure the feasibility of the training android module.

Instrument Reliability. Reliability questionnaire testing used SPSS software. The questionnaire obtained user reliability value of 0.889. Thus reliability in the user questionnaire gets the category "Highly Reliable".

Material Expert Validation. The material assessment consists of 5 aspects, namely: Self Instruction, Self-Contained, Stand Alone, Adaptive, and User Friendly. The results of the expert material assessment on each aspect can be seen in Table 2.

Table 2: Material Expert Validation.

Aspects	Material Experts		
	1	2	3
<i>Self Instruction</i>	54	66	59
<i>Self Contained</i>	17	23	18
<i>Stand Alone</i>	6	11	9
<i>Adaptive</i>	7	10	10
<i>User Friendly</i>	15	19	14
Total	99	129	110
Category	Feasible	Highly feasible	Highly feasible
Percentage	70.7	92.1	78.6

According to material experts, android module feasibility categorized feasible. Modules deserve to be a medium of learning in training activities because it contains relevant learning objectives with competency standards, clearly presented and module materials by learning objectives—packaging specific materials, easy to understand and to guide active users to self-learning. Materials are supported by examples and illustrations that are relevant, clear and easy to understand and the mindmap, and images presented clarify real understanding. The availability of evaluation encourages a user's material understanding, guiding independent and critical user learning. The language used by the android module is clear, easy to understand and by the correct Indonesian rules. Summaries are available in each chapter that makes it easy for users to understand the material and can strengthen user memories. The android modules developed have self-contained characters because the training modules have been compiled based on competence on the syllabus, the contents of the module by the competence of the syllabus and all the competencies in the syllabus contained in the material. The theory, symbols and images presented are correct and appropriate to the material. Android modules can be studied without the help of other modules and media, structured according to technological developments and can serve as relevant references. Android modules display clear instructions, easy to understand, general, easy to understand terms used. The glossary is still incomplete because of many unfamiliar foreign terms.

Media Expert Validation. Media assessment consists of 6 aspects, namely: format, organization, attraction, shape and size of letters, space (space), and consistency. Once the android module is finished validated by the media expert, then calculated the average number of module evaluations. The results of

media expert's assessment on each aspect can be seen in Table 3.

Table 3: Media Expert Validation.

Aspects	Media Experts		
	1	2	3
Format	23	20	22
Organization	40	42	43
Attractiveness	33	33	37
Letters and Sizes	22	21	28
Empty Space	18	22	23
Consistency	27	35	34
Total	163	173	187
Category	Highly feasible	Highly feasible	Highly feasible
Percentage	81.5	86.5	93.5

According to media experts, android modules feasibility categorized highly feasible. Android modules deserve to be a medium of learning in training activities because of the format of the proportional column, the paper size is right, and the paper format by the typing layout. The use of the icon is appropriate, i.e. italics to emphasize the different term, bold to emphasize the importance and the use of correct punctuation. The scope of the android module is easy to find the user and by the description of the contents of the module material. The material is arranged systematically in mindmap form, the order correctly and efficiently understood in steps of zerosicks model. The table presented as needed; the presentation of the picture does not disturb the writing. The selection of attractive cover colours with matching colour combinations, the shape and size of the proportional letter and the corresponding cover illustration images. The use of bold, italics, underline is appropriate. Packaging evaluation is attractive, clear and appropriate to the material. Android module does not use too many fonts, type and font size easy to read. The shape and size of the letters in the title, subheadings and contents of the chapter are proportional. Space (blank space) cover, proportional chapter, proportional edge, the spacing between lines, between paragraphs and proportional chapters. The use of letter variation is not excessive. The size of lines between lines, between paragraphs, between sub-chapters, is consistent. Typing layouts between sub-chapters, paragraphs and page numbering are consistent. There are some images in the android module that are less clear, and the evaluation presented is less varied.

User Trial. Modules that have been validated and declared eligible by material experts and media experts then conducted trials to the user to get responses and feedback on the feasibility of developed modules. User questionnaire consists of 2 aspects, namely: media and materials. The feasibility level of the module is seen from the score obtained through a questionnaire of 35 point statements using a Likert scale model with intervals of 1 to 4. The results of user ratings on each aspect can be seen in Table 4.

Table 4: User Results.

No.	Aspects	Average	Percentage	Category
1.	Media	65.7	86.4 %	Highly feasible
2.	Material	54.6	85.3 %	Highly feasible
	Total	102.2	85.9%	Highly feasible

Assessment of user responses which included material and media aspects got 85.3% and 86.4% respectively, with both categorized "highly feasible". Android module is very suitable to be used as learning media in vocational education management activity. The android module presented contains materials relevant to technological developments. The language used is clear and easy to understand. The selection of colours and drawings on the cover is exciting and by the electrical safety installation. The font type and size are appropriate. The combination of colours used accordingly. The tables and pictures presented do not interfere with the writing.

3.4 Disseminate

The disseminate stage is the stage of the use of training android modules developed on a broader scale. The deployment stage is carried out after the training modules developed through various tests include testing by material experts, media experts and user judgments, and improvements made based on assessment results. The dissemination stage is limited, by disseminating the final product in the form of OHS training android module to the user that is the Industry that holds the activity of vocational education management and training.

3.5 Module Advantages

The advantages of this Android module are: containing learning objectives relevant to competency standards, clearly presented, easy to understand and to guide active users to learn independently. The material is supported by examples and illustrations that are relevant, clear and easy to understand and mind map; the images presented

clarify the understanding of the material. A summary is available in each chapter that makes it easy for users to understand the material and can strengthen the user's memory. Android modules can be studied without the help of modules and other media and are arranged based on technological developments and can function as relevant references. The format and systematics of android modules are made proportionally, and the material is arranged systematically

Compared to research by Rikanita (2017) on the development of a website-based school information system at Makassar State Vocational School containing only school profile data, as well as the development of management information systems Susanto, et al., (2015) contains management educators and education staff. This android module includes material about health and safety in SMK. Another study by Milka (2014) on the use of management information systems in vocational high schools using SMS Gateway media, Website schools and e-learning, while in this research development using android module media so that it is more practical and systematic.

Suggestions

The advantages of this Android module are: containing learning objectives relevant to competency standards, clearly presented, easy to understand and to guide active users to learn independently. The material is supported by examples and illustrations that are relevant, clear and easy to understand and mind map; the images presented clarify the understanding of the material. A summary is available in each chapter that makes it easy for users to understand the material and can strengthen the user's memory. Android modules can be studied without the help of modules and other media and are arranged based on technological developments and can function as relevant references. The format of android modules are made proportionally, and the material is arranged systematically.

4 CONCLUSION

Based on the results of research and discussion of "Electrical Safety Training Modules" can be concluded as follows: (1) development of training modules of Occupational Health and Safety (OHS) of electrical installation using 4D method produces the product in the form of training android module and worksheet of training android module. This module

discusses the Zerosicks of health and safety concepts in electrical installations. Include potential electrical installation hazards, risk analysis, accidents due to electric power installation, risk management, solution of hazard control, unsafe behaviour, hazard communication, OHS electrical power installation and first aid requirements, and personal protective equipment. The material in the module refers to competence (SKKNI) Employment of Occupational Health and Safety Sector and Permenaker No. 12 Tahun 2015. (2) According to material expert 1, modules feasibility got 70.7% and categorized "feasible". According to material expert 2, modules feasibility got 92.1% and categorized "highly feasible". According to material expert 3, modules got 78.6% and categorized "highly feasible". (3) According to media expert 1, modules feasibility got 81.5% and categorized "highly feasible". According to media expert 2, modules feasibility got 86.5% and categorized "highly feasible". According to media expert 3, modules feasibility got 93.5% and categorized "highly feasible". (4) Assessment of user responses which included material and media aspects got 85.3% and 86.4% respectively, with both categorized "highly feasible". Overall the electrical health and safety module based on Zerosicks with the android operation is originality highly feasible implemented in the electrical vocational education management process. The android module is using more familiarity, can generating creativity, and understanding quickly. The other side, unsafe behaviour evaluation, and learning media integration can be limited to this research.

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