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Development of the Acid and Base E-Module Based on Contextual Teaching And Learning for Class XI SMA/MA

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A B S T R A C T

Acids and bases are one of the chemistry learning materials that are studied in class XI SMA/MA. Acids and bases are contextual and have a lot of relevance in everyday life. Additionally, acids and bases are prerequisites for studying some other chemistry. Therefore, appropriate learning models or strategies and teaching materials are needed. One of them is the use of contextual learning-based e-modules. This study aims to determine the validity, practicality, and on effectiveness of developing an acid-base e-module based on contextual teaching and learning for class XI SMA/MA. This form of study is an educational design research that uses the Plomp model which consists of three stages, namely the preliminary research, the prototyping phase, and the assessment phase. The assessment phase is not carried out. The results showed that e-modules had content, construct, and media validity values of 0.87, 0.88, and 0.89 respectively with valid categories, practicality according to teachers 88.52% with very practical categories and practicality according to students 85.10% with practical category. The average N-gain value for the effectiveness test is 0.7 with the high effectiveness category. The results of this study indicate that the developed e-module is valid, practical, and effective.

1. Introduction

The development of global technology has affected all aspects of human life, one of which is education (Ngafifi, 2014). Through technological advances in education, it is possible to change the orientation of learning from conventional learning to digital learning. Digital learning can be applied, one of which is in the presentation of learning content, such as e-module-based digital learning content (Kurniawan & Kuswandi, 2021).

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E-modules are independent teaching materials that are systematically arranged in certain learning units and presented in an electronic format. In learning activities, e-modules are connected by links as navigation that is more interactive in adding to the student's learning experience, and is equipped with video, animation, image, or audio presentations so that students can become more active in learning (Kemendikbud, 2017). The use of technology in learning can improve learning outcomes, teaching effectiveness, and can influence what and how learning should be studied and taught (Nugrahaeni et al., 2017; Nurkolis & Muhdi, 2020). The use of e-modules in learning is also in accordance with the demands of the 2013 curriculum development prevailing in Indonesia, where e-modules can change student learning orientation from teacher-centered learning to student-centered learning (Najuah et al., 2020).

One of the learning materials that can use e-modules in learning is chemistry. Chemistry is a science that studies the properties of matter and the changes it undergoes (Chang, 2010). One of the chemicals for class XI SMA/MA is acids and bases. Acids and bases are prerequisite materials for several chemistry materials in SMA/MA such as acid-base titration, buffer solutions and salt hydrolysis. If students do not understand the acid-base material well, then students will have difficulty understanding the next material. Acids and bases are contextual and have a lot of relevance in everyday life. Acid and base compounds are found in many household products, food, medicines, and of course almost every chemical laboratory (Tro, 2011). Based on this, it is appropriate for students to understand and be able to relate the acid and base material they are learning to everyday life. To be able to apply acid and base material in everyday life requires a strategy or learning model. One of the learning models that connects learning materials with real-life situations is Contextual Teaching and Learning (Antara et al., 2019; Zulaiha, 2016).

Contextual teaching and learning (CTL) is a learning strategy that fully involves students to be able to find the material being studied and be able to connect and apply it in real life (Sanjaya, 2010). With students being able to connect the material they learn with real life, students will be able to find the meaning or purpose of what they are learning, thus making students more interested in learning (Johnson, 2002). Contextual learning is different from traditional learning. Where in traditional learning, the main role of the teacher is to convey facts and procedures. The role of students is to memorize facts and practice the procedure. In contrast, in contextual learning the teacher's role is expanded, namely the teacher creates various learning experiences with a focus on understanding rather than memorizing (Crawford, 2001).

The results of Nuratika's research, et al (2020), reveal that the use of the CTL can improve student learning outcomes and students become more enthusiastic and active in learning, because students can more easily understand the subject matter with the linkage of the material they learn with real life. The results of Roziyah and Haryani's research (2017) also reveal that learning with the CTL. The model can increase student motivation and learning outcomes. Research by Dewi and Primayana (2019) revealed that there are significant differences in conceptual understanding between students equipped with contextual-based learning modules and ordinary learning modules. Modules with CTL learning can improve students' conceptual understanding, because the CTL-based learning model emphasizes the process of constructing knowledge. In other words, the contextual learning model emphasizes more on providing direct experience to students to get to know more about nature so that students are more interested in the learning process. In this case, it is important for educators to strengthen student involvement in the material being taught by helping students associate the relationship between the knowledge they already have and their application in everyday life.

Based on the results of the questionnaire given to five SMA/MA chemistry teachers, namely MAN 2 Kerinci, SMAN 1 Kerinci, SMAN 7 Padang, SMAN 8 Padang, and SMAN 12 Padang, it was found that the teaching materials used by teachers in schools were generally still in the form of printed teaching materials, and some also use video and PPT. However, some students do not have these teaching materials. The teaching materials used by the teacher are also not based on contextual learning, only in the form of teaching materials commonly used in general. The teaching materials used by the teacher have also not been able to overcome the difficulties of some students in understanding the concepts being taught. The teacher also revealed that all schools were equipped with adequate ICT facilities and infrastructure, and the teacher also agreed to develop e-module teaching materials based on contextual learning on acids and bases.

Meanwhile, based on the results of questionnaire analysis from 60 students at SMAN 7 Padang, SMAN 8 Padang, SMAN 12 Padang, and MAN 2 Kerinci, it was obtained data that some students, namely 50% of students still considered acid and base material difficult, 95% of students wanted material more interesting teaching materials, and 93% of students agree with the use of teaching materials in the form of e-modules in chemistry learning, especially on acids and bases. Based on the data and problems above, the purpose of this research is to develop an acid and base e-module based on contextual teaching and learning for class XI SMA/MA which is valid, practical, and effective.

2. Methodology

This type of research is educational design research. This research will produce a product in the form of an acid and base e-module based on contextual teaching and learning for class XI SMA/MA and an analysis of the validity, practicality, and effectiveness of the e-module. The subjects in this study were three FMIPA UNP's chemistry lecturers, two SMA/MA's chemistry teachers at MAN 2 Kerinci and SMAN 1 Kerinci, and 16 students in class XI SMA/MA at MAN 2 Kerinci. Meanwhile, the object in this study is the E-module based on Contextual Teaching and Learning. The research model used is the Plomp development model (2013) developed by Tjeerd Plomp, which consists of three stages, namely the preliminary research stage, the prototyping phase, and the assessment phase. However, due to time and cost constraints, this research was limited to the prototyping phase. At the preliminary research stage, needs and context analysis, literature study and conceptual framework development were carried out. At the prototyping phase, a prototype e-module design based on Contextual Teaching and Learning on acid and base materials for class XI SMA/MA. For each prototype, a formative evaluation will be carried out to improve and refine the developed e-module. This prototype building stage produces four prototypes. Figure 1 shows the overall design and research procedures of the Plomp model in this study.

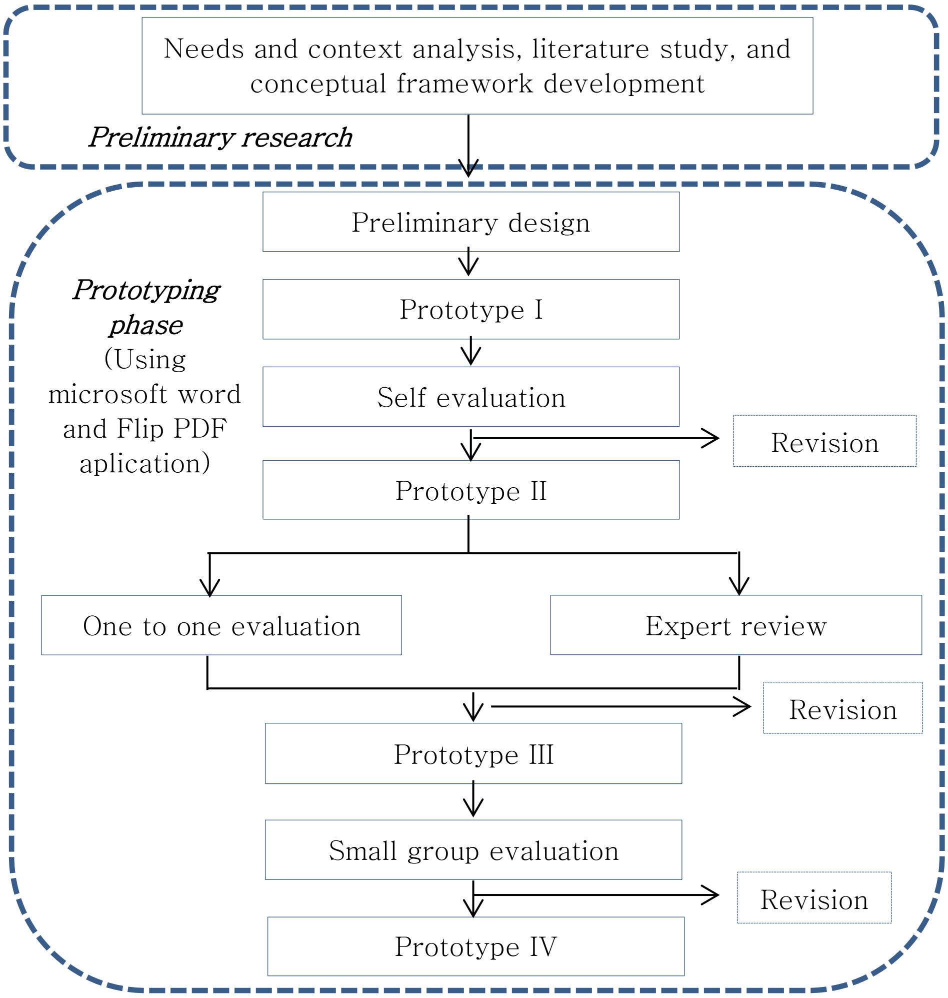

Figure 1. Plomp Development Procedure Modified from Plomp (2013)

The research data were analyzed using descriptive statistical techniques to obtain the average and percentage figures.

1. Validity

   In the validity test, an instrument in the form of a questionnaire was used which was analyzed by the Aiken's V formula. Table 1 shows the validity assessment criteria based on the Aiken's V scale.

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

s = r - lo

Description:

V = Coefficient of validity

lo = The lowest value of the validity assessment (lo = 1)

c = The highest score of validity assessment (c = 5)

r = Validator category score

n = Number of validators

Table 1. Right-Tail Probabilities (p) for selected Values of the Validity Coefficient (V) (Aiken, 1985)

No. of Items (*m*) or Raters (*n*)	Number of Rating Categories (c)											
	2		3		4		5		6		7	
	V	p	V	p	V	p	V	p	V	p	V	P
2							1.00	.040	1.00	.028	1.00	.020
3							1.00	.008	1.00	.005	1.00	.003
3			1.00	.037	1.00	.016	.92	.032	.87	.046	.89	.029
4					1.00	.004	.94	.008	.95	.004	.92	.006
4			1.00	.012	.92	.020	.88	.024	.85	.027	.83	.029
5			1.00	.004	.93	.006	.90	.007	.88	.007	.87	.007
5	1.00	.031	.90	.025	.87	.021	.80	.040	.80	.032	.77	.047

2. Practicality

   In the practicality test, an instrument in the form of a questionnaire was used which was analyzed with the practicality percentage formula from Purwanto (2009).

$$\textit{Practicality level percentage} = \frac{\textit{score obtained}}{\textit{max score}} \text{ x } 100\%$$

   Practicality assessment criteria adapted from Purwanto (2009), as follows:

   86% - 100% = Very practical

   76% - 85% = Practical

   60% - 75% = Quite practical

   55% - 59% = Less practical

   ≤ 54% = Not practical

3. Effectiveness

   The effectiveness test used instruments in the form of pre-test and post-test questions which were analyzed using the N-Gain formula. The steps of the N-Gain test are:

   1) Calculated the score of each test taker based on the pretest score and posttest score.

$$\textit{Student value} = \frac{\sum \textit{the answer score obtained}}{\textit{max score}} \; x \; 100\%$$

   2) The N-Gain value of each student uses the N-Gain formula equation.

$$N\text{-}Gain = \frac{Posttest\ score - Pretest\ score}{100 - Pretest\ score}$$

3) Calculate the average N-Gain of each student.

$$Average\ N\text{-}Gain = \frac{\sum N\text{-}Gain\ of\ students}{number\ of\ students}$$

The results of the average N-Gain calculation are then interpreted using the N-Gain criteria. Table 2 shows the N-Gain criteria of Hake (1998).

Table 2. N-Gain Criteria of Hake (1998)

N-Gain Criteria	**Interpretation**
$g \geq 0,7$	Hight
$0,7 > g \geq 0,3$	Medium
$g < 0,3$	Low

3. Results and Discussion

Preliminary research

The needs and context analysis stage aims to collect information about the problems faced related to teaching materials used in schools as well as to develop learning objectives, materials, and learning strategies, especially on acid and base materials so that it is necessary to develop teaching materials in the form of e-modules based on contextual teaching and learning. At the needs analysis stage, it is done by distributing questionnaires to five chemistry teachers and 60 students. This questionnaire distribution activity was carried out at MAN 2 Kerinci, SMAN 1 Kerinci, SMAN 7 Padang, SMAN 8 Padang, and SMAN 12 Padang. Based on the results of the questionnaire analysis, information was obtained that: (1) the teaching materials used by teachers in schools are generally still in the form of printed teaching materials, while learning has now entered the digital era. (2) some students do not have these teaching materials, (3) some students still find acid and base material difficult, so students still have difficulty understanding the concepts that exist in acid and base material, and (4) the unavailability of the acid and base e-module based on contextual teaching and learning in schools. In the context analysis, it is obtained by analyzing the abilities that must be mastered by students in the learning process in accordance with the 2013 revised 2018 curriculum. Table 3 shows the basic competencies of acid and base materials, as well as learning indicators that are derived based on these basic competencies.

Table 3. Basic Competencies and Indicators of Achievement in Acid and Base Material Competencies.

The basic competencies of acid and base materials are as follows.	
3.10	Explain the concepts of acids and bases and their strengths and ionizing equilibrium in solution.
4.10	Analyzing the trajectory of changes in the pH of several indicators extracted from natural materials through experiments.
Learning indicators that can be derived based on basic competencies are as follows.	
3.10.1	Explain the concepts of acids and bases based on the Arrhenius theory.

3.10.2	Explain the concepts of acids and bases based on the Bronsted-Lowry theory.
3.10.3	Explain the concepts of acids and bases based on the Lewis theory.
3.10.4	Describe the degree of acidity (pH) based on its ionizing equilibrium in solution.
3.10.5	Explain the strength of acids and bases and their relationship to the degree of ionization and their ionization constants.
3.10.6	Calculating the pH of a strong and weak acid/base solution.
4.10.1	Analyzing the properties of acidic, basic, or neutral solutions based on the color changes of several indicators extracted from natural materials and litmus paper indicators.
4.10.2	Predict the pH of a solution using chemical indicators.
4.10.3	Measuring the pH of various solutions of weak acids, strong acids, weak bases, and strong bases with the same concentration using universal indicators of pH meters

The next step in this preliminary research stage is literature study that aims to collect useful information to support the research process. The results obtained information that the e-module was compiled based on the books of the Kemendikbud (2017), Depdiknas (2008), and Suryosubroto (1983), with the source material in the e-module being sourced from a textbook chemistry. The e-module was developed using a contextual teaching and learning strategy (Crawford, 2001). As for the Plomp development model, it is based on the book "An Introduction to Educational Design Research" (Plomp, 2013).

The next stage is the development of a conceptual framework as a guide in the next development step, namely the formation of a prototype. This is done to find out what are the main concepts that need to be studied in acid and base materials, such as: determination of acid and base properties of solutions, theory of acids and bases, degree of acidity (pH), strength of acids and bases, pH measurement of solutions, and calculation of the pH of an acid and a base solution.

Prototyping phase

Prototype I, the design and preparation of the CTL-based acid and base e-module was carried out based on the results of the literature study that had been carried out. The e-module is organized into six meetings, where each meeting contains five CTL learning strategies, namely relating, experiencing, applying, cooperating, and transferring. The five strategies are contained in the form of activity sheets and worksheets which are one of the components of the e-module. This stage produces Prototype I.

In the relating section, it is presented by giving an image or phenomenon that is known by students in general and is associated with acid and base material. In the experiencing section, activity sheets are presented in the form of activities that must be carried out by students, such as observing practical videos, observing illustration images, simulations, virtual lab activities, and problem solving activities. This activity is carried out so that students can build new knowledge through direct experience that is arranged in the learning process. In the applying, a worksheet containing questions is presented to apply an information or concept that has been obtained in the previous activity. The cooperating section is presented simultaneously with the experiencing section and the applying section. In this section, students work on activity sheets and worksheets in groups. In the transferring section, questions are presented in the form of a new context or as enrichment so that students can learn to transfer the knowledge they have learned. Figure 2 shows an example of an e-module display in each section.

Figure 2. Example of e-module display in each section.

Prototype II, a formative evaluation was carried out in the form of self-evaluation of the e-module design on prototype I which aims to see the completeness of the e-module components developed. From the results of self-evaluation with a *checklist* for the components of the e-module, it was found that this prototype does not require revision because the e-module components are complete. At this stage produce a prototype II.

Prototype III, a formative evaluation is carried out in the form of expert review and one-to-one evaluation. The expert assessment was carried out by five validators who are experts in chemistry to analyze the validity of the content, construct, and media of the developed e-module. Table 4 shows information on the content validity data of the e-module. The content of the CTL-based e-module on acid and base material is declared valid by the validator with an average V value of 0.87. This shows that the content of the e-module developed is in accordance with the demands of Basic Competence (BC) 3.10 and 4.10 acid and base material in the 2013 revised 2018 curriculum. A teaching material can be said to be valid if it is in accordance with the applicable curriculum (Hafsah et al. al., 2016; Wijayanti et al., 2016).

Table 4. Content Validity Result Data

Aspects assessed	V	Category
The contents of the e-module are in accordance with KD 3.10.	0,95	Valid
The contents of the e-module are in accordance with KD 4.10.	0,9	Valid
The competency achievement indicator to be achieved is in accordance with KD.	0,95	Valid
The learning objectives are in accordance with KD.	0,95	Valid
The material contained in the e-module is correct.	0,8	Valid
The E-module contains explanations, pictures, illustrations, which are suitable for acids and bases.	0,9	Valid
There is a suitability of the questions given with the material in the e-module.	0,8	Valid
The contents of the e-module are contextual/ show phenomena that are close to everyday life.	0,85	Valid
The contents of the e-module can add insight to students' knowledge.	0,9	Valid
The images provided can provide information on acid and base material to students.	0,9	Valid
The videos provided can provide information on acid and base material to students.	0,8	Valid
E-module can be used for student-centered learning.	0,8	Valid
E-modules can be used for contextual teaching and learning.	0,8	Valid
Average	0,87	Valid

The next validity test is construct validity. This construct validity questionnaire contains two components, namely the linguistic component and the presentation component. Table 5 shows information about the data from the construct validity results. The construct validity of the CTL-based acid and base e-module by the validator found the average Aikens V value of 0.88 with a valid category. This shows that the e-module is valid in terms of construct feasibility, namely in terms of language and presentation. From the assessment of the linguistic component with an average V value of 0.89, it shows that the e-module that has been developed is communicative, does not cause confusion, and uses good and correct Indonesian rules so that it is easy to understand. According to Handayani & Legi (2016), a teaching material must be prepared using clear sentences and language so that it is easily understood by its users. Meanwhile, from the assessment of the presentation components with an average V value of 0.87, it shows that the developed e-modules have been arranged systematically, coherently and clearly with e-module elements according to Suryosubroto (1983) and Kemendikbud (2017). In addition, e-modules have also been presented in accordance with 5 learning strategies of contextual teaching and learning that are systematically arranged Crawford (2001).

Table 5. Contstruct Validity Result Data

Aspects assessed	V	Category
Language Component	0,89	Valid
Presentation Component	0,87	Valid
Average	0,88	Valid

The next validity test is the validity of the media. This media validity questionnaire contains two aspects, namely graphic aspects and programming and utilization aspects. Table 6 shows information regarding the data from the validity of the media. The validity of the media from the CTL-based acid and base e-module by the validator found the average Aikens V value of 0.89 with a valid category. From the assessment of the graphic component with an average V value of 0.89, it shows that the type and size of the letters, layout, and images on the e-module can be observed clearly and the overall design and appearance of the e-module is attractive. Meanwhile, from the assessment of programming and utilization aspects with an average V value of 0.88, it shows that the e-module is appropriate in the programming aspect so that it is easy to use and can be utilized in chemistry learning. Daryanto (2013) a good e-module is user friendly.

Table 6. Media Validity Result Data

Aspects assessed		V	Category
Graphical component		0,89	Valid
Programming and utilization aspects		0,88	Valid
	Average	0,89	Valid

Next is a one-to-one evaluation of three students. The results of the analysis from the one-to-one evaluation found that the e-module developed was good both in terms of design and appearance, as well as in terms of presentation of material, use of letters, and language, it was also clear coupled with the images, tables, videos and animations contained in the e-module. e-modules can help students understand the material. Based on the suggestions obtained from expert assessments and one-to-one evaluations, revisions were made to improve and produce valid products. This stage produces prototype III.

Prototype IV, evaluation of the valid prototype III is carried out. The evaluation was carried out through small group trials to determine the level of practicality and effectiveness. Assessment aspects of the practicality of e-modules consist of aspects of benefits, ease of use, and time efficiency. In terms of the practicality of the acid and base e-module by the teacher, the results obtained were 88.52% with a very practical category. Table 7 shows the results of processing the CTL-based acid and base e-module practicality data by the teacher. Meanwhile, in terms of the practicality of the acid and base e-module by students, the results obtained are 85.10% in the practical category. Table 8 shows the results of processing practical data on the CTL-based acid and base e-module by students. This shows that the e-module developed is easy to use, the language is easy to understand, the learning time is used more efficiently, and can help the teacher's role as a facilitator. This is in accordance with what was stated by Yuliani & Seragih (2017) that the teacher acts as a facilitator in learning activities. The use of teaching materials can assist teachers in delivering material, so that learning time becomes more efficient (Asmiyunda et al., 2018). In addition, the components of the e-module can help students understand the material and can increase students' interest and motivation in learning. E-modules can also help students understand the material (Groth et al., 2018; Herawati & Muhtadi, 2018). A teaching material can be said to be practical if it has ease of use and is useful in the learning process (Sukardi, 2012).

Table 7. Results of Practicality Analysis by Teachers

Aspects assessed	P (%)	Category
Ease of use	85,55	Practical
Efficiency of learning time	90	Very practical
Benefit	90	Very practical
Average	88,52	Very practical

Table 8. Results of Practicality Analysis by Students

Aspects assessed	P (%)	Category
Ease of use	85	Practical
Efficiency of learning time	86,30	Very practical
Benefit	84	Practical
Average	85,10	Practical

Furthermore, the assessment of the effectiveness of the CTL-based acid and base e-module is seen based on the increase in students' understanding by comparing the results of the pre-test and post-test. The pre-test is a test conducted before students learn to use the acid and base e-module, while the post-test is carried out after learning using the acid and base e-module. The test results showed an increase in student scores before and after the use of e-modules. The average increase in the N-Gain students is 0.7 with the category of high e-module effectiveness. That is, the CTL-based acid and base e-module can improve students' understanding. Contextual learning can make students active in the learning process and able to improve student learning outcomes (Nanda et al., 2017; Susiloningsih, 2016). CTL-based e-modules can also improve the scientific literacy of high school students (Nurhasnah & Sari, 2020).

4. Conclusion

Based on the results of research and data processing that has been carried out, it can be concluded that the acid and base e-module based on Contextual Teaching and Learning for class XI SMA/MA which was developed through the Plomp model is valid, practical, and effective in improving student learning outcomes and can help students understand the concepts contained in acid and base chemistry.

References

Antara, P.A., Ujianti, P.R., & Patissera, A.L. (2019). Pengaruh Model Pembelajaran Kontekstual Terhadap Kemampuan Membaca Permulaan Anak. *Jurnal Mimbar Ilmu, 24(2),* 223.

Asmiyunda, A., Guspatni, G., & Azra, F. (2018). Pengembangan E-Modul Kesetimbangan Kimia Berbasis Pendekatan Saintifik untuk Kelas XI SMA/ MA. *Jurnal Eksakta Pendidikan (JEP)*, *2(2),* 155.

Aiken, L. R. (1985). Three Coefficients For Analyzing The Reliability And Validity Of Ratings. *Educational And Psychologycal Mesurement*. 45, 131-142.

Chang, Raymond. (2010). *Chemistry 10th Edition*. New York: McGraw-Hill

Crawford, L. (2001). *Teaching Contextually: Research, Rationale, and Techniques for improving, Student Motivation and achievement in Mathematics and sciences*. Texas: CCI Publishing, Inc.

Daryanto. (2013). *Strategi dan Tahapan Mengaja*r. Bandung: Yrama Widya

Depdiknas. (2008). *Panduan Penyusunan Bahan Ajar*. Jakarta: Direktorat Pembinaaan SMA

Dewi, P. Yulia A., & Primayana, K. H. (2019). Effect of Learning Module with Setting Contextual Teaching and Learning to Increase the Understanding of Concepts. *International Journal of Education and Learning*. *1(1),* 19–26.

Groth, M., Barthe, K. G., Riemer, M., Ernst, M., Herrmann, J., Fiehler, J., & Buhk, J. H. (2018). Critical Analysis of an e-Learning and Interactive Teaching Module with Respect to the Interpretation of Emergency Computed Tomography of the Brain. *RoFo Fortschritte Auf Dem Gebiet Der Rontgenstrahlen Und Der Bildgebenden Verfahren*, *190(4),* 334–340.

Hafsah, N. R., Rohendi, D., & Purnawan, P. (2016). Penerapan Media Pembelajaran Modul Elektronik Untuk Meningkatkan Hasil Belajar Siswa Pada Mata Pelajaran Teknologi Mekanik. *Journal of Mechanical Engineering Education*, *3(1),* 106

Hake, R. R. (1999). *Analyzing Change/ Gain Score*. California: Indiana University.

Handayani, F. & Legi, W. (2016). Pengembangan Modul Kesetimbangan Kimia Berbasis Pendekatan Saintifik untuk Kelas XI SMA/MA. *Journal of Saintek*, *8(1),* 85-97

Herawati, N. S., & Muhtadi, A. (2018). Pengembangan Modul Elektronik (E-Modul) Interaktif Pada Mata Pelajaran Kimia kelas XI SMA. *Jurnal Inovasi Teknologi Pendidikan*, *5(2),* 180–191

Johnson, B., E. (2002). *Contextual Teaching and Learning: What It Is and Why It's Here to Stay*. California: Corwin Press, Inc.

Kemendikbud. (2017). *Panduan Praktis Penyusunan E-modul*. Jakarta: Direktorat Pembinaan SMA.

Kurniawan, C., & Kuswandi, D. (2021). *Pengembangan E-Modul Sebagai Literasi Digital pada Pembelajaran Abad 21*. Jawa Timur: Academia Publication.

Najuah., Lukitoyo, P. S., Wirianti, W. (2020). *Modul Elektronik: Prosedur Penyusunan dan Aplikasinya*. Medan: Yayasan Kita Menulis.

Nanda, K. K., Tegeh, I. M., & Sudarma, I. K. (2017). Pengembangan video pembelajaran berbasis pendekatan kontekstual kelas V di SD Negeri 1 Baktiseraga. *Jurnal Edutech Universitas Pendidikan Ganesha*, *5(1),* 88–99.

Ngafifi, Muhammad. (2014). Kemajuan Teknologi dan Pola Hidup Manusia dalam Perspektif Sosial Budaya. *Jurnal Pembangunan Pendidikan: Fondasi dan Aplikasi, 2(1),* 34-47

Nugrahaeni, A., Redhana, I. W., & Kartawan, I. M. A. (2017). Penerapan Model Pembelajaran Discovery Learning untuk Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Kimia. *Jurnal Pendidikan Kimia Indonesia*, *1(1),* 23–29.

Nurhasnah, & Sari, L. A. (2020). E-Modul Fisika Berbasis Contextual Teaching And Learning Menggunakan Aplikasi Kvisoft Flipbook Maker Untuk Meningkatkan Literasi Sains Peserta Didik SMA/MA Kelas XI. *NATURAL SCIENCE: Jurnal Penelitian Bidang IPA Dan Pendidikan IPA, 6(1),* 29–40.

Nurkolis, N., & Muhdi, M. (2020). Keefektivan Kebijakan E-Learning berbasis Sosial Media pada PAUD di Masa Pandemi Covid-19. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini, 5(1),* 212.

Nuratika, A., Utami, L., Octarya, Z. (2020). Pengaruh Pendekatan Contextual Teaching and Learning Disertai Media Audio Visual Terhadap Hasil Belajar Siswa. *Journal of Research and Education Chemistry*, *2(2),* 56-70.

Plomp, T. (2013). *Educational Design Research*. Netherland: Institute for Curriculum development.

Purwanto, N. (2009). *Prinsip-Prinsip dan Teknik Evaluasi Pengajaran.* Bandung: Remaja Rosdakarya.

Roziyah, I. F., & Haryani, S. (2017). Peningkatan Motivasi Dan Hasil Belajar Melalui Contextual Teaching Learning Berbantuan Study Card. *Jurnal Inovasi Pendidikan Kimia*, *11(1),* 1828–1839.

Sanjaya, W. (2010). *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan.* Jakarta: Kencana Prenada Media Group.

Sukardi. (2012). *Evaluasi Pendidikan: Prinsip dan Operasionalnya*. Jakarta: Bumi Aksara.

Suryosubroto, B. (1983). *Sistem Pengajaran dengan Modul.* Jakarta: Bina Aksara.

Susiloningsih, W. (2016). Model Pembelajaran CTL (Contextual Teaching and Learning) dalam Meningkatkan Hasil Belajar Mahasiswa PGSD Pada MataKuliah Konsep IPS Dasar. *PEDAGOGIA: Jurnal Pendidikan*, *5(1),* 57

Tro, Nivaldo, J. (2011). *Chemistry: A Molecular Approach Second Edition*. United State of America: Pearson Education, Inc.

Wijayanti, N. P. A., Damayanthi, L. P. E., Sunarya, I. M. G., & Putrama, I. M. (2016). Pengembangan E-Modul Berbasis Project Based Learning Pada Mata Pelajaran Simulasi Digital Untuk Siswa Kelas X Studi Kasus di SMK Negeri 2 Singaraja. *Jurnal Pendidikan Teknologi Dan Kejuruan, 13(2),* 184–197.

Yuliani, K., & Suragih, S. (2015). The Development of Learning Devices Based Guided Discocery Model to Improve Understanding Concept and Critical Thinking Mathematically Ability of Students at Islamic Junior High School of Medan. *Journal of Education and Practice*, *6(24),* 116-128.

Zulaiha, S. (2016). Pendekatan Contextual Teaching and Learning dan Implementasinya dalam Rencana Pembelajaran PAI MI. BELAJEA: *Jurnal Pendidikan Islam*, *1(1)*, 42–60.

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