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Development of E-Module Based on Digital Flipbook Maker Containing Chemo-Entrepreneurship (CEP) Chemical Bond Material to Increase High School Student's Interest in Learning

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ABSTRACT

The low interest in student learning makes chemistry challenging to understand and affects expected student learning results. This research aims to develop an e-module based on a digital flipbook maker loaded with Chemo-Entrepreneurship (CEP) chemical bond material. This research is a Research and Development (R&D) type using a 4D development model. Product quality is evaluated using student responses and product quality assessment sheets. The results of the e-module assessment by material experts get an ideal percentage of 91.4% with a very good category, media experts 92% with a very good category, reviewers 91.3% with a very good category, and a positive response from students with a percentage of 93.3%. In light of the assessment results, the e-module developed can be utilized as another learning medium on chemical bond material to increase student learning interest. The results of this study imply that it can provide references for education in choosing learning media and strategies for delivering learning materials that are effective in increasing student interest. Furthermore, this can be used as a basis for further development to produce effective media and learning approaches.

Keywords: *Chemo-entrepreneurship, E-module, Flipbook, Chemical Bonding, Learning Interest*

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INTRODUCTION

The digitalization of education has changed education in Indonesia from conventional to all-digital (Maksum & Fitria, 2021). Digitalization of education is an effort to support the teaching and learning process by involving technology without reducing the essence of delivering learning materials (Sukmawati et al., 2022). The digitalization of education has a positive effect as students more quickly and easily access information (Wulandari et al., 2021), varied learning resources (Salsabila et al., 2020), and efficiency in the use of space and time (Maghfiroh, 2020). The positive effect of the digitalization of education for teachers is easier delivery of learning materials and more interactive learning (Septiana & Hidayati, 2022; Supartini, 2016). According to Rahayuningsin & Muchtar (2022), the critical role of digitalization in education is to make abstract material concrete so that understudies can all the more effectively grasp the material and make students more intelligent and creative. Therefore, teachers must master educational technology to create effective and exciting learning (Meidyanti et al., 2018; Sonia, 2019). Mastering technology is critical to improving teachers'

professional competence in teaching (Ardiansyah & Trihantoyo, 2023; Siregar et al, 2024). But, based on research conducted by Marzal (2013), only 40.48% of teachers in Indonesia have mastered educational technology, so many teachers need help making technology-based learning media.

Efforts to increase mastery of educational technology for teachers can be made by implementing a learning media digitization program in schools (Wardani, 2021). One program application form uses electronic modules as learning media (Prasetyo, 2020; Resita & Ertikanto, 2018). The electronic module is a learning guide in electronic form that displays text, pictures, video, sound, liveliness, and designs in the growing experience (Rokhmania & Kustijono, 2017; Winatha, 2018). Photos and videos in electronic modules can create an active learning atmosphere in students (Saputri, 2021). The use of electronic modules has advantages in the form of minimizing paper usage (Wulandari et al., 2021), visualizing abstract material concepts in the form of animation (Aysolmaz & Reijers, 2021), presenting material interactively and dynamically (Assidiqi, 2022), and being accessible flexibly (Gevi & Andromeda, 2019). According to research, Hastari et al., (2019) express that electronic modules can build understudies' learning advantages and motivation. In any case, the amount of electronic modules in schools still needs to be improved (Putri, 2022). Therefore, to support the learning process in schools, the development of electronic modules is needed (Sani et al., 2021).

Electronic module development innovation can be combined with digital flipbooks (Hermawati et al., 2020). Flipbook is a media with an electronic format that can display interactive simulations by combining animation, text, video, images, audio, and navigation, making students learn more interactively (Sidiq & Suhendro, 2021). Flipbook media can accommodate all interactive learning activities, such as listening, reading, and writing (Fonda & Sumargiyani, 2018). Flipbooks are converted into digital flipbooks by converting PDF files through a digital flipbook maker (Muafiah, 2019). Digital flipbooks have a flip effect in the form of opening or flipping sheet by sheet, such as print modules (Asmi et al., 2018), video performance in one tap (Dianawati & Suputra, 2022), and can be accessed online and offline (Ameriza & Jalinus, 2021). Digital flipbooks have benefits for students, including being able to be used for independent learning (Mardiana & Harti, 2022), being skilled in the use of technology (Rokhim et al., 2020), and having definite references in understanding the material (Hamid & Alberida, 2021). Digital flipbooks can make the delivery of learning materials by teachers easier (Dharmayanti et al., 2021). Digital flipbooks can also improve students' ability to create and operate learning media (Maynastiti et al., 2020). Therefore, digital flipbook-based e-modules are suitable for learning media, especially for visualizing abstract material (Purwanto et al., 2020).

One field of science that has many abstract concepts is chemistry (Gurses et al., 2015). Chemistry is a complex science field for most students because it has a distinctive vocabulary, formulas, calculations, and abstract concepts (Cardellini, 2012; Priliyanti et al., 2021; Sari, 2020; Yosimayasari, 2021). One of the chemical materials that students consider difficult is chemical bonding material (Hernawati et al., 2016; Taylor et al., 2023). Students need help learning chemical bonds because chemical bond material is theoretical and requires high reasoning skills to understand it (Smith & Nakhleh, 2011). Chemical bonding material is related to atoms in forming bonds, both with the same atom and with different atoms (Febriani, 2019). Chemical bonding materials are usually grouped into four sub-themes: ionic bonds, covalent bonds, metallic bonds, and intermolecular forces (Vrabec & Prokša, 2016). Learning chemical bond material requires memorizing and understanding concepts (Fauzi et al., 2019).

Lack of knowledge of concepts impacts low understudy learning results (Zakiyah et al., 2018). Given the consequences of meetings with science educators in Temanggung, data was acquired that students had difficulty understanding chemical bonding material, so many learning outcomes did not reach the Minimum Completeness Criteria (KKM). According to research by Openhotman et al., (2017), only 49.81% of students have reached KKM. One of the student's difficulties in understanding chemical bond material is the lack of explanation about the benefits of chemical bonds in everyday life (Priliyanti et al., 2021).

Learning chemistry will be more meaningful if the teacher teaching it is related to real life (Dewi & Rahayu, 2022). Applying chemistry learning in everyday life can be combined with entrepreneurship in chemistry (Chemo-Entrepreneurship) (Arfin et al., 2018). Chemo-entrepreneurship (CEP) is an approach to chemistry learning that produces a product of economic value to foster student motivation for entrepreneurship (Purnama et al., 2020). Using the CEP approach is expected to positively impact chemistry learning and allow students to optimize their potential in producing a product (Rahmawanna et al., 2016). However, using the CEP approach in school chemistry learning still needs improvement and only applies to certain materials (Ismulyati & Ikhwani, 2018). The limitation of using the CEP approach only on certain materials is due to the provision of the Fillons for achieving Basic Competencies contained in the syllabus, so teachers cannot develop the learning process to be more exciting and innovative (Safriani, 2021). This causes chemistry learning to seem monotonous and impacts students' low interest in learning (Afriani et al., 2020). Therefore, research on the development of CEP-loaded e-modules is important to conduct research because it can attract students' learning interest, create a more interesting learning experience, motivate students to engage more deeply, and ultimately improve learning outcomes and student character development.

Learning interest is closely related to the learning outcomes obtained by students (Huliselan, 2020; Rizki et al., 2024; Buaja et al., 2024). Interest in learning is a sense of interest that strengthens and encourages students to learn (Pan et al., 2023). The existence of an interest in learning in students can create a desire to learn without coercion so that interest in learning arises (Ayuni & Tressyalina, 2020; Ningrum, 2018). Student interest in learning can be fostered by creating an exciting learning atmosphere (Rulita et al., 2021; Sari et al., 2018; Sirait, 2016). Therefore, uninteresting learning can cause students' interest in learning to decrease (Abidin & Ismawati, 2021). The results of research Marti'in and Wicaksono (2019) stated several characteristics that cause low interest in learning, such as being bored with learning 90%, like to sit behind 86%, playing cellphone 84%, being lazy to study 81%, often permission to go to the toilet 80%, talk to friends 78%, passive in accepting teacher explanations 77%, not focused on learning 74%, not doing tasks 70%, and sleepy and sleep 69%. One way to overcome the low interest in student learning in some aspects is by improving the quality of the learning process (Trismayanti, 2019). The existence of a learning process that is more fun, not monotonous, involves students, and is meaningful for students is expected to foster interest in learning, which can ultimately improve student learning outcomes (Nuraida, 2016). Even varied learning media can increase students' passion for learning (Widiasih et al., 2018). Therefore, teachers have a vital role in designing learning so that the learning process becomes more varied, interactive, and conducive to increasing student interest in learning (Wibowo, 2016). Basically, the development of flip book-based e-modules containing CEP aims to increase students' learning interest and ability in entrepreneurship. Through these learning media, students can create projects or

works creatively and be directly involved during learning process (Chen et al., 2022; Hanif et al., 2019; Yamin et al., 2020). Furthermore, the development of flip book-based e-modules containing CEP also has advantages in accommodating students' learning interests because during the learning process, students are given freedom to plan, define and execute projects and develop 21st century skills.

One suitable entrepreneurial project-based subject is chemistry. Entrepreneurial project experiments involve chemical science to produce real work in the form of innovative products with economic value (Ead et al., 2023). Creative products resulting from an entrepreneurial project experiment is expected to equip students to entrepreneurship. One of the chemical materials that can be applied to entrepreneurial project experiments is chemical bonds. Chemical bonding materials can be applied in project experiments because the material is applicable. Examples of entrepreneurial projects in previous research such as the MEc Bond making project (Arieska & Kamaludin, 2018). The project's experiments involved only science, aspects of engineering, and mathematics, but do not involve art and technological aspects. Though the involvement of aspects of art and technology is important for that students to develop creativity and adaptability to technological developments. Therefore, in this study researchers tried to develop an e-module loaded with an entrepreneurial project of chemical bond material that combines aspects technology, art, science, engineering and mathematics.

Based on the exposure to these problems, this study intends to foster an e-module given a computerized flipbook creator loaded with Chemo-Entrepreneurship (CEP) on chemical bond materials. The advancement of e-modules given automated flipbook makers containing Chemo-Entrepreneurship (CEP) is expected to make it more straightforward for students to understand the concept of chemical bonding, increase student interest in learning, and foster the entrepreneurial spirit in students so that they can become provisions in the future. In addition, this e-module can make it easier for teachers to teach the relationship between chemical bond material and applications in students' real lives so that chemistry learning is more meaningful and valuable.

METHOD

Type of Research

This type of research is Research and Development (R & D). The research product is an e-module based on a digital flipbook maker containing Chemo-Entrepreneurship Chemical Bond material. This study adopted a 4D model of defining, designing, developing, and disseminating.

Research Procedure

This development research procedure consists of four stages as follows:

1. Define

The characterize stage is helped through necessities and accessibility examinations (Sumuweng et al., 2022). An accessibility examination was directed through perception and meetings with secondary school science educators regarding the availability and usefulness of e-modules. A requirements investigation was led through interviews with secondary school science instructors.

2. Design

The design phase includes selecting software, collecting reference materials, designing and making initial product designs, and creating assessment instruments.

3. Develop

The development stage is carried out to produce a revised product based on expert input. Experts in this study are one material expert, one media expert, four reviewers (high school chemistry teachers), and ten class X students as responders to the developed product.

4. Disseminate

The dissemination stage is a broad field test stage.

Research Subject

The subjects of this study include material experts, media experts, reviewers, and high school students in grade X.

Data Collection Techniques and Instruments

Information assortment strategies in this review were carried out in several ways, namely interviews and questionnaire distribution. The instruments utilized in this study were item quality evaluation sheets and understudy reaction sheets

Data Analysis

Information examination procedures are completed by changing the evaluation consequences of media experts, material experts, and reviewers in the form of qualitative data into quantitative data based on a Likert scale with Very Good, Good, Enough, Less, Very Few answer options, every one of which has a score of 5, 4, 3, 2, and 1. In addition, the overall assessment aspect of the score that has been obtained and the average score of each element are calculated. The typical worth can be determined utilizing recipe (1):

$$\bar{X} = \frac{\Sigma x}{n} \quad (1)$$

$\bar{X}$ = Average score

Σx = Total score of each rater

n = Number of appraisers

The score is then changed into subjective qualities as indicated by the best appraisal measures, as shown in Table 1.

Table 1. Ideal Assessment Criteria

Score Range	Category
Xi + 1,80 SBi < X	Very Good
Xi + 0,60 SBi < X ≤ Xi + 1,80 SBi	Good
Xi – 0,60 SBi < X ≤ Xi + 0,60 SBi	Enough
Xi – 1,80 SBi < X ≤ Xi – 0,60 SBi	Less
X ≤ Xi – 1,80 Sbi	Very Less

Using the Guttman scale, student response data are converted into scores, which are then used to calculate quantitative data, as seen in Table 2.

Table 2. Guttman Scale Scoring Rules

Information	Score
Yes	1
No	0

The data converted into a score is then calculated as the percentage of product ideality of each aspect and the overall aspect. The percentage of ideality (%) is calculated using the formula:

$$\text{Percentage of ideality} = \left(\frac{\text{score reached}}{\text{Ideal maximum score}} \right) x\ 100\%$$

RESULT AND DISCUSSION

The media developed in this study is an electronic module based on a digital flipbook maker loaded with Chemo-Entrepreneurship (CEP) chemical bond material. Software used to create electronic modules is Word, PosterMyWall, Kvisoft, and Flipbook Maker. The three applications were picked in light of the fantastic similarity between applications, complete highlights, and usability by fledglings (Maharcika et al., 2021). Word application creates attractive designs and can be saved in PDF form. The PosterMyWall application creates covers and can be held in jpg form. The Kvisoft Flipbook Maker application is used to edit and convert PDF form files into flip-shaped electronic modules so that they have a book-like page display (Agustin, 2019). Highlights given in Kvisoft Flipbook Creator incorporate connections associating module pages, pictures, recordings, intelligent tests, and varieties in module configurations to be dispersed (Fitri & Pahlevi, 2020).

The developed electronic modules are integrated with the Chemo-Entrepreneurship (CEP) approach. CEP is an approach to chemistry learning that produces a product of economic value to foster student motivation for entrepreneurship (Mursalin, 2020). The integration of CEP in the modules developed is outlined in a CEP project. The CEP project contained in this e-module focuses on the task of making lava lamps and aromatherapy candles.

This research adopts the 4-D model proposed by Thiagarajan (1974), which consists of definition, design, development, and dissemination stages.

1) Define

The defined stage includes availability and needs analysis. The analysis was conducted by interviewing SMA Negeri 3 Temanggung chemistry teachers, SMA Negeri 1 Sewon, and SMA Negeri 2 Banguntapan. Interviews were directed to track down the appearance of materials and learning media used by educators in the educational experience. Given the meeting results, data was obtained that the materials involved by educators in the educational experience were bundle books and modules containing materials and questions. The accessible books and modules should be incorporated with the Chemo-Business venture (CEP) to move toward the understudies' dire need.

In the interim, in light of the results of the necessities examination, it was found that the ongoing educational program requires educators to be more creative when carrying out the teaching and learning process. However, creative learning media can only be applied in the learning process if there are teaching materials designed. The chemistry teacher at SMA Negeri 3 Temanggung explained that students' interest in learning about chemical bond material is still relatively low due to the absence of teaching materials that integrate chemical bond material with its usefulness in everyday life so that the availability of electronic modules loaded with CEP is needed. Therefore, electronic modules are beneficial for learning.

2) Design

At the plan stage, the product utilized in making electronic modules given computerized flipbook creators contains Chemo-Entrepreneurship (CEP) synthetic holding materials in words, PosterMyWall, and Kvisoft Flipbook Producer. Moreover, the choice of arrangements is acclimated to convenience, in particular HTML design, where with this configuration, modules can be gotten to utilizing cell phones or PCs without introducing them. The reference or material used in research is a substance bond material comprising ionic, metal, and covalent bonds. Material and CEP projects equipped with instructional videos are included in the developed modules. The most

common way of making this electronic module starts with making a cover configuration utilizing the PosterMyWall application. Coming up next is making electronic modules in light of computerized flipbook producers stacked with Chemo-Entrepreneurship (CEP).

The first stage is preparing chemical bonding material and other components needed to compile the module. The second stage is the cover design process using the PosterMyWall application. This stage is done by designing the cover and selecting colors, images, and fonts. After the cover design is complete, the result is saved in JPG format. The third stage is the process of creating modules in Word applications.

The introduction, content, and conclusion are the components of the developed product. The initial segment contains a chapter-by-chapter guide, directions for use, fundamental skills, learning targets, and idea maps. The list of chapters is introduced as a succession of vital pieces of the module, for example, directions for use, idea maps, sub-materials, assessment questions, and a catalog. A number that expresses the request for the chapter-by-chapter guide of the module connected to the connection to the objective page. In the meantime, the purpose of the instructions is to make it more straightforward for perusers to utilize the electronic module and comprehend the details of each button.

In the content section of the flipbook e-module, the chemical bonding material integrates with the CEP approach, which consists of fundamental questions, project planning design, result analysis, and project evaluation. This integration is expected to increase or bring out the entrepreneurial spirit in students.

The principal question contains inquiries regarding the elements that cause oil and water not to meet up and the primary elements for making candles. The autonomous educational plan's fundamental capabilities in substance-holding materials change the genuine inquiries. Basic inquiries like inventiveness, familiarity, and adaptability can work on understudies' capacities. Enhancing one's ability to come up with original, one-of-a-kind solutions to problems, fluency in offering various options, and adaptability in coming up with ideas from multiple perspectives to produce oil-and-water products. Here's what the fundamental questions look like, which can be seen in **Figure 1.**

Figure 1. Fundamental Questions

The project planning design contains entrepreneurial project information that students will practice. The project planning design aims to answer fundamental questions and arouse students' curiosity to increase their interest in learning chemical bond material. The projects that students will create are lava lamps and aromatherapy candles.

The execution of venture exercises was done for two days, which started with a conversation among educators and understudies on the planning of undertaking plans.

Hence, the execution of the task runs in an organized way. Project exercises were completed by making lava lamps and aromatherapy candles.

At the project design stage, students' abilities are developed in fluency, originality, and flexibility in determining various ideas based on several sources to create creative projects, such as making lava lamps and aromatherapy candles. The project design contains the tools and materials to manufacture lava lamps and aromatherapy candle projects. The project design display can be seen in **Figure 2.**

Figure 2. Project Design

The working steps of making lava lamps consist of four parts, namely washing bottles/jars, adding water and oil, adding alka-seltzer tablets, and decorating with trinkets. The lava lamp project is concerned with polarizing materials. The working steps of making lava lamps can be seen in **Figure 3.**

Figure 3. Lava Lamp Making

The working steps of making aromatherapy candles consist of four parts: making the first, making the second, adding essential and patchouli oils, and stirring the first and second mixtures. The aromatherapy candle project is concerned with intermolecular force materials. The working steps of making aromatherapy candles can be seen in **Figure 4.**

Figure 4. Aromatherapy Candle Making

The task of the entrepreneurship project is also accompanied by making a fund budget using the concept of selling 1000 pieces of lava lamps and aromatherapy

candles to find out the details of the costs used and the profits. A detailed view of the cost of an entrepreneurial project can be seen in **Figure 5.**

No	Nama Bahan	Harga
1.	Minyak sayur atau baby oil	Rp5.000,00
2.	Air	-
3.	Pewarna Makanan	Rp5.000,00
4.	Pernak pernik	Rp2.000,00
5.	Tablet Alka-seltzer	Rp8.000,00
Total		Rp20.000,00

Modal	Harga Jual	Untung
@Rp20.000,00	@Rp25.000,00	Untung = Rp25.000,00- Rp20.000,00 = Rp5.000,00
1000 buah		Untung = **Rp5.000,00 x 1000 = Rp5.000.000,00**

No	Nama Bahan	Harga
1.	Parafin 25 gr	Rp5.000,00
2.	Asam stearat 2,5 gr	Rp500,00
3.	Pewarna lilin 0,15 gr	Rp1.500,00
4.	Minyak nilan 2 ml	Rp2.000,00
5.	Benang lilin	Rp1.500,00
6.	Minyak essensial 2 ml	Rp2.000,00
7.	Gelas/sloki	Rp3.000,00
8.	Pita hias	Rp500,00
9.	Plastik hias	Rp500,00
Total		Rp16.500,00

Modal	Harga Jual	Untung
@Rp16.500,00	@Rp25.000,00	Untung = Rp25.000,00- Rp16.500,00 = Rp8.500,00
1000 buah		Untung = **Rp8.500,00 x 1000 = Rp8.500.000,00**

Figure 5. Cost breakdown table

The outcomes investigation and conversation sheet contain inquiries regarding the lava lamp and aromatherapy candle project results. The outcome analysis question involves a Chemo-Entrepreneurship (CEP) approach. The display of the results analysis sheet and discussion can be seen in **Figure 6.**

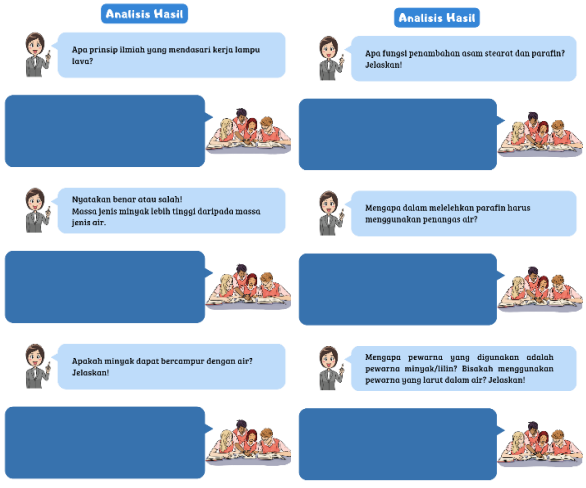

Figure 6. Analysis of Results

Project assessment is arranged in light of the undertaking execution process. Understudies are approached to assess the impediments experienced during the task interaction. This assessment should involve thought and improvement for understudies and educators. The venture assessment sheet resembles this, as seen in **Figure 7.**

Figure 7. Project Evaluation Sheet

In addition to entrepreneurial projects, the contents section also contains chemists' columns. The chemist's column section includes the knowledge of chemical scientists. This chemist column is expected to motivate students to learn and be interested in experiments that previous chemists have yet to study. The view of the chemist's column can be seen in **Figure 8.**

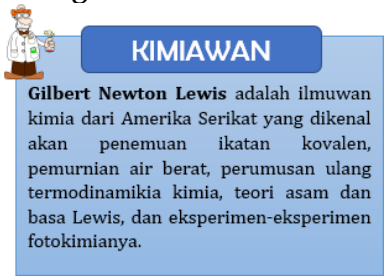

Figure 8. Chemist's Column

The closing part of the e-module contains evaluation questions. The evaluation questions presented are related to the subject matter that has been investigated, which aims to improve the ability to understand chemical bond materials.

The fourth stage is to upload the PDF format module and insert the learning video into the module utilizing one of the menus accessible in the Kvisoft flipbook maker. The process of inserting the video can be seen in **Figure 9.**

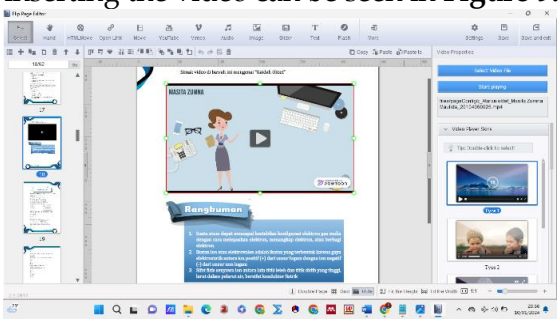

Figure 9. Video Insertion Process

The completed e-module developed with Kvisoft flipbook maker software is then saved, and the final product is an electronic module with bit.ly format. The final result of the e-module can be seen in **Figure 10.**

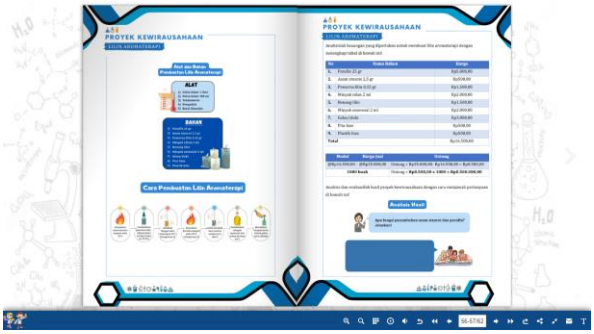

Figure 10. Final Result E-module

Furthermore, the assembling of item quality evaluation instruments and understudy reactions. Material specialists, media specialists, and reviewers will evaluate several aspects of the product quality assessment instrument. Simultaneously, the understudy's response is a proclamation that the understudy will reply with a yes or no response.

3) Develop

The completed item is then approved and surveyed for quality at the advancement stage. Item quality evaluation instruments and understudy reactions are utilized for appraisal. Perspectives used in item quality appraisal incorporate substance, language, show, illustrations, module attributes, CEP approach, Computerized Flipbook, and interest in learning. In addition, the material, language, presentation, user-friendliness, CEP approach, and interest in learning comprise the assessment aspect of student response. The evaluation was completed by one media master, one material master, four commentators (secondary school science educators), and ten secondary school understudies in grade X. The consequences of the item quality appraisal and understudy reaction are visible in **Table 3.**

Table 3. Product Quality Assessment Results and Student Responses

Product Quality Assessment/ Student Response	Assessment Aspect	∑ Score	∑ Maximum Ideal Score	% Ideality	Category
Material Expert	Fill	19	20	95%	Very Good
	Language	18	20	90%	Very Good
	Module Characteristics	23	25	92%	Very Good
	CEP Approach	9	10	90%	Very Good
	Learning Interest	18	20	90%	Very Good
Media Expert	Serving	14	15	93%	Very Good
	Graphics	14	15	93%	Very Good
	Digital Flipbook	9	10	90%	Very Good
Reviewer	Fill	19	20	95%	Very Good
	Language	19	20	95%	Very Good

	Serving	19	20	95%	Very Good
	Graphics	14	15	93%	Very Good
	Module Characteristics	23	25	92%	Very Good
	CEP Approach	4	5	80%	Good
	Digital Flipbook	9	10	90%	Very Good
	Learning Interest	18	20	90%	Very Good
Student	Material	18	20	90%	Very Good
	Language	19	20	95%	Very Good
	Serving	18	20	90%	Very Good
	User friendly	20	20	100%	Very Good
	CEP Approach	18	20	90%	Very Good
	Learning Interest	19	20	95%	Very Good

Based on Table 3. The quality of e-modules based on digital flipbook makers loaded with chemo-entrepreneurship (CEP) chemical bond material received a very good category with a percentage of ideality by material experts of 91.4%, media experts of 92%, and reviewers of 91.3%. The quality appraisal results show that the e-modules created have material substance that can build understudies' information, the language is straightforward and open, and the introduction of CEP project tasks is fun, so understudies feel keen on learning compound bond material. This interest in e-modules fosters in students an interest in learning. This is reinforced by research conducted by Arieska & Kamaludin (2018), which states that student books can be used as alternative media in education because they can increase student interest in learning.

In the following stage, the e-module created was answered by grade X secondary school understudies from parts of the material, language, show, ease of use, CEP approach, and interest in learning. Given understudy reactions, the nature of the e-modules created got an ideation level of 93.3% with a remarkable class. Furthermore, the part of revenue in learning reached a level of 95%. The findings demonstrate that these learning tools can pique students' interest in chemical bond materials. The developed media can be used as an alternative learning medium in the classroom and can increase students' interest in learning. The consequences of this study depend on research led by Pratiwi, et.al (2020), which expresses that flipbook-based e-modules can build understudies' advantage in learning

DISCUSSION

This research aims to develop teaching materials in the form of e-modules containing Chemo-Entrepreneurship (CEP) based on digital flipbooks on high school class X chemical bonding materials. At the define stage, it is known that schools still use printed modules for learning and there is no class X chemistry subject module that uses an entrepreneurial approach. One of the chemical materials in class X that is difficult is chemical bonding because the material is abstract so it takes logic and high reasoning power to understand. Therefore, the teaching materials developed are equipped with entrepreneurial projects that can make chemical bonding materials more concrete and can improve students' entrepreneurial spirit.

The research results showed that the flipbook-based e-module media containing CEP that was developed was able to increase students' interest in learning. The results of this research received a positive response from students, namely that students felt happy learning chemistry using developing e-module media. Because the material presented is coherent, easy to understand, and has various illustrations, pictures and videos that can attract students' interest in learning. E-modules presented in flipbook form are considered appropriate to current developments where students can learn to use them cell phones anywhere and anytime, so students don't need to bother carrying books to understand the material. The results of this research also received positive responses from teachers that teachers were interested in implementing the CEP project as a learning model in the classroom. This is because the CEP project reacts to assessing material that is deemed relevant to the curriculum.

The results of this research are in line with research by Arieska & Kamaludin (2018), Jamilah (2018), and Kusuma (2011) that the CEP-oriented textbook developed was declared suitable for use in the learning process. The application of the CEP learning approach is in accordance with the results of Paristiowati et al. (2015) research that the chemo-entrepreneurship (CEP) learning approach can be applied in developing students' cooperation and communication skills. Because, learning like this also requires students to continue working together to achieve learning completion and good communication. Research by Rahmawanna et al. (2016) and Saptorini (2016) also revealed that implementing the CEP approach in chemistry learning can increase students' positive attitudes towards chemistry lessons and students' entrepreneurial interest. The development of teaching materials in the form of electronic modules is very suitable for conducting research because it can foster students' interest in learning, such as research conducted by Elmunsyah et al. (2023). Apart from that, the results of this research are also in accordance with research by Beneroso & Robinson, (2022) that project learning packaged in online media is considered more effective in developing skills. The aromatherapy candle project implemented is in accordance with Indah et al., (2023) research, namely in making candles Aromatherapy also has economic value and has the potential to be developed as an alternative additional income. In addition, entrepreneurial projects can improve the vocational skills of making aromatherapy candles for children with mild intellectual disabilities in accordance with research by Annisa et al., (2023). The CEP project was implemented in accordance with research by Saroinsong, (2018) and Ramadayanti et al., (2017), namely that the implementation of the CEP project can develop students' creative and critical thinking. In other research by Albar & Southcott, (2021) that investigative activities in learning that include projects can significantly improve students' creative thinking skills, this is in accordance with the results of this research on basic questions and results analysis sheet. The learning model project packaged in electronic modules is in accordance with research Zen et al., (2022) and Rohayati et al., (2016) state that project learning through online media can improve students' entrepreneurial abilities through the experience gained during project learning. Apart from that, the results of this research are also in accordance with Asni et al., (2018) research, that students' creativity in designing products is honed through CEP project activities. The results of Nurfadilah, (2022) research also stated that students' creativity levels increased with learning that implemented projects. The results of this research are also in accordance with research by Prayitno et al., (2016) and Afwa et al., (2020) that students' interest in learning increases after using CEP-oriented modules. Apart from that, based on research by Rezeki (2023) e-modules containing CEP can improve learning outcomes and

entrepreneurial interest in students. Lastly, the CEP project activities are in accordance with Farkhati & Sumarti, (2019) research that the implementation of the CEP project implements several activities such as asking questions, organizing activities/projects, assessing process, and product evaluation.

The e-module developed can be an alternative learning media for students and the chemical bonding material presented in flipbook form can make it easier for students to understand chemical material. Apart from that, the entrepreneurship project also contained in this e-module can be a reference for chemistry teachers to carry out a chemistry learning process based on a chemo-entrepreneurship project (CEP) on chemical bonding material. The existence of the CEP project in the e-module is expected to increase students' entrepreneurial spirit.

This research is limited to chemical bonding material. There are only 2 entrepreneurial projects contained in the module, namely making aromatherapy candles which is related to the sub-material of intermolecular forces and making lava lamps which is related to the sub-material of polarity. For further research, it is recommended to test the effectiveness of the E-module developed on student learning outcomes. In addition, it is hoped that research on entrepreneurial projects will be expanded to other chemical projects.

CONCLUSION

The research conducted resulted in a product in the form of an e-module based on a digital flipbook maker loaded with chemo-entrepreneurship (CEP) chemical bond material. The results of the assessment by material experts amounted to 91.4% in the very good category, media experts by 92% in the very good category, and reviewers by 91.3% in the very good category. The response of high school students obtained an ideal percentage of 93.3% and was categorized as very good. An e-module based on a digital flipbook maker loaded with chemo-entrepreneurship (CEP) chemical bond material can be an alternative learning medium to increase student learning interest. The suggestion for further research, it can be carried out to determine the effectiveness of developed e-module on learning outcome in the classroom. Another that the research on Chemo-Entrepreneurship (CEP) be extended to other chemical projects.

REFERENCES

Abidin, A. A., & Ismawati. (2021). Strategi Menumbuhkan Minat dan Membangun Semangat Siswa dalam Belajar di Madrasah Ibtidaiyah Negeri 2 Gresik. *Angewandte Chemie International Edition, 6(11), 951–952.* *https://doi.org/10.61815/alibrah.v7i1.182*

Afriani, R. A., Suyanti, R. D., & Simorangkir, M. (2020). *The Effect of Chemical Learning Interest on Students' Critical Thinking Skills in Periodic System Materials*. *488*(Aisteel), 443–446. https://doi.org/10.2991/assehr.k.201124.090

Afwa, S. R., Abdullah, A., & Linda, R. (2020). Pengembangan Modul Pembelajaran Kimia Berorientasi Chemoentrepreneurship (Cep) Pada Pokok Bahasan Senyawa Turunan Alkana Kelas Xii Sma/Ma. *Jurnal Pendidikan Kimia Universitas Riau*, *3*(2), 1. https://doi.org/10.33578/jpk-unri.v3i2.7779

Agustin, D. (2019). pengembangan e-modul menggunaakan alikasi Kvisoft Flipbook Maker pada mata pelajaran ilmu pengetahuan alam kelas V SD/MI. *Pengembangan E-Modul Menggunakan Aplikasi Kvisoft Flipbook Maker Pada Mata Pelajaran Ilmu Pengetahuan Alam Kelas V SD/MI*, 52. Google Scholar

Ameriza, I., & Jalinus, N. (2021). Pengembangan E-Modul pada Mata Pelajaran

Simulasi dan Komunikasi Digital. *Jurnal Edutech Undiksha*, *9*(2), 181. https://doi.org/10.23887/jeu.v9i2.38571

Anak Agung Meka Maharcika, Ni Ketut Suarni, & I Made Gunamantha. (2021). Pengembangan Modul Elektronik (E-Modul) Berbasis Flipbook Maker Untuk Subtema Pekerjaan Di Sekitarku Kelas Iv Sd/Mi. *PENDASI: Jurnal Pendidikan Dasar Indonesia*, *5*(2), 165–174. https://doi.org/10.23887/jurnal_pendas.v5i2.240

Annisa, A., Ardisal, A., & Triswandari, R. (2023). Meningkatkan Keterampilan Vokasional Membuat Lilin Aromaterapi melalui Metode Project Based Learning (PjBL) bagi Anak Tunagrahita Ringan. *Jurnal Pendidikan Tambusai*, *7*(November 2022), 16488–16491. https://doi.org/10.31004/jptam.v7i2.8989

Ardiansyah, D., & Trihantoyo, S. (2023). Peningkatan Kompetensi Digital Guru Dalam Mewujudkan Inovasi Pembelajaran Di Era Revolusi Industri 4.0. *Jurnal Inspirasi Manajemen Pendidikan Volume 10 Nomor 04Tahun 2023, 757-770*, *10*(04), 757–770. Google Scholar

Arfin, W., Latisma, L., & Oktavia, B. (2018). *A development module of chemistry learning based on chemo-entrepreneurship oriented*. 394–400. https://doi.org/10.29210/2018157

Arieska, H., & Kamaludin, A. (2018). Pengembangan Buku Siswa Berorientasi Chemo-Entrepreneurship (Cep) Pada Materi Ikatan Kimia Sma/Ma Kelas X. *Jurnal Tadris Kimiya*, *3*(2), 199–208. https://doi.org/10.15575/jtk.v3i2.3795

Asmi, A. R., Dhita Surbakti, A. N., & C., H. (2018). E-Module Development Based Flip Book Maker for Character Building in Pancasila Coursework Sriwijaya University. *Jurnal Pendidikan Ilmu Sosial*, *27*(1), 1. https://doi.org/10.17509/jpis.v27i1.9395

Asni, W., Vita, I., & Dadang, A. (2018). Meningkatkan Kreativitas Siswa Melalui Project Based Learning pada Siswa Kelas V SDIT LHI. *Prosiding Pendidikan Profesi Guru Fakultas Keguruan Dan Ilmu Pendidikan*, 1430–1440. Google Scholar

Assidiqi, S. (2022). International Journal of Education , Information Technology and Others (IJEIT). *International Journal of Education, Information Technology and Others (IJEIT)*, *5*(2), 389–399. https://doi.org/10.5281/zenodo.5747017

Aysolmaz, B., & Reijers, H. A. (2021). Animation as a dynamic visualization technique for improving process model comprehension. *Information and Management*, *58*(5), 103478. https://doi.org/10.1016/j.im.2021.103478

Ayuni, Q., & Tressyalina. (2020). *Analysis of Needs Of E-LKPD Based on Contextual Teaching and Learning (CTL) in Linear Learning for Exposition Text Materials*. *485*(Iclle), 279–283. https://doi.org/10.2991/assehr.k.201109.047

Buaja, T., Ramadanaryanthi, R., & Miradj, S. (2024). Penggunaan Media Animasi Audio Visual untuk Meningkatkan Hasil Belajar IPA di SD Negeri 2 Kota Ternate. *Attractive: Innovative Education Journal*, *6*(3), 176-186. https://doi.org/10.51278/aj.v6i3.1477

Ridlo, M. F., & Novita, D. (2019). Penerapan Model Pembelajaran Process Oriented Guided Inquiry Learning (Pogil) Untuk Melatihkan Multiple Intelligences Siswa Pada Materi Ikatan Kimia Kelas X Man Surabaya. *Unesa Journal of Chemical Education*, *8*(3), 282-287. https://doi.org/10.26740/ujced.v8n3.p%25p

Cardellini, L. (2012). Chemistry: Why the Subject is Difficult? *Educacion Quimica*, *23*, 305–310. https://doi.org/10.1016/S0187-893X(17)30158-1

Dewi, C. A., & Rahayu, S. (2022). Pentingnya Mengoptimalkan Literasi Kimia Melalui Pembelajaran Berbasis Isu-isu Sosiosaintifik di Abad Ke-21. *Proceeding Seminar Nasional IPA*, 348–359. Google Scholar

Dharmayanti, N. M. D., Putra, I. N. A. J., & Paramartha, A. A. G. Y. (2021). Developing

Displayed Flipbook as Teaching Material for Assisting Teacher to Teach English in Online Learning for the Fourth Grade Elementary School Students. *Indonesian Journal Of Educational Research and Review*, *4*(1), 113. https://doi.org/10.23887/ijerr.v4i1.35314

Dianawati, I. A., & Suputra, I. N. (2022). Pengembangan e-modul berbasis flipbook maker untuk meningkatkan hasil belajar peserta didik pada kelas XII SMK. *Fair Value: Jurnal Ilmiah Akuntansi Dan Keuangan*, *4*(9), 3815–3825. https://doi.org/10.32670/fairvalue.v4i9.1557

Ead, H. A., Rezk, M. R. A., Piccinetti, L., Santoro, D., Elbadry, A., Sakr, M. M., Innovation, S., Services, T., & Suite, D. (2023). *http://jssidoi.org/esc/home*. *5*(2), 72–82. Google Scholar

Erawati, N. K., Kadek, N., Purwati, R., Wayan, N., Putri, S., Wayan, I., & Wardika, G. (2023). Pelatihan Pemanfaatan WIZER.ME Sebagai Media Pembelajaran Digital. *Edisi Januari*, *4*(2), 125–134. https://doi.org/10.37296/jpi.v4i2.133

Farkhati, A., & Sumarti, S. S. (2019). Implementasi Manajemen Pembelajaran Kimia Berbantuan E-LKPD Terintegrasi Chemoentrepreneurship Untuk Menganalisis Soft Skill Siswa. *CiE (Chemistry in Education)*, *8*(2), 1–5. Google Scholar

Fauzi, H., Farida, I., Sukmawardani, Y., & Irwansyah, F. S. (2019). The making of e-module based in inquiry on chemical bonding concept with representation ability oriented. *Journal of Physics: Conference Series*, *1402*(5). https://doi.org/10.1088/1742-6596/1402/5/055059

Febriani, P. (2019). ANALISIS KEMAMPUAN PENYELESAIAN SOAL KIMIA BERBASIS SUBMIKROSKOPIK PADA MATERI IKATAN KIMIA DI SMA NEGERI 1 MEULABOH. *Tesis*, 1–127. Google Scholar

Fitri, E. R., & Pahlevi, T. (2020). Pengembangan LKPD Berbantuan Kvisoft Flipbook Maker pada Mata Pelajaran Teknologi Perkantoran di SMKN 2 Nganjuk. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, *9*(2), 281–291. https://doi.org/10.26740/jpap.v9n2.p281-291

Fonda, A., & Sumargiyani, S. (2018). the Developing Math Electronic Module With Scientific Approach Using Kvisoft Flipbook Maker Pro for Xi Grade of Senior High School Students. *Infinity Journal*, *7*(2), 109. https://doi.org/10.22460/infinity.v7i2.p109-122

Gevi, G. R., & Andromeda, A. (2019). Pengembangan E-Modul Laju Reaksi Berbasis Inkuiri Terbimbing Terintegrasi Virtual Laboratory Untuk SMA/ MA. *Edukimia*, *1*(1), 53–61. https://doi.org/10.24036/ekj.v1.i1.a8

Gurses, A., Dogar, C., & Geyik, E. (2015). Teaching of the Concept of Enthalpy Using Problem Based Learning Approach. *Procedia - Social and Behavioral Sciences*, *197*(February), 2390–2394. https://doi.org/10.1016/j.sbspro.2015.07.298

Hamid, A., & Alberida, H. (2021). Pentingnya Mengembangkan E-Modul Interaktif Berbasis Flipbook di Sekolah Menengah Atas. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(3), 911–918. https://doi.org/10.31004/edukatif.v3i3.452

Hanif, S., Wijaya, A. F. C., & Winarno, N. (2019). Enhancing Students' Creativity through STEM Project-Based Learning. *Journal of Science Learning*, *2*(2), 50. https://doi.org/10.17509/jsl.v2i2.13271

Hastari, G. A. W., Gede Agung, A. A., Sudarma, I. K., & Teknologi Pendidikan, P. (2019). Pengembangan Modul Elektronik Berpendekatan Kontekstual Pada Mata Pelajaran Ilmu Pengetahuan Sosial Kelas Viii Sekolah Menengah Pertama. *Jurnal EDUTECH Universitas Pendidikan Ganesha*, *7*(1), 33–43. Google Scholar

Hermawati, F. M., Sunaryo, S., & Rustana, C. E. (2020). *Pengembangan Modul Elektronik*

Flipbook Berbasis Problem Based Learning Pada Materi Induksi Elektronik Sma Kelas Xii. *IX*, 25–32. https://doi.org/10.21009/03.snf2020.02.pf.04

Hernawati, D., Hernani, & Mudzakir, A. (2016). *Analisis nature of science (nos) pada materi ikatan kimia dalam buku teks pelajaran kimia sma kelas X di kota bandung*. *10*(1), 1–23. https://doi.org/10.17509/jrppk.v10i2.52241

Huliselan, S. A. (2020). *Pengaruh Model Pembelajaran Make A Match Pada Materi Ikatan Kimia Terhadap Hasil Belajar Siswa Kelas X Di SMA Negeri 2 Banda Aceh*. Google Scholar

Indah Fajar Dini, Y., Wihue Tarekar, W., Jocelyn, N., Vonnylia, V., Sutjiali, F., & Styvani, S. (2023). Analisa Manajemen Proyek Terhadap Ide Bisnis "Mi Vela" Lilin Minyak Jelantah. *Jurnal Minfo Polgan*, *12*(1), 911–925. https://doi.org/10.33395/jmp.v12i1.12538

Ismulyati, S., & Ikhwani, Y. (2018). Pengaruh Pendekatan Chemo-Entrepreneurship (Cep) Terhadap Minat Dan Hasil Belajar Siswa Sma N 1 Bukit Kabupaten Bener Meriah Pada Materi Perubahan Materi. *Lantanida Journal*, *6*(1), 28. https://doi.org/10.22373/lj.v6i1.3156

Jamilah, S. (2018). Buku Panduan Pendidik Ikatan Kimia. *Journal of Chemical Information and Modeling*, *53*(9), 1–116. Google Scholar

Kumalasari, D. (2018). *Faktor-Faktor Yang Memengaruhi Minat Belajar Komputer Akuntansi Siswa Kelas XI Smk Negeri 1 Depok Tahun Ajaran 2017/2018*. 287. Google Scholar

Kusuma, E. (2011). Pengembangan Bahan Ajar Kimia Berorientasi Chemo-Entrepreneurship Untuk Meningkatkan Hasil Belajar Dan Life Skill Mahasiswa. *Jurnal Inovasi Pendidikan Kimia*, *4*(1), 544–551. Google Scholar

Lawhon, D. (1976). Instructional development for training teachers of exceptional children: A sourcebook. *Journal of School Psychology*, *14*(1), 75. https://doi.org/10.1016/0022-4405(76)90066-2

Maghfiroh, W. (2020). The impact of technology on education. *Journal of Chemical Education*, *73*(8), 669. https://doi.org/10.1021/ed072p669

Maksum, A., & Fitria, H. (2021). Transformasi dan Digitalisasi Pendidikan Dimasa Pandemi. *Prosiding Seminar Nasional Pendidikan*, 121–127. Google Scholar

Mardiana, R., & Harti, H. (2022). Pengembangan E-Modul Berbasis Flipbook untuk Meningkatkan Pemahaman Siswa SMK pada Materi Hubungan dengan Pelanggan. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(4), 5062–5072. https://doi.org/10.31004/edukatif.v4i4.2946

Marti'in, Luhur Wicaksono, P. (2019). Analisis tentang rendahnya minat belajar peserta didik kelas XI SMA Negeri 5 Pontianak. *Artikel Penelitian*. Google Scholar

Marzal, J. (2013). Pengembangan skill dan kompetensi TIK guru matematika dan IPA kota jambi melalui e-tutorial berbasis kebutuhan guru (teacher's need). *Tekno-Pedagogi*, *3*(1), 28–41. https://doi.org/10.22437/teknopedagogi.v3i1.2297

Maynastiti, D., Serevina, V., & Sugihartono, I. (2020). The development of flip book contextual teaching and learning-based to enhance students' physics problem solving skill. *Journal of Physics: Conference Series*, *1481*(1). https://doi.org/10.1088/1742-6596/1481/1/012076

Meidyanti, W. E., Kantun, S., Tiara, & Sutrisno, B. (2018). Pengembangan Media Pembelajaran Berbasis Teknologi Informasi Dan Komunikasi Pada Materi Pokok Jurnal Khusus Untuk Kelas XI Akuntansi SMK Negeri 1 Jember. *Jurnal Pendidikan Ekonomi: Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi, Dan Ilmu Sosial*, *12*(1), 123–129. https://doi.org/10.19184/jpe.v15i1.20273

Muafiah, A. F. (2019). Zingiber officinale Rosc. *Αγαη*, *8*(5), 55. https://doi.org/10.33859/jpcs.v4i1.454

Mursalin, E. (2020). Peningkatan Minat Kewirausahaan Berbasis Penggunaan Buku Ajar Mata Kuliah Hidrokarbon Berorientasi Chemoentrepreneurship (Cep). *AMAL: Journal of Islamic Economic And Business (JIEB)*, *02*(01), 81–90. https://doi.org/10.33477/eksy.v2i01.1378

Ningrum, K. D. (2018). Upaya meningkatkan minat belajar siswa melalui penggunaan media audio visual pada siswa kelas V di SDN Manggarai 09 Pagi Jakarta Selatan. *Prosiding Seminar Dan Diskusi Pendidikan Dasar 2018*, 307–313. Google Scholar

Nuraida, D. (2016). *Pembelajaran konstrukstivisme melalui strategi penugasan dan latihan untuk meningkatkan hasil belajar biokimia*. 1–23. Google Scholar

Nurfadilah, N. (2022). Upaya Meningkatkan Kreativitas Siswa Melalui Model Media Sampah Dalam Pembelajaran Ips Kelas Vii B Di Mts Muhammadiyah Singaparna Tasikmalaya. *Social Studies*, *10*(1), 1–14. Google Scholar

Openhotman, Sihaloho, M., & Isa, I. (2017). Analisis Pemahaman Siswa pada Konsep Ikatan Kimia Menggunakan Tes Paralel. *Jurnal Entropi*, *12*(2), 149–155. Google Scholar

Paristiowati, M., Slamet, R., & Sebastian, R. (2015). Chemo-entrepreneurship: Learning Approach for Improving Student's Cooperation and Communication (Case Study at Secondary School, Jakarta). *Procedia - Social and Behavioral Sciences*, *174*, 1723–1730. https://doi.org/10.1016/j.sbspro.2015.01.829

Prasetyo, M. T. (2020). Modul Elektronik Sebagai Media Pembelajaran Daring di Masa Pandemi. *Konferensi Internasional Pertama Tentang Manajemen Pendidikan Dan Ekonomi Syariah*, *September*, 134–138. Google Scholar

Prayitno, M. A., Dewi, N. K., & Wijaya, N. (2016). Pengembangan Modul Pembelajaran Kimia Bervisi Sets Berorientasi Chemo-Entrepreneurship (CEP) Pada Materi Larutan Asam Basa. *Jurnal Inovasi Pendidikan Kimia*, *10*(1), 1617–1628. Google Scholar

Priliyanti, A., Muderawan, I. W., & Maryam, S. (2021). Analisis Kesulitan Belajar Siswa Dalam Mempelajari Kimia Kelas Xi. *Jurnal Pendidikan Kimia Undiksha*, *5*(1), 11. https://doi.org/10.23887/jjpk.v5i1.32402

Purnama, N., Hasan, M., & Syukri, M. (2020). Implementing Chemo-entrepreneurship-based inquiry learning on the acid-base concept to increase science process skills and students' interest in entrepreneurship. *Journal of Physics: Conference Series*, *1460*(1). https://doi.org/10.1088/1742-6596/1460/1/012098

Purwanto, A., Nurjayadi, M., & Tantaruna, J. E. (2020). Pengembangan e-Modul Elektrokimia Terintergasi Lingkungan Berbasis Kontekstual Untuk SMK Kompetensi Keahlian Teknik Otomotif. *JRPK: Jurnal Riset Pendidikan Kimia*, *10*(1), 18–26. https://doi.org/10.21009/jrpk.101.03

Putri, D. V. S. (2022). Pengembangan E-Modul Berbasis Discovery Learning Pada Mata Pelajaran Ipa Untuk Siswa Kela Viii Smpn 5 Kota Bengkulu. *Education 3-13*, *1*(1), 5. https://doi.org/10.1080/03004277308558792

Rahayuningsih, Y. S., & Muhtar, T. (2022). Pedagogik Digital Sebagai Upaya untuk Meningkatkan Kompetensi Guru Abad 21. *Jurnal Basicedu*, *6*(4), 6960-6966. https://doi.org/10.31004/basicedu.v6i4.3433

Rahmawanna, Adlim, & Halim, A. (2016). Pengaruh Penerapan Pendekatan Chemo-Entrepreneurship (Cep) Terhadap Sikap Siswa Pada Pelajaran Kimia Dan Minat Berwirausaha. *Jurnal Pendidikan Sains Indonesia*, *04*(20), 113–117. Google Scholar

Ramadayanti, N., Muderawan, I. W., & Tika, I, N. (2017). Pengaruh Model

Pembelajaran Berbasis Proyek Terhadap Keterampilan Berpikir Kritis Dan Prestasi Belajar Siswa. *Prosiding Seminar Nasional MIPA*, *3*(2), 194–204. Google Scholar

Resita, I., & Ertikanto, C. (2018). Designing electronic module based on learning content development system in fostering students' multi representation skills. *Journal of Physics: Conference Series*, *1022*(1). https://doi.org/10.1088/1742-6596/1022/1/012025

Rezeki, W. (2023). *Pengembangan Website Pembelajaran Interaktif Berorientasi Chemo-Entrepreneurship Pada Materi Koloid* (Doctoral dissertation, Universitas Jambi). Google Scholar

Rohayati, Sumarni, W., & Wijayati, N. (2016). Kontribusi Pembelajaran Berbasis Proyek Terhadap Jiwa Kewirausahaan Siswa. *Jurnal Inovasi Pendidikan Kimia*, *9*(2), 1556–1565. Google Scholar

Rokhim, D. A., Widarti, H. R., & Fajaroh, F. (2020). Pengembangan bahan belajar flipbook pada materi redoks dan elektrokimia berbasis pendekatan stem-pjbl berbatuan video pembelajaran. *Kwangsan: Jurnal Teknologi Pendidikan*, *8*(2), 234. https://doi.org/10.31800/jtp.kw.v8n2.p234--250

Rokhmania, & Kustijono. (2017). Efektivitas penggunaan E-Modul berbasis flipped classroom untuk melatih keterampilan berpikir kritis. *Seminar Nasional Fisika UNESA*, *November*, 91–96. Google Scholar

Rulita, M., Wardhani, S., & W.S. Sumah, A. (2021). Analisis kejenuhan dan minat belajar siswa dalam pembelajaran daring pada pelajaran biologi di SMAN 1 Unggulan Muara Enim. *Biodik*, *7*(4), 95–106. https://doi.org/10.22437/bio.v7i4.14490

Rizqi, M., Faujianor, A., & Yuliani, H. (2024). Validitas Pengembangan Media Pembelajaran Bagan dan Audio pada Materi Wudhu. *Attractive : Innovative Education Journal*, 6(3), 414–422. https://doi.org/10.51278/AJ.V6I3.1702

Safriani, Y. (2021). Desain dan Uji Coba Modul Pembelajaran Kimia Berbasis Chemo Entrepreneurship (CEP) Pada Materi Koloid. *Edusainstika: Jurnal Pembelajaran MIPA*, *1*(2), 81. https://doi.org/10.31958/je.v1i2.4930

Salsabila, H., Irna Sari, L., Haibati Lathif, K., Puji Lestari, A., & Ayuning, A. (2020). Peran Teknologi Dalam Pembelajaran Di Masa Pandemi Covid-19. *Al-Mutharahah: Jurnal Penelitian Dan Kajian Sosial Keagamaan*, *17*(2), 188–198. https://doi.org/10.46781/al-mutharahah.v17i2.138

Sani, D. M., Sukarmin, & Suharno. (2021). The needs analysis for the development of electronic learning module (e-module) based on local wisdom information search in senior high schools' physics online learning during COVID-19 pandemic. *IOP Conference Series: Earth and Environmental Science*, *1796*(1). https://doi.org/10.1088/1742-6596/1796/1/012020

Saptorini, W. T. L. dan. (2016). Peningkatan Kemampuan Chemo-Entrepreneurship Siswa Melalui Penerapan Konsep Koloid Yang Berorientasi Life Skill. *Jurnal Inovasi Pendidikan Kimia*, *9*(1), 1450–1458. Google Scholar

Saputri, M. S. (2021). Pengembangan Media Modul Elektronik Berbasis Aplikasi 3d Page Flip Rofessional Pada Tema Menyayangi Tumbuhan dan Hewan Untuk Kelas III SD/MI. *Paper Knowledge . Toward a Media History of Documents*. Google Scholar

Sari, D. P. (2020). *Literasi Digital Pada Kalangan Guru Smp Di Surabaya*. 1–21. Google Scholar

Sari, D. P., AR, R., & Deskoni, D. (2018). Pengaruh iklim kelas terhadap motivasi

belajar peserta didik di SMAN 3 Tanjung Raja. *Jurnal PROFIT Kajian Pendidikan Ekonomi Dan Ilmu Ekonomi*, *5*(1), 80–88. https://doi.org/10.36706/jp.v5i1.5639

Saroinsong, W. P. (2018). Penerapan Model Pembelajaran Berbasis Proyek Untuk Meningkatkan Keterampilan Berpikir Kritis dan Kreatif Mahasiswa. *Jurnal Pendidikan Anak Usia Dini*, *1*(1), 66–72. Google Scholar

Septiana, M., & Hidayati, D. (2022). Kepemimpinan Guru Dalam Pembelajaran Di Era Digital. *Manajemen Pendidikan*, *17*(2), 101–116. https://doi.org/10.23917/jmp.v17i2.19354

Sidiq, R., & Suhendro, P. (2021). Utilization of Interactive E-Modules in Formation of Students's Independent Characters in the Era of Pandemic. *International Journal of Educational Research and Social Sciences (IJERSC)*, *2*(6), 1651–1657. https://doi.org/10.51601/ijersc.v2i6.194

Sirait, E. D. (2016). Pengaruh minat belajar terhadap prestasi bela jar matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *6*(1), 35–43. https://doi.org/10.30998/formatif.v6i1.750

Siregar, T. P. (2024). The Effect of Project-Based Learning Method on Understanding Geometry Concepts in Secondary School Students. *Attractive: Innovative Education Journal*, *6*(3), 302-310. https://doi.org/10.51278/aj.v6i3.1545

Sonia, T. N. (2019). Menjadi guru abad 21: jawaban tantangan pembelajaran revolusi industri 4.0. *Unimed*, 191–199. http://dx.doi.org/10.30998/formatif.v6i1.750

Sukmawati, E., ST, S., Keb, M., Fitriadi, H., Pradana, Y., & ... (2022). Digitalisasi Sebagai Pengembangan Model Pembelajaran. In *Global Eksekutif Teknologi* (Vol. 6, Issue 2). Google Scholar

Sumuweng, S. A. ., Wantah, E., Lumampow, L. S., & Wuryaningrat, N. F. (2022). Identifikasi Masalah dan Analisis Kebutuhan Pengembangan Media Pembelajaran Ekonomi Berbasis Komik Peserta Didik Kelas IX Di SMP Negeri 4 Tondano Kabupaten Minahasa. *YUME : Journal of Management*, *5*(3), 180–187. https://doi.org/10.2568/yum.v5i3.3067

Supartini, M. (2016). Pengaruh Penggunaan Media Pembelajaran Dan Kreativitas Guru Terhadap Prestasi Belajar Siswa Kelas Tinggi Di Sdn Mangunharjo 3 Kecamatan Mayangan Kota Probolinggo. *Jurnal Penelitian Dan Pendidikan IPS*, *10*(2), 277–293. Google Scholar

Taylor, C. J., Pomberger, A., Felton, K. C., Grainger, R., Barecka, M., Chamberlain, T. W., Bourne, R. A., Johnson, C. N., & Lapkin, A. A. (2023). A Brief Introduction to Chemical Reaction Optimization. *Chemical Reviews*, *123*(6), 3089–3126. https://doi.org/10.1021/acs.chemrev.2c00798

Trismayanti, S. (2019). *Strategi Guru dalam Meningkatkan Minat Belajar Peserta Didik di Sekolah Dasar*. *17*(2). https://doi.org/10.35905/alishlah.v17i2.1045

Vrabec, M., & Prokša, M. (2016). Identifying Misconceptions Related to Chemical Bonding Concepts in the Slovak School System Using the Bonding Representations Inventory as a Diagnostic Tool. *Journal of Chemical Education*, *93*(8), 1364–1370. https://doi.org/10.1021/acs.jchemed.5b00953

Wardani, E. (2021). *Kompetensi Guru Dalam Memanfaatkan Media Pembelajaran Berbasis Teknologi Informasi Dan Komunikasi Di Smpn 1 Prambanan Teacher Competence in Using Information and Communication Technology-Based Learning Media At Smp:N 1 Prambanan*. *2*, 807–807. Google Scholar

Wibowo, N. (2016). Upaya Peningkatan Keaktifan Siswa Melalui Pembelajaran Berdasarkan Gaya Belajar Di Smk Negeri 1 Saptosari. *Elinvo (Electronics, Informatics, and Vocational Education)*, *1*(2), 128–139.

https://doi.org/10.21831/elinvo.v1i2.10621

Widiasih, R., Widodo, J., & Kartini, T. (2018). Pengaruh Penggunaan Media Bervariasi Dan Motivasi Belajar Terhadap Hasil Belajar Mata Pelajaran Ekonomi Siswa Kelas Xi Ips Sma Negeri 2 Jember Tahun Pelajaran 2016/2017. *JURNAL PENDIDIKAN EKONOMI: Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi Dan Ilmu Sosial*, *11*(2), 103. https://doi.org/10.19184/jpe.v11i2.6454

Winatha, K. R. (2018). Pengembangan E-modul Interaktif Berbasis Proyek Mata Pelajaran Simulasi Digital. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *15*(2), 188–199. https://doi.org/10.23887/jptk-undiksha.v15i2.14021

Wulandari, F., Yogica, R., & Darussyamsu, R. (2021). Analisis Manfaat Penggunaan E-Modul Interaktif Sebagai Media Pembelajaran Jarak Jauh Di Masa Pandemi Covid-19. *Khazanah Pendidikan*, *15*(2), 139. https://doi.org/10.30595/jkp.v15i2.10809

Wulandari, R., Santoso, S., & Ardianti, S. D. (2021). Tantangan Digitalisasi Pendidikan bagi Orang Tua dan Anak Di Tengah Pandemi Covid-19 di Desa Bendanpete. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(6), 3839–3851. https://doi.org/10.31004/edukatif.v3i6.1312

Yamin, Y., Permanasari, A., Redjeki, S., & Sopandi, W. (2020). Project Based Learning To Enhance Creative Thinking Skills of the Non-Science Students. *Jhss (Journal of Humanities and Social Studies)*, *4*(2), 107–111. https://doi.org/10.33751/jhss.v4i2.2450

Pratiwi, G., Akhdinirwanto, R. W., & Nurhidayati, N. (2020). Pengembangan E-UKBM dengan aplikasi kvisoft flipbook maker dalam pembelajaran fisika untuk meningkatkan kemampuan problem solving peserta didik. *JIPFRI (Jurnal Inovasi Pendidikan Fisika Dan Riset Ilmiah)*, *4*(2), 46-55. https://doi.org/10.30599/jipfri.v4i2.697

Yosimayasari, S. (2021). Pengembangan mobile game untuk pembelajaran pada materi larutan penyangga. *Jurnal Inovasi Pendidikan IPA*, *7*(1), 94–105. https://doi.org/10.21831/jipi.v7i1.37561

Zakiyah, Ibnu, S., & Subandi. (2018). Analisis Dampak Kesulitan Siswa pada Materi Stoikiometri Terhadap Hasil Belajar Termokimia. *EduChemia (Jurnal Kimia Dan Pendidikan)*, *3*(1), 119–134. https://dx.doi.org/10.30870/educhemia.v3i1.1784

Zen, Z., Reflianto, Syamsuar, & Ariani, F. (2022). Academic achievement: the effect of project-based online learning method and student engagement. *Heliyon*, *8*(11). https://doi.org/10.1016/j.heliyon.2022.e11509