Metacognition E-LKPD Development Using 3D Pageflip on Electrolyte and Non-Electrolyte Material

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Abstract—**Metacognition is one of the core competencies that must be achieved in 2013 curriculum learning. It includes four types of metacognition skills, namely; problem-solving, decision making, critical thinking, and creative thinking. The use of teaching materials such as student electronic worksheet (e-LKPD) metacognition-based can undoubtedly train and guide students to think and master these metacognition skills. This study aims to develop metacognition-based e-LKPD using 3D pageflip Electrolyte and Non-Electrolyte Solution material and find out students' responses to the e-LKPD. This research is research and development that adapts the ADDIE development framework. The research instruments used were interview guidelines, needs questionnaires, expert team validation questionnaires, assessment questionnaires, and student response questionnaires. The product of the development was validated by a team of experts and was assessed by the teacher then tested on small group students of class X SMAN 8 Yogyakarta. The results of the study showed that the metacognition-based e-LKPD assessment, according to media experts and material experts, obtained assessment scores of 82% and 80.4% with the category of "very valid" then the percentage of student ratings obtained by 88% with the category of "very good." Based on the overall development process, it can be concluded that this metacognition-based e-LKPD is very well used as a learning media and chemical teaching material.**

Keywords: e-LKPD, metacognition, electrolyte and non-electrolyte

I. INTRODUCTION

The development of the era or often known as the era of globalization that brings influence in various aspects of life, one of which is in the field of technology. Currently, most fields of life have applied for technological advances, including in the world of education. In the educational aspects, informational technology helps the students in the learning process and also give some significant role for the teachers, especially to facilitate the teachers to explore their teaching abilities. Computers become one of the essential technologies for society because they are widely used both in the fields of business, education, and others. In the learning process, especially in terms of the delivery of material, the existence of computer technology is no longer a new thing because computer technology has been utilized in the learning process. In fact, with the start of computers in education, it has become easier for teachers to provide knowledge and for students to get it. The use of technology has made the learning process more enjoyable [1]. Technologies give us the option to use in learning

that is able to make learning for students more active and increase student's interest in learning [2]. Chemistry learning is one of the learning processes that has made use of technology.

Chemistry learning focuses on how students construct the knowledge they have. Knowledge of chemistry is not enough just by providing information from the teacher, but students must also construct their own understanding of the concept. Constructivist teachers do not just provide knowledge to students but students must build their own knowledge. The teacher only provides convenience by giving students the opportunity to find or implement their own ideas, that means students should not only know and memorize matters related to chemical concepts but also understand and implement them in their daily lives [3]. To assist students in constructing their understanding, Effective learning strategies are needed to support the chemistry learning process that is well organized. But usually it requires too much media or help in the learning process [4]. One possible solution is to develop teaching materials in the form of worksheets that can facilitate student learning activities so that it will form active interactions between students and teachers [5].

Student Worksheet (LKPD) is an activity sheet containing information and instructions from the teacher to students so that students can work on a learning activity themselves, through practice or the application of learning outcomes to achieve learning objectives. Learning media is one of the many components of the teaching system which is the most important factor in supporting the success of the learning process. Learning media can be defined as a tool or means that can support teaching materials in the learning process. Attractive learning media can increase students' interest and motivation to learn, with the media expected to make users fully understand the material provided. Learning media are believed to help teachers convey their material to students [6].

In the 2013 curriculum, students are required to understand, apply, and explain metacognitive knowledge in science, technology, art, culture, and humanities. Metacognition is a person's skill in managing and controlling their cognitive processes. These skills differs from one individual to another according to the ability of the thought process. Metacognition includes four types of skills, namely: (1) Problem solving, (2) Decision making, (3) critical thinking, and (4) Creative thinking [7]. Metacognitive

development and scientific reasoning are important, because theses processes help the students in developing a meaningful learning atmosphere, develop thinking skills, engage in analysis or problem solving processes, make generalizations, and in choosing strategies to improve future cognitive performance. There are three types of metacognitive knowledge, namely; declarative, procedural, and conditional knowledge. Declarative knowledge is knowledge about yourself as learners, and factors that influence someone's performance. Procedural knowledge is knowledge of how to use everything something already known in knowledge declarative, while conditional knowledge is knowledge of when and why using declarative knowledge and knowledge procedural[8].

Based on observations in several schools in Yogyakarta, there are many LKPD that are used by different publishers. LKPD which distributed from publishers, do not cover all the expected set of metacognition activities. Some metacognition activities are not displayed, for example, designing activities. Experimental activities in LKPD do not lead students to be able to design their experiments. Most of the experimental activities have been given direct work steps so that they do not provide opportunities for students to think and design experimental activities to be carried out.

Meanwhile, based on the results of the distribution of questionnaires to students in class X Yogyakarta Senior High School, in learning chemistry in general, students get knowledge from the teacher's explanation and still rely on learning packages textbooks. Furthermore, it was also obtained that students rated chemical materials difficult to understand. Electrolyte and Non-Electrolyte Solutions is an example of the material that is considered difficult to understand by students. It seen from 80% of students think this material is not too difficult, but in higher thinking, students find it difficult to understand. As many as 60% of students say that teachers have used teaching materials in learning. 100% of students respond well to the development of metacognition-based teaching material on chemical materials, especially electrolyte and non-electrolyte solution materials. Finally, students expect these teaching materials are made as attractive as possible.

Based on the problems described above, the authors offer a metacognition-based e-LKPD development that will later enable learning to be effective, and students will be easier to understand the material, especially the material Electrolyte and Non-electrolyte solution. The e-LKPD teaching materials will later be operated using professional 3D PageFlip software. Professional 3D PageFlip software is a superior program specifically for display material in the form of electronic books that can be equipped with audio, images, moving animations, and videos that are more interesting than Microsoft PowerPoint and other development programs. Teaching materials using professional 3D PageFlip are not operated via a laptop only, but also through Smartphones, Tablets, and Gadgets by changing the file format from exe to 3gp. So that wherever and whenever students can learn independently So from the description above, the researchers conducted a development study entitled " Metacognition e-LKPD Development Using 3d Pageflip on Electrolyte and Non-Electrolyte Material ".

II. LITERATURE REVIEW

A. Metacognition

The 'meta' refers to higher-order cognition about cognition or 'thinking about one's thinking'. It is often considered to have two dimensions: metacognitive knowledge and metacognitive regulation. metacognitive knowledge is stable declarative knowledge, that is, a person has to do with cognition and memory, which are stored in memory long term, so that it is accessible conscious, and can be used to control cognitive process [9].

Metacognitive knowledge is students' knowledge about their own cognitive abilities (e.g., they have difficulty remembering people's names), learners' knowledge about certain tasks (e.g., ideas in writing articles), and students' knowledge about various strategies, including when have to use this strategy (e.g., if I divide the telephone number into pieces I will easily remember it.) [10].

Metacognitive knowledge evaluates how learners are reviewed and controls their cognitive processes. For example, the compilation participants discussed the strategies used in chemical defense to no avail and tried to find other strategies [10]. Details of monitoring in the next section.
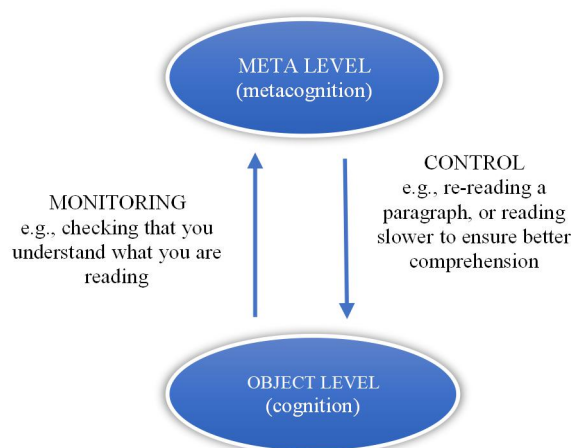

Fig. 1 Model of Metacognition
(Nelson and Narens':1990)

B. Student Worksheet(LKPD)

Student activity sheet is a guide for students in conducting guidance or problem solving activities. Can form a guide to the exercise of developing other aspects besides that, in the form of a study guide also a demonstration. Student worksheets are teaching materials that are printed with sheets of paper that contain material, quantitative, and instructions for organizing learning that students must work on, which are intended for the competencies needed [12].

Student Worksheets are one form of teaching materials which consists of the sheets that should be done by students. When students answer questions on their worksheet, they must fulfill cognitive activity so that it can improve their understanding [13]. The quality of student worksheets is also regulated. Product quality measurement, development, and program evaluation meet valid, practical and effective criteria. Based on these three aspects, it will prove the

validity, practicality, and effectiveness of students' worksheets in the learning process [14].

III. RESEARCH METHOD

The type of research used is Research and Development. Research and Development are research used to produce a product and test the effectiveness of the product. The development model used is the ADDIE model, which consists of five stages Analysis, Design, Development, Implementation, and Evaluation. The test subjects in this study were students of class X SMAN 8 Yogyakarta. The type of data in this research is qualitative data and quantitative data.

IV. RESULTS AND DISCUSSION

In this research development, using ADDIE framework, which consists of 5 stages, that is:

A. Analysis

In the analysis phase, the distribution of needs questionnaires carried out, which was useful for collecting data related to the problems faced by teachers and students of Class X in SMAN 8 Yogyakarta. Data obtained from the needs analysis questionnaire is reviewed from the aspects of students 'character, material, level of cognitive development, learners' knowledge, and technology analysis.

B. Design

At this stage, the aim is to design a metacognition-based chemical e-LKPD and components related to the e-LKPD. The parts designed in e-LKPD are as follows:

Cover

The cover is an essential part of the attractiveness of students to read it, while the cover image display of metacognition-based chemistry e-LKPD as shown below.
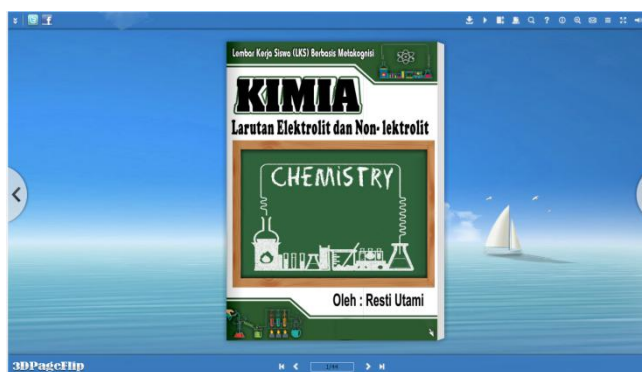

Fig. 2 Design Cover

• *Preface and table of contents*

The preface contains an introduction about e-LKPD that used in the learning process. The table of contents makes it easy for students to find pages on e-LKPD.

• *Introduction*

This section contains a brief description of the steps in learning metacognition, instructions for using e-LKPD, competency standards, basic competencies, indicators, and learning objectives.

• *Concept map*

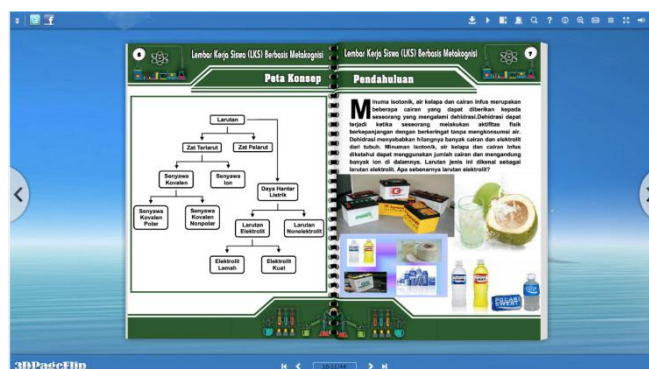Concept maps are crucial for students and teachers because the learning concept map will be more directed.

Fig. 3 Concept map design

• *Learning activities*

Metacognition-based e-LKPD products consist of four learning activities, namely: 1) Problem solving, 2) Decision making, 3) Critical thinking, and 4) Creative thinking.

Fig. 4 Learning activities design

C. Development

At this stage, the metacognition-based e-LKPD was created and then validated by a team of experts named the material expert and the media expert. The validation of the expert team was carried out by the lecturer. Suggestions, input, and comments obtained from the expert team are then used to improve e-LKPD based on metacognition.

Result of e-LKPD validation by Material Expert

TABLE I. RESULTS OF MATERIAL EXPERT

No	e-LKPD criteria	Validation Value	Criteria
1	Learning	83.3%	Very Valid
2	Fill in the material	85%	Very Valid
3	Use	78.3%	Valid
4	Metacognition skills	81.7%	Very Valid
Average		82%	Very Valid

Based on the table above, the overall percentage of the assessment by the material experts is very valid, because it is at the ideal percentage of $81\% \leqslant$ Value $\leqslant 100\%$ so that the e-LKPD made does not require revision. However, comments from material experts are used as material for the improvement and improvement of e-LKPD.

Results of e-LKPD Validation by Media Experts

TABLE II.   RESULTS OF MEDIA VALIDATION

No	e-LKPD criteria	Validation Value	Criteria
1	Display	83.3%	Very Valid
2	Programming	85%	Very Valid
3	Use	78.3%	Very Valid
4	Metacognition skills	75%	Valid
	Average	80.4%	Very Valid

From the table above, note that the percentage of the overall aspects of e-LKPD ratings from both expert matter of learning is very valid because it is the percentage of ideals 81% $\leq$ Value $\leq$ 100%.

D. Implementation

At this stage, the developed e-LKPD was tested to the students of SMA N 8 Yogyakarta. Test try, that do that test try to group small that do for the 15 participants of learners. At this stage, practicality data and the success of using e-LKPD are obtained to facilitate the metacognition ability of electrolyte and non- electrolyte solution materials through an assessment questionnaire.

Test Result Data

TABLE III.   RESULTS OF MATERIAL EXPERT

No	Variable	Validation Value	Criteria
1	Student interest and e-LKPD Display	90.3%	Very Good
2	Use of e-LKPD	85%	Very Good
3	Understanding of concepts and materials	89.2%	Very Good
4	Metacognition Ability	87.6%	Very Good
	Average	88%	Very Good

Based on the table above, the calculation of the overall data results of the test try is 88 %, so it categorized very well because the ideal percentage is 81% $\leq$ Value $\leq$ 100 %. From these results, the e-LKPD does not need revisions anymore. However, comments and suggestions from students are still used as improvements to improve this e-LKPD.

E. Evaluation

Evaluation is the process of seeing whether learning media are made successfully, according to initial expectations or not. Evaluation can be done at each stage of development. This final evaluation is to determine students' responses to the use of instructional media that have been declared appropriate by the expert team. This evaluation is formative because the purpose is for the needs of revision. After the implementation phase is carried out product trials, the authors obtain data in the form of a questionnaire.

Based on the results of the analysis of the validation of material experts and media experts, the results of the assessment of 82% and 80.4% of the results of the expert assessment showed that the metacognition-based e-LKPD

developed was very valid and could be used in chemistry learning. While the results of data analysis obtained in the study indicate that the e-LKPD developed has a very good category, with a percentage of 88%. This assessment shows that e-LKPD based on metacognition has been able to facilitate the ability to understand chemical concepts, especially electrolyte and non-electrolyte solutions students learn if there is a change in a person caused by experience [15]. The process of positive changes that occur in student behavior as a subject an increase in knowledge, skills, values, appreciation, logical and critical thinking skills, and the creativity achieved [16].

V. CONCLUSION

It concluded results of the analysis of the data can be concluded that the e-LKPD based metacognition that has have been feasible to use and can meet the characteristics of participants or learners and materials based on the research that has been conducted researchers recommend terms of the following : (1) For the teacher can use the e-LKPD chemical-based metacognition in the process of learning the material solution of electrolyte and non-electrolyte since been tested and the results are valid, and can facilitate the participants or students in improving the ability of metacognition . (2) metacognition -based chemical e-LKPD is further developed and in-depth by conducting experiments using a comparison class so that the quality of e-LKPD effectively tested. (3) For the researchers, subsequently, develop e-LKPD based metacognition with material that is different and the material that is more widely again.

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