E-Module Development with Implementation of *Cybergogy* to Train Junior High School Students Self-Awareness in the Mixture Separation Sub-Material

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Abstract. The changes in the era of society 1.0 are transitioning into the era of society 5.0 where life can easily be accessed and reached at any time just in the palm of your hand, which has the impact of changing times where students must have the ability, one of which is initiative, awareness, and self-management in responding to everyday problems, so that by using E-modules in 21st century learning are a real embodiment of learning *cybergogy* in technological development. The research objective is to develop E-Module teaching materials with the implementation of *Cybergogy* to train junior high school students self-awareness in the mixed separation sub-material, which is categorized as valid in terms of content and construct validity as well as readability for teachers and students. The stages of the research method refer to Plomp's (2013) teaching development model, which consist of 3 stages: (1) initial research; (2) development phase or *prototyping*, and (3) assessment phase. The research instrument is a teaching module validation sheet and readability validation. A form of quantitative research data analysis. The E-Module product was tested for validity by teachers with an average score of 3.28, and readability by teachers with an average score of 97.14% and readability by students with an average score of 95.1%. Based on the validity and readability results, the value is in the very valid and very well readable category, and the product E-Module is excellent for use.

Keywords: *E-Module, Cybergogy, Self-Awareness*.

1   Introduction

Changing times accompanied by increasingly advanced technology pushed civilization to its peak. The speed of information and communication links pushed the human era, which initially only consisted of hunting and farming (*society 1.0*), into life with easy access and reach at any time, just in the palm of your hand (*society 5.0*). *Cybergogy* in the world of education is a system or framework that aims to realize the involvement of online learning by making it easy to access at anytime and anywhere. Cybergogy is an educational approach that leverages technological and innovations to support students' cognitive, social, and

emotional development though face-to-face online learning (synchronous)In the 21st century, with *society* changing *5.0* and *cybergogy*, students need skills that are certainly much different. They not only compete with other humans in society but also with robots, artificial intelligence, and all the changing times that exist within it. There are 13 points that are at least important to master in this era to compete, namely: 1. *Life plan* (plans in life); 2. *Adapt skill* (ability to adapt); 3. initiative and self-management; 4. Entrepreneurship; 5. social or cultural interaction (*social connecting*); 6. productivity and accountability; 7. (*leadership*) attitude of a leader 8. *Critical thinking* (critical thinking); 9. *Problem solving* (solving a problem); 10. Communication; 11. collaboration and teamwork; 12. *Life learning* (living to learn) as well as; 13. digital literacy [1].

Referring to some of the abilities above, there are initiative and self-management abilities that must be mastered. This is related to the ability of self-awareness. Self-awareness is a condition when a person realizes that in his mind there are emotions in dealing with problems so that the person can then master them. Someone who has good self-awareness can recognize and sort out feelings, understand what is being felt and know the causes of these feelings [2]. Therefore by increasing students' self-awareness by using reflection, they can focus more on learning to achieve their goals.

Based on the results of interviews with teachers and observations at SMP Negeri 1 Bagor, it shows that the learning methods used at SMP Negeri 1 Bagor mostly use the lecture method. Apart from that, the technology empowerment facilities used at SMP Negeri 1 Bagor are still minimal. The use of teaching materials in science learning at SMP Negeri 1 Bagor includes articles, textbooks, the internet, and science module books issued by the Nganjuk Regency Science MGMP. Therefore, it requires learning innovations such as the application of E-Modules which also train students' self-awareness. Based on the results of interviews, students have never applied learning to E-Modules.

Based on the results of interviews with teachers, it was stated that the percentage of cognitive results from daily tests on mixed separation material for students that reached the KKM was 50%. This shows that students' understanding of the material is still low. Apart from that, the level of student awareness of science learning is still very low, at approximately 25%. This is because the majority of students still consider science to be a subject that is very difficult to learn and understand, so they are less interested in it.

The aim of science learning in SMP/MTs is to train students to be aware of themselves and their surrounding environment, as well as know how to protect and preserve the surrounding environment. Apart from that, students must also be prepared to face the 21st century with necessary abilities [3]. Therefore, by looking at the problems around students, students can train their self-awareness to protect and preserve the surrounding environment.

The use of E-Modules in 21st century learning is a concrete manifestation of technological developments in the world of education. Modules, which are usually printed in book form contain basic learning material. Modern developments have made it possible to change the form of packaging, initially in printed form, now packaged in digital format or what is usually called an E-Module. E-Modules are learning tools or facilities for students designed not only to focus on certain subject matter, but E-Modules must also be designed so that they can help and improve student learning outcomes and can develop awareness in students [4] Referring to the problem above, E-Module is one solution to increase students' self-awareness through the implementation of Cybergogy with digital media, the E-Module itself can be accessed

via the website. The E-Module focuses on the mixture separation sub-material. Therefore, the application of E-Modules, which contain material on problems in everyday life can train students' self-awareness.

Based on the description of the problem above, it appears that it is necessary to develop a teaching material, namely an E-Module to train junior high school students' self-awareness in the sub-material Separating Mixtures. The e-module includes an opening section containing the title, table of contents, instructions for using the module, information map, and list of competency objectives. Apart from that, there is a core section that contains the relationship between material or other lessons, and the material description includes activities that include competency objectives, material descriptions, formative tests, practice questions, and final tests. As well as a closing section that contains a glossary, final test, answer key, and index. The E-Module also contains aspects of students' self-awareness abilities, so it can be a solution for training students' self-awareness. E-Modules can be packaged in a practical form so that students can use them online anywhere and at any time. Therefore, this research developed an E-Module assisted by a digital flipbook that was designed efficiently and effectively to train junior high school students' awareness of mixture separation material.

2   Method

The aim of this research is E-Module Development with the implementation of *Cybergogy* to train junior high school students' self-awareness in the mixture separation sub-material. Based on these objectives, this research is a type of development research. The data source is an assessment of teaching materials that were assessed by five validators, namely 5 science teachers and 32 junior high school students for the E-Module readability test. The E-Module development model, which refers to the development stages of Plomp, (2013) consists of 3 (three) stages, namely: (a) initial research; (b) development phase or *prototyping;* and (c) assessment phase (1). Plomp's (2013) model was chosen by considering several things, namely (a) This model combines research with practical aspects of instructional design, which allows the development of effective educational solutions based on empirical evidence; (b) a systematic and structured approach to designing education or developing teaching materials; and (c) allows adjustments and improvements based on the needs and circumstances of the continually evolving educational environment. A schematization of the development of the Plomp model is presented in Figure 1.
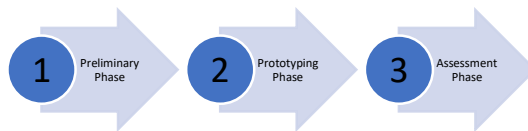

Fig. 1. Schematization of Plomp Model Stages
Source: [5]

Plomp model stages in the prototype development phase (*Prototyping Phase*) developed a series of prototypes. The prototype is evaluated by referring to formative evaluation. Formative evaluation has several stages or layers which are illustrated in Figure 2.
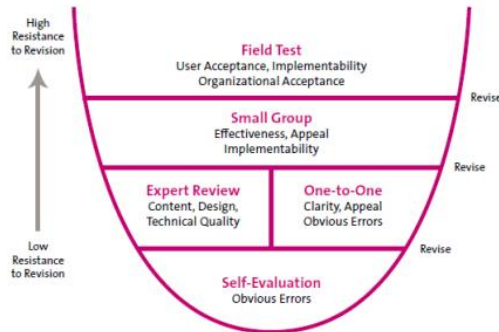

Fig. 2. Formative Evaluation Layers of the Plomp Development Model
Source: [6]

Next, Plomp stated the stages of research design, namely that the first includes an initial investigation in the form of needs and context analysis, literature, and developing a conceptual and theoretical framework for the research. Second, the prototype development process includes a cyclical and sequential design process in the form of a more micro-research process and uses formative evaluation to improve and refine the intervention. Third, evaluation, namely a semi-summative evaluation to conclude whether the solution or intervention is in accordance with what is desired, as well as proposing recommendations for intervention development [6].

Referring to the Plomp model stages, the initial research stages applied in this research include developing research instruments, analyzing needs, analyzing the curriculum, and analyzing the character of students, identifying teaching objectives, and developing E-Modules as an implementation of learning. *cybergogy*, as well as the preparation of E-Modules. Preparing E-Modules includes compiling learning materials, creating LKPD (Students Worksheets, creating questions, and so on). At the development stage or *prototyping* includes developing E-Modules using applications such as Canva which is then published on the page *https://fliphtml5.com/*. Hence, learning *cybergogy* can be realized through activities in accessing the E-Module online on the page. Next, the assessment phase includes the validation of the E-Module by science teachers, which will then be tested for readability by 5 science teachers and 32 students to determine the suitability of the product.

Validity tests consist of three types, namely content validity, construct validity, and empirical validity. Content validity includes instruments that are prepared in accordance with the curriculum, materials, and expected learning objectives, then given to experts or validators. Construct validity and empirical validity include trials on similar respondents. Researchers can ask respondents to read the instrument to see if it can be read and understood clearly. The results of limited trials are used to improve existing instruments. In addition, empirical validity was carried out on respondents outside the research sample for the purpose of testing the instrument [7].

The results of the validity test responses were analyzed using a scale *Likert,* which has been validated by the validator, while the results of the readability test responses were analyzed descriptively quantitatively, and classified according to the scale score category *Guttman*, namely "Yes" a score of 1 and if you choose "No" you get a score of 0. Analyze the data using the score percentage equation, which is expressed in the following equation [8]:

$$\%score = \frac{scores\ from\ respondents}{maximum\ score}\ x\ 100\%$$

The average score (P) from the validators' E-Module validation test results is aligned with the assessment criteria in Table 1.

Table 1. Model Assessment Criteria

Interval Shoes	Assessment criteria	Information
3.25 < P < 4.00	Very valid	Can be used without revision
2.50 < P < 3.25	Valid	Can be used with minor revisions
1.75 < P < 2.50	Not valid	Can be used with major revisions
1.00 < P < 1.75	Invalid	It cannot be used yet and still requires consultation

Source: [9]

After getting a percentage of readability scores, they are then grouped according to the following criteria [10]:

90% - 100% with very valid criteria

80% - 89% with valid criteria

65% - 79% with quite valid criteria

55% - 64% with less valid criteria

Less than 55% with invalid criteria

The analysis of research data is quantitative. Software (software) is utilized for analyzing numerical data in the form of numbers (quantitative). In order for research analysis to produce correct information, there are at least four stages in data processing that must be passed, namely: (1) *Editing*, namely activities by checking the contents of forms or questionnaires; (2) *Coding*, namely the process of converting data from the form of letters into data in the form of numbers; (3) *Processing*, namely data processing by doing *entry* data from questionnaires to computer data packages; (4) *Cleaning*, namely the activity of re-checking data that has been *entry*. The data analysis technique uses a descriptive statistical test method in the form of numbers [11].

3   Result and Discussion

3.1 Results

a. Validity of E-Module

The E-Module validity was carried out by validators, namely three science subject teachers at SMP Negeri 1 Bagor, namely Mrs. Eny Trianawati, S.Pd., Mrs. Andarista Diaz Aleydaputri, S.Si., and Mrs. Fatatus Rizka Nurdiana, S.Pd. , one science subject teacher at SMP Negeri 1 Ngluyu, namely Mrs. Dwi Reknonigsih, S.Pd., and one science subject teacher

at SMP Negeri 3 Nganjuk, namely Mrs. Dika Isnaini Fahma, S.Pd., Gr., by filling in the validity questionnaire. The results of the validity data analysis can be shown in Table 1.

Table 2. Validity Test Assessment Results

No.	Aspect	Grade Average	Criteria
1	Feasibility of content components	3,2	Valid
2	Feasibility of presentation	3,15	Valid
3	Language	3,5	Very Valid
Total		9,85	Very Valid
Rate-rate		3,28	

Based on the results of the validity assessment in Table 1, it was found to be very valid with an average value of 3.28. This shows that the E-Module developed is valid both in terms of the appropriateness of content components, the appropriateness of presentation, and linguistics.
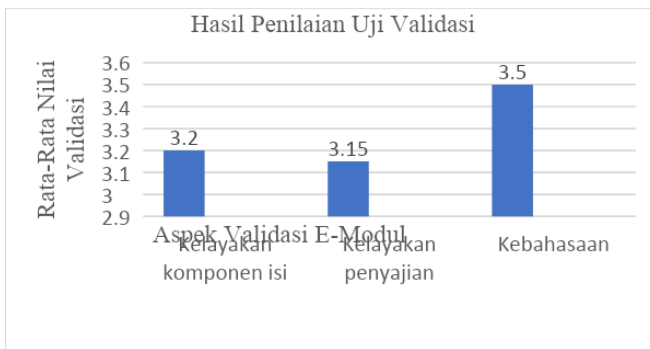

Fig. 3. Validation Test Assessment Results

Based on Figure 3, the order of levels of E-Module validation aspects is based on high criteria, namely linguistic aspects, appropriateness of content components, and appropriateness of presentation. These results show that the teacher assesses the linguistic aspect as superior to other aspects contained in the E-Module, getting a score of 3.5.

b. Readability

The E-Module readability test in this research was carried out in stages, including: (1) distributing the draft E-Module for mixed separation material to science teachers and class VIII-A students who were taking mixed separation material, (2) asking teachers and students to read the E-Module draft carefully, (3) asking teachers and students to provide opinions and suggestions regarding the contents of the draft E-Module provided through a questionnaire instrument. This research involved 5 science teachers and 32 students as questionnaire respondents. The readability test results are presented in Table 3 below.

Table 3. Teacher Readability Test Results

No.	Aspect	Average Value (%)	Criteria
1	Conformity of sentences with EYD rules	100	Reads Very Well
2	Use of easy-to-read symbols	100	Reads Very Well
3	Clear writing	100	Reads Very Well
4	The use of language is communicative	100	Reads Very Well
5	The use of language does not give rise to multiple interpretations	80	Well read
6	Use of clear images	100	Reads Very Well
7	The font size is not too small and easy to read	100	Reads Very Well
Total		680	Reads Very Well
Average readability score		97,14	

Based on Table 3, it explains the results of the teacher's readability test on the E-Module, namely that almost all aspects of the readability test received very good readability criteria except for the aspect of language use that did not give rise to multiple interpretations, getting an average score of 80% with good readability criteria. In the readability test results, the teacher produced an average readability score of 97.14 with the criteria being very well read.

Table 4. Student Readability Test Results

No.	Aspect	Average Value (%)	Criteria
1	Conformity of sentences with EYD rules	96,9	Reads Very Well
2	Use of easy-to-read symbols	100	Reads Very Well
3	Clear writing	100	Reads Very Well
4	The use of language is communicative	93,8	Reads Very Well
5	The use of language does not give rise to multiple interpretations	87,5	Well read
6	Use of clear images	96,9	Reads Very Well
7	The font size is not too small and easy to read	90,6	Reads Very Well
Total		665,7	Reads Very Well
Average readability score		95,1	

Based on Table 4, it explains the results of students' readability tests on the E-Module which resulted in almost all aspects of the readability test getting very good readability criteria except for the aspect of language use that does not give rise to multiple interpretations getting an average score of 87.5% with good readability criteria. In the readability test results, students produced an average readability score of 95.1 with the criteria being very well read.

3.2 Discussion

E-module validation is an evaluation process carried out by experts or validators to ensure that the e-module meets the quality standards required for learning [12]. The analysis of the data from the E-Module validity questionnaire assessed included the suitability of content elements, the suitability of testing, and language. The results obtained show that validators provide positive responses to aspects of ease and understandability. This shows that the e-module is good enough in terms of providing material that is easily accessible and understood

by students. However, the validator also identified several areas that needed improvement, especially in terms of visual appeal and suitability to the recommended learning format.

Readability is an important aspect of creating e-modules, because it is directly related to students' ability to read and understand the material presented. A good e-module must be able to adapt based on developments in science and technology and use text that is clear and easy to read [13].

Based on the validation results, there is a suggestion from the validator, which shows that in the concept map section, the font color does not contrast with the base color, so the writing is difficult to read. Improvements in this aspect are very important to ensure that students can easily read and understand the information presented in the e-module. Apart from that, the validator also provides suggestions for adding library sources according to Indonesian language rules, such as name and year quotes. This is important to increase the credibility and readability of the e-module, as well as make it easier for students to understand the references used. Meanwhile, the validation results of the readability test from the validator show that overall, the E-Module is good, easy to read, and easy to understand. The appearance of the E-module is attractive and systematic, so it can increase students' enthusiasm for learning. Suggestions for improvement from the validator, namely the video link in the E-Module has a barcode scanning feature added and the source name and year are written in the image as a quote. Apart from that, the source of the image should use a more trusted image source.

According to Daniel Goleman, he describes indicators of self-awareness based on self-awareness abilities, including [14]:

1. Recognize your own feelings and behavior. Individuals are able to recognize what feelings they are feeling, why those feelings arise, what behavior they carry out, and the impact it has on other people.
2. Recognize your own strengths and weaknesses. Individuals are able to recognize or identify their strengths and weaknesses.
3. Have an independent attitude. Individuals have an independent attitude or do not depend on other people, which shows there is encouragement or motivation to do something based on belief in one's own abilities.
4. Make the right decisions. Individuals are able to make or take appropriate decisions, especially regarding career planning.

The self-awareness indicator to measure research results is in the form of an E-Module assessment sheet filled in by the teacher along with a questionnaire filled in by the teacher and students. However, the research results have not directly measured how this E-Module successfully implements the principles of Cybergogy or how the module trains students' self-awareness. To measure this, several variable indicators that can be used include: the level of module interactivity, the module's ability to provide personalized and adaptive learning, and the extent to which the module encourages collaboration and independent learning. Apart from that, to measure students' self-awareness training, it can be seen from the presence of reflective activities, recognition and management of emotions, as well as increased personal responsibility in learning. Other relevant indicators include text readability, suitability of the language, visuals, and aesthetics of the module, as well as conformity with the applicable curriculum. The use of these indicators will provide a more comprehensive picture of the

effectiveness of the E-Module in achieving learning objectives in accordance with the research title.

The results of the research entitled "Development of an E-Module with the Implementation of Cybergogy to Train Middle School Students' Self-Awareness in Mixed Separation Sub-Material" show that the E-Module developed has been assessed as valid and has very good readability. The validity of the E-Module was assessed by the teachers with an average score of 3.28, indicating that this module meets the expected criteria in terms of suitability of content, presentation, and language. The readability test also showed positive results, both from teachers and students, with average scores of 97.14% and 95.1% respectively, which shows that this E-Module is easy to read and understand.

This research shows that the E-Module developed is quite good in terms of validity and readability. The research also provides clear guidance regarding aspects that need to be improved, such as visual adjustments and the addition of more credible references. With results showing high validity and readability, this E-Module can be relied on as an effective learning tool. Suggestions for improvement provided by validators indicate that module developers must continue to iterate to ensure that E-Modules are getting closer to perfection in terms of functionality and comfort of use, especially in educational environments.

4   Conclusion

Based on the results of the validity test and readability test on the E-Module, it can be concluded that the E-Module is valid based on the validity test and readability test, so it is suitable for use.

Disclosure of Interests. The authors declare that there is no conflict of interest regarding the publication of this manuscript. Additionally, ethical issues, including plagiarism, infringement, data fabrication and/or falsification, duplicate publication and/or submission, and redundancy are at the sole discretion of the authors.

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