Development of digital product assessment instruments for preservice teacher's biology

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Abstract. This researched purpose to determine the characteristics of assessment instruments for digital teaching materials to assesses the quality and feasibility of digital teaching materials. Assessment instruments for digital teaching materials that are reviewed according to evaluation experts, media experts and linguists. This development research uses the ADDIE model which consists of the stages of analysis, design, development, implementation and evaluation. The subject of the instrument assessor was a lecturer in the education evaluation course and three expert lecturers consisting of one evaluation expert, one media expert, and one linguist. Review and input from this expert lecturer as instrument validation. Assessment instruments that have been developed have various characteristics. The findings obtained (1) the products produced in this research and development are instruments for evaluating digital teaching materials for biology learning. (2) Based on the validation results obtained a score of 4 which is included in the criteria both with minor revisions. So in terms of feasibility it can be concluded that the assessment instrument for biology digital learning materials is worthy to be used in assessing digital learning media created by prospective biology teacher students.

1. Introduction
Mastery in the field of technology, especially in the field of information and communication technology (ICT) is one of the mandatory requirements for madrasah teachers today. Teachers in this case are people who provide knowledge and skills to the students dikarsukan able to convey the knowledge of good and quality [1]. Using only the conventional teaching model, where the teacher stands in front of the class and explains the subject of biology, it is felt that there is still a lack of power. Biology subjects are one abstract concept that requires interactive visualization in embedding concepts in students. So biology subjects require visual media to display abstract concepts to be easily digested and understood by students.

One way that can be taken to overcome these problems is the need for an additional mechanism (Supplements) that can be used as an additional learning media teacher companion. Teachers can create a learning medium that contains the materials taught. In the learning media the teacher can write the material from the beginning to the end of the meeting, even including examples of problems with key answers [2]. Teaching materials along with sample questions can be updated easily and quickly to get better quality of learning. This can be done by utilizing Information and Communication Technology.
Information and communication technology (ICT) or in foreign terms ICT (Information and communication technology) currently greatly affect human life in various aspects of life from the start smartphone to personal computer. The higher the ability to utilize ICT, the higher the ability to compete in life. Communications technology that continues to progress will affect the pattern of community communication later. Therefore, learning can be integrated with ICT in accordance with the rapid development of the times [3]. In 21st century learning is required to be able to use ICT as a source of unlimited information learning. In addition to being able to use ICT as a source of learning, teachers are also required to be able to create creative and innovative learning that is integrated with ICT, the preparation that can help teachers realize that is how biology teacher candidates can develop digital teaching materials that will be used in the learning process later [4].

During this time the difficulty of biology learning leads to the abstract nature of biology for students. This may be the reason they are not motivated to study biology. Besides, students assume that biology contains many rote texts, especially if it is a description of a process. Biology also often uses scientific terms and a series of difficult language. Students need the visualization of biological materials to be able to understand and understand them. To generate attention and motivation one of the teachers can use teaching aids [5]. Teaching aids or learning media can be tailored to the needs of learning. Biology learning requires visualization media that can clarify an abstract concept. Moreover visualization media can help students understand a process mechanism that is not directly observed in everyday life. Media visualization that can be used in biology learning one of them by utilizing information and communication technology [6]. Biology as an abstract science requires auxiliary media to approach the concepts of abstract to concrete so that creativity in the presentation of teaching materials is a skill required by prospective teachers. Presentation of teaching materials has now been integrated in digital form by using the computer.

Products from prospective biology teacher FTK UIN SGD Bandung in follow lectures of learning media and ICT learning biology such as learning video animation stop motion PIC PAC, Video Use props or educational game tools educational biology with Camtasia, biology learning web with domain weebly.com, interactive multimedia biology in the form of crossword puzzles with Eclipse crossword, Evaluation of learning with wondershare quiz creator, making infographic with easl.ly, online questionnaire with google form application and media conveying material with prezzi application. For more details, all biological digital teaching materials that will be assessed for quality and feasibility are presented in any figure below. [7-8] in figure 1 shows the Workshop on Product Completion in the technology-based distribution model taught by learning media and ICT Biology Learning for prospective biology teacher students.

Figure 1. Workshop Product digital teaching materials.
Figure 2. Example for project Wondershare Quiz Creator Version 4.5.0 Application Program.

Figure 3. Example for project Prezi Application Program 5.2.8 Available at www.prezi.com.

Figure 4. Example for project Make Infographics.

Figure 5. Example for project website.

Figure 6. Example of a project from a learning video.

Figure 7. Example of a project from Created with the Eclipse crossword Application.
In producing the products of the project given to the biology teacher students, the lecturer facilitates and builds the project execution space in the lecture, so that the student can be consulted about the problem of the product being made. Observation activities in the implementation of project-based learning models on learning media courses and ICT learning biology can be seen in Figure 1. Based on this it is necessary to train the creativity of prospective teachers in making this digital teaching materials. Not only make, it is necessary in the value of the level of eligibility and quality of digital materials that have been made [9].

The development activities of digital teaching instrument assessment tools for biology teacher candidate students will be implemented in the several stages described that is: 1) Needs Analysis: Learning Outcome Concepts and materials Utilization ICT Development teaching materials. 2) Instrument Design Video Appraisal Instruments, Website Appraisal Instrument, Appraisal Instruments An application program for learning evaluation activities, Assessment Instrument Presentation of data with Infographic. 3) Development and Implementation, Material Expert Validity, Validation Media experts and Validation Linguists. 4) Valid Instruments Appraisal of quality and feasibility of digital materials of biological materials.

2. Methods
The method used in this study was a research development (Research and development) by using Hanafin and Peck development model [10]. This development model consists of several phases, namely the phase of needs analysis (need assessment), the phase of design and development and implementation. In this model, assessments and revisions need to be carried out in each phase. The Hanafin and Peck [10] Development Model is a more product oriented model so that it is suitable for developing the assessment of digital teaching materials of biology learning by the creation of prospective biology teachers. In Development of this Instrument the development procedure is described as follows:

2.1. Needs Analysis (need assessment).
Needs analysis is done by identifying the needs required in developing the instrument of assessment of this digital instructional product. At this stage, the researcher conducts a study of the necessary needs in the development of the instrument that includes the analysis of the curriculum, semester lecture plan (RKPS), materials, students, tasks and formulate the objectives or results expected in the development of the assessment of digital biology teaching materials. After all the needs are identified Hanafin & Peck [10] emphasizes running an assessment of the results before proceeding to the next phase.

2.2. Designing.
In this phase the information from the analysis phase is transferred into the form of document which will be the objective of making this product assessment instrument. The design phase aims to identify and document the best rules to achieve the objective of developing the product penalty instrument. At this stage prepare a document in the form of assessment components and rubric criteria assessment. This design stage can be described in the form of a story board or flow chart that will be developed in the
assessment instrument of digital biology materials. The instrument of assessment of biological digital teaching materials products that have been completed in evaluation by education evaluation experts, biology material experts and multimedia learning experts. The results of the study of experts to be input to refine the design that has been made. Furthermore, the researcher develops the instrument of digital biology teaching materials to obtain valid internal and external instruments.

2.3. Development and implementation.
Activities undertaken in this phase include testing and assessment. At this stage is limited to formative test that is validity test of assessment instrument of digital biology teaching product conducted by validator from educational evalist, biology education expert and multimedia learning expert. The validated and refined biodiversity assessment instrument of biological materials has been revised and refined.

Data validation results in the analysis with percentage analysis techniques. The formula used to calculate the result of questionnaire from validator is as follows [11]:

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Information:
P: Percentage
\(\Sigma x\): Total number of respondents’ answers
\(\Sigma xi\): Fifth overall ideal value in 1 item

Guidance of decision-making from data analysis using a qualification scale to determine the conclusion. The eligibility criteria of the validation results are presented in table 1 below.

| Presentation | Level criteria         |
|--------------|-----------------------|
| 25-39        | Not Eligible          |
| 40-54        | Less Eligible         |
| 55-69        | Decent Enough         |
| 70-84        | Eligible              |
| 85-100       | Very decent           |

Figure 9. Flow Chart for Development of Instrument for Evaluating Products for Digital Teaching Materials for Biology Creation of Prospective Biology Teacher Students.
In figure 9 it can be explained about the flow of formulation of digital teaching material instruments from the need analysis to the design of digital teaching materials assessment instruments which will then be used as a basis for evaluating digital teaching materials products.

3. Results and Discussion

Research Results of the Mining Assessment instrument for learning biology digital teaching materials will be described based on the steps of research and development by Plomp which has been slightly modified into four main phases, i.e:

3.1. Needs Analysis

The media of digital teaching materials that have been produced by the biology education students have not been analyzed in the feasibility and quality because there is no valid and standard instrument in assessing a digital teaching material in the form of video, application program, picture and website. There is currently no valid assessment of the quality of biological digital teaching materials based on the evaluation of evaluation experts, media experts and linguists. With the instrument of assessment of the quality of this digital teaching materials, it is expected to assist the parties who conduct research development of electronic media-based learning in the field of biology and provide innovative research in the field of education. The instrument is shown in table 2.

Table 2. Types of Instruments Developed for Assessment of Digital Learning Materials Biology Learning.

| No | Type of Instrument for Assessing Digital Teaching Materials for Biological Learning |
|----|----------------------------------------------------------------------------------|
| 1  | Instrument for Assessing Stop Motion Animated Video Products with PicPac Application |
| 2  | Video Product Appraisal Instruments Using Teaching Aids (AP) or Educational Game Tools (APE) Biology Learning |
| 3  | Biological Learning Products Product Assessment Instruments |
| 4  | Product Appraisal Instruments Wonderhare Quiz Creator Application |
| 5  | TTS Product Appraisal Instruments with Eclipse Crossword |
| 6  | Infographic Product Appraisal Instruments with easl.ly |
| 7  | Learning Instrument Product Assessment Materials with the Prezzi Application |

In the table shows that digital teaching materials projects have 7 projects which will later produce biology teaching products which are then made assessment instruments 7 products are the results of digital learning projects. each instrument made with the characteristics of criteria in accordance with teaching material products involving different project assignments is then validated by an expert validator to be used.

3.2. Development and Implementation of Instrument Products that have been developed.

Prior to the introduction of digital learning materials, this instrument was first assessed (validated) by three experts in the field of biology, biology and instructional education to ensure the feasibility of its use in the development of digital teaching materials of biology learning.
### Table 3. Recapitulation of Judgment Results.

| Assessment Aspect                                      | Assessment Results                                                                                                                                 |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Appraisal Instrument for Stop Motion Animated Video Products with PicPac Application | Added conformity with Curriculum KI, KD (asoek A) and oengukuran (linguistic aspect) about the use of standard language if using non-standard word count and not using duration of time |
| Video Product Appraisal Instrument (AP) or (APE)       | Recommended for detailed Assessment scores                                                                                                                                                                   |
| Appraisal Instrument Product Website Biology Learning Instrumentation Appraiser Product Wonderhare Quiz Creator Application | Recommended for detailed Assessment scores                                                                                                                                                                   |
| Product Appraisal Instrument TTS Application with Eclipse Crossword | There should be an emphasis on making questions that measure the ability of high-level thinking with a record of the composition of seusi problem with cognitive level                                                                 |
| Instrument of Assessors of Poster Infographic Products with easl.ly Instrument of Appraiser of Learning Material with Prezzi Application | Note Questions and directives made by students, aspects of understanding and legibility need to be considered                                                                                               |
|                                                        | Recommended for detailed Assessment scores                                                                                                                                                                   |
|                                                        | Need to adjust the format of SK to adjust the form by replacing it with KI in accordance with the applicable national curriculum                                                                               |

In table 3 the three judgments in general can be known as follows:

- Need to be completed with assessment rubric
- Koten teaching materials adapted to the standard of arcane (there is a reference with rubric in the same direction)
- It is recommended to improve in terms of spelling errors and rubrics an ambiguous judgment for TTS application products needs to be summarized to avoid too much
- The main assessment focuses on the content aspect

Digital teaching materials are good for abstract use of examples in the cell biology course. Apply the abstract concept to be understood by the learners with the use of this digital medium.

### 4. Conclusion

Based on the results of the research and discussion described earlier, it can be concluded as follows: (1) the product produced in this research and development is the instrument of assessment of digital teaching materials of biology learning. (2) Based on the validation results obtained a score of 4 which is included in the criteria both with minor revisions. Therefore, in terms of feasibility, it can be concluded that the instrument of assessment of digital teaching materials biology learning is feasible to be used in assessing the digital learning media of the creation of biology teacher candidates.

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