Development of e-learning-based evaluation tools for learning energy sources in elementary schools

Riyanti\textsuperscript{1*}, E Susilaningsih\textsuperscript{2}, and N M D Putra\textsuperscript{3}

\textsuperscript{1}Department of Primary Education, Graduate Program, Universitas Negeri Semarang, Indonesia
\textsuperscript{2}Department of Chemistry, Faculty of Mathematics and Natural Science, Universitas Negeri Semarang, Indonesia
\textsuperscript{3}Department of Physics, Faculty of Mathematics and Natural Science, Universitas Negeri Semarang, Indonesia

*Corresponding author: riyantiatika.ra@gmail.com

Abstract. This study aims to develop an e-learning-based evaluation tool to assist teachers and students in distance learning activities about energy sources in elementary schools. Preliminaries conducted by researchers in ten elementary schools in Cirebon Regency show that teachers find it difficult to evaluate students so that the results obtained have not reached 75\% complete classical. The type of used research is research and development (R&D) with a 4-D model consisting of 4 stages, namely define, design, development, and dissemination. This study used a group pretest-posttest design. The research subjects were 58 students of SD Negeri 3 Panembahan Cirebon Regency. The data collection instruments were carried out with interview sheets, tests and questionnaires. Quantitative data analysis techniques with parametric statistics, t-test one sample spss, Z proportion test. The results showed that the e-learning based evaluation tool using hosting and the developed domain was feasible, namely 3.82 with an average total score of 4.00 very valid category. Teacher response obtained 97.14\% (very good). Student response obtained 98.42\% (very good). Students experience classical completeness by 89\. It can be concluded that the use of e-learning based evaluation tools is a solution to the faced problems by teachers and students today as an alternative in assisting the implementation of distance learning.

1. Introduction
The development of technology has a positive impact on the progress of education so that it can be used as a means of learning activities for students [1] [2]. One of which is done by creating innovative learning activities in the form of evaluating questions according to needs [3] [4] [5]. Evaluation of essential items is carried out as a measurement of student achievement based on learning objectives while participating in learning activities without any manipulation or subjectivity [6]. This is by Permendikbud No. 67 of 2013 concerning the basic framework and structure of elementary schools tailored to the needs of students [7]. Evaluation of questions can be developed at the primary school level according to the learning topics that have been discussed by the teacher. One of the developments is in learning energy sources based on field needs, seeing that the evaluation results have not reached classical completion due to current conditions that require students to carry out distance learning activities (PJJ). So that students are less ready to learn. The existence of technological advances today is very helpful in assessing students. This can be developed using an electronic or computer system known as e-learning
to support learning in evaluation activities to complete student tasks [8]. E-learning is an information technology in learning that can be done without face to face with the help of the internet so that it is not limited to space and time [9] [10]. One of the e-learning developments is in the form of a web course for educational purposes [11] [12]. This is in line with research, which explains that the existence of an electronic learning system or e-learning can assist teachers in evaluating students' assessments according to competency objectives. students have, namely 4C, one of which is the ability to think creatively. Evaluation of creative thinking skills can be done referring to the rubric score developed with the Rubric for Creative Thinking Skills Evaluation [13].

Early March 2020, the coronavirus disease or known as covid-19 began to spread in Indonesia. In the middle of March 2020, the government implemented distance learning (PJJ), which aims to prevent more people from being exposed to the corona virus. This is in line with the implementation of educational policies related to the implementation of learning activities during the emergency period of the spread of the corona virus disease (covid-19) carried out by distance learning (PJJ). Distance learning is a teaching and learning process that is carried out without direct face-to-face contact between teachers and students [14] The existence of covid-19, the application of question evaluation conducted by the teacher must be carried out online or e-learning still with an accurate assessment.

Based on the results of observations carried out by analyzing the needs of students, it was found that they were less accustomed to facing distance learning, it was still rare to provide practice questions in the cognitive domains of C4, C5 and C6. Insufficient implementation of question evaluation without face to face face to face. In addition, data was obtained that 90% of teachers said they needed an e-learning based question evaluation tool that could help carry out assessments based on student achievement following competencies. Increasing the feeling of saturation of students has the potential to cause anxiety which can make it difficult for students to concentrate. Therefore an alternative solution is needed to solve the students' learning problems, one of which is by creating an e-learning based question evaluation tool according to the needs of elementary schools in Cirebon district.

Evaluation of e-learning based questions can be interpreted as a tool to assist teachers in assessing students to encourage to build knowledge and creative thinking skills. So that students will be a more open mindset. This study focuses on the development of e-learning based question evaluation in learning energy sources in elementary schools with the aim of knowing the feasibility of an evaluation tool characterized by learning energy sources so that it can be classically completed on the theme "Kayanya Negeriku" in grade IV Elementary School and the response students and teachers on the evaluation of e-learning-based questions.

2. Methods
The research method used is research and development (R&D) with a 4-D model by Thiagarajan, which consists of 4 stages, namely define, design, development and dissemination. Development research is used to produce a product in the form of an e-learning based question evaluation. The defined stage uses the interview sheet as an instrument to analyze field needs. The design stage is based on the current needs of students, namely using hosting and domains to be implemented. Evaluation of students without face to face on learning material sources of energy. The development stage uses expert validation sheets, namely material experts, while the aspects measured consist of material content and language. The aspects measured by media experts consisted of display format, problem solving strategy and practicality. The instrument for the test of students' creative thinking ability was used to measure classical completeness with quantitative data analysis techniques using parametric statistics, the average completeness test of the spss one sample t-test and the Z proportion test. The questionnaire in this study was used to determine the responses of teachers and participants. Students towards the development of e-learning-based question evaluation. The research subjects of grade IV students at SD Negeri 3 Panembahan, Cirebon Regency, were 58. The dissemination stage was used by distributing products to elementary school teachers, especially in energy source learning materials.
3. Results and Discussion

3.1 Validation of E-Learning Based Question Evaluation Tools

Validation. The results of field studies at the define stage in this study, students working on evaluating questions not yet based on e-learning, still use questions given by the teacher to student representatives to be distributed to other students so that the teacher waits for students' answers within a few days. Classical completeness of students is less than 75% due to the less accustomed students to distance learning activities. The low level of students' knowledge of e-learning-based learning activities is because teachers rarely carry out e-learning-based question evaluations. Problems in the field evaluation of questions given by the teacher need to be designed because they are less practical in implementing distance learning activities [15].

A teacher must be able to innovate the learning activities of students according to the needs of environmental conditions [16]. Based on the statement of the previous research, one of the innovations that can be carried out according to the needs is developing an e-learning based question evaluation to improve the value of students, especially in learning energy sources. The results at the design stage match the problems in the environment. The researcher designed the evaluation of questions based on e-learning so that it could be implemented effectively without face to face. The main problem that is being faced is in learning energy sources. So that to facilitate the evaluation of questions used hosting and domain, namely http://sumberenergievaluasi.soal.com. Students must first access the website address that has been created by the researcher. The initial display of question evaluation is presented in Figure 1.

![Figure 1](image1.png)

Figure 1. (a) Initial display of student account login (b) display of teacher account login

Students and teachers are directed to the home / welcome display on their respective accounts. Students' accounts have questions to answer questions in accordance with the learning that has been taught from material 1, 2, 3, 4 and log out. The teacher's account display shows that the account belongs to the teacher and the answers to questions that have been done by students. The presentation of the home accounts of students and teachers is presented in Figure 2.

![Figure 2](image2.png)
The home display on the student's account contains steps to answer question evaluations to help students when they have difficulty answering questions. In the display of student account material there is an identity name that must be filled in, a collection of evaluation questions, especially learning energy sources with a discussion of material 1 related to heat and sound energy, material 2 about energy changes, material 3 on the topic of alternative energy and its use, material 4 giving questions related to renewable and non-renewable energy sources. The answer menu serves as input data for students' answers which will appear on the teacher's account. The display of student and teacher accounts is not different, it's just that the teacher's account contains databases of all students' answers to materials 1, 2, 3 and 4 to make it easier for teachers to provide grades and be practical to use. The material display and students' answers on each account can be seen in Figure 3.

The question evaluation design developed by the researcher was made using a computer language script in accordance with the results the researcher wanted that was according to the needs of students at this time. The scripts developed by researchers on the accounts of students and teachers can be seen in Figure 4.

The development stage of an e-learning-based evaluation tool in learning energy sources was validated by material experts consisting of aspects of material content, language. Media experts consist of aspects of appearance, workmanship strategy and practicality. The results of the material and media expert validation obtained an overall average of 3.82 from the total average score of 4.00, in this case it can be said that the e-learning-based question evaluation tool is feasible to use. The design of the question evaluation tool was revised according to input from media experts regarding the size of the picture on each question and added a video tutorial on the stages of answering the questions so that...
students’ answers could be input into the teacher’s account. The results of expert validation can be seen in Table 1.

| Material | Average Score | Meaning   |
|----------|---------------|-----------|
| Media    | 3.72          | Very valid|

Evaluation is one of the essential activities carried out in learning activities that are useful for knowing the achievement of students [17]. One of the achievements of students in the 21st century is the ability to think creatively [18]. The dissemination stage is by distributing the product in the form of an e-learning based question evaluation tool developed to elementary school teachers, especially in energy source learning materials to assist teachers in the implementation of question evaluation without face to face with students.

3.2 Classical Completeness of Students

Acquisition of average completeness using the calculation of the SPSS one-sample t-test with an average result of 62.71 based on the value of BTA 45 t count 29.63 and t table 2.00. So it can be concluded that the average exceeds BTA. The Z proportion test aims to determine the classical completeness obtained by students by applying an e-learning based question evaluation on learning energy sources to the ability to think creatively by giving test questions. The results of data analysis are the value of \( z_{table} = (0.5-\alpha) = z (0.5-0.05) = z_{0.45} = 1.64 \). The 5% error level is obtained \( z_{hitung} = 2.57 > 58 z_{table} = 1.64 \). Because \( z_{hitung} > z_{table} \) means that the proportion of students who completed more than 75% is as much as 89.65%. Students have a complete score according to BTA on the pretest as many as 21 students out of 58 students, posttest as many as 52 students. Results of classical completeness Table 2.

| Kelas  | t hitung | t table | Kriteria |
|--------|----------|---------|----------|
| Eksperimen | 29,635   | 2,000   | Ho ditolak|

3.3 Responses of Teachers and Students

Teacher and student responses to the evaluation of e-learning-based questions developed were in the very good category. The results of the teacher’s response are 97.14% and students’ 98.42% can be seen in Figure 5.

![Figure 5](image)

(a) Results of teacher responses (b) results of student responses

Description of teacher response indicators: (1) display question evaluation, (2) suitability of question evaluation content with basic competencies, (3) language, (4) presentation, (5) image suitability, (6) image clarity, (7) practicality. Some input from the teacher, namely adding a video on how to use e-learning based question evaluation to make it easier for students to answer questions. Student response indicators: (1) interest in answering questions based on e-learning, (2) easy to answer according to their own ideas, (3) practicality, (4) image display, (5) language, (6) letter size suitability, (7) suitability of the font. So in this case the e-learning-based question evaluation tool gets a positive response from teachers and students to help carry out the question evaluation activities. The e-learning-based question evaluation tool can help teachers in assessing the learning that has been achieved. This
is in line with research which explains that e-learning-based question evaluation tools provide teacher satisfaction in assessing [19].

4. Conclusion
The conclusion of this study is the validation results of the development of an e-learning based question evaluation tool obtained a very good category so that it can be used as an assessment of students without face to face. Teacher and student responses to the e-learning-based question evaluation tool received a positive response. So that in this case, the students get a complete classical score.

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