International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 28 No. 2 September 2021, pp.14-20

Power Point-i Spring Learning Media Integrated Three Levels of Chemical Representation on Buffer Solutions: Its Validity and Practicality

Sonia Sisriyani[1], Minda Azhar[2*]

[1]Postgraduate of Chemistry Education, Deparment of Chemistry, Faculty of Mathematics and Sciences, Universitas Negeri Padang, Jl. Prof. Hamka, Padang 25131, Indonesia

[2*]Deparment of Chemistry, Faculty of Mathematics and Sciences, Universitas Negeri Padang
Jl. Prof. Hamka, Padang 25131, Indonesia

Abstract— Buffer solutions are known as one of the difficult subjects for high school students because of their complex, abstract, mathematical calculations and graphs content. The purpose of the research is to determine the validity and practicality of PowerPoint-iSpring learning media integrated three levels of chemical representation on buffer solution. The research method is development research by using Plomp's model. The research subject is 128 students and 3 chemistry teachers from Senior High School in Padang Panjang City. The research instruments were interview sheets, self-evaluation sheets, validity and practicality sheets. The PowerPoint-iSpring learning media was validated by 5 validators. The validity was analyzed using Aiken's V. The result showed that the Powerpoint-iSpring learning media had high validity (V=0,861). Practicality was analyzed using practicality percent. Teacher response of practicality percent was 86,60. Respond of students in the small group were 85,86, while in the big group was 87,34. The media category was very practical.

Keywords— buffer solution, learning media, mental model, powerpoint-iSpring, three levels of chemical representation

I. Introduction

Chemistry is the study of the structure, properties of matter, and their changes, as well as the energy involved in these chemical changes [1]. One of the chemistry topics in class XI SMA is a buffer solution. Basically, a buffer solution examines the principles and components of a buffer solution, determining the pH of a buffer solution and the role of a buffer solution in living organisms. This material includes concepts that are complex and difficult to understand because there are defined concepts, abstract concepts, mathematical calculations, and graphics [2][3][4]. In order for the buffer solution topic to be easily understood by students, it is necessary to explain it with three levels of chemical representation [5].

The three levels of chemical representation include microscopic, submicroscopic, and symbolic levels [6]. Macroscopic representation is that students directly observe phenomena that occur, either through experiments carried out or phenomena that occur in everyday life. Submicroscopic representation is an abstract level that explains macroscopic phenomena. This representation provides an explanation at the particle level where matter is described as an arrangement of atoms, molecules, and ions. The levels of symbolic representation are chemical equations, mathematical equations, graphs, reaction mechanisms, and analogies [7]. Many students explain the buffer solution only at the symbolic level so that it shows an incomplete understanding of chemical concepts. Supposedly, learning chemistry involves the ability to understand the three levels of chemical representation [3][8][9].

All three make a major contribution to the development of students' mental models in constructing meaning and conceptual understanding [10].

One of the learning innovations is the use of ICT-based learning media with interesting and innovative concepts and techniques, resulting in a more meaningful learning experience using the iSpring application [11]. iSpring is an additional feature that can add to the main functions of PowerPoint [12]. The advantage of this media is that it combines all media elements such as text, video, animation, images, graphics, and sound into a unified presentation, even abstract material can be concertized through the media [13]. The media can increase interest in independent learning because it can always be accessed wherever [14]. *PowerPoint-iSpring* media can also accommodate all student learning styles. This program can accommodate students who have both visual, auditory, and kinesthetic learning styles [15]. The research purpose is to reveal the validity and practicality of learning media *Powerpoint-iSpring* integrated three-level of chemical representation on buffer solutions for students in high school.

II. Research and Method

2.1. Type of Research

This type of research is educational development research or Educational Research Design is a process or steps to develop a new product or improve an existing product, in which all activities are equipped [16].

2.2. Research Procedure

Preliminary research consists of needs analysis and context analysis. Needs analysis aims to determine the common problems experienced by students and teachers in learning chemistry. Context analysis was carried out with curriculum analysis and concept analysis. The prototyping stage is the realization of the PowerPoint-iSpring learning media. The prototyping stage is used to develop learning media before the field test stage [16].

2.3. Research Instruments

The instruments of research were teacher interview guidelines, student questionnaires, validity test questionnaires, and practicality questionnaires.

2.4. Data Analysis Technique

Validity category is determined using Aiken's V formula [17] with categories as contained in Table 1.

$$V = \frac{\sum s}{n(c-1)}$$

Description:

r = number given by the assessor

lo = the lowest assessment number

c = the highest assessment number

n = the number of experts or practitioners

Table 1. Validity Categories based on Aiken's V formula

Interval	Category
V ≤ 0,4	Low
0,4 < V ≤ 0,8	Medium
V < 0,8	High

The practicality assessment was analyzed using the formula of practicality percent [18]:

$$\% \, Practicality = \frac{Total\ value}{Max\ value} \text{ x } 100\%$$

III. RESULTS AND DISCUSSION

The Powerpoint-iSpring learning media integrated three levels of chemical representation on the buffer solution that has been developed using Plomp's model. This material includes concepts that are complex and difficult to understand because in it there are defined concepts, abstract concepts, mathematical calculations, and graphics [2][3][4]. The results of the development of the learning media can be explained as follows:

A. Preliminary Research

Preliminary research begins with needs analysis, curriculum analysis and concept analysis. The results of the analysis are described as follows:

1. There are still many students who think that the buffer solution material is difficult to understand
2. Teaching materials used by teachers such as textbooks, modules, LKPD, and videos.
3. Have not used learning media using atom/molecule modeling (three levels of chemical representation).
4. Teachers and students expect easy-to-understand and interesting learning media

B. Prototyping Stage

The development of learning media is designed according to the results in the preliminary stage. In the first prototype stage, the Powerpoint-iSpring learning media is integrated with three levels of chemical representation in the buffer solution material. Media design consists of several components, namely: cover, media table of contents, instructions for use, KI, KD, GPA, learning objectives, materials, quizzes, and references. Next, a self-evaluation was carried out which focused on typos, use of pictures, and the completeness of learning media. Several components of learning media are contained in Figure 1 and Figure 2.

Fig. 1. Cover of learning media

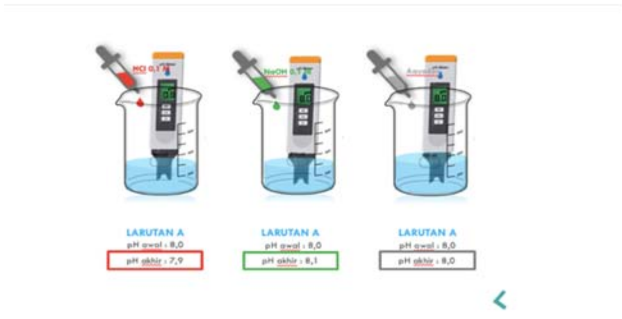

Fig. 2. Observation stage on learning media

Based on the self-evaluation result, prototype II was produced. Furthermore, an evaluation by experts and a one-to-one evaluation are carried out. The learning media was validated by 5 validators. The validation results of learning media can be seen in Table 2.

Table 2. The validation results of learning media

N	Rated Components	V	Category
1	Content Component	0.812	High
2	Construct Component	0.850	High
3	Language Component	0.905	High
4	Graphic Component	0.878	High
Average		**0.861**	High

The assessment of the validity of the learning media consists of an assessment of the content component, the linguistic component, the construct component, and the graphic component [19]. The validity assessment instrument used is a validation sheet that contains 32 aspects of the assessment. Validity testing was carried out by at least three experts [20]. The assessment data of the learning media validation sheet was analyzed using Aiken's V formula.

The value of Aiken's V content component was 0.812 with a high category. This shows that the learning media developed are in accordance with the Core Competencies, Basic Competencies, Indicators, and Indicators of Competency Achievement to be achieved. The contents of the learning media presented such as pictures, animations, videos, learning materials in the form of facts, concepts, principles, and procedures as well as the use of three levels of representation (macroscopic, submicroscopic, and symbolic) are scientifically correct in accordance with the 2013 curriculum guidelines. This is in accordance with the theory that Content validity indicates that the product is developed according to the curriculum and is based on a strong theoretical rationale [21]. A product is said to be valid in terms of content if it meets the needs and components based on the latest scientific knowledge [16][22].

Assessment of construct components, learning media had an average Aiken's V value of 0.850 with a high validity category. This assessment showed that there are clear indicators of competency achievement and learning objectives to be achieved, learning media have been arranged systematically from cover to reference, concepts contained in learning media are related to each other, learning media are easily accessible by students as well as questions. quiz in the media. This is in accordance with the opinion [21] that the construct validity of a product shows that the various components in the product are related to one another and have a consistent relationship. The product is said to be valid in terms of constructs if all components are consistently interrelated [16][22].

The validity of the linguistic aspect of the learning media has an Aiken's V average value of 0.905 with a high validity category. The category showed that the text, images, animations and videos used in the learning media are communicative, unambiguous, effective and efficient and in accordance with good and correct Indonesian language rules. This is in accordance with the statement [23] that the indicators assessed by the validator in terms of linguistics include readability, clarity of information, suitability of writing correct Indonesian language rules and use of language effectively and efficiently.

The validity of the graphic aspect of the Powerpoint-iSpring learning media had an average Aiken's V value of 0.878 with a high validity category. The graphic component shows that the use of type and size of letters (fonts), images, animations, videos, layouts, designs and colors as well as the use of three levels of chemical representation of the learning media developed are attractive as a whole. The existence of colorful pictures, animations, videos can help students understand the concepts being studied [24]. The average overall validity value is 0.861 with a high validity category.

The next stage is a one to one evaluation by interviewing three students of class XII MIPA at SMAN 1 Padang Panjang, namely students with low ability, medium ability, and high ability. Three aspects will be assessed at this stage, namely clarity, obvious errors. At this stage, typos still exist as questions in evaluation questions. The result of improvements from Prototype II is called Prototype III. Furthermore, a small group evaluation was carried out on prototype III. Small group evaluation was conducted to see the practicality of the learning media developed before the field test. In this evaluation, there are 6 students with low, medium and high abilities.

Assessment of the practicality of a learning media can be seen from the aspect of ease of use, the efficiency of learning time, and the benefits of teaching materials on student interest [25]. The results of the practicality assessment of students in the small group obtained a practicality value of 85.86 with a very practical category. Assessment Stage

At the field test stage, a questionnaire was given to 63 students. The results of the practicality assessment of students in the large group obtained a practicality value of 87.34 and the questionnaire given to the teacher obtained a practicality value of 86.60% with a very practical category. The practicality of the learning media can be seen in Table 3.

Table 3. The practicality results of learning media

No	Rated Aspects	% Practicality	Category
1-9	Ease of use	87,88	Very Practice
10	Times Efficiency	88,49	Very Practice
11-17	Benefits	85,66	Very Practice
Average		**0,844**	**Very Practice**

In terms of ease of use, the % practicality value was 87.88 with a very practical category and the teacher's response questionnaire was 90.74. This shows that the Powerpoint-iSpring learning media integrated three levels of representation on buffer solution was easy to use because the instructions for use are easy to understand, the material in the learning media is easy to understand and simple, the material presented is clear and simple as well as pictures, animations and videos are easy to understand. In addition, the three levels of chemical representation in learning media are clear and easy to understand [26]. The use of learning media also facilitates and makes students more active in learning [27]. This is in accordance with the theory which states that the level of product practicality can be seen by considering whether the product is easy to understand and can be used by teachers and students under normal conditions [16].

The practicality of the Powerpoint-iSpring learning media integrated three levels of chemical representations on the buffer solution, viewed from the aspect of learning time efficiency, the level of practicality was obtained in a high category with a practicality % value of 88.49 and a teacher response questionnaire of 83.33 with a very practical category. This showed that the time available was sufficient in understanding the material in the learning media and the use of learning media in the learning process can saved learning time [28]. Learning by using learning media can made learning time more efficient, overcome the limitations of space and time and senses [29].

In terms of the benefits of learning media, the practicality level had a practicality value of 85.66 and a teacher response questionnaire of 85.74 with a very practical category. This showed that learning with Powerpoint-iSpring learning media can help students find and understand concepts in the buffer solution material, train students' mental models through quiz questions and three levels of chemical representation, in addition to increasing students' interest and learning activities as a whole. independently [14].

IV. Conclusion

The development of PowerPoint-iSpring learning media integrated three levels of chemical representation on buffer solution was developed using Plomp’s model. The media had a very valid and very practical level of validity and practicality by teachers and students.

ACKNOWLEDGMENTS

Thanks to Mr. Dr. Mawardi, M.Si, Mrs. Dr. Yerimadesi, S.Pd, M.Si, Mrs. Idnawati, M.Si, Mrs. Asnizar, M.Si dan Mrs. Rahmadiana Yusra, S.Pd as validators of the PowerPoint-iSpring learning media integrated three levels of chemical representation on buffer solutions.

REFERENCES

[1] R. Chang, *General Chemistry: The Essensial Concepts Third Edition*. The McGraw-Hill Companies, 2011.

[2] B. A. Sesen dan L. Tarhan, "Active-learning versus teacher-centered instruction for learning acids and bases," *Res. Sci. Technol. Educ.*, vol. 29, no. 2, hal. 205–226, 2011, doi: 10.1080/02635143.2011.581630.

[3] I. Devetak, M. Juriševič, dan S. A. Glažar, "Comparing Slovenian year 8 and year 9 elementary school pupils' knowledge of electrolyte chemistry and their intrinsic motivation," *Chem. Educ. Res. Pract.*, vol. 10, no. 4, hal. 281–290, 2009, doi: 10.1039/b920833j.

[4] N. Sanjiwani, M. IW, dan S. IK, "Analisis Kesulitan Belajar Siswa Pada Materi Larutan Penyangga," *J. Pendidik. Kim. Undiksha*, vol. 2, no. 2, hal. 75–84, 2018, [Daring]. Tersedia pada: http://jonedu.org/index.php/joe/article/view/94.

[5] A. H. Johnstone, "Chemical education research in Glasgow in perspective," *Chem. Educ. Res. Pract.*, vol. 7, no. 2, hal. 49–63, 2006, doi: 10.1039/B5RP90021B.

[6] B. Waldrip, V. Prain, dan J. Carolan, "Learning Junior Secondary Science through Multi-Modal Representations," *Electron. J. Sci. Educ.*, vol. 11, no. 1, hal. 87–107, 2006.

[7] J. M. P. Sanchez, "Integrated Macro-Micro-Symbolic Approach in Teaching Secondary Chemistry," *Kimika*, vol. 28, no. 2, hal. 22–29, 2017, doi: 10.26534/kimika.v28i2.22-29.

[8] I. Farida, "Interkoneksi Multipel Level Representasi Mahasiswa Calon Guru Pada Kesetimbangan Dalam Larutan Melalui Pembelajaran Berbasis Web Ringkasan Disertasi Diajukan Untuk Memenuhi Sebagian Dari Syarat Untuk Memperoleh Gelar Doktor Ilmu Pendidikan Pada Program St," UIN Sunan Gunung Djati Bandung, 2012.

[9] R. Tasker dan R. Dalton, "Research into practice: Visualisation of the molecular world using animations," *Chem. Educ. Res. Pract.*, vol. 7, no. 2, hal. 141–159, 2006, doi: 10.1039/B5RP90020D.

[10] Sunyono, "Kajian Teoritik Model Pembelajaran kimia Berbasis multipel Representasi (SiMaYang) dalam Membangun Model Mental Pebelajar," *Pros. Semin. Nas. Sains, Univ. negeri Surabaya, 14 januari 2012*, hal. 486–495, 2012.

[11] K. Hernawati, "Modul Pelatihan Ispring Presenter," *J. Pelatih. Pembuatan Media Pembelajaran Interaktif dengan Perangkat Lunak Ispiring Present. bagi Guru Sekol. Menengah pada Tanggal 23 Juli 2010 di Lab. Komput. Jurdik Mat. FMIPA UNY*, hal. 1–18, 2010.

[12] V. A. Rochma dan M. Ibrahim, "Pengembangan Media Pembelajaran Berbasis Ispring Suite 8 Pada Materi Bakteri Untuk Siswa Kelas X SMA," vol. 8, no. 2, hal. 312–320, 2019.

[13] A. Mudlofir dan E. Fatimatur, *Desain Pembelajaran Inovatif*. Jakarta: Rajawali Pers, 2017.

[14] N. A. Harahap, R. R. Harahap, S. Salbiah, dan H. Humei, "Penggunaan Media Microsoft PowerPoint Untuk meningkatkan Kefektifan Belajar Siswa di SD/ MI Kelas Rendah." Fakultas Tarbiyah Dan Ilmu Keguruan Institut Agama Islam Negeri (IAIN), Padang Sidempuan, 2019.

[15] Maryana, Suaedi, dan Nurdin, "Pengembangan Media Pembelajaran Matematika Menggunakan PowerPoint Dan Ispring Quizmaker Pada Materi Teorema Pythagiras," *J. Penelit. Mat. dan Pendidik. Mat.*, vol. 2, no. 3, hal. 53–61, 2019.

[16] T. Plomp dan N. Nieven, "Educational Design Research: Part A Introduction," *Educ. Des. Res.*, 2013.

[17] H. Retnawati, *Analisis Kuantitatif Instrumen Penelitian*. Yogyakarta: Parama Publishing, 2016.

[18] D. T. P. Yanto, "Praktikalitas Media Pembelajaran Interaktif pada Proses Pembelajaran Rangkaian Listrik," *INVOTEK J.*

Inov. Vokasional dan Teknol., vol. 19, no. 1, hal. 75–82, 2019, doi: 10.24036/invotek.v19i1.409.

[19] Depdiknas, *Panduan Pengembangan Bahan Ajar*. Direktorat Pembinaan Sekolah Menengah Atas, 2008.

[20] Sugiyono, *Metode Penelitian Pendidikan*. Bandung: Alfabeta, 2017.

[21] Rochmad, "Desain Model Pengembangan Perangkat Pembelajaran Matematika," *J. Kreano*, vol. 3, no. 1, hal. 59–72, 2012.

[22] H. P. Murni, M. Azhar, dan A. Ulianas, "Validity and practicality level of structured inquiry-based reaction rate module containing macro, submicro and symbolic representation," *J. Phys. Conf. Ser.*, vol. 1481, no. 1, 2020, doi: 10.1088/1742-6596/1481/1/012080.

[23] Depdiknas, "Penulisan Modul," Jakarta: Direktorat Tenaga Kependidikan, Direktorat Jenderal Peningkatan Mutu Pendidik dan Tenaga Kependidikan, Departemen Pendidikan Nasional., 2008.

[24] E. Jalius, *Pengembangan Program Pembelajaran*. Padang: UNP Press, 2009.

[25] I. K. S. Semadiartha, "Pengembangan Media Pembelajaran Berbasis Komputer Dengan Microsoft Excel yang berorientasi Teori Van Hiele Pada bahasan Trigonometri Kelas X SMA Untuk Meningkatkan Prestasi Dan motivasi Belajar Matematika Siswa," Universitas Pendidikan Ganesha, 2012.

[26] R. Sagita, F. Azra, dan M. Azhar, "Development of Mole Concept Module Based on Structured Inquiry with Interconection of Macro, Submicro, and Symbolic Representation for Grade X of Senior High School," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 335, no. 1, 2018, doi: 10.1088/1757-899X/335/1/012104.

[27] Nurhasanah, M. Azhar, dan A. Ulianas, "Validity and practicality of chemical equilibrium module based on structured inquiry with three levels representation for students grade XI of senior high school," *J. Phys. Conf. Ser.*, vol. 1481, no. 1, 2020, doi: 10.1088/1742-6596/1481/1/012084.

[28] D. Adriani, M. Azhar, L. Dj, A. Putra, dan Yerimadesi, "Validity and Practicality Level of Acid-Base Electronic Module Based on Structured Inquiry Containing Three Levels of Chemical Representation for Senior High School Student," *J. Phys. Conf. Ser.*, vol. 1788, no. 1, 2021, doi: 10.1088/1742-6596/1788/1/012038.

[29] H. S. Zainiyati, *Pengembangan Media Pembelajaran Berbasis ICT*. Jakarta: PT Kharisma Putra Utama, 2017.