

Interactive E-Module Development through Chemistry Magazine on Kvisoft Flipbook Maker Application for Chemistry Learning in Second Semester at Second Grade Senior High School

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ABSTRACT This research is an innovative development on teaching materials in order to intensify the movement of "Satu Guru Satu Buku (SAGUSABU)" and to prepare skillful media users on mastering Information and Communication Technologies (ICT). The resulting prototype is an interactive e-module named Chemistry Magazine which have two editions: ionic equilibrium and pH of buffer solution and solubility equilibrium. Applying research and development study design with Plomp model, assessment and suggestion by validator team on material substance aspect, instructional design, display (visual communication) and software utilization using validation sheet are in valid category. Percentage of legality score by media validator is 91.70% for ionic equilibrium and pH of buffer solution edition; and 94.18% for solubility equilibrium edition, whereas by material validator is 93.75% and 94.45% on each. Users response score rate through questionnaire for teachers and students on ionic equilibrium edition and pH of buffer solution edition are 87.08% and 88.45%; meanwhile 94,25% and 91,43% are obtained from solubility equilibrium edition.

Keywords Interactive e-Module, Chemistry Magazine, Kvisoft Flipbook Maker, Buffer, Solubility, Plomp Model

1. INTRODUCTION

Having a good teaching material is an essential point on acquiring chemistry, it can facilitate both teachers and students while in the learning process (Direktorat Pembinaan SMA, 2008). Teaching materials are the resources a teacher uses to deliver instruction. Each teacher requires a range of tools to draw upon in order to assist and support student learning. These materials play a large role in making knowledge accessible to a learner and can encourage a student to engage with knowledge in different ways. Since 2016, Ministry of Education and Culture has been promoted the motion called "Satu Guru Satu Buku (SAGUSABU)" in order to improve teachers capability in producing paperwork. One of the examples is a module. Andi Zulkarnain, et al (2015) stated that a module is a learning tool that contains the materials, methods, limitations, and steps used systematically and appealing to achieve the expected competence according to the complexity level (Direktorat Pembinaan SMA, 2008).

Printed modules teaching material can be modified into a filled glossary magazines form, as has been done by Wulandari, Azrita, & Hendri (2016). This breakthrough

appear due to learners are accustomed to technological advances and it can be observed that learners have a better understanding on android system technology rather than the teacher itself (Syahrowardi & Permana, 2016). This is in line with the aim of our national education which stated that chemistry learning is expected to deliver participants who are capable of using Information and Communication Technologies (ICT).

Chemistry Magazine is a teaching material in the form of interactive e-module. It can be accessed easily by students using computers and various types of gadgets anywhere and anytime. This module can be created using flipbook applications namely Kvisoft Flipbook Maker (Syamsurizal & Chairani, 2015). This kind of practicality can enrich digital products such as texts, images, audio, videos, animations, flash and links (www.kvisoft.com, 2015).

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Two of the hardest discussion, based on student's difficulty; one is about ionic equilibrium and pH of buffer solution, and the other is solubility equilibrium; are considered as the proper material for e-module content. Those subjects require a thorough understanding of theory and analysis to solve the problems, as well as proficient in calculations because the basic concepts related to solubility are described in terms of mathematical equations.

Based on the explanation above, the research was conducted on the development of interactive e-module Chemistry Magazine by utilizing Kvisoft Flipbook Maker Application for chemistry learning on a second-grade senior high school in the course of the second semester.

2. METHOD

The research is held in Chemistry Education Study Program, Faculty of Teachers Training and Education, Riau University with trials in SMA Negeri 8 Pekanbaru, SMA Negeri 12 Pekanbaru and SMA Negeri 2 Bangkinang Kota. Interactive e-module Chemistry Magazine by utilizing Kvisoft Flipbook Maker application for chemistry learning on a second-grade senior high school in the course of the second semester is adopted from Plomp development model. Consisting of initial investigation phase, design phase, realization/construction phase, validation, trials, and revision phase, and implementation phase (Rochmad, 2012). The implementation phase is not done because the purpose of the research is limited to obtain output in the form of valid product based on material substance aspect, instructional design, display (visual communication) and software utilization.

Data gathering related to user's validity and responses to interactive e-module Chemistry Magazine was obtained in validation phase, experiment and improvement using

Table 1 Validity criteria

Percentage score (%)	Validity criteria
75.00-100	Valid
50.00-74.99	Valid Enough
25.00-49.99	Less Valid
0.00-24.99	Not Valid

Table 2 User response scoring guidelines

Statement of attitudes	Score
Agree (S)	4
Quite Agree (CS)	3
Less Agree (KS)	2
Disagree (TS)	1

Table 3 Criteria for user response

Percentage (%)	Criteria for user response
75.00-100	Very Good
50.00-74.99	Good
25.00-49.99	Less Good
0.00-24.99	Not Good

research instrument in the form of validation sheet prepared by one media validator and two material validators along with rubrics and user response questionnaires by teachers and students.

The data collected is then analyzed by specific analytical techniques. Analysis of validity using the formulation by Rohmad, Suhandini, & Sriyanto (2013). The data collected is then analyzed by specific analytical techniques. Analysis of validity using the formulation by Rohmad, Suhandini, & Sriyanto (2013).

$$P = (n/N) \times 100\%$$

Explanation:

P = Percentage score (%)

n = Number of scores obtained

N = Maximum score

The percentages obtained are then converted to qualitative values with the validity criteria in Table 1. The user response analysis is measured by the Likert four-choice scale with scoring guidelines in Table 2. The formula used in calculating the percentage of user response scores using the formulation by Yamasari (2010):

$$R = (f/n) \times 100\%$$

Explanation:

R = Percentage of respondents score (%)

f = Number of scores obtained

n = Maximum score

The percentages obtained are then converted to qualitative values with the validity criteria in Table 3.

3. RESULT AND DISCUSSION

This research development produces interactive e-module Chemistry Magazine products for ionic equilibrium and pH of buffer solution and solubility equilibrium materials. This product can be accessed via electronic media such as a computer, laptop, Android, iPhone, iPad, and other technology both online and offline. Teachers and students can use the interactive e-module Chemistry Magazine during the learning process in the classroom and as self-teaching materials even not in lesson time. Here is the exposure of results and discussion of each development phase that has been done. Research stages using the Plomp model include the initial investigative phase, design phase, realization/construction phase, validation, trial, and revision phase, and the implementation phase. The explanation of the results of each stage of development, as follows:

3.1 The Initial Investigation Phase

Front End Analysis, Information and data obtained from the analysis of the front end is a little source of learning that also can generate interest and motivation of the learners, and it can help the learners to connect with the material that has been learned in daily life. The teaching materials commonly used in the learning process is printed

text materials in the form of textbooks, student worksheet, and copied task and digital resources in the form of powerpoint text (PPT). Analysis of the front end to some relevant literature, obtained the information that the chemistry subject is expected can bring the students to fill the 21st century ability, one of that is, skilled in using media, technology, information and communications (ICT) (Kementerian Pendidikan dan Kebudayaan, 2016) and in the framework of teacher competence development in producing a paper which is intensified through movement of "Satu Guru Satu Buku (SAGUSABU)" by Directorate of Teacher and Education Personnel of Ministry of Education and Culture since 2016.

Student's Analysis, Characteristics of learners adjust with the design of the development product that has made. The results of the analysis of students showed that students at the second class of senior high school are in the range age of 16-17 years. Based on Piaget's cognitive development theory, on this age, the learners approach the maximum intellectual efficiency, but due to lack of experience thereby limiting their knowledge and skills to exploit what is known. Many things that can be learned through experience, but learners sometimes have difficulty in understanding of the abstract concepts (Piaget, 2001).

The result of the questionnaire is 100%, the learner stated that the existence of the learning resource is considered important. As many as 85.54% of students find difficulties in learning chemistry subject, in this case, it's

because less of the learning resources that can help the learners to an understanding about the subject, therefore the existence of learning resources in this interactive e-module Chemistry Magazine is expected can help the learners in the learning process. It is also supported by the facilities for interactive e-module Chemistry Magazine that is 81.92% of students have PC or gadget to operate of interactive e-module Chemistry Magazine.

Material's Analysis, The results of interviews with chemistry teachers found that the material of ionic equilibrium and pH of buffer solution there are three main points; the nature of the buffer solution, the pH of the buffer solution and the function of the buffer solution in the body of living beings and in daily life. Sub-material properties of buffer solutions are sub-material theories that require an understanding of the concepts that the learners must really understand because these sub-materials are the first sub-matter of the ion equilibrium material and the pH of the solution, as well as for the functions of sub-material buffer solution in the body of living beings and in daily life. The calculation of pH sub-material of the buffer solution is a calculation material involving some of the precursor material such as stoichiometry and acid-base. While in the material of solubility equilibrium, learners learn about the definition of solubility, the yield of the solubility product (K_{sp}), forecasting the formation of precipitate from mixing the ions with opposite charge, the influence of the same ion on the solubility of ionic solids in water, the factors that

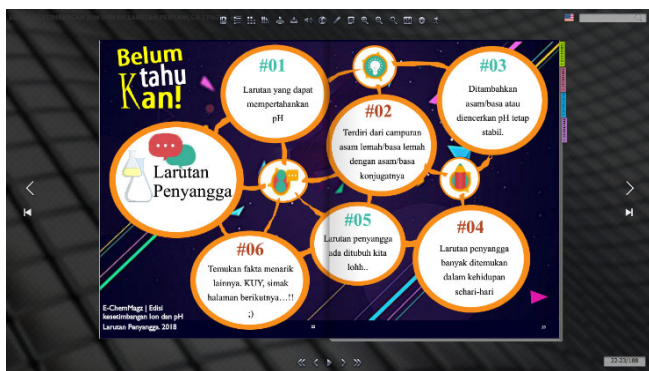


Figure 1 Examples of products in ionic equilibrium and pH of buffer solutions editions on material design part

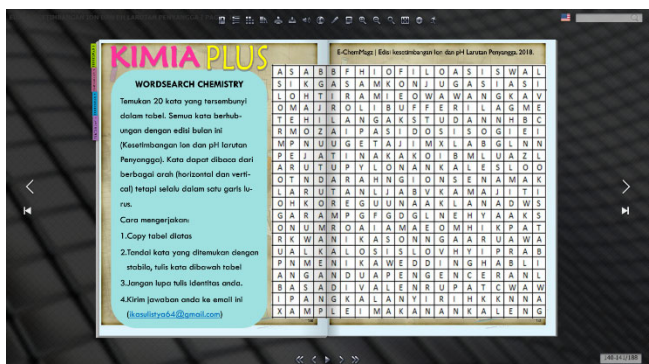


Figure 2 Examples of products in ionic equilibrium and pH of buffer solutions editions on magazine part

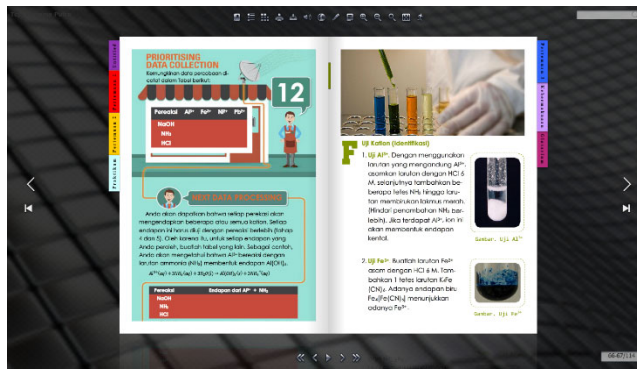


Figure 3 Examples of products in solubility equilibrium editions on material design part



Figure 4 Examples of products in solubility equilibrium editions on magazine part

affect the solubility, and selective precipitation (Watoni, 2014).

Competency Analysis, The ionic equilibrium, and pH of the buffer solution is one of the chemical learning materials found in the basic competence of 3.12 and 4.12 in the syllabus of chemical subjects of senior high school (Kementerian Pendidikan dan Kebudayaan, 2016). While the solubility equilibrium material is found in the basic competencies of 3.14 and 4.14. The results of the syllabus analysis will be obtained indicators of learning achievement and learning objectives to be achieved by learners.

3.2 Design Phase

The design phase is designed to design the initial product that will be developed in outline. The results of the design stage are; (1) the blueprint of interactive e-module Chemistry Magazine, (2) grid sheet validation of material experts and media experts and (3) design of user response questionnaires by teachers and students. The blueprint of interactive e-module Chemistry Magazine load e-module content according to Direktorat Tenaga Kependidikan (2018), that is; 1) Cover page, 2) Preface, 3) Table of contents, 4) Position map, 5) Description of content, 6) Benefits, 7) Instructions for use, 8) Concept maps, 9) Learning; which includes a) learning objectives, b) material description; composed of apperception, learning material, sample questions, formative tests; in the form of crossword and multiple choice puzzles, summaries, assignments, follow-up, magazine content; in the form of scientific articles, tips, galleries, and profile figures, 10) Evaluation, 11) Answer keys, 12) Glossary and 13) Bibliography.

3.3 Realization or Construction Phase

The results obtained in this phase are; (1) the prototype as the realization of the design result of interactive e-module Chemistry Magazine which is in accordance with the results of the analysis that has been carried out, the characteristics and structure of an interactive e-module, magazine content, and components of ICT-based teaching materials assessment, (2) the validation sheet of material experts and media experts refers to the guidance of developing ICT-based teaching materials by the Direktorat Pembinaan SMA (2010) and (3) user response questionnaires constructed in such a way as to the needs of the study.

3.4 Validation, Trial and Revision Phase

Validation aims to derive valuations and suggestions from a validator team consisting of a media validator and two material validators. Validation is done until the product developed in category valid. Some examples of products in ionic equilibrium and pH of buffer solutions editions can be seen in Figure 1 and Figure 2. As for the solubility, equilibrium can be seen in Figure 3 and Figure 4.

For the validation of the ionic equilibrium and the pH of the buffer, solution edition can be seen in Figure 5 and

Figure 6. As for the result of validation of the equilibrium solubility edition can be seen in Figure 7 and Figure 8.

Overall, the validation results show very good criteria, which means that the e-module Chemistry Magazine that has been developed has met the requirements set by the Direktorat Pembinaan SMA (2010) in the guide to the development of ICT-Based teaching materials that covering substance aspect, instructional design, display (communication visual) and software utilization.

The trial aims to derive user-side assessments and suggestions of teachers and students of interactive e-module Chemistry Magazine. Scores of respondents of ionic equilibrium and pH of buffer solution edition were obtained from teachers questionnaire sheet of 87.08% and 88.45% of students questionnaires. As for the solubility equilibrium edition, a percentage of 94.25% was obtained from the teachers and 91.43% from students. Based on Table 4, the 75% -100% range is in the very good category, it can be concluded that the developed interactive e-

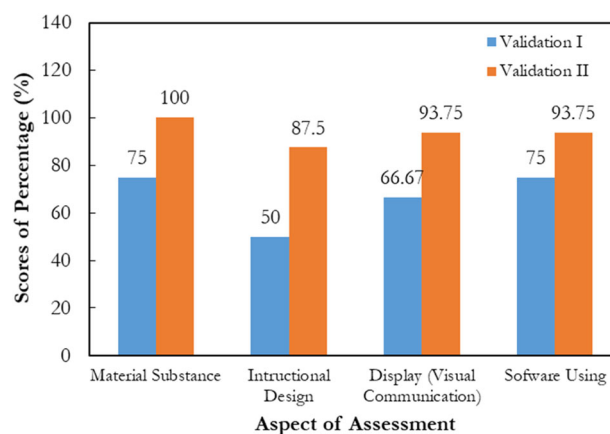


Figure 5 Comparison diagrams validation I and II by media experts the ionic equilibrium and the ph of the buffer solution edition

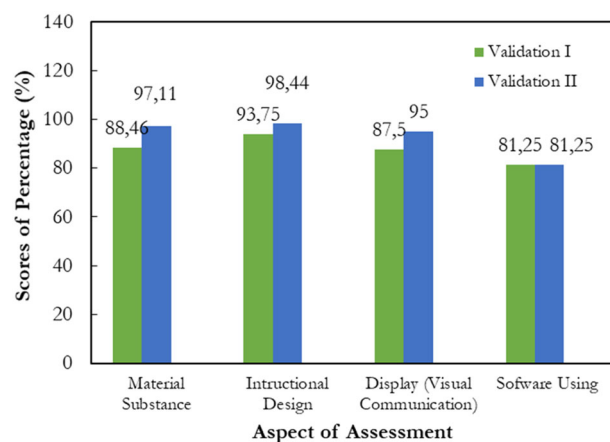


Figure 6 Comparison diagrams validation I and II by materials experts in the ionic equilibrium and the ph of the buffer solution edition

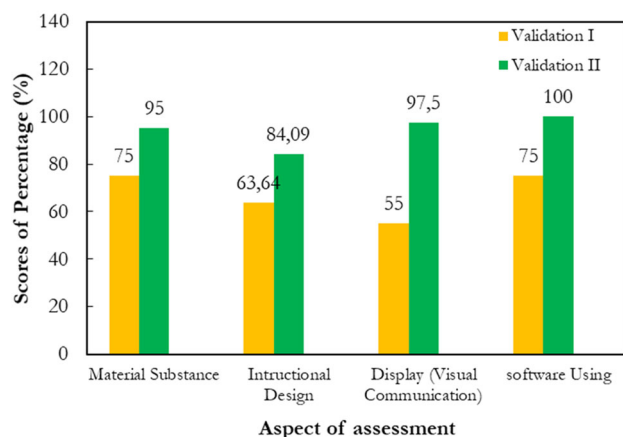


Figure 7 Comparison diagrams validation I and II by media experts in the equilibrium solubility

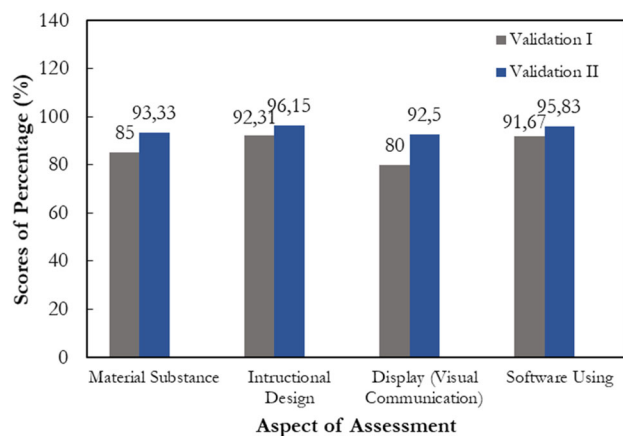


Figure 8 Comparison diagrams validation I and II by materials experts in the equilibrium solubility

module Chemistry Magazine is considered positive by the respondents and can be used in the learning process.

4. CONCLUSION

This research was conducted until the phase of validation, trial, and revision, which produced a learning product in the form of ICT-based teaching materials. The phases of the research that have been carried out involve investigating the target users of the product, designing, constructing and evaluating by experts to regarding the wetness of the material and the use of the media in the learning process.

The results of the research on the development of interactive e-module Chemistry Magazine of ionic equilibrium and pH of buffer solution edition and solubility equilibrium edition are valid by material validator with a

score of 93.75% and 94.45%. While the media validator obtained a score of 91.70% and 94.18%. The interactive e-module Chemistry Magazine is also rated very well by students and teachers with a percentage of 88.45% and 87.70% in ionic equilibrium and pH of buffer solution edition. While on an edition of solubility equilibrium obtained by percentage of 91,43% by teachers and 94,25% by students.

REFERENCES

- Direktorat Pembinaan SMA. (2008). *Teaching materials development guidelines (Panduan pengembangan bahan ajar)*. Jakarta: Kementerian Pendidikan Nasional Direktorat Jenderal Manajemen Pendidikan Dasar dan Menengah.
- Direktorat Pembinaan SMA. (2010). *ICT-based teaching materials development guidelines (Panduan pengembangan bahan ajar berbasis TIK)*. Jakarta: Kementerian Pendidikan Nasional Direktorat Jenderal Manajemen Pendidikan Dasar dan Menengah.
- Direktorat Tenaga Kependidikan. (2008). *Module writing (Penulisan modul)*. Jakarta: Direktorat Jenderal Peningkatan Mutu Pendidik dan Tenaga Kependidikan Departemen Pendidikan Nasional.
- Kementerian Pendidikan dan Kebudayaan. (2016). *Chemistry syllabus for high school (Silabus mata pelajaran kimia sekolah menengah atas/madrasah aliyah SMA/MA)*. Jakarta: Kementerian Pendidikan dan Kebudayaan.
- Kvisoft. (2015). Kvisoft Flipbook Maker. Retrieved from <http://www.kvisoft.com/>.
- Piaget, J. (2001). *The Psychology Of Intelligence*. London: Routledge.
- Rohmad, A., Suhandini, P., & Sriyanto. (2013). Development of student worksheets based on exploration, elaboration and confirmation and disaster as geography subject learning materials for SMA/MA in rembang *Pengembangan lembar kerja peserta didik (LKS) berbasis eksplorasi, elaborasi dan konfirmasi (EEK) serta kebecnanaan sebagai bahan ajar mata pelajaran geografi SMA/MA di Kabupaten Rembang*. *Edu Geography*, 1(2), 1-5.
- Rochmad, R. (2012). Design of mathematics learning tool development model (*Desain model pengembangan perangkat pembelajaran matematika*). *Kreano, Jurnal Matematika Kreatif-Inovatif*, 3(1), 59-72.
- Syahrowardi, S., & Permana, A. H. (2016). Multimedia handout design using 3D professional pageflip for learning media on android systems (*Desain handout multimedia menggunakan 3D pageflip professional untuk media pembelajaran pada sistem android*). *JPPPF (Jurnal Penelitian dan Pengembangan Pendidikan Fisika)*, 2(1), 89-96.
- Syamsurizal, H., & Chairani, N. (2015). Pengembangan e-Modul Berbasis Keterampilan Proses Sains pada Materi Kesetimbangan Kimia untuk Tingkat SMA. *SEMIR-ATA*, 2015.
- Watoni, A. H. (2014). *Chemistry for SMA/MA K11 (Kimia Untuk SMA/MA Kelas XI (Peminatan)*. Bandung: Yrama Widya.
- Wulandari, R., Azrita, & Hendri, W. (2016). Development of teaching materials based on magazine-nuanced modules equipped with a glossary for K8 students at SMPN 12 Padang (*Pengembangan bahan ajar berbentuk modul bernuansa majalah dilengkapi dengan glosarium untuk peserta didik kelas VIII di SMPN 12 Padang*). *Bung Hatta University*, 5(7).
- Yamasari, Y. (2010). Development of high quality ICT-based mathematics teaching media (*Pengembangan media pembelajaran matematika berbasis ICT yang berkualitas*). *Seminar Nasional Pascasarjana X-ITS. FMIPA Unesa*, 2010.