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Development Of Computer-Assisted Chemistry Learning Media With The Macromedia Flash Program To Measure Problem-Solving Abilities

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ABSTRACT

Efforts to improve the quality of education are influenced by the factors involved during the learning process; such as teachers, curriculum, infrastructure, and the environment. This is in line with Law no. 20 of 2003 which states that "Learning is a process of student interaction and learning resources in a learning environment". Over time, the foundations of the world of education began to be neglected, so that UNESCO (United Nations Education Scientific and Cultural Organization) initiated four pillars of education to improve the quality of education, namely: Learning to know, learning to do, learning to be, and learning to live together. To realize the four pillars of education in the current era of information globalization, teachers as learning agents are required to master and apply Information and Communication Technology in learning. This study aims to measure students' problem solving abilities using macromedia flash chemistry learning media. This type of research is R&D. The subjects in this study were 35 students of class X SMA Negeri 4 Binjai. The data taken is in the form of the results of the feasibility of macromedia flash-based chemistry learning media in measuring students' problem-solving abilities and the responses given. From the data generated, 95.71% of students gave positive responses and out of 35 students there were 2 students who had very low scores, so it can be concluded that macromedia flash-based chemistry learning media can be used.

PRELIMINARY

Efforts to improve the quality of education are influenced by the factors involved during the learning process; such as teachers, curriculum, infrastructure, and the environment. This is in line with Law no. 20 of 2003 which states that "Learning is a process of student interaction and learning resources in a learning environment". The learning environment is a system consisting of components or elements; objectives, materials/subject matter, strategies, tools, students, and teachers (Tanjung, 2017:2). Learning is a communication process that is carried out in two directions, teaching is carried out by the teacher (teacher) as an educator and learning is carried out by the student (students) as students. The learning activities carried out by students are a process of obtaining a new change as experience in interaction with the environment. However, the fact is that one of the problems faced by our world of education is in the learning process.

Over time, the foundations of the world of education began to be neglected, so that UNESCO (United Nations Education Scientific and Cultural Organization) initiated four pillars of education to improve the quality of education, namely: Learning to know, learning to do, learning to be, and learning to live together. (Juliani & Widodo, 2019:2).

To realize the four pillars of education in the current era of information globalization, teachers as learning agents are required to master and apply Information and Communication Technology in learning (Jamun, 2018: 1&2). In learning, the role of computer-based multimedia is becoming increasingly important today, because multimedia systems consisting of media components (text, images, graphics, animation, audio and video) are designed to complement each other so that they become an efficient and efficient system. Efficient, where a whole is better than the sum of its parts (Priyanto. 2009:3). Learning multimedia can also provide opportunities for students to conduct experiments and explorations so as to provide learning experiences rather than just hearing the teacher's descriptions or explanations. Macromediais one of the software used to create and view animation. Flash is one of the software which is a superior product for making animated vector images that are in great demand today. Macromedia Flash is a software for creating visual forms that can display various media such as video, animation, images and sound. So that this program is quite reliable in making various kinds of interactive and interesting tutorial applications, using Macromedia Flash students can be more interested in participating in learning.

According to Helmy Hidayat, Maria Erna, and Lenny Anwar (2021: 1) that "the main difficulty for students is only being able to repeat definitions in chemical bonds, but do not understand their meaning or students have not been able to apply the concept of chemical bonds and tend to still rely on memorization". If students' understanding of the concept is not in accordance with the experts, then there is a misconception, this concept error causes students to experience learning difficulties so that student learning outcomes are low. Based on the results of the International Chemistry Olympiad (ICHO) for students in the past few years, we can see that the results obtained are unsatisfactory, this indicates that students' understanding is not optimal.

Based on the background that has been described above, the authors are interested in conducting research entitled development of computer-assisted chemistry learning media using the macromedia flash program to measure high school students' problem-solving ability in chemical bonding materials.

METHOD

Based on the formulation of the problem and the stated research objectives, this type of research is Research and Development (R&D) using the model developed by Sugiyono. The research is focused on efforts to develop learning media (macromedia flash) in learning Chemistry on chemical bonds. This research was conducted in class X SMA Negeri 4 Binjai Jalan Cut Nyak Dhien No. 134. Exod, Tanah Tinggi, Kec. East Binjai, Binjai City. Academic Year 2022/2023. The subjects of this study were students of class X IPA4 for the 2022/2023 academic year at SMA Negeri 4 Binjai.

The object of research is the application of learning media (Macromedia Flash) in chemistry subjects the subject matter of chemical bonds using the Problem Solving learning model. Several terms in this study need to be defined operationally so as not to cause misunderstanding and to provide clear direction in its implementation. These terms are: (1) Learning media are learning aids used to motivate students in learning, clarify learning information, emphasize important parts, provide learning variations and clarify learning structures. The media used in this research is Macromedia; (2) Problem solving ability is the ability that students have in solving chemistry questions starting from understanding the problem, planning a calculation strategy, and carrying out calculations according to the strategy that has been planned.

In this development research used a data collection instrument in the form of a questionnaire. The questionnaire used in this study were: (1) Subject matter expert

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questionnaire (2) Learning media expert questionnaire (3) Learning media practicality test questionnaire and (4) Student response questionnaire to learning media.

The data analysis technique used is in the form of qualitative and quantitative analysis, to see the validity of the developed media as well as the responses and results of the development of macromedia flash chemistry learning media, so that the data obtained through the instrument can be the basis for assessing the feasibility of the developed media. Making this media using the Macromedia Flash program. The implementation process uses multimedia development procedures and the research design is carried out through 7 main stages in the form of (1) Potential and Problems, (2) Data Collection, (3) Product Design, (4) Design Validation, (5) Design Revision, (6) Product Trials and, (7) Product Revisions.

RESULTS AND DISCUCCIONS

Learning Media Development Results

1. **Potential and Problems**

This stage begins with knowing whether the school under study has implemented the use of macromedia flash media in learning and whether or not learning media is needed to help the learning process.

2. **Data Collection**

This stage begins by collecting some data from interviews and observations related to the problem that the researcher has explained, so that the researcher can examine the material and manufacturing tools.

3. **Product Design**

This stage begins with designing a learning media framework so that a prototype is obtained, then proceed with making storyboards. Next, arrange the learning material, the material used in the development of this chemistry learning media is chemical bonding material, then make student worksheets (LKS).

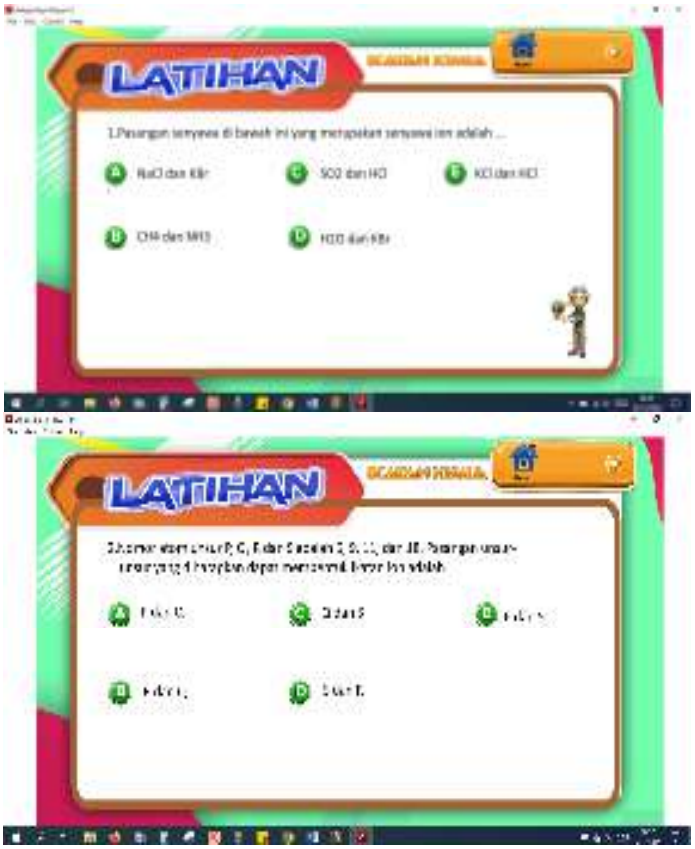

Figure 1: Display of LKS Macromedia Flash Chemistry Learning Media

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4. Design Validation

Validation is the most important part in developing learning media to correct errors and weaknesses in design results. The validators selected in this study consisted of 5 UNIMED lecturers and two high school chemistry teachers. Furthermore, the validators were divided into two groups, where the first group as learning media experts consisted of three validators and the second group as chemistry subject matter experts consisting of two validators. Validation activities are carried out by submitting learning media and research instruments to the validator along with the validation sheet to be examined and assessed for feasibility by the validator. Learning media validation includes the quality of media design, graphics, language and the feasibility of the content of the material. The results of expert validation of learning media can be seen in the following table.

Validators	Average Score	Criteria
Chemistry Learning Media Expert and Chemistry Learning Material Expert	4,6	Valid

Table 1: Results of Learning Media Validation

5. Design Improvements

At this stage the researcher made improvements to the learning media which lies in the explanation of the material, practice questions and no explanation of the use of the media. More details will be described in the following explanation:

Before Revision:

In learning media on ionic bonds, the explanation regarding the movement of an electron is still unclear, so that later students will not understand how stable it is. Can be seen in the following image:

Figure 2: Pre-Revised Chemistry Learning Media Macromedia Flash

After Revision:

After being revised, the learning media has displayed animations and a more detailed explanation of how the transfer process is and how to get the stability of the electrons. Can be seen in the following image:

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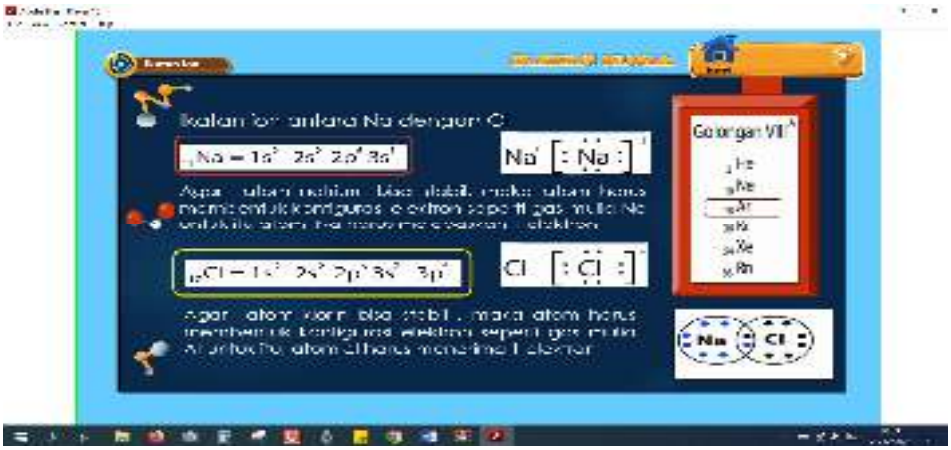

Figure 3: After Revised Chemistry Learning Media Macromedia Flash

After reviewing and revising the developed learning media, the results of the improvements/revisions made will be tested on students with the aim of producing even better quality learning media.

6. Product Trials

At this stage the researcher conducted a product trial after revising the product design, then this learning media will then be tested at the research site, namely class X students of SMA Negeri 4 Binjai. The trial was conducted in class X MIPA 4 with 35 students. The trial was carried out in 3 meetings. At the time of the trial, the researcher acted as a teaching teacher. This test was carried out by the researcher conveying material using macromedia flash media to students, then the researcher gave a research questionnaire to find out students' responses to chemistry learning media. Based on the results of the student response questionnaire analysis, it can be seen that the percentage results of all statements stating positive answers were 95.71%, while there were 4.29% of students stating negative answers. If these results are referred to the established criteria, it can be concluded that the students' response to the learning media was positive, because more than 30 students gave positive responses to the developed Macromedia Flash-based learning media.

The developed learning media is said to be practical in terms of expert/practitioner assessments. The developed learning media can be used with little or no revision and in terms of the results of the chemistry learning media practicality questionnaire distributed to chemistry teachers at school.

Observed Aspects	Practicality Score (%)	Practicality Criteria
Effective aspect	83.65	Very Practical
Interactive aspect	82.95	Very Practical
Interesting aspect	81.25	Very Practical
Efficient aspect	83,33	Very Practical
creative aspect	77.50	Practical

Table 2: The Average Score of the Practically of Learning Media by Teacher

Based on the table above, it can be seen that the average practicality score of the Macromedia Flash-based mathematics learning media developed is in the practical category with a score for the effective aspect of 83.65%, for the interactive aspect of82.95%, interesting aspect of81.25%, efficient aspect of83,33% and the creative aspect of77.50%. Based on the practicality criteria of learning media, it can be concluded that the developed mathematics learning media is classified as practical.

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Observed Aspects	Practicality Score (%)	Practicality Criteria
Effective aspect	80.05	Practical
Interactive aspect	87.41	Very Practical
Interesting aspect	83.57	Very Practical
Efficient aspect	82,62	Very Practical
creative aspect	81.86	Very Practical

Table 3: The Average Score of the Practicality of Learning Media by Students

Based on the table above, it can be seen that the average practicality score of the Macromedia Flash-based mathematics learning media developed is in the practical category with a score for the effective aspect of 80.05%, the interactive aspect of 87.41%, the interesting aspect of 83 .57%, efficient aspect of 82.62% and creative aspect of 81.86%. Based on the practicality criteria of learning media, it can be concluded that the developed mathematics learning media is classified as practical.

7. Product Revision

At this stage the researcher revised the product again and concluded that the new learning method was better than the old learning method.

Discussion of Research Results

This research is a development research that aims to produce a product in the form of macromedia flash-based animation media and to determine the feasibility of the product as well as to see student responses to the macromedia flash media that has been made and to measure students' problem solving abilities. Based on the formulation of the problem and the research objectives proposed, so that the data obtained from the trial results are known to be the answers to the problem formulation and the proposed research objectives. The results of the analysis of the data obtained from the trial results show: (1) the validity, practicality, and effectiveness of the learning process carried out using macromedia flash learning media; (2) the ability to solve problems in working on questions.

Before the learning media that will be used in the previous learning process is validated by experts and media experts. The validation results obtained from several validators state that the media developed is valid but still needs improvement. Learning media that has been developed are said to be practical if they have been tested on students for the learning process and have met practical criteria. In this study the practicality of the media was assessed from the results of the validator's assessment, all validators stated that the media was feasible to use (valid) with a little revision. Likewise, through the practicality test questionnaire distributed to students in the trial, the results stated that the media used was included in the practical category (practicality value > 76%).

Based on the trial results, the developed learning media met the effective category in terms of classical student learning completeness, students gave positive responses to learning media, and the time used was ideal. Based on the results of the data analysis of the trial results, it was obtained that the average percentage of student responses in each trial was positive. That is, students gave a positive response to the developed macromedia flash-based chemistry learning media. Student responses given in each trial have reached the predetermined criteria category, namely ≥ 80%. This shows that the developed Macromedia Flash-based mathematics learning media has fulfilled the criteria of being effective in terms of student responses. Based on the research that has been done, the use of time to teach chemical bonding material using macromedia flash-based media is in accordance with the existing lesson plans, namely learning is carried out at

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the same time as usual. So it can be concluded that this study has a good time achievement.

SUMMARY

Based on the results of the analysis of the discussion data in this study, several conclusions were put forward as follows: (1) The feasibility or validity of the developed learning media has a percentage of 92.3%. Where based on predetermined criteria, the developed macromedia flash-based chemistry learning media is feasible to use; (2) From the data obtained, student responses to macromedia flash-based chemistry learning media had a positive value with a percentage of 95.71% and a negative value of 4.29%. So it can be concluded that macromedia flash-based chemistry learning media is positive, because more than 80% of students gave a positive response to macromedia flash-based chemistry learning media;(3) Of the 35 students subject to the trial, there were 13 students who had a "high" level of problem-solving ability with a percentage of 37.14%, there were 12 students who had a "medium" level of problem-solving ability with a percentage of 34.29%, there were 8 who have a level of problem-solving ability of students in the "low" category with a percentage of 22.86%, and 2 students who have a level of problem-solving ability in the "very low" category with a percentage of 5.71%. So that the average problem-solving ability of students is 44.25 in the "moderate" category. So it can be concluded that macromedia flash-based chemistry learning media can measure students' problem-solving abilities on chemical bonding questions.

REFERENCES

Devi, P, K; Syahrul, H; Kalsum, S; Masmiani, Liliasari. 2009. *Kimia 1 Kelas X SMA dan MA*. Jakarta:Pusat Perbukuan Departemen Pendidikan Nasional

Fuadi, T, M; Musriandi, R; Suryani, L. 2020. Covid-19: Penerapan Pembelajaran Daring DI Perguruan Tinggi. *Jurnal Dedikasi Pendidikani*. Vol 4(2):193-200

Handriani, O, I; Wulandari, S, S. 2020. Pembelajaran Daring Sebagai Upaya *Study from Home* (SFH) Selama Pandemi Covid 19. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*. Vol 8(3):496-503

Harnanto, A; Ruminten. 2009. *Kimia 1 Untuk SMA/MA Kelas X*. Jakarta:Departemen Pendidikan Nasional.

Hermawan; Sutarjawinata, P; Al, H, P. 2009. *Aktif Belajar Kimia Untuk SMA & MA Kelas X*. Jakarta:Departemen Pendidikan Nasional

Hidayat, H; Erna, M; Anwar, L. 2021. The Problem Base Learning Model in Improving Concept Understanding and Self-Confidence Identification on Chemical Bonds at SMA Negeri 13 Pekanbaru. *Journal of Educational Sciences*. Vol 5(3):409-416

Jamun, Y, M. 2018. Dampak Teknologi Terhadap Pendidikan. *Jurnal Pendidikan dan Kebudayaan Missio*. Vol 10(1):48-52.

Juliani, W, I; Widodo, H. 2019. Integrasi Pilar Pendidikan (UNESCO) Melalui Pendidikan Holistik Berbasis Karakter Di SMP Muhammadiyah 1 Prambanan. *Jurnal Pendidikan Islam*. Vol 10(2):65-74

Kusaeri, Al. 2019. *Pengembangan Program Pembelajaran Matematika (studi praktis dengan pendekatan problem solving dan ethnomatematika budaya sasak)*. Mataram: Fakultas Tarbiyah dan Keguruan UIN Mataram

Lestari. A. S. 2013. Pembelajaran Multimedia. *Jurnal Al-Ta'dib*. Vol. 6(2): 84-98

Permana, I. 2009. *Memahami Kimia 1 SMA/MA Untuk Kelas X Semester 1 dan 2*. Jakarta: Departemen Pendidikan Nasional

Priyanto. D. 2009. Pengembangan Multimedia Pembelajaran Berbasis Komputer. *Jurnal Pemikiran alternatif Kependidikan*. Vol. 14(1): 1-13

Purba, E; Yusnadi. 2017. *Filsafat Pendidikan*. Medan: Unimed Press

Rahayu, I. 2009. *Praktis Belajar Kimia untuk Kelas X Sekolah Menengah Atas/Madrasah Aliyah Program Ilmu Pengetahuan Alam*. Jakarta:Departemen Pendidikan Nasional

Sadikin, A; Hamidah, A. 2020. Pembelajaran Daring di Tengah Wabah Covid-19. *BIODIK: Jurnal Ilmiah Pendidikan Biologi*. Vol. 6(12):214-224

Safitri, A, F; Widarti, H, R; Sukarianingsih, D. 2018. Identifikasi Pemahaman Konsep Ikatan Kimia. *Jurnal Pembelajaran Kimia*. Vol. 3(1):41-50

Sani, R, A. 2019. *Strategi Belajar Mengajar*.Depok: Rajawali Pers.

Sanjaya, W. 2017. *Strategi Pembelajaran berorientasi Standar Proses Pendidikan*. Jakarta:Kencana Prenadamedia Group.

Sanuaka, I, W, A, A; Ariawan, K, U; Sutaya, I, W. 2017. Pengembangan Media Pembelajaran *Electronick Book (E-Book)* Interaktif Multimedia Dalam Mata Pelajaran Teknik Animasi 3D dan Teknik Animasi 2D di Jurusan Multimedia SMK Negeri 3 Singaraja. *Jurnal Pendidikan Teknik Elektro Undiksha*. Vol. 6(1):9-20

Sari, H, L; Negara, E, K. 2011. Media Pembelajaran Kimia Terpadu Pada Madrasah Tsanawiyah Negeri (MAN) 2 Kota Bengkulu. *Jurnal Media Infotama*. Vol 7(2):103-120

Setyawati, A, A. 2009. *Kimia Kelas X*. Jakarta:Departemen Pendidikan Nasional

Sinta, I, N; Wardani, S; Kurniawan, C. 2021. The Influence of Comic Media on Studens' Concept Understanding on Chemical Bonding Material. *International Journal of Active Learning*. Vol 6(2):85-90

Sukiman. 2012. *Pengembangan Media Pembelajaran*. Depok:Pedagogia

Sunarya, Y. 2010. *Kimia Dasar 1 Bedasarkan Prinsip-Prinsip Terkini*. Bandung:CV.YRAMA WIDYA.

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