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# The development of interactive mathematics learning media based on schoology and visual basic through industrial revolution 4.0

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**Abstract.** The application of technology in learning is very appropriate to against the industrial revolution 4.0. The use of technology is the development of online-based learning media. The aimed of this research is to develop interactive mathematics learning media based on schoology and visual basic which valid, practical and effective. This developed learning media can be accessed by online using computer devices and android smartphones. The type of this research is a development research that refers to the modified 4D development model. This research consists of three phases that is defining, designing and developing phase. The subjects of this research were 17 the 8th Grade students of SMPN 5 Jember, East Java, Indonesia. The data were collected by validation, interview, questionnaires and test. Based on the findings, showed the level of validity 95%, practicality level 98%, and the effectiveness of 88.25%.

## 1. Introduction

The development of technology in the era of globalization raises the issue of a fourth industrial revolution or called the industrial revolution 4.0 [1]. Industrial revolutions 4.0 did not influence only the production itself, but also the labor market and the educational system as well [2], [3]. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres [4]. One of the innovation that teacher uses to respond the industrial revolution 4.0 is the use of technology-based learning media such as interactive learning media in mathematics.

Learning is the main process in the formal education [5]. Formal learning: is the learning that occurs in an organized and structured context [6]. According to the Law of the Indonesian National Education System Number 20 of 2003 Article 1 Paragraph 20, Learning means the process of interaction between learners and educators and learning resources in a particular learning environment. Anything that can be used to transmit messages from the sender to the recipient to stimulate students' mind, feelings, concerns and willingness so that the learning process occurs called media [7], [8]. Media are the vehicles or channels which are used to convey information, entertainment, news, education, or promotional messages are disseminated [8]. Technology-based learning media is important in mathematics learning [9]. In the process of learning mathematics, media can generate desire, motivation, and stimulation. The goal is to make learning communication effectively, so the planned learning aim is reached [10].

In general, information and communication technology has been suggested as a means to improve educational outcomes [11]. One of the technology and information-based projects that can be applied



in learning Mathematics is by using Schoology and visual basic. Schoology is an application that combines social networking and LMS (Learning Management System) or CMS (Courses Management System) [12]. Schoology is one of the social-networked LMS that offers the same learning as in a class free and easy to use just like Google Classroom. Visual basic is a tool to create a variety of computer programs, especially which use windows operating system. The use of visual basic is very support in the process of developing mathematics learning media. The use of visual basic in learning has a positive impact on student cognitive achievement [13], [14]. The advantages of visual basic applications that can be designed or modified itself in accordance with the wishes of users, can correct the code that has been designed user and can test the program with debugging feature.

One of the industrial revolution 4.0 program is IoT (Internet of Thing) or IoE (Internet of Everything) [15]–[17]. This indicates that the internet users are widely utilized in the Industrial Revolution 4.0. Based on The Indonesian Ministry of Communication and Information (Kominfo) data in 2014, showed that Indonesia is at the 6th ranked in the world [18]. That is a fairly high number, so the internet usage needs to be applied in various sectors, especially in learning. Therefore, visual basic media is designed as an online media on the Schoology learning website in order the students can access it anytime and anywhere. Schoology's website is very safe and easy to use by students. The use of Schoology in learning is also effective in improving student achievement [12], [19]–[21]. In addition, innovative learning tool can improve students' cognitive and psychomotor abilities [22], [23]. Innovative method can also improve students' critical thinking [24], [25].

Base on the description, it is conducted the development research interactive mathematics learning media based on Schoology and visual basic which valid, practical and effective. Besides easy to access by students both from android or from computers which connected to the internet, online interactive learning media based on Schoology has the main advantage of being an interactive media as like as discussions or frequently asked questions, sharing between teachers with students, students with students and teachers with parents. There are "courses features" as online classroom media that can be accessed by students. It also provides "attendance features" that can be used to check students' attendance and "analytic features" that can be used to observe all students' activities on each course.

## 2. Method

The type of this research is a development research. Research and development is an emerging concept which is required by almost each and every firm in one manner or another [26]. Research and development affect the performance of the firms and is a means for improving performance. The subjects of this research were 17 the 8th Grade students of SMPN 5 Jember, East Java, Indonesia. The mathematics learning topic is System of Linear Equations in Two Variables. The linear equation in two variables is defined as an equation in which there are two variables whose degree of each variable is one.

The development model used is a modified 4D model consisting of three phases, which are defining, designing and developing phases [27]. The defining phases are observations and behavioral analysis of students in learning activities, curriculum and syllabus assessment, and also resources supported by teachers in learning. The selecting media, formats, preliminary learning media & creating the syllabus, and research instruments have completed in the designing phases. The media development format follows the existing format at <https://www.schoology.com/>. The preliminary design of learning media begins with the visual basic installation, making of visual basic applets, Schoology installation, making classes and courses on the Schoology page which then continued with creating research instrument that consisting of tests. The implementation of preliminary developing learning media is doing in the developing phase. At this phase also tested the validity, practicality and effectiveness of learning media that has been developed.

### 3. Result and Discussion

The research instruments used are validation sheets, teacher observation sheets, student response questionnaire and test. Which all instruments have been tested the validity. Validity in research refers to how accurately a study answers the study question or the strength of the study conclusions [28].

Data analysis techniques include validity analysis, practicality analysis and effectiveness analysis. Data analysis techniques are described as follows:

The validity analysis is done by recapitulating the validity data of learning media from each validator then determining the average of the total validation result from three validators, according to Table 1. The media has been valid if the correlation coefficient is in high or very high category.

**Table 1.** Validation Coefficients Category

Coefficients	Category
$0,80 < \alpha \leq 1,00$	Very high
$0,60 < \alpha \leq 0,80$	High
$0,40 < \alpha \leq 0,60$	Medium
$0,20 < \alpha \leq 0,40$	Low
$\alpha \leq 0,20$	Very Low

Practicality analysis is done by recapitulation of questionnaire data from user response of learning media then determine the average of total value of the user response questionnaire and change the average value into percentage. The developed learning media is practical if the average percentage of user response questionnaire were at the good or very good category, according to Table 2.

**Table 2.** The Percentage of user Response Questionnaire Category

Coefficients	Category
$P > 95\%$	Excellent
$80\% < P \leq 95\%$	Very good
$65\% < P \leq 80\%$	Good
$50\% < P \leq 65\%$	Fair
$P \leq 50\%$	Poor

Effectiveness analysis obtained from the percentage of student learning tests and student responses. Learning media was effective if 80% of all students satisfied the "complete" category and 50% of students give a positive response.

#### 3.1. Developing Learning Media

The developed learning media in this research is a visual basic media that is packaged interactively using Schoology that can be accessed online using a computer or android smartphone. The use of visual basic media is expected to motivate students and make it easier to understand the system of linear equations in two variables.

At the opening page there is a main menu consist of home, instructions, syllabus, topic, examples, exercise and author (Fig. 1a). The instruction feature contains the explanation about the main menu. The syllabus feature contains core competencies, basic competencies and indicators based on the 2013 curriculum. Topic feature contains the explanation about system of linear equations in two variables. The example feature contains about the application of the method in solving system of linear equation in two variables (Fig. 1b). The exercise feature contains description of the student test (Fig. 1c) and solving the exercises (Fig. 1d). The author feature contains the developer profile.



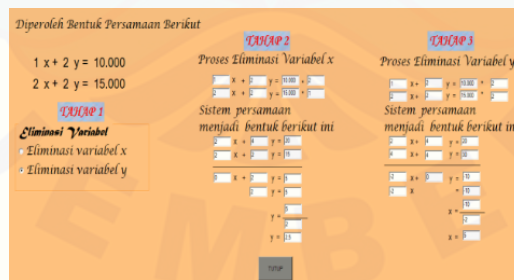
(a)



(b)



(c)



(d)

**Figure 1.** (a) Main Menu Feature (b) Example Feature (c) Exercise Feature (d) Solving Exercise Feature

### 3.2. Validity of Learning Media

Three aspects were assessed on the feasibility test of learning media, such as the feasibility of content, language, and format. Validation results were assessed by three expert validators. Recapitulation on each aspect was presented in Table 3.

**Table 3.** Recapitulation of Validity Score

No	Indicator (i)	(V <sub>ji</sub> )			I <sub>i</sub>
		V <sub>11</sub>	V <sub>21</sub>	V <sub>31</sub>	
1	The suitability of subject matter with standard content	5	5	5	5
2	The suitability of subject matter with knowledge level	5	4	5	4,67
3	The suitability of subject matter with learning aim	5	4	5	4,67
4	The clarity of matter content	5	5	4	4,33
5	The equality of choice answer	5	4	5	4,67
6	The suitability of answer keys and discussion	5	5	5	5
7	The standard language	5	5	4	4,67
8	The use of communicative language	4	5	5	4,67
9	The clarity of exercises processing	4	5	5	4,67
10	The advantages of learning media	4	5	5	4,67
11	The suitability of text size and image	5	5	5	5
12	The suitability of image illustration and subject matter	5	5	5	5
13	The clarity of text size guidance and image usage	5	5	5	5
14	The creativity and innovation of learning media	4	5	5	4,67
15	The accuracy of button in the program	5	5	5	5
16	The simplicity of touch and drag function	4	5	5	4,67

In the validation process, the coefficient of  $\alpha$  was 0.95. It showed that the developed learning media was valid with very high category, so the media is suitable for use in the learning process.

### 3.3. Practicality of Learning Media

Practicality of the media was assessed based on a questionnaire of user response after using the learning media. The average recapitulation of user responses was presented in Table 4.

**Table 4.** The Average Recapitulation of User Responses

No	Aspect	Average value
1	I can open the front page of online learning media easily	100%
2	I was happy to study the lesson by using this learning media	100%
3	I wasn't feel bored studying the lesson by using this learning media	100%
4	I can repeat the desired section of the lesson	100%
5	I was motivated to learn mathematics after using this media	100%
6	I understood the media instructions easily	97%
7	I could do the test easily	97%
8	I felt that the questions of the test were easy	91%
<b>Average</b>		<b>98,13%</b>

Based on the result, it represented the percentage of the average value is 98.13%, so that learning media is satisfying practicality level.

### 3.4. Effectiveness of Learning Media

The effectiveness of learning media that have been developed is obtained from test result data and student response percentage. Based on the results of data analysis were obtained that the completeness percentage was 88.25% (15 of 17 students) and student response was positive so it can be concluded that learning media is satisfying the effectiveness level.

#### 4. Conclusion

Based on data analysis, mathematics learning media using Schoology and visual basic can be considered valid with validity coefficient is 0.95. Through the data obtained can be interpreted that learning media in the practically level with student response percentage 98%. According to the percentage of completeness 88.25% and student response was positive, so it satisfying the effectiveness level.

Based on findings and conclusion, the developed learning media is satisfying validity, practicality, and effectiveness. So the developed learning media is feasible to help the student in understanding the system of linear equations in two variables in the Industrial Revolution 4.0.

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