JTK: Jurnal Tadris Kimiya 6, 1 (June 2021): 51-61
Website: http://journal.uinsgd.ac.id/index.php/tadris-kimiya/index
ISSN 2527-9637 **(online) ISSN** 2527-6816 **(print)**

Design and Trial of Electronic Smart Worksheets Based on POE (Predict, Observe, Explain) on Acid-Base Topic

Yuni Fatisa[1], and Endang Astuti Br Galingging[1*]
[1]Department of Chemistry Education, Faculty of Education and Teacher Training, UIN Sultan Syarif Kasim Riau, Jalan HR. Soebrantas Panam Km.15 No.155, Pekanbaru, 28293, Indonesia
[*]E-mail: endangastutii123@gmail.com

Received: 10 March 2021; Accepted: 22 June 2021; Published: 30 Juni 2021

Abstract

This research aims to produce and determine the feasibility of Predict, Observe, Explain (POE) based student electronic smart worksheet. The method used is research and development design. The development stages of this model consist of three stages: defining, designing, and developing. The research respondences were media design experts, learning material experts, chemistry teachers, and ten students. Instruments that used to validate and practical tests are questionnaires. Electronic smart worksheets are created using the articulate storyline application to develop the stages of POE learning. The validity of the worksheet in terms of media, material, practical, and student response results are 80% (valid), 97.14% (very valid), 96.81% (very practical), 89.61% (very practical), respectively. Based on these results, it could be concluded that POE based student electronic smart worksheet is suitable for use as an acid-base learning media.

Keywords: acid-base, POE (predict, observe, explain), student electronic smart worksheet

DOI: http://doi.org/10.15575/jtk.v6i1.9853

1. Introduction

In education, especially in the learning process in delivering material, computer technology is no longer a new thing for students and teachers because computer technology is often used. For example, computers have been used when teachers explain learning material using PowerPoint. Computers have also been used as learning resources for students where students can do the tasks easily and creatively because computers can display text, images, colors, motion, sound and video. With computers, teachers can also create teaching materials such as electronic books, electronic modules and others.

Teaching materials are defined as a set of learning tools or tools that contain learning materials, methods, limitations, and ways of evaluating that are designed systematically and attractively to achieve the expected goals (Taufiqurrohman et al., 2017). One example of teaching materials is the student worksheet.

Student worksheet can activate students in the learning process, assist students in developing concepts, train students to find and develop process skills, train students to find and develop process skills, as a guide for educators and students in carrying out the learning process and can help students obtain notes about the material learned through learning activities and can increase learning success and make students more active and efficient in learning (Ariska et al., 2017).

Along with technological advances, the use of technology for teaching materials has been researched by Apriyanto et al. (2019) about the

development of electronic student worksheet, which shows that from the results of student responses, it is found that electronic student worksheet is very easy to use, can make learning more fun, and make it easier for students to understand the material. Other research on the development of android-based electronic teaching materials as interactive media shows that using electronic teaching materials can make learning more effective (Jazuli et al., 2018). Wismadi (2013) mentions that the use of selected media can activate students during learning activities. For example, animation media can describe abstract materials. This means that animations, videos and more can help students to facilitate interpretation and get information.

In addition to using electronics for student worksheets, these teaching materials have also been developed by applying learning models. Some of them are student worksheet based on discovery learning (Ariani et al., 2020), student worksheet with a problem-based learning model (Fitriani et al., 2016). Another study using student worksheet that applies predict, observe and explain models shows that learning models in student worksheet can improve students' reading comprehension skills (Fathonah et al., 2016).

POE model is a learning model introduced and developed by White and Gustone, which is arranged according to three steps, prediction, observation and explanation (Jasdilla, 2019). This learning model involves students actively, and students can build their knowledge, observe phenomena, communicate thoughts, and write down the results of discussions (Sreerekha, 2016).

POE-based student worksheet is very important because using POE-based student worksheet; students can predict first then make observations. Finally, students will explain whether or not the initial predictions were true. In addition, the use of POE-based student worksheet can be used to find students' ideas and provide information for teachers to find out how students think, trigger discussion activities, motivate students to explore students' conceptual knowledge, trigger students to investigate (Fannie et al., 2014). The results shows that POE-based student worksheet can provide convenience for students in understanding concepts and train students to learn independently and be more active in learning activities (Fannie et al., 2014). The development of student worksheets based on the POE model on elasticity and Hooke's law shows that using student worksheets by applying the POE model can develop students' mental and physical activities optimally and improve students' understanding (Nurul et al., 2017).

Researchers at SMAIT Al-ittihad Pekanbaru have also conducted an initial study. In this study, it was found that the student worksheet used only contained material descriptions, questions and filling questions without explaining the process of obtaining answers to these questions. So that students do not understand the subject material, have not facilitated students to obtain meaningful learning and have not explored the initial ideas that students have. The teaching materials used at SMAIT Al-Ittihad also have not utilized technology. SMAIT Al-Ittihad Pekanbaru has complete learning facilities. For example, SMAIT Al-Ittihad has a computer laboratory and an internet network that can be accessed throughout the school environment but never used in chemistry learning. At the same time, facilities in schools support teachers to use technology in learning, such as the use of electronic worksheets in chemistry learning.

Based on the background described, it is necessary to design and test student worksheet in POE-based electronic smart worksheets on acid-base materials. Using the integration of electronic worksheets and the POE model, it is hoped that students can actively build knowledge either independently or with colleagues who are not limited by space and time so that learning becomes more meaningful following the 2013 curriculum. The feasibility of the POE-based electronic smart worksheet produced was measured based on the results of validity and practicality test data analysis.

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

2. Research Method

This research is included in the type of research and development. Research development is a process or steps to develop a new product or improve an existing product (Sukmadinata, 2008). This research aims to produce a product, namely an electronic smart worksheet based on POE on acid-base material.

This study uses a research and development design from the Four-D (4-D) model. This model was developed by Thagarajan et al. The development stages of this model consist of four stages, defining, designing, developing and distributing (Pratywari et al., 2015). In this research, not all of these steps were conducted but only conducted until the development stage.

This research was conducted at SMAIT Al-Ittihad Pekanbaru class XI IPA Pa. The subjects in this study were learning media experts, learning materials experts, and practicality test experts. At the same time, the object of research is an electronic smart worksheet based on POE on acid-base materials. The samples used in this study were two chemistry teachers and ten students in class XI at SMAIT Al-Ittihad Pekanbaru.

POE-based electronic smart worksheets were validated by two lecturers and tested for practicality by two chemistry teachers. The instrument in this research is a questionnaire. The data analysis technique used is qualitative and quantitative descriptive analysis. There are criteria for validity test results that can be seen in Table 1, and criteria for practicality test results can be seen in Table 2 (Riduwan, 2012).

Table 1. Validity Test Results Criteria

No	Interval (%)	Criteria
1	81 - 100	Very Valid
2	61 – 80	Valid
3	41 – 60	Quite Valid
4	21 – 40	Less Valid
5	0 – 20	Invalid

Table 2. Practicality Test Results Criteria

No	Interval (%)	Criteria
1	81 - 100	Very Practical
2	61 - 80	Practical
3	41 - 60	Practical
4	21 - 40	Less Practical
5	0 - 20	Impractical

3. Result and Discussion

The results of the research conducted based on the steps of the 4-D (four-D) development procedure are as follows:

3.1. Define stage *(Define)*

At the define stage, there are several steps taken. The steps taken are as follows:

3.1.1. Front End Analysis (Curriculum Analysis)

Front end analysis (Curriculum Analysis) is the first step to find competencies that require teaching materials in the form of Student Worksheets. In Permendikbud No.68 of 2013, the 2013 Curriculum learning was developed through improvements to the mindset, namely the passive learning pattern into active-seeking learning and the passive learning pattern into a critical learning pattern. The analysis was conducted based on the 2013 Curriculum chemistry subject syllabus. The results obtained in this analysis are that one of the chemistry materials that require POE-based electronic smart worksheets is acid-base material. This material is one of the complex materials that contains theory, calculations and practicum and has a lot to do with everyday life.

3.1.2. Student Analysis

Student analysis is conducted by distributing a questionnaire on the needs of students. The results of the questionnaire analysis of student needs shows that 50% of students consider acid-base material a difficult material, all students said that they often use technology in everyday life, 70% of students said that technology helps them understand the concept of acid-base and 80% of students said they needed alternative teaching materials to study acid-base materials and 80% of students

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

agreed to use POE based electronic smart worksheets on acid-base materials.

So the teaching material in the form of an electronic smart worksheet is designed based on POE on acid-base material where students are given POE steps consisting of three steps, prediction, observation and explanation where these steps help students to understand acid-base materials. In addition, electronic smart worksheets are designed as attractive as possible with various color combinations, images and videos to motivate students to be more interested in reading and working on the questions contained therein.

3.1.3. Concept Analysis

Concept analysis of acid-base material is conducted by identifying the main concepts to be taught to stimulate students through learning activities contained in the student worksheet that will be produced. The analysis results are several basic competencies that will be developed through indicators and sub-topics so that the concepts become interconnected with each other to form a concept map contained in the Worksheet on the subject of acid-base based on POE.

3.1.4. Learning Objectives Analysis

Analysis of learning objectives is conducted to determine indicators of learning achievement based on concept analysis and curriculum analysis. Researchers can determine what will be displayed in the electronic smart worksheet, the question grid, and how much the learning objectives are achieved by writing the learning objectives. The steps taken to determine the learning objectives are detailed in the electronic smart worksheet, namely by reviewing core competencies and basic competencies related to acid-base materials.

3.2. Design Stage

The design stage aims to design learning devices following the specification of learning objectives at the define stage. The electronic smart worksheets are created using the articulate storyline application. Articulate itself is an application that was just introduced in 2001. Articulate is used to present information for a specific purpose, expertise in making presentations related to this ability can produce interesting tutorials (Pratama, 2018). So that it can attract students to follow the presentation, the display of developed. The display of the developed electronic smart student worksheet can be seen in Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.

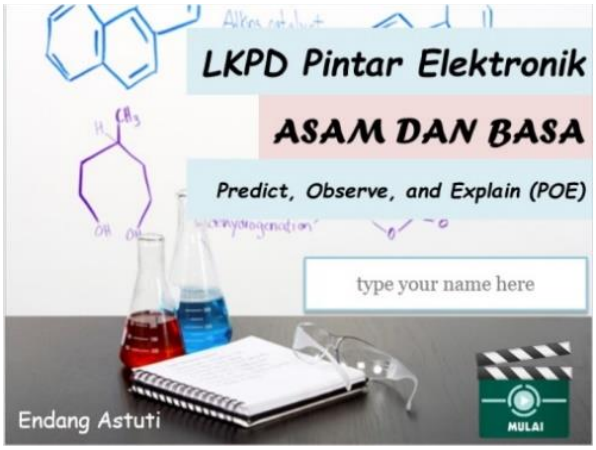

Figure 1. Initial Display Design

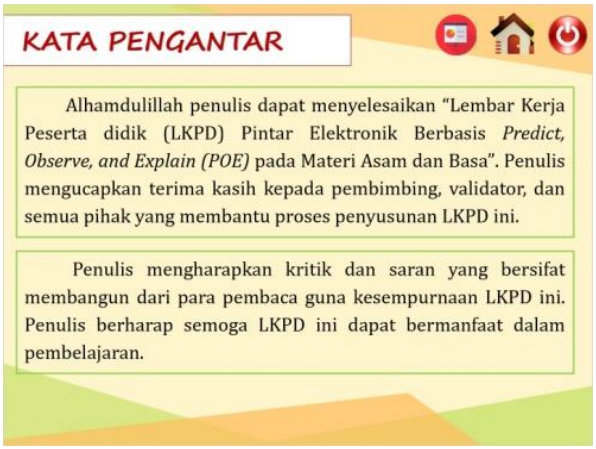

Figure 2. Preface

Figure 3. Main Menu Display

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

Figure 4. Concept Map Display

Figure 5. Material Activity Display

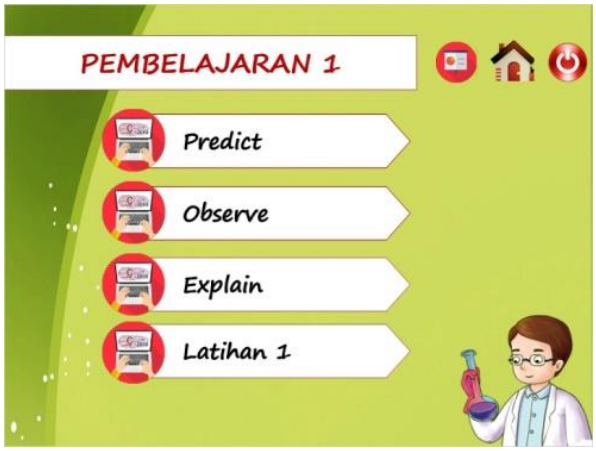

Figure 6. Learning 1 Display

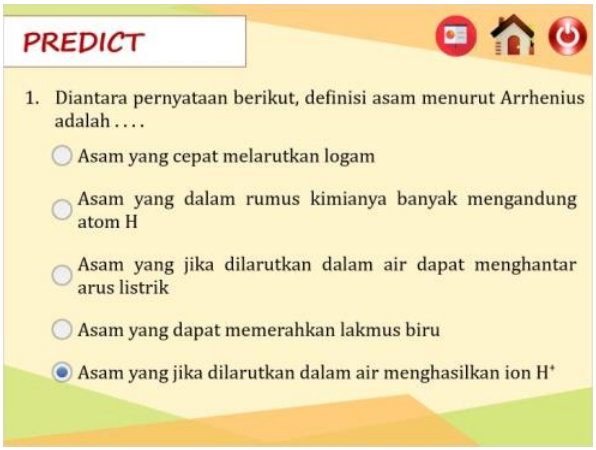

Figure 7. Predict Activity Display

Figure 8. Observe Activity Display

Figure 9. Study Material Display

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

Figure 10. Exercise Display

Figure 11. Final Page Display

3.3. Development Stage

The development stage aims to produce products in electronic smart worksheets that media experts and material experts have revised. The validation carried out by media, and material experts aim to find out the shortcomings of electronic smart worksheets. After the electronic smart worksheet is validated, the revision stage is carried out until the electronic smart worksheet product is tested.

3.3.1. Electronic Smart Student Worksheet Validation

The validation stage is conducted by asking for opinions from experts to assess the products produced so that the strengths and weaknesses of the product can be known. Validators will validate products produced at the design and product development stages in their fields. Product validation is carried out by two experts or consisting of one media expert and one learning material expert. Product validation by media experts is carried out by showing and explaining products in POE-based electronic smart worksheets on acid-base materials to media experts. This electronic worksheet has been improved after being analyzed by a media expert validator. According to media experts, after being repaired by researchers, this product is suitable for learning media in teaching materials in schools. This is in line with Ramayani et al. (2019) research that teaching materials must be validated first by experts to determine the accuracy of the aspects or components of their preparation before being used in learning. The results of the assessment by media experts can be seen in Figure 12.

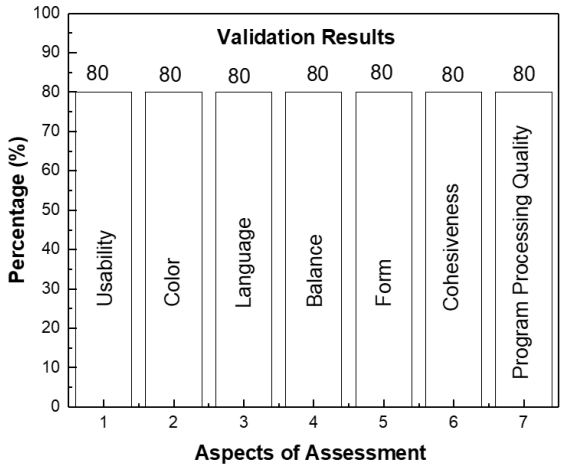

Figure 12. Validation Results by Media Experts

Figure 12 is the validation results of the learning media in electronic smart student worksheet by media experts. The assessment sheet is in the form of a questionnaire containing 17 indicators for media assessment aspects. As for the aspects of the assessment, namely the usability aspect including the attractiveness of the electronic worksheet made, the color aspect including the suitability and accuracy of the use of color, the language aspect including the accuracy of language use and the ease of using language to understand. This means that the language used must be following the rules of Indonesian and communicative. This follows Amri's opinion, which states that the language in teaching materials must be communicative (2013).

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

Furthermore, the balance aspect includes the accuracy and suitability of the background used. Moreover, the integration aspect includes the completeness of content presentation and clarity of instructions. Finally, the program processing quality aspect includes the ease and operation of electronic worksheets.

This questionnaire has the highest weight of 5 and the lowest weight of 1. The feasibility of the electronic smart worksheet POE-based in the valid category with a percentage of learning media validity of 80%, meaning that the learning media is in the form of a POE-based electronic smart worksheet deserves to be tested in schools.

Furthermore, electronic worksheets based on POE on acid-base materials were analyzed by material experts, where electronic worksheets were improved after being analyzed by material expert validators. After being repaired by researchers and re-analyzed by material experts according to material experts, this electronic worksheet has good quality and can be applied in learning. This is in line with the previous research that before implementing the worksheets that have been developed, the quality is assessed first by asking for an assessment from a team of experts so that a score is obtained for each aspect (Fitriani et al., 2016).

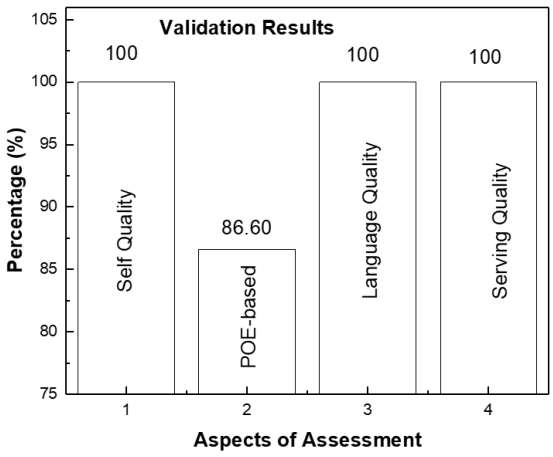

Figure 13. Validation Results by Material Experts

Figure 13 shows the validation results of the learning media in the form of electronic smart worksheets by learning material experts.

The assessment sheet is in the form of a questionnaire containing 15 indicators of material assessment aspects. The assessment aspects are the quality of the content, which includes the suitability of the material, the achievement of learning objectives, the accuracy of the data, and the development of science. Aspects of POE include prediction, observation and explanation activities and encourage students' curiosity. The language aspect includes the use of language, the ease and clarity of writing and spelling used according to the EYD. The presentation aspect includes the structural arrangement of the presentation, the availability of images, audio and video, the completeness of the presentation attributes, and the background's accuracy.

This questionnaire has the highest weight of 5 and the lowest weight of 1. Figure 13 shows that the feasibility of the POE-based electronic smart worksheet (Predict, Observe, and Explain) is in the very valid category with a percentage of learning media validity of 97.14%, meaning that the learning media is in the form of POE based electronic smart worksheets are worth testing in schools.

3.3.2. Electronic Smart Student Worksheet Practical Test

Electronic smart worksheets that material and media experts have validated are then carried out in limited trials to schools. The trial was conducted at SMAIT Al-Ittihad Pekanbaru, namely to two chemistry teachers and ten students.

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

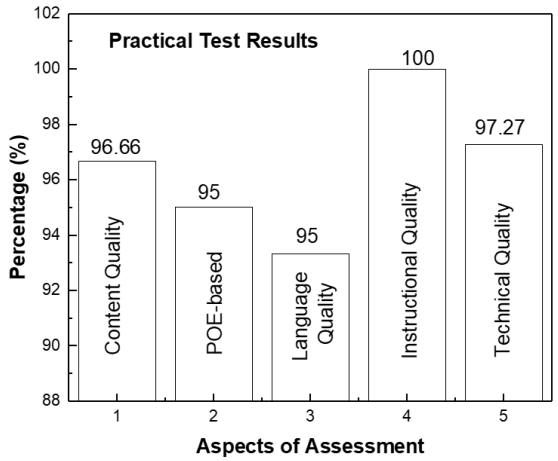

Figure 14. Practical Test Results by 2 Chemistry Teachers

Figure 14 is the practical test results of learning media in electronic smart worksheets by two chemistry teachers. The assessment sheet is in the form of a questionnaire containing 22 items of assessment aspect indicators. The assessment aspects are the quality of the content, which includes the suitability of the material, the achievement of learning objectives, the accuracy of the data, and the development of science. Aspects of POE include prediction, observation and explanation activities and encourage students' curiosity. The language aspect includes the use of language, the ease and clarity of writing and spelling used according to the EYD. Aspects of instructional quality include the attractiveness of electronic student worksheet, ease of use. Technical aspects include the accuracy of fonts, buttons, colors, images, videos, layouts, backgrounds, sizes, quality of display images used, ease of operation, advantages of using electronic worksheets, and each function in electronic worksheets can work properly.

This questionnaire has the highest weight of 5 and the lowest weight of 1. Therefore, the practicality level of POE-based electronic smart worksheets on acid-base materials is in the very practical category with a practicality percentage of 96.81%. This means that POE-based electronic worksheets on acid-base material are suitable for use judging from the quality of content, attractiveness of electronic worksheets, ease of understanding and ease of operation of electronic worksheets.

This is supported by Haritsa Ulya's research which states that the practicality of the teaching materials developed is measured based on the practicality of the teacher's responses with a very high category (Ulya et al., 2018).

After two teachers carried out the practicality trial, then the electronic smart worksheet was tested on ten students. Students learn by using POE-based electronic smart worksheets on acid-base materials in the computer laboratory. First, researchers explain how to use electronic smart worksheets to students. Then students use and work on the exercises available on POE-based electronic smart worksheets on acid-base materials. After the students finished using the electronic worksheets, the researcher asked them to respond to the electronic worksheets they had tested. Finally, the researchers gave a questionnaire to be filled out by the students.

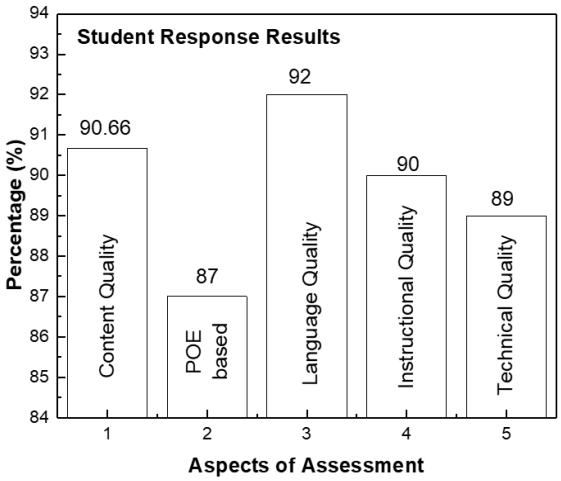

Figure 15. Student Response Results

Figure 15 is the learning media test in the form of electronic smart worksheets by ten students. The assessment sheet is in the form of a questionnaire containing 21 points of assessment aspect indicators. As the assessment aspects are the quality aspects of content spanning suitability of material, achievement of learning objectives, the accuracy of the data, and the development of

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

science. For example, aspects of POE include prediction, observation and explanation activities and encourage students' curiosity. The language aspect includes the use of language, the ease and clarity of writing and spelling used according to the EYD. Aspects of instructional quality include the attractiveness of electronic student worksheet, ease of use. Technical aspects include the accuracy of fonts, buttons, colors, images, videos, layouts, backgrounds, sizes, quality of display images used, ease of operation, advantages of using electronic worksheets, and each function in electronic worksheets can work properly.

This questionnaire has the highest weight of five and the lowest weight of one, from student responses to POE-based electronic smart worksheets on acid-base materials in the very practical category, a practicality percentage of 89.61%. This means that electronic worksheets are suitable for use as teaching materials assessed from the quality of content, attractiveness of appearance, ease of understanding for students and ease of operation of electronic worksheets.

This is also commensurate with Tasdelen and Koseaglu, which states that teaching material is said to be good if it gets a positive response from students regarding aspects of attractiveness, the extent to which it can help students. It is easy for students to understand (Febrianti et al., 2015).

This study indicate that the POE-based electronic smart worksheet on acid-base materials designed by researchers has the advantage that this teaching material is more interesting because it can display images, audio, and video. In addition, this electronic smart worksheet is also easy to use in learning, has utilized technology, implemented the POE learning model to make students play an active role in learning and make it easier for students to understand learning material without being limited by space and time.

This is also commensurate with Nopria's opinion that electronic learning media can stimulate students to think critically, use imagination skills to give birth to creativity and can increase the efficiency of the learning process because the use of electronic media can reach students in different places, within an unlimited scope (Nopriadi et al., 2015). Therefore, POE-based electronic worksheets on acids and bases are worthy of being used as learning resources.

4. Conclusion

Based on research and data analysis that has been carried out using a 4D development model until the development stage, a product is produced in the form of a POE-based electronic smart worksheet on acid-base materials. Based on the results of validation tests by material experts, media experts, practicality tests by teachers and student responses, it was found that POE-based electronic smart worksheets on acid-base materials were suitable for use in the learning process. However, future researchers to should implement POE-based electronic smart worksheets on acid-base materials that can be used on a wide scale and carry out the advanced stage of 4D design.

References

Amri, S. (2013). *Pengembangan & model pembelajaran dalam Kurikulum 2013*. Jakarta: PT. Prestasi Pustakakarya

Apriyanto, C., Yusnelti, Y., & Asrial, A. (2019). Pengembangan E-LKPD bependekatan saintifik larutan elektronik dan non elektronik. *Jurnal of The Indonesian Society of Integred Chemistry*, *11*(1), 38-42. https://doi.org/10.22437/jisic.v11i1.6843

Ariani, D., & Meutiawati, I. (2020). Pengembangan lembar kerja peserta didik berbasis discovery learning pada materi kalor di SMP. *Jurnal Pendidikan Fisika dan Terapan*, *1*(1), 13-19. http://dx.doi.org/10.22373/p-jpft.v1i1.6477

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

Ariska, A., Fadiawati, N., & Kadaritna, N. (2017). Efektivitas LKS berbasis KPS asam basa dalam meningkatkan KPS siswa laki-laki dan perempuan. *Jurnal Pendidikan dan Pembelajaran Kimia*, *7*(1), 184-196. Retrieved from http://jurnal.fkip.unila.ac.id/index.php/JPK/article/view/14493

Fannie, R. D., & Rohati. (2014). Pengembangan lembar kerja siswa (LKS) berbasis POE (predict, observe, explain) pada materi program linear kelas XII SMA. *Jurnal Sains dan Matematika*, *8*(1), 96-109. Retrieved from https://www.neliti.com/publications/221053/pengembangan-lembar-kerja-siswa-lks-berbasis-poe-predict-observe-explain-pada-ma#cite

Fathonah, F. S. (2016). Penerapan model POE untuk meningkatkan keterampilan membaca pemahaman siswa kelas IV sekolah dasar. *Jurnal Pendidikan Guru Sekolah Dasar*, *1*(1), 171-178. https://doi.org/10.17509/jpgsd.v1i1.9070.

Fitriani, F., Hasan, M., & Musri, M., (2016). Pengembangan lembar kegiatan peserta didik (LKPD) berbasis masalah untuk meningkatkan pemahaman konsep dan aktivitas belajar peserta didik pada materi larutan penyangga. *Jurnal Pendidikan Sains Indonesia*, *4*(1), 26-42. Retrieved from http://www.jurnal.unsyiah.ac.id/JPSI/article/view/6577

Febrianti, E., Haryani, S., & Supardi, K.I., (2015). Pengembangan lembar kerja siswa (LKS) materi larutan penyangga odel problem based learning bermuatan karakter untuk siswa SMA. *Journal of Innovative Science Education*, *4*(1), 1-9. Retrieved from https://lib.unnes.ac.id/37623/

Jasdilla, L., Fitria, Y., & Sopandi, W. (2019). Predict observe explain (POE) strategy toward mental model of primary student. *J. Phys.: Conf. Ser.*, *1157*(2), 1-6. Retrieved from https://iopscience.iop.org/article/10.1088/1742-6596/1157/2/022043/meta

Jazuli, M., Azizah, L. F., & Meita, N. M. (2018). Pengembangan bahan ajar elektronik berbasis android sebagai media interaktif. *LENSA (Lentera Sains): Jurnal Pendidikan IPA*, *7*(2), 47-65. https://doi.org/10.24929/lensa.v7i2.22

Nopriadi, N., & Syofii, I. (2015). Pengembangan bahan ajar berbasis modul elektronik pada mata kuliah konstruksi bodi kendaraan pada program studi pendidikan teknik mesin Universitas Sriwijaya. *Jurnal Pendidikan Teknik Mesin*, *3*(2), 126-135. https://doi.org/10.36706/jptm.v3i2.5361

Nurul, F., Sutarto, S., & Harijanto A. (2017). Pengembangan LKS model POE (prediction, observation, explanation) untuk pembelajaran fisika di SMA (uji coba pada pokok bahasan elastisitas dan Hukum Hooke). *Jurnal Edukasi, 4*(2), 4-8. https://doi.org/10.19184/jukasi.v4i2.5202

Pratama, R. A. (2018). Al-Barik (tutorial gambar grafik): suatu media pembelajaran berbasis articulat storyline 2. *Jurnal AdMathEdu*, *8*(2), 185-198. http://dx.doi.org/10.12928/admathedu.v8i2.12349

Ramayani, C., & Delfianto, D. (2019). Pengembangan bahan ajar berdasarkan pendekatan saintifik untuk siswa SMP Negeri 2 Sungai Limau. *Jurnal Kepemimpinan dan Pengurusan Sekolah*, *4*(1), 1-10. https://dx.doi.org/10.34125/kp.v4i1.357

Riduwan. (2012). *Skala Pengukuran Variabel-Variabel Penelitian.* Bandung: Alfabeta.

Sreerekha, S., & Sankar, S. (2016). Effect of predict-observe-explain strategy on achievement in chemistry of secondary school students. *International Journal of*

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)

Education and Teaching Analytics, 67-69. Retrieved from https://www.semanticscholar.org/paper/EFFECT-OF-PREDICT-OBSERVE-EXPLAIN-STRATEGY-ON-IN-OF-Sreerekha-ArunRaj./672e4ec80cc1d4f16431cde3c9c5760b7f43e207

Sukmadinata, N. S. (2008). *Metode Penelitian Pendidikan*. Bandung : PT Remaja Rosdakarya.

Taufiqurrohman, T., Suryani, N., & Suharno, S. (2017). Pemanfaatan LKS digital untuk meningkatkan hasil belajar KKPI di SMK Negeri 1 Gesi Kabupaten Sragen. Prosiding Seminar Pendidikan Nasional, 189-195, Surakarta.

Ulya, H., Rubibyani, R. B. & Efkar, T. (2018). Pengembangan modul kimia berbasis problem solving pada materi asam basa Arrhenius. *Jurnal Pendidikan dan Pembelajaran Kimia*, *7*(1), 129-141. Retrieved from http://jurnal.fkip.unila.ac.id/index.php/JPK/article/view/13979

Wismadi, R. H. (2013). Penggunaan multimedia interaktif dalam pembelajaran IPA di SMP. *Jurnal Ilmiah Guru COPE*, 30-33. Retrieved from https://journal.uny.ac.id/index.php/cope/article/view/2961

This is an open access article under CC-BY-SA license (https://creativecommons.org/licenses/by-sa/4.0/)