Development of reqol (real quest outdoor learning) learning model to improve critical thinking skills (criticall thinking skill) in physics education

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Abstract. Learning curriculum in 2013 encouraging students to learn actively (Active learning) and train students to thinking skills needed in the 21st century learning, one of which is the critical thinking skills. Critical thinking skills in Java in the last three years is still relatively low, in addition to the model of learning that continues constantly evolving, demanding teachers to use instructional model inovativ. So do research ReQOL learning model development as one of the main efforts to develop a model that inovativ. The learning model ReQOL (Real Quest Outdoor Learning) is a learning model approach to learning outside the classroom (Outdoor Learning) that can provide real learning experience to students in learning activities. Syntax ReQOL learning model consists of five stages: 1) orienting; 2) Questing; 3) Mapping; 4) Sharing; 5) Evaluating. This type of research is the development of research using a model of development research and Nieven Ploom. Data obtained in the form of criteria for the validity, effectiveness, and student response. ReQOL learning model declared invalid by experts with a value of 90.2% validation criteria predictably very valid, and effective way to train critical thinking skills with high effectiveness criteria, namely 0.75, student responses to the lessons learned with the value 77.25%. So that ReQOL learning model can be used as one inovativ models that can be used by teachers to train students' critical thinking skills.

1. Introduction
Learning era of globalization students are required to have a variety of skills to become a successful personal life, so that teachers are expected to prepare the learning so that students can master the various skills according to the demands in the era of the 21st century [24] US-based Partnership for 21st Century Skills (P21), identifying the skills required in the 21st century is "The 4Cs" - communication, collaboration, critical thinking, and creativity. Learning curriculum in 2013 to encourage optimal physical and mental activity of students, so that learning is active (Active learning) and train students to have the ability to think is needed on learning 21st century, one of which is of critical thinking skills [18]. Critical thinking skills are one of the high order thinking skills that are important possessed by students in the 21st century [18].

Critical thinking skills in Java in three years terarkhir still relatively low, that showed of several studies: 1) Research at two high schools in Malang with 115 respondents were chosen randomly, obtained 86.6% of students enter the category of critical thinking ability is low [17] 2) Research on the two high schools in Bandung obtained 72% in the poor category and only 28% of the total students in both categories [10] 3) Research analysis of critical thinking skills physics performed in 11 high school all Yogyakarta Special region 2 school obtained in the low category, 7 low category schools, and 2 high school category [13], 4) Research at two high schools in Magetan showed students' critical thinking skills by 52. 28% with less category and 63.94% category enough (Susilowati et al, 2017). From several studies in the last 3 years, high school students' critical thinking skills in Java is still relatively low. One of the main factors that lead to a lack of critical thinking skills students are learning model used by teachers in classroom teaching [15], so it needs to be a design study model capable melatihkan critical thinking skills to learners.
The learning model is a tool that is used educators during the learning process, to create a fun learning environment and to motivate students to enthusiasm in learning [2]. Each learning model has elements of a systematic, social systems, the impact of the companion instructional impact, reaction principle, and support systems [7] [8] According to the times, the learning model has experienced growth, many new innovations in the learning model developed. Therefore, educators must be able to master some of the models, and enhanced creativity to innovate and develop models of learning [8].

The learning model that can improve critical thinking skills of one of them is a learning model Problem Based Learning (PBL), the model learning PBL students are required to think critically and logically in every step of learning, from formulating the problem, formulate hypotheses, collect data, deducing and reflect on the conclusions [20]. The weakness of PBL learning is most students have difficulties in the problem solving process, this depends on prior knowledge of the students. Students who have a lower initial ability may have difficulty in acquisition capabilities (Cheong, 2008). Concepts that have been discovered during the learning students should be able to presented in an attractive form, so that the process of remembering (retention) is more easily done by students. Mind Mapping learning model trains students to be creative record that allows students to remember a lot of information [5].

Physics is part of the science that studies the natural phenomena that are presented in the form of concepts, theories, and laws, so that the learning of physics should not ignore the nature of physics as a science, ie physics as physics as its processes and products [21][ 22]. Learning physics should be able to provide a real learning experience (real) on the students. The learning experience can directly deliver learning that is meaningful to the students, so that students can understand the concepts studied [21] One lesson that can provide real learning experience to students is a field-based learning (Outdoor Learning) [2016]. Outdoor Learning Learning will go well with the cooperation between students working in groups. Collaboration is a skill in which students are able to work in groups and contribute to the experimental activities to achieve a goal [2].

From the description above problems, then developed a learning model ReQOL (Real Quest Outdoor Learning) are able to train students to have 21st century skills, especially critical thinking skills (Critical Thinking) and provides real learning experiences to learners.

2. Methods

This type of research is the development of research. The development of research aimed at developing learning models ReQOL (Real Quest Outdoor Learning) for teaching physics in high school in accordance with the criteria for a valid product development, practical, and effective. This research refers to the development model of Plomp and Nieveen [12] stages include: (1) Preliminary research, (2) Prototyping stage, and (3) Assessment stage (summative evaluation).

Data taken peada this study were 1) Data validation, 2) Data effectiveness, 3) Data response. The data analysis technique used is quantitative descriptive analysis. Qualitative descriptive analysis was used to analyze quantitative data to be converted into data on qualitative data, qualitative data such as category ReQOL validity of the model, the model ReQOL effectiveness category, and the category of students' responses to learning ReQOL models.

Prior to conducting the field trials, and its learning model ReQOL perangakat pembelajaran namely Learning Implementation Plan (RPP), the syllabus in doing the validation of expert learning model development is professor at the University of Jember. Data validation experts then diprosentasi by the formula:

\[
\text{Nilai prosentasi} = \frac{\sum n}{\sum N} \times 100\%
\]

Information :

n: number of earned value
N: the number of maximum value

After getting a percentage value then the level of validity categorized in accordance with Table 1.

| percentage | Category validity | Information          |
|------------|-------------------|----------------------|
| 80% - 100% | very Valid        | Excellent for use    |
| 61% - 80%  | valid             | May be used with minor revisions |
Once the model of learning kits and teaching model ReQOL have met a valid category, then performed limited testing of the models developed. Data were taken on a limited test in that the data ReQOL effectiveness of the learning model and student response data. Data effectiveness as a value enhancement of students' critical thinking skills gained through engineering test with the provision about prior learning Pre-Test and Post-Test matter after learning. Indicators developed critical thinking Ennis (2011) include: 1) Provide a simple explanation; 2) Build basic skills; 3) Summing up; 4) Providing further explanation; 5) Providing further explanation. Data Pre-Test and Post-Test obtained and analyzed using the formulation:

\[ g = \frac{S_f - S_i}{S_{max} - S_i} \]

Information:
- \( g \) = gain
- \( S_f \) = The average value of the post-test
- \( S_i \) = The average value of the pre-test
- \( S_{max} \) = The highest score obtained by students

N-Gain value obtained is then converted to the criteria of effectiveness such as the Table 2 below.

Table 2. The level of students' critical thinking

| Coefficient     | Criteria          |
|-----------------|-------------------|
| \( \leq 0.70 \) | High              |
| \( \leq 0.30 \) | Medium            |
| Gain <0.3       | Low               |

Student response data obtained through the questionnaire responses were analyzed using the following formula:

\[ \%Rs = \frac{A}{N} \times 100\% \]

Information:
- \( Rs \): Percentage of students' responses
- \( A \): The proportion of students who choose yes or no
- \( N \): The number of students who completed questionnaires

Furthermore, from the results the percentage of student responses categorized by criteria such as in Table 3.

Table 3. Response Criteria Students

| Response Percentage Students | Student Response Criteria |
|------------------------------|---------------------------|
| 0-20                         | Bad                       |
| 21-40                        | Less                      |
| 41-60                        | Enough                    |
| 61-80                        | Good                      |
| 81-100                       | Very good                 |

(Riduan, 2010: 15)
3. Results and Discussion

3.1. ReQOL Learning Model (Real Quest Outdoor Learning)

The learning model ReQOL (Real Quest Outdoor Learning) is a blend of learning model Problem Based Learning (PBL) and Learning Model of Mind Mapping, presented by Outdoor Learning approach, and there are indicators of skills to collaborate in it. Outdoor Learning approach provides a real learning experience in accordance with the environment around the student, and the students can easily collaborate to solve the problems around it. Syntax learning model ReQOL (Real Quest Outdoor Learning) as presented in Figure 1 and Table 1 below.

![Diagram of ReQOL Learning Model](image_url)

**Table 3. Syntax of ReQOL Learning Model**

| Syntax       | Student activity                                                                 | Teacher activity                                                                 |
|--------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| stage 1      |                                                                                  |                                                                                  |
| orienting    | 1. Given the previous material                                                   | 1. Reviewing previous material relating to the material to be studied           |
| (Introduction of contextual issues on the students)  | 2. Understanding the problems kontestual given by the teacher                    | 2. Presents a problem kontestual                                                |
|              | 3. Creating a temporary answer of prior knowledge                                | 3. Motivate students                                                            |
|              |                                                                                  |                                                                                  |
| phase 2      |                                                                                  |                                                                                  |
| questing     | 1. Preparing search activity (investigation techniques)                           | 1. Accompanying the students both individually and collectively in the process of preparing and prospecting activities in the wild |
| (Search for answers in the Outdoor on a given issue) | 2. Conducting searches in the outdoors (troubleshooting)                         |                                                                                  |
|              | 3. Contribute in preparing and conducting the search (contribution)              |                                                                                  |
|              | 4. Cooperating with group members in the search for a solution in the wild (in collaboration) |                                                                                  |
|              | 5. Managing time in search activity (time management)                            |                                                                                  |
| stage 3      |                                                                                  |                                                                                  |
| mapping      | 1. Analyze your data with the findings of the group members                      | 1. Accompanying the students individually or in groups to analyze and create a concept map search results |
| (Attach results in the form of a concept map)      | 2. Together with members of the group make a concept map results                 |                                                                                  |
| stage 4      |                                                                                  |                                                                                  |
| Sharing      | 1. Delivering results in the other group members                                 | 1. Penyampain guide this discussion results                                     |
| (Communicating results)                           | 2. Discussion actively during the process of delivering the results of discussions |                                                                                  |
| stage 5      |                                                                                  |                                                                                  |
| Evaluating   | 1. Listening to the feedback submitted by teachers                              | 1. Provide feedback to students                                                |
| (Evaluating learning activities)                    | 2. Together teachers make learning conclusion                                    | 2. Encourage students to make inferences                                         |
|              |                                                                                  | 3. Assign the task of test item                                                 |
3. The task in the form of test item evaluation

3.2. ReQOL Learning Model System (Real Quest Outdoor Learning)

a. Social system
The social system in which dikembagkan ReQOL learning model by researchers in the form of interaction of teachers and students in the learning process that formed as the syntax of the model in learning. Some interactions that reflect the social system in the learning model ReQOL among other students work together in search activities in the wild, the students actively discussing during search activities and presentations, students active in the question and answer session with the teachers, and the teacher to control the class in order to create an atmosphere effective and efficient learning.

b. Support system
Support system in ReQOL learning model developed by the researchers is the teacher provides worksheets for conducting construct hypotheses, search, analysis and mapping concepts.

c. reaction principle
The principle of the reaction in the learning model ReQOL developed by researchers is the teacher serves as a controller and a facilitator in the learning activities such as motivating students in learning activities, guiding students to make hypotheses, guiding students to conduct searches in nature, guide students to analyze the results, guiding students create concept maps, guides the course of the presentation, as well as to respond to the questions of students during the learning activities.

d. impact Intruksional
Instructional impact of ReQOL learning model developed by the researchers is rising 21st century skills, especially critical thinking of students, increasing students' ability representation, as well as increasing students' mastery of the concepts of physics.

e. impact Companion
Impact accompaniment that can be obtained from the learning model developed ReQOL namely the increasing skills of cooperation of students and increasing scientific attitudes held by students.

3.3. Learning Model Validation ReQOL (Real Quest Outdoor Learning)
ReQOL Learning Model validation was conducted to see the validity of the learning model ReQOL before tested field, validation is performed by an expert on ReQOL learning model along with the device. The results of the model validation and learning devices are presented in Table 4.

| No. | Validation sheet | Results Validation Expert | Criteria |
|-----|------------------|---------------------------|----------|
| 1.  | Validation of Model | 91.6% | very Valid |
| 2.  | Validation of learning Tool | 88.8% | very Valid |
| Total | | 90.2% | very Valid |

From Table 2 above the mean values obtained for model validation percentage of 91.6% belong to the very valid criteria. Validation of the device obtained an average value of percentage of 88.8% belong to the very valid criteria. Validation total percentage obtained a mean value of 90.2% belong to the very valid criteria. Based on the results of expert validation has been done on ReQOL learning models and learning models ReQOL device can proceed to the stage of field trials.

3.4. Critical Thinking Skills in Learning Model ReQOL (Real Quest Outdoor Learning)
Critical thinking skills of students be obtained through tests about critical thinking skills before and after the learning model pemberlajaran ReQOL on the material grade 10 high school straight motion. Small-scale trials conducted to determine the effectiveness of the learning model ReQOL to improve high school students' critical thinking skills, from experiments conducted criteria values obtained N-Gain increase is as shown in Table 5 below.
### Table 5. Values of N-Gain Critical Thinking skills

| Indicator Critical Thinking       | Pretest | Post Test | N Gain | Criteria |
|----------------------------------|---------|-----------|--------|----------|
| Elementary clarification         | 30.7    | 76.5      | 0.77   | High     |
| The basic for decision           | 35.5    | 78.8      | 0.74   | High     |
| Inference                        | 48.3    | 79.4      | 0.69   | Medium   |
| Advance clarification            | 38.5    | 78.8      | 0.78   | High     |
| Strategies and tactics           | 43.8    | 83.2      | 0.77   | High     |
| **Total N-Gain**                 | 39.4    | 79.3      | 0.75   | High     |

![Critical Thinking Improvement](image)

**Figure 2. Table Improved Critical Thinking Skills**

Based on data obtained critical thinking skills Elementary clarification indicator get N-Gain values 0.77 categorized high criteria. The basic for decision indicators get N-Gain values 0.74 N categorized high criteria. Inference indicator get N-Gain values 0.69 were classified criteria. Indicators Advance clarification obtained N-Gain value of 0.78 relatively high criteria. Strategies and tactics Indicators N-Gain value obtained relatively high criteria 0.77. The total value of the N-Gain critical thinking skills acquired by students in the amount of 0.75 relatively high criterion, so that the model can be said to be effective ReQOL to improve high school students' critical thinking skills.

An increase in critical thinking skills after learning because students' critical thinking skills (Critical Thinking Skill) covers every step in the learning model ReQOL. Phase 1 orienting, can train critical thinking indicators Elementary Clarification, namely by focusing on the problems of the students, guiding students to ask and answer questions. Phase 2 Questing, can train critical thinking indicators The Basic for Decision, namely to train students to observe the answer by conducting an investigation. Phase 3 Mapping, can train critical thinking indicators Inference, which trains students summed up the results of observation. Stage 4 Sharing, can train critical thinking Advance Clarification indicators, namely jasmine students provide further explanation in the activities of the class discussion. Stage 5 Evaluating.

3.5. **Students at Model pembelajaran response ReQOL (Real Quest Outdoor Learning)**

The response is a response to students' learning by ReQOL models. Student response data obtained through a questionnaire given to students after learning ReQOL models. So we get the response data as shown in Table 6 below.
Table 6. Response Student Learning Rodel ReQOL

| No. | Question                                                                 | Answering Yes |
|-----|---------------------------------------------------------------------------|---------------|
| 1   | At the beginning of the learning activities, teacher's explanation to my attention. | 72.7%         |
| 2   | Motivation delivered stirs my spirit to learn.                            | 72.7%         |
| 3   | Just learning process was very interesting.                               | 90.9%         |
| 4   | I was motivated by their questions in early learning                     | 63.6%         |
| 5   | I can understand better understand the material presented by the lab      | 72.7%         |
| 6   | Teachers often provide assistance to students if experiencing difficulty in learning. | 90.9%         |
| 7   | The time given for discussions, presentations and other learning activities are in accordance with the needs. | 81.8%         |
| 8   | Teachers give all students the opportunity to ask about the matter who do not understand | 63.6%         |
| 9   | Teachers guide the students to draw conclusions learning materials.       | 81.8%         |
| 10  | I understand the material and are motivated by their exercises            | 81.8%         |
|     | **Total**                                                                 | **77.25%**    |

Based on learning student response data using model ReQOL on a straight motion of matter, we found the percentage of the total score on all indicators saying yes as much as 77.25% and fall into either category. Thus it can be concluded that learning with the learning model ReQOL on material rectilinear motion getting a good response from the student, the student is unbelievably enthusiastic in participating in learning activities, in students' learning tend to be active in conducting experiments outside the classroom. In learning activities are also a good interaction between students and teachers as well as students and other students in the study group. With his own students had given the problem-solving process, students can understand the concepts learned.

4. Conclusions

ReQOL learning model has a syntax that is Orienting, Questing, Mapping, Sharing and Evaluating. The learning model ReQOL memiliki social system, the principle of reaction, support systems, instructional impact, and the impact of accompaniment. Critical thinking skills in the learning model ReQOL accompany any learning syntax. From the results of expert validation study model ReQOL acquire 90.2% of expert validation value with very valid criteria and can be used in learning activities. The results of field trials to measure the effectiveness of the learning model ReQOL in improving critical thinking skills with a 0.75 and categorized into high N-Gain criteria, ReQOL learning model can be said effective to improve high school students' critical thinking skills. Students' response to learning using learning model ReQOL by 77, 25% and categorized into good response category. So that ReQOL learning model can be used by teachers as one of the models that is fun for the students and also able to train the students' critical thinking skills in learning activities.

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