



## Development of Interactive Teaching Materials Supplements to Improve Learning Results in the Digestive System

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### Abstract

Interactive teaching materials supplement in the form of additional teaching materials containing materials and assignments that are linked online and given to students so that they can learn independently. This study aims to test the validity and effectiveness of these supplements in improving learning outcomes of the digestive system material. The research method uses research and development (R & D) which consists of research, development, validation, and testing. Analysis of development needs is carried out on learning constraints, teaching materials, and digestive system materials. Teaching materials are developed from the results of the analysis and then validated and tested for legibility. The trial was carried out at SMA N 1 Brebes with a one-group pretest-posttest research design, which was carried out in one group only without a comparison group. The results of the validation by media experts showed an index of 87.31% and material experts showed an index of 85.41% with valid criteria, the module readability test resulted in an index of 87.48% with criteria easy to understand. The results of the application of learning using this supplement showed an effect on improving student learning outcomes with an average N-gain test of 0.57 which was included in the moderate criteria.

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## INTRODUCTION

Innovative learning is a strategy to increase student learning activities and creativity. Teachers are required to provide innovative learning, while students must be ready to face the learning process. There is a minimum effort that must be made by students so that students are ready for learning. According to the student book, the 2013 curriculum provides minimal efforts that students must do, namely looking for other available learning sources nearby.

Interviews conducted by teachers and students at SMA Negeri 1 Brebes on biology learning show that school facilities in the form of wifi have not been used optimally. Even though wifi can help students to find learning resources. The teacher stated that there were still limited learning time constraints but the scope of biology material was broad. Teachers only focus on material achievement and are less innovative in learning. Research conducted by Castle and McGuire (in Budiarti 2015) states that the concept of learning with the internet is an alternative problem solving from a small allocation of time with extensive material.

The use of technology in education has grown rapidly. The use of technology in learning is the use of information technology or it can be abbreviated as IT. According to Siahaan (2019) there are 3 functions of computer and network-based learning in the classroom. 1) Supplement or its additional character, if students have the freedom to choose between direct or online learning 2) Complementary means that it has an additional function after students do learning in class (Lewis, 2002). This means as an enrichment program, supplementary, and as a remedial program for students. 3) Substitute, where many, or semi-conventional, or completely via the internet. This program has the same learning and assessment criteria.

The whole learning process is carried out in a network called online learning. Online learning requires the right media so that learning takes place well and is directed. Online learning has a type of learning, namely synchronous (teachers and students interacting at the same

time face to face) and asynchronous (teachers and students interact not at the same time but can be anytime and anywhere).

Synchronous allows for interaction between students and teachers, meaning that students and teachers access the internet simultaneously. This type is known as virtual classroom learning (Hartanto, 2016). According to Rustiani et al. (2020) synchronous learning requires support, including laptops, devices, internet networks and media as learning tools.

According to Banggur et al., (2018) integration between technology and various innovations is a feature of online learning so that online learning requires the right media to take place well and directed. One way is by providing interactive teaching material supplements. Teaching materials are a form of a collection of materials obtained and designed in an actual and systematic manner (Prastowo, 2013).

Teaching materials are required to follow the times by utilizing information technology (IT). Interactive teaching material supplement is a form of teaching material with the application of IT. This teaching material supplement can be designed offline and online so that students can use it independently, anytime, and anywhere (Lestari et al., 2016).

The purpose of this study was to test the validity and effectiveness of the use of interactive teaching material supplements. Supplement materials are expected to help students achieve KD in cognitive aspects which can be seen in the learning outcomes of the human digestive system.

## METHODS

The development of interactive teaching material supplements is carried out through the research and development (R&D) method. The research stage includes the identification of learning constraints and teaching materials used in schools.

The development stage includes the preparation of learning materials for human digestion systems, images, and online links. In this stage, interactive teaching material

supplements are developed with the availability of online link columns. The online link is a feature in the interactive teaching material supplement where the material in the supplement is added with additional information that can be accessed by students, be it material, assignments, or material implementation. How to use it by clicking on the online link column section provided in the material or students can scan the barcode available in the teaching material supplement, an example can be seen in the figure 1.



**Figure 1.** Example of online link column section

The validation stage is carried out to test the validity and legibility of the teaching material supplements. The validation of interactive teaching material supplements by media experts includes 3 aspects, namely 1) presentation 2) cover design and 3) content design. Supplement validation by material experts includes aspects of assessment, namely 1) material suitability, 2) material accuracy, 3) supporting material, 4) appropriateness of understanding, 5) communicative, 6) language suitability, 7) concordance and image unity, and 8) usage term.

The field-testing stage was carried out to test the effect of teaching material supplements on a large-scale test using 2 classes. Assessment of the effect of teaching material supplements is carried out on the cognitive aspects of student learning outcomes. Data from material experts and media experts in the form of supplement validity were taken using a questionnaire. Data sourced from teachers in the form of development needs and responses to supplements were taken using a questionnaire. Data sourced from students in the form of knowledge values

and responses to supplements were taken using tests and questionnaires. The data obtained were analyzed using descriptive statistics. The effect of the supplement was seen based on the increase in cognitive learning outcomes from the pre-test and post-test scores. The magnitude of the effect of the supplement is based on the N-gain value which is the difference between the pretest and posttest scores.

**RESULTS AND DISCUSSION**

The results of the study consisted of 1) media validation and interactive teaching material supplement material, 2) user response to the use of interactive teaching material supplements and, 3) analysis results of the effect of interactive teaching material supplements.

**Media Validation and Interactive Teaching Material Supplementary Materials**

The feasibility of supplementing interactive teaching materials can be explained in Table 1.

**Tabel 1.** Media Validation

No.	Component	Score	Creterion
1.	Media Expert content eligibility Serving eligibility	87.31	Valid
2.	Matter Expert Content Eligibility Serving eligibility	85.41	Valid
	Average	86.36	Valid

The results of the validation of the interactive teaching material supplements are in the valid category, but there are still revisions to the image and concept map sections. Validation from media experts emphasizes the appearance of teaching material supplements. All aspects of material validity also show validity. Despite this, the validator's suggestions remain. According to Hanifah (2014), good textbooks in terms of graphics and appearance can be an attraction for students and the achievement of learning objectives can be conveyed, because they can

affect student interest and motivation when learning takes place (Hersandi et al., 2017).

**Effect of Supplements for Interactive Teaching Materials Based on Student Cognitive Learning Outcomes**

The average pretest score before being given treatment was 38.16 for the Mathematics 1 class and 38.42 for the MIPA 2 class. The post-test scores showed an increase after being given treatment. The mean score for the MIPA 1 class was 72.05 and the MIPA 2 class was 73.33. The number of students who completed the assessment after learning was 30 students and those who did not complete were 7 students.

**Table 2.** The N-gain results of the Student Cognitive Learning Outcomes

No.	Data	Average	Ngain	Kriteria
1	Class XI	36	0.48	Medium
	MIPA 1	Student		
	Average of	59.3		
	of Pretes	78.61		
2	Class XI	36	0.65	Medium
	Mipa 2	Student		
	Average of	55.20		
	Pretest	84.53		
	Average of			
	Postest			

The N-gain results were obtained to see the analysis of the effect of the interactive teaching material supplements developed as an effort of the online learning process on student learning outcomes in class XI Mipa 1 and XI Mipa 2. The increase in the results of students' pre-test and post-test showed the number 0.48 for class XI MIPA 1 and 0.65 for class XI Mipa 2. The N-gain results with this acquisition showed moderate criteria.

Afifah et al. (2018) state that the "moderate" criteria in research on the development of a teaching material supplement are said to be effective in use. Sari & Susanti (2016) also stated that a media is said to be effective if the media can increase student learning activities and improve student learning

outcomes. This is what shows that interactive teaching material supplements are good to use as teaching material supplements.

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**User Responses of Interactive Teaching Materials Supplements**

**a. Student Responses**

Student responses to interactive teaching material supplements for display criteria with a mean score of 85.50 with very suitable criteria. Scores for the assessment of student responses to the implementation of learning using interactive teaching material supplements with an average score of 84.85 on very feasible criteria. The criteria for a media are said to be used for learning, namely if it has a value > 62.50.

Supplement Good teaching materials can motivate students to learn. Retariandalas (2017) states that the motivation that is raised during learning has a positive effect on student achievement. Students give a positive response to the display of interactive teaching material supplements in learning, and it is stated that they add insight and knowledge.

**b. Teacher Responses**

The teacher's positive response to interactive teaching material supplements is shown by an average rating of 90.00 with very feasible criteria. The data shows that according to the teacher, this interactive teaching material supplement is good as a supplement for teaching materials when learning the digestive system.

The teacher's comments on the questionnaire were also assessed as quantitative data that the interactive teaching material supplement has a display and supporting features that can be connected to the internet so that this interactive teaching material supplement makes

readers want to open interactive teaching material supplements. The supplementary content of interactive teaching materials with supporting features can invite students to open sites related to the material considered to be able to help teachers to find more contextual examples. interactive teaching material supplements can also increase students' knowledge so that they can use the internet better and wisely and help students understand the material, so that they can add to students' insight into learning.

Teaching material supplements are books that are used as a complement to the main book. Teaching material supplement has a character that has the aim of strengthening the concepts to be achieved in the learning objectives (Setyanto et al., 2016).

Teaching material supplements can improve student learning outcomes if they have certain criteria, including according to Wulandari et al. (2017). Suniah et al. (2018) explained that teaching materials can improve student cognitive learning outcomes when viewed from the value of student learning outcomes before being given teaching material supplements and the results after being given teaching material supplements when learning. Good criteria according to Fatonah et al. (2017); Munawaroh et al, 2018; Rizqiyah et al., 2018), which is seen from the minimum completeness achieved by students.

## CONCLUSION

Based on the research, the problems of students who have not prepared for learning and have not utilized the existing internet technology during the learning process can be solved by providing interactive teaching material supplements. This supplement based on expert validation is said to be valid but there are still revisions in certain parts. The responses given by students and teachers stated that interactive teaching material supplements are very suitable for use in learning the digestive system. Student learning outcomes have increased as indicated by the N-gain test getting moderate criteria.

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