Validity and practicality of electrolyte and non-electrolyte solution modules posit on guided inquiry with probing prompting technique for grade X in senior high school

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Abstract. The 2013 curriculum development requires students to be active during the learning process and critical thinking. The using of electrolyte and non-electrolyte modules is a way to improve students' critical thinking skills. This study aims to produce an electrolyte and non-electrolyte solution module posit guided inquiry with probing prompting technique and reveals validity and practicality of the using of the module. In this research, the model is the Plomp model expanded by Tjeerd Plomp. The instruments were validation sheet questionnaire and practicality sheet. The validation has been validated by three chemistry lecturers at UNP, two Payakumbuh SMA N 3 chemistry teachers, and a chemistry teacher of Payakumbuh SMA N 5 schools. Validation of the module using Cohen's Kappa formula. The yield with a kappa moment value of 0.90. Practicality sheets were given to 58 students. The result of the practicality has a very high validity level of 0.90.

1. Introduction

There are improvements to the 2013 curriculum such as the 2013 revision of the 2018 curriculum to improve all existing deficiencies. In the 2013 curriculum, the students are expected to be able to learn more actively. The most important thing in terms of the ability for life that can be used for various aspects of life is critical thinking. Critical thinking is one of the characteristics of intelligent humans. Critical thinking will occur if it is preceded by critical awareness which is expected to be developed through education [1]. There are four areas of critical thinking: reasoning effectively, using a system of thought, make judgments and decisions, solve problems [2].

The material for class X semester 2 electrolyte and non-electrolyte solutions have many abstract concepts such as the division of a fully ionized, partially, and non-ionized solute. Division of the solution based on its electrical conductivity. These materials are abstract, so it takes a strong imagination of students to read and analyze the subject matter, so that it makes students difficult to understand it. As a result, students find it difficult to understand the concepts contained in this material [3]. These materials such as the distribution of solutes based on their ionization, fully ionized solutes, partially ionized solutes, and solutes that are not ionized. This material is of course interrelated with a solution that is mapu and unable to conduct electricity. The more students having trouble of ionized, non-ionized
dissolved, students will find it difficult to understand the limit for a solution that can conduct electricity and cannot conduct electricity.

The author's interviews with teachers and students at SMA N 3 Payakumbuh and SMA N 5 Payakumbuh, the results show that, the use of textbooks in schools is still limited, the number is not comparable to many students, textbooks with complete contents are still small, so that students who are quick to borrow textbook that can use these textbooks. In schools, teaching materials, worksheets, and modules are also used, but the material is still simple, and has not been able to improve students' critical thinking skills. The posit on the yield of the beginning investigation analysis of critical thinking skills in SMA N 3 Payakumbuh and SMA 5 Payakumbuh students' critical thinking skills are low.

The learning models suitable for use in making students more active in discovering concepts is the guided inquiry learning model. Inquiry comes from the English word "inquiry" which literally means, investigation, exploration, investigation, examination, research, search. The thinking process itself is carried out through question and answer between teachers and students [4]. Guided inquiry-based strategies are used to center on students, students will form small groups, and each individual plays an active role in the learning process and is guided by the teacher [5]. There are 4 stages of guided inquiry, namely orientation (introduction), exploration and concept formation, application, and closure.

The support implementation of inquiry-based learning models. needed learning techniques that are suitable in making students more active during the learning process. One of the questioning techniques suitable for use in the learning process is the probing prompting.

Probing prompting is a questioning technique by means of the teacher giving a series of questions to students. the technique of asking is done by giving questions that are carried out randomly, without differentiating between students, so students cannot avoid questions given by the teacher during the learning process [6]. Probing means investigating, examining, digging or tracing whereas prompting means encouraging or guiding. probing prompting technique is a technique of asking in the form of a series of questions that are probing and also guiding so that a thought process occurs that links each student's knowledge and experience with the new knowledge that is being studied [7-9]. The support students maniri teaching materials are needed. with the module allows students to be able to learn independently and not depending on other parties[10]. Fefri Febriany's research results entitled "Solubility Module and Solubility Times Results Based on a Scientific Approach Using Probing Prompting Techniques to Improve Students' Critical Thinking Ability at SMA N 1 Pariaman" The results showed that the application of probing prompting in the learning process terrace student learning outcomes and thinking skills. critical learners [11].

The explanation researcher is fascinated about “Validity and Practicality of Electrolyte and Non-Electrolyte Solution Modules Based on Guided Inquiry with Probing Prompting Technique for Class X SMA”.

2. Research methods
The type of research used development or Research and Development (R & D). This research, the be expanded model is the Plomp model be expanded by Tjeerd Plomp[12]. This research has only been carried out until the stage develop, namely the validity and practicality test of product. Resulting is a module electrolytes and non-electrolytes based on guided inquiry with probing prompting techniques for class X SMA.

The initial investigation stage was carried out: needs analysis, at the needs analysis stage was carried out by interviewing 4 chemistry teachers, namely 2 chemistry teachers at SMA N 3 Payakumbuh and 2 teachers of SMA N 5 Payakumbuh, interview questionnaires to sixty students., the analysis study was carried out main in electrolyte and non-electrolyte solution to be taught and detailing relevant concepts through several chemistry books which were then outlined in the form of concept analysis tables which became the basis for drafting concept maps. Student analysis aims to determine the characteristics of students, difficulties faced by students, the need for teaching materials and students' critical thinking skills [13]. The analysis of students was carried out with a literature study on the characteristics of students.
The prototyping stage: prototype 1 stage is designing electrolyte and non-electrolyte solution modules based on guided inquiry with probing prompting techniques. The next stage is self evaluation. Prototype 2 stage is to validation with 3 chemistry lecturers of UNP, and validation with 2 teachers of SMA N 3 Payakumbuh and 1 teacher of SMA N 5 Payakumbuh. prototype 3 is to test one to one evaluation on 3 students of SMA 3 N Payakumbuh. Prototype 4 conducted a small group test by providing practicality to 9 students of SMA 3 N Payakumbuh. The assessment phase was carried out by means of practicality testing by giving practicality questionnaires to 58 students, and teacher practicality sheets to 3 high school chemistry teachers.

3. Results

3.1 Preliminary Investigation Stage

3.1.1 Needs Analysis. In the needs analysis stage was collected on problems encountered while studying chemistry, especially in the material for class X SMA electrolyte and non-electrolyte solutions. needs analysis was carried out by providing interview questionnaire sheets to 4 chemistry teachers.

The yield of interviews with four chemistry teachers found various problems in learning chemistry. Students are still learning in the old method, namely with lectures given by the teacher, students also learn with the method of interest, then students also learn with the question and answer method given by the teacher.

Chemistry learning is oriented towards students, although the lecture method still dominates. The application of the learning model with the probing prompting technique is still not widely used in schools. During learning, the teacher has provided learning to students with questioning techniques. The questions given by the teacher have not fully explored and guided students in finding their own concepts. Thus, the use of the probing prompting learning technique is still not maximally applied to the learning process in schools.

3.1.2 Curriculum Analysis. To determine what competencies students after students learn the material of electrolyte and non-electrolyte solutions. Curriculum analysis carried out in accordance with the current curriculum, namely the 2013 revised 2018 curriculum, starting from the analysis of basic competencies (KD) for electrolyte and non-electrolyte solution material in class X semester 2. Basic competencies for electrolyte and non-electrolyte solution materials.

3.1.3 Concept Analysis. The concepts of electrolyte and non-electrolyte solution materials are: solution, ionized and non-ionized solutes, properties of electrolyte solutions their conductivity, Archenius’ acid-base theory, ectrolyte solutions posit ionic and polar covalent compounds.

3.1.4 Student Analysis. The results of the questionnaire given to 60 students. The following information was obtained: In general, the difficulties faced by students are difficulties in analyzing the differences in electrolyte solutions that are fully ionized, partially and non-ionized, and the properties of the solutions produced from solutions derived from ionic compounds, covalent compounds, and non-polar covalent compounds, Students are interested in guided inquiry-based learning using the probing prompting technique, Students like teaching materials that are illustrated and have attractive colors, generally, students like blue, orange, red, purple, students' critical thinking skills are poor.

3.2 Prototyping Phase

3.2.1 Prototype 1. After the indicators and learning objectives are formulated, then the electrolyte and non-electrolyte soluble module design is carried out based on guided inquiry with the probing prompting technique.
Self Evaluation. After designing and making inquiry-based modules guided by the probing prompting technique. The next stage is to conduct a formative evaluation in the form of self-evaluation. This self-evaluation focuses on obvious errors or obvious errors such as misuse of pictures, typos and completeness of the module.

3.2.2 Prototype II. Validating the instrument, then validating the developed module. The validation was carried out by three UNP chemistry lecturers and three chemistry teachers, consisting of 2 chemistry teachers at SMA N 3 Payakumbuh and 1 chemistry teacher at SMA N 5 Payakumbuh.

Table 1. Categories of decisions based on Kappa Moment (k)

| No | Rated aspect                                                                 | k  | Validity Category |
|----|------------------------------------------------------------------------------|----|-------------------|
| 1  | The congruence of the material, indicators, and objectives learning to be achieved. | 0.91 | Very High         |
| 2  | The contents of the module are made according to the skills of high school students | 0.96 | Very High         |
| 3  | Correspondence problem given with the material being taught                  | 0.91 | Very High         |
| 4  | Conformity questions for find the concept                                     | 0.91 | Very High         |
| 5  | Truth of facts, concepts, principles scientifically                            | 0.91 | Very High         |
|    | Average                                                                       | 0.92 | Very High         |

The results of the content component analysis show that the aspect number 1, 2, 3, 4, 5 has a very high validity. The evenly kappa moment value of 0.92 with a very high validity category. The results of the content component data analysis by the validator venomed breck in table 1.

The results of the construct component analysis show that aspects number 7 and 10 have high validity. Then aspects 6, 8, 11, 12, and 13 have the validity and the average kappa moment for the prototype II construct component of the electrolyte and non-electrolyte solution module posit guided inquiry with the probing prompting technique obtained a value 0.90. The results of the construct component assessment by the validator venomed breck in table 2.

Table 2. Results of the construction component assessment analysis

| No. | Aspects are rated                                                                 | k   | Validity Category |
|-----|----------------------------------------------------------------------------------|-----|-------------------|
| 6   | The relationship between the concept and problems are given in the module.        | 0.91| Very High         |
| 7   | The observing stage can guide students to analyze problems                        | 0.86| High              |
| 8   | Phase ask that contain questions probing prompting can lead participant students and explore the knowledge of participants learners to formulate the problem in the form of a question the hypothesis | 0.91| Very High         |
| 9   | Stage processing of data can guide the participant students to memberikan explanation is simple, write an example, memebuat definition and provide argument in favor ( kemeampuan give reasons) | 0.91| Very High         |
The data processing stage can lead students to provide simple explanations, write examples, make definitions and provide arguments (skills give reasons)  

0.86 High

The stage can lead students to prove hypotheses and provide further explanations  

0.91 Very High

Stage make conclusions, can lead students to make conclusions based on destination Learning  

0.96 Very High

Problem on the evaluation sheet already in accordance with the learning objectives in the module.  

0.90 Very High

Average 0.90 Very High

The linguistic component analysis show that all aspects have a very high validity. The linguistic component of the prototype II module value of 0.94 with a very high validity category. The results of the analysis of the language component assessment data by the validator venomed breck in table 3.

| No. | Aspects are rated | k  | Validity Category |
|-----|------------------|----|-------------------|
| 14  | Font size and shape can be Be read | 0.96 | Very High |
| 15  | Instructions and information are presented in the modules clearly | 0.96 | Very High |
| 16  | Modules use rules Languages Indonesia are correct | 0.91 | Very High |
| 17  | The language that is used to Understood | 0.91 | Very High |
| 18  | Languages that use a clear (not cause confusion) | 0.96 | Very High |
|     | Average | 0.90 | Very High |

The components graphic show all that all aspects have validity are high. The results of the analysis of data assessment component graphic by the validator venomed breck in table 4.

| No. | Aspects are rated | k  | Validity Category |
|-----|------------------|----|-------------------|
| 19  | Use of font sizes vary | 0.86 | High |
| 20  | Interesting module layout | 0.86 | High |
| 21  | Illustrations, images, and graphics interesting | 0.86 | High |
| 22  | Design module as a whole Interesting | 0.80 | High |
|     | Average | 0.84 | High |
The posit of Table 5, graphic component analysis show that aspects number 19, 20, 21 have the same high validity. The average kappa moment for the prototype II graphical component of the electrolyte and non-electrolyte solution posit guided inquiry with probing prompting technique obtained a value of 0.84. The following yield assessment of each aspect given by the validator as shown in table 5.

The four components of the assessment of the module prototype II, namely the content, construct, linguistic and graphic components, the overall validation result assessment is obtained which venom breck in table 5.

**Table 5. Results of Analysis Assessment Prototype II In Overall**

| No. | Aspects are rated     | k     | Validity   |
|-----|-----------------------|-------|------------|
| 1   | Content Components    | 0.92  | Very High  |
| 2   | Construct components  | 0.90  | Very High  |
| 3   | Language Component    | 0.94  | Very High  |
| 4   | Graphic Components    | 0.84  | Very High  |
|     | Average               | 0.90  | Very High  |

3.2.3 **Prototype III.** Individual evaluation was interviews with three students of class X SMA N 3 Payakumbuh. On the activity sheet, the researcher mentions the stages of guided inquiry contained in the module and then students are asked to read and pay attention to each of the steps in the module and pay attention to the pictures given. At the stage of exploration and concept formation students experience a little difficulty in formulating concepts. Students with high and moderate abilities are still hesitant to mention the problems contained in the exploration and concept formation stages in key questions, while students with low abilities have not been able to formulate concepts. The difficulty in formulating the concept of this problem is overcome by adding questions to the problems given from these questions. It is hoped that students will be able to formulate concepts related to questions.

3.2.4 **Prototype IV.** Prototype IV was obtained from the results of the small group evaluation of prototype III. The module of electrolyte and non-electrolyte solution material give to 9 students of SMA N 3 Payakumbuh class X MIPA, where each student received 1 (prototype III). Learning using modules is only done for learning in class (2 meetings). The practical result at the small group stage was 0.89 with a high validity criterion. The results of practicality value small group can be showed in figure 1.

![Results of Small Group Practical Value](image)

**Figure 1. Results of small group practical value**

This appraisal stage with practicality. Practicality trials carried out by SMA N 3 Payakumbuh and SMAN 5 Payakumbuh. Practicality data were faciled from questionnaires to students (student questionnaires) and chemistry teachers (teacher response questionnaires).

The student response questionnaire was filled in by 58 students after learning using modules. The average kappa moment for the practicality was 0.90 with a high level of practicality. The results obtained from the practicality data analysis of the module at the field test stage can showed in figure 2.
The questionnaire of an average kappa moment for practicality from the teacher's response questionnaire is 0.90 with a very high level of practicality, meaning that the module of electrolyte and non-electrolyte solutions. The results obtained from the practicality data analysis of the module at Module from the Teacher Response Questionnaire show in figure 3.

4. Discussion

Product quality resulting from development research is assessed based on three aspects, namely validity, practicality and effectiveness (Nieveen, 1999: 127). The validity, practicality and effectiveness of electrolyte and non-electrolyte modules with probing prompting techniques are explained as follows.

4.1 Module Validity

The module design was validated by six validators, consisting of three chemistry lecturers at the Faculty of Mathematics and Natural Sciences, two chemistry teachers at SMAN 3 Payakumbuh questions and one chemistry teacher at SMAN 5 Payakumbuh.

Construct component of module has an average kappa moment of 0.90 with a very high validity category [13]. The linguistic component of the module has an average kappa moment of 0.94 with a very high validity category. The module graphic component has an average kappa moment of 0.84 with high validity category. The very high kappa moment category indicates that the font size used varies, using attractive layouts, illustrations, images, graphics and attractive overall module design.

Overall, the evenly kappa moment acquisition for the validity of electrolyte and non-electrolyte solutions based on guided inquiry with developed probing prompting technique is 0.90 with a very high validity category. The results of module validation indicate that the designed module is valid.
Overall the average kappa moment acquisition for the validity of the guided inquiry electrolyte and non-electrolyte modules guided by the probing prompting technique developed was 0.90 with a very high validity category.

4.2 Practicality of Modules

The practicality assessed consists of three aspects, namely ease of use, efficiency of learning time and benefits of modules [14]. Modules are said to be practical when teachers and target users (students) judge that the module can and is easy to use. The instrument used was a practicality questionnaire given to nine students at the small group evaluation stage, 58 students in the experimental class and three chemistry teachers.

The module was tried out in actual conditions with nine students who had low, medium and high skills in small group stage. the field, the module was tested in two schools, namely SMA N 3 Payakumbuh and SMA N 5 Payakumbuh. The results of the practicality assessment of students in small groups obtained an average kappa moment of 0.89 and in the field trial it was 0.90 with a high level of module practicality for the aspect of ease of module use.

The aspect of learning time efficiency obtained a very high level of practicality with a kappa moment of 0.80 in small group evaluations and 0.89 in field trials. This shows that by using electrolyte and non-electrolyte solution modules based on guided inquiry with the probing prompting technique, learning time becomes more efficient. Learners who complete an activity sheet more quickly can continue to complete another activity sheet.

The benefit of the module is that the practicality level is very high with a kappa moment of 0.9 in the small group evaluation and 0.91 in the field trial. The results of the teacher practicality assessment at the field trial stage obtained an average kappa moment of 0.90 for the ease of use aspect, 0.91 for the efficiency aspect of learning time, 0.90. This shows that the material presented in the module is clear, easy to understand, and has a practical size. the role of the teacher as a facilitator, reduce the burden on the teacher because it does not need to explain material repeatedly and can measure students' understanding and achievement of learning objectives.

Overall the average kappa moment acquisition for the practicality of electrolyte and non-electrolyte solution modules based on guided inquiry with the probing prompting technique developed was 0.89 from students (field test) and 0.90 from teachers with high and very high practicality levels respectively. high. The results of the practicality of the module show that the modules designed are practical.

5. Conclusions

Posit the results of research and discussion, it can be concluded that the module of electrolyte and non-electrolyte solutions based on guided inquiry with the probing prompting technique has a very high level of validity and practicality. The mean kappa moment score (K) from the results of the validity test by experts, namely 0.90 for validity with very high validity criteria, and the results of the practicality of students, namely 0.90 with very high validity criteria.

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