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# Development of Teaching Materials for Digital Higher Education in the Industrial Revolution 4.0 Era

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**Abstract**---This study was the development of digital teaching materials in the era of the industrial revolution 4.0 era is a type of development research or R&D. The development of teaching materials in this study adapted the software development life cycle (SDLC) development model. Based on the results and discussion, we can conclude that the design and development of digital teaching material can be improve the effectiveness of the learning process and the use of online learning will be a new method/ approach of learning systems in the industrial revolution 4.0.

**Keywords**---digital textbook, industrial revolution 4.0, learning solution.

**Introduction**

During the Industrial Revolution 4.0, there have been many modern tools that have become tools for solving human problems. And of course this is one of the reasons that the Industrial Revolution 4.0 period existed. Every detail of human life cannot be separated from science and technology. One of the foundations that

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support the development of science and technology as it is today is mathematics. As stated by [Sudrajat \(2008\)](#), which states that the rapid development of science and technology is due to the support of mathematics. The foundation of support is due to the strength of mathematics in its structure and reasoning. The development of mathematics often pioneered the possibility of new applications in various other fields of science. [Sirozi \(2013\)](#), says that according to UNESCO, educational institutions are not only required to encourage students to learn, but also are required to be able to encourage students to learning to acquire knowledge, promote learning to act, learning to live together, and learning for life, with the paradigm of lifelong learning ([Junco & Clem, 2015](#); [Lau et al., 2018](#)).

COVID-19, which is one of the pandemics that hit the world and was found in Wuhan, China at the end of 2019 ([Ferdias & Ahmar, 2021](#); [Ahmar et al., 2021](#)). COVID-19 has an impact on Social, Psychological, Economic and Health Conditions ([Atuahene et al., 2020](#)). [Rana et al. \(2021\)](#), said that significant disadvantages are also found in education. COVID-19 forces the occurrence of "learning from home" and "working from home" which of course forces us to learn new things including the use of technology in our daily lives. This new thing happened because of the implementation of the Social Distancing policy that was implemented by all countries in order to prevent the spread of COVID-19. The transition from the learning process to "learning from home" forces various parties to think and drains the brain so that the learning process can continue during the COVID-19 period. And the choice is the use of technology as an online learning medium ([Rai & Selnes, 2019](#); [Gerjets et al., 2006](#)).

## **Method**

Research on the development of digital college teaching materials in the face of the industrial revolution 4.0 era is a type of development research or R&D. The development of teaching materials in this study adapted the software development life cycle (SDLC) development model. There are four stepwise of prototype method of SDLC:

- Basic Requirements Identification.
- Developing the initial Prototype.
- Review of the Prototype.
- Revise and enhance the Prototype ([Rusli et al., 2020](#)).

The implementation of this research was carried out at the Mathematics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Makassar, Indonesia ([Vamvoudakis et al., 2012](#); [Samaniego et al., 2020](#)).

## **Results and Discussion**

From the observations that have been made, the need for online teaching materials is important. Online teaching materials are a method of developing teaching materials that can be accessed by users anywhere and anytime. COVID-19 is also one of the reasons that the need for online teaching materials is important ([Alaloul et al., 2020](#); [Carvalho et al., 2018](#)). Learning media is a means that can be used as an intermediary in the learning process to increase

effectiveness and efficiency in achieving teaching goals and increase the motivation of students' enthusiasm for learning in the learning process. The results of the book are presented in Figure 1 (Amori, 2021; Suwija et al., 2019).

From Figure 1, it can be seen that digital teaching materials present the subject in detail and each subject is accompanied by learning objectives. By displaying the learning objectives, students are expected to know the results to be achieved from the learning process. To see the validity of this digital teaching material, an expert validation process is carried out. The validated rubric can be seen in table 1.

Table 1  
Validation rubric for digital teaching materials

No	Aspects of Assessment	Descriptor	Point (1 - 5)
1	Relevance	The material is relevant to the competencies that students must master	4
		Completeness of material according to the level of student development	5
		The material is sufficient to meet the demands of the curriculum	5
		Media illustration according to the level of student development	3
		Media illustrations are functional enough	4
2	Accuracy	The material presented is in accordance with scientific truth	5
		The material presented is in accordance with the latest developments	4
		The packaging of the material in the media is in accordance with the scientific approach concerned (scientific approach)	4
		Conformity of science concepts	4
3	Basic Concepts of Material	The suitability of the concept of developing student knowledge	4
		Clarity of content / description of the material	5
		Coverage (breadth / depth) of material	3

No	Aspects of Assessment	Descriptor	Point (1 - 5)
		Clarity of examples are included to clarify the content	4
		Clarity and appropriateness of the relevance of the language used	4
		The suitability of the material content with the standard concept	4
4	The suitability of the dish with the demands of Industrial Revolution 4.0 learning	Encourages students' curiosity	5
		Encourage student interaction	4
		Encourage students to build their own knowledge	3
		Encourage students to study independently and in groups	3
Overall			4.05

Note of point: (1) irrelevant, (2) less relevant, (3) quite relevant, (4) relevant, and (5) very relevant.

From the results of the validation carried out by expert validators, it was found that this digital teaching material is feasible for further use without revision. This was supported by the assessment of validation results obtained overall value which was 4.05 or equivalent to the relevant category (Vaidya et al., 2018; Qin et al., 2016). From the results and discussions, it could be concluded that digital teaching materials could already be used in general in the learning process. It was also reinforced by the content validator's recommendation that it was worth using without revision. It was expected that from the existence of this teaching material, the teaching and learning process can be implemented effectively (Tri et al., 2021; Ernayani et al., 2021).

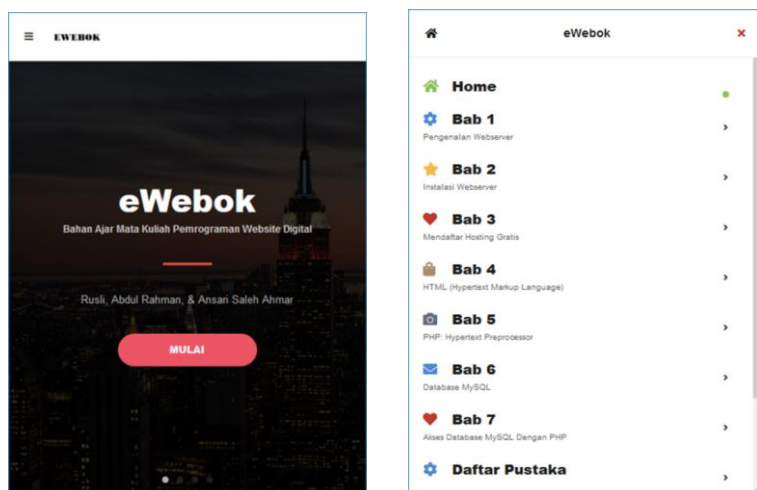


Figure 1. The screenshot of digital teaching materials

## Conclusion

Based on the findings of this research, we can conclude that the development of digital teaching material in Mathematics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Makassar, Indonesia can improve the effectiveness of the learning process and this development can as a new method/approach of learning systems in the industrial revolution 4.0 (Khudoyqulova, 2021; Dewi, 2020).

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