

# E-Module Development Based on Differentiation in Chemistry Subjects Class XI SMA Acids and Bases Solution Material

Dwi Ita Agustina, Mustaji, Achmad Noor Fatirul

Study Program School of Education Technology Postgraduate PGRI Adi Buana University,  
Surabaya

[dwita200881@gmail.com](mailto:dwita200881@gmail.com), [mustaji@unesa.ac.id](mailto:mustaji@unesa.ac.id), [anfaturul@gmail.com](mailto:anfaturul@gmail.com)

Accepted: August 14 <sup>th</sup> 2023	Reviewed: Sept 18 <sup>th</sup> 2023	Published: Nov 30 <sup>th</sup> 2023
---	---	---

## Abstract

Early study results on the educated participants class XII SMA Negeri 1 Kedungpring through interviews and observations shows that educated participant experience difficulty in understanding solution acids and bases material. It happens because the module used did not fill their different need in study. Survey result shows that the module desired by them is different namely text book, videos, simulations and pictures. This Study aims to develop e- modules based on differentiation in chemistry class XI SMA acids and bases solution material in order to fill the educated participant need in study. Study held at SMA Negeri 1 Kedungpring Lamongan. The Study is development study using the ADDIE model (*Analysis, Design, Develop, Implement, Evaluation*). Trial appropriateness product done with validation test by content expert, design expert, media experts and colleague. Furthermore validated E- module was tried out. The trial carried out in two stages namely trials \_ group small (6 respondents) and trials group large (30 respondents). Data collection used are validation questionnaire and response questionnaire of educated participant. The data is in form of number then analyzed in a manner descriptive. Analysis results from material expert is 95.4 %, design expert is 92.9%, media experts is 94% and colleague is 96.9%. Based on material expert, design expert, media experts and colleague analysis, the e- module based on differentiation in chemistry class XI SMA acids and bases solution material is in very decent category to use. Trial results at little group is 94.5% meanwhile trials results at big group is 95.4%. Based on yield data trials the e-module based on differentiation in chemistry class XI SMA acids and bases solution material is in very decent category to use.

**Keywords:** e - module, differentiation, acids and bases solution

## Introduction

Chemistry is branch of knowledge studying composition and characteristic of material as well as the changes that they experience <sup>1</sup>. Chemistry learns abstract and concrete things, hence educated participants often consider chemistry is one of tough subject. Based on initial survey results through interviews and observations , one of material considered difficult for the educated participants is acid bases consist of acid base theory, pH determination , and the reaction. The

---

<sup>1</sup>Moore, John T. 2008. *Kimia for Dummies*. Klaten:Pakaraya

difficulty happens because the material difficult to understand and lacking of interesting teaching material.

Teacher is important figure in the learning process. Correct choice in both learning teaching method and media influences in teaching learning process. The survey results of the analyses of needs of the participants at SMA Negeri 1 Kedungpring, 181 respondents consisting of 62.6% class XI and 37.4% class X, shows 63.5% vote on teaching materials in form of videos, 46.4% in form of simulation, 33.1 in form of picture as well as 19.9% of participants educate vote the teaching materials in the form of reading. The survey result shows that every participant has different interests.

Considering the results of analysis, teachers can choose available teaching materials to fulfill the need of the students. That is why the teacher can choose differentiated learning teaching in which the content of the module should give learning process that focus on student and the student become subject not object of learning.

According to Tomlinson, at the class implementing differentiation learning, a teacher does consistent effort to respond the need of students. Differentiated Learning is the learning which focuses on characteristics of students and their potencies<sup>2</sup>. This approach notices on individual differences of students. Differentiation Learning is very important to be applied because everyone has own uniqueness. Learning process will go maximum if we are capable to optimize the potency existing in students.

According to Tomlinson there are three aspects of students need namely students' readiness, students' interest, and students' study profile. Students' readiness is not about the level of intelligence but more about the information whether the knowledge or skills possessed by students recently is in line with new knowledge or skill will be taught so all the students are treated correctly. Students' interest is a mental condition which produces response directed to the situation or certain object which is fun and gives self-satisfaction. Students' profile (style) of learning refers to an approach or how the most preferred way for students in order to able to understand lesson well.

Research conducted by Puspitasari shows students' response toward learning implementation where the students are very happy getting learning with different model using the book creator on the theme, the place, and time where we are<sup>3</sup>.

To fulfill student need, teachers can develop module that uses digital technology namely electronic module or e- module. E- module is a medium which suitable applied to the students because they can use smartphones for learning. To increase students' motivation, e- module can be made more interesting and interactive by adding images, videos, animations and simulations. The use of the E- module that presents a learning by combining text and images can display the examples of application acids and bases concept which equipped with material summary that can be used by students to understand acids and bases material as well as questions exercises to evaluate students' ability in mastering the material that has learned .

At the practical guide of e-module arrangement of Ministry of Education and Culture explained that module is learning material which is specially prepared and designed systematically based on certain curriculum which is packaged to be a smallest learning unit (modular) that can be

---

<sup>2</sup> Tomlinson, C. A. (2001). *How to Differentiate instruction in mixed-ability classrooms 2nd Ed*). Alexandria, VA: ASCD.

<sup>3</sup> Puspitasari, V, Ruffi'I, Waluyo, J. 2020. Pengembangan Perangkat Pembelajaran Dengan Model Diferensiasi Menggunakan Book Creator Untuk Pembelajaran Bipa Di Kelas Yang Memiliki Kemampuan Beragam. *Jurnal Pendidikan dan Pembelajaran Sains Indonesia* (Vol 4 No 2 2020)

used by learner independently to reach certain learning purposes which has set<sup>4</sup>. The advantages of e- module according to Directorate SMA coaching is 1) improving students' motivation because every time they do task, it will be restricted and appropriate with ability , 2) after doing evaluation , teachers and students know correctly , in which module they have had been successful and in which part of module they are not successful yet, 3) materials lesson divided more equally in one semester, 4) education is more empower because the material is arranged according to academic level, static presentation of the print out module can be changed into more interactive and dynamic , element of *verbalism* that too high on the module can be reduced by serving visual elements using video tutorials.

## Method

This study is kind of research and development type or Research and Development (R&D). According to Sugiyono research and development method is method which has function for evaluating, developing and creating certain product. This Study develops e- modules based on differentiation in chemistry class XI SMA acids and bases material<sup>5</sup>.

Stages of development of learning model design refer to development design of the ADDIE model. The ADDIE model consists of five steps, namely: (1) *Analysis*, (2) *Design*, (3) *Development*, (4) *Implementation* and (5) *Evaluation*<sup>6</sup>.

Explanation from ADDIE stages can seen in the following table :

**Table 1:** ADDIE stages

	<b>Analyze</b>	<b>Design</b>	<b>Develop</b>	<b>Implement</b>	<b>Evaluate</b>
<b>Concept</b>	Identify the probable causes for a performance gap	Verify the desired performances and appropriate testing methods	Generate and validate the learning resources	Prepare the learning environment and engage the students	Assess the quality of the instructional products and processes, both before and after implementation
<b>Common Procedures</b>	<ol style="list-style-type: none"> <li>1. Validate the performance gap</li> <li>2. Determine instructional goals</li> <li>3. Confirm the intended audience</li> <li>4. Identify required resources</li> <li>5. Determine potential delivery systems (including cost estimate)</li> <li>6. Compose a project management plan</li> </ol>	<ol style="list-style-type: none"> <li>7. Conduct a task inventory</li> <li>8. Compose performance objectives</li> <li>9. Generate testing strategies</li> <li>10. Calculate return on investment</li> </ol>	<ol style="list-style-type: none"> <li>11. Generate content</li> <li>12. Select or develop supporting media</li> <li>13. Develop guidance for the student</li> <li>14. Develop guidance for the teacher</li> <li>15. Conduct formative revisions</li> <li>16. Conduct a Pilot Test</li> </ol>	<ol style="list-style-type: none"> <li>17. Prepare the teacher</li> <li>18. Prepare the student</li> </ol>	<ol style="list-style-type: none"> <li>19. Determine evaluation criteria</li> <li>20. Select evaluation tools</li> <li>21. Conduct evaluations</li> </ol>
	<b>Analysis Summary</b>	<b>Design Brief</b>	<b>Learning Resources</b>	<b>Implementation Strategy</b>	<b>Evaluation Plan</b>

Product validation feasibility test in this study is carried out by the experts involving material expert, learning design expert, media experts and colleague. Trial design is carried out in 2 stages namely small test group (6 respondents) and large group (30 respondents). Developmental test

<sup>4</sup> Kementerian Pendidikan dan Kebudayaan. 2017. Panduan Praktis Penyusunan E-modul. Jakarta: Direktorat Pembinaan Sekolah Menengah Atas Dirjen Pendidikan Dasar dan Menengah Kementerian Pendidikan dan Kebudayaan

<sup>5</sup> Sugiono. 2017. Metode Penelitian dan Pengembangan. Bandung: Alfabeta

<sup>6</sup> Branch, Robert Maribe. Instructional Design The ADDIE Approach. London: Springer New York Dordrecht Heidelberg London

subjects of e- module based differentiation product is the students of SMA Negeri 1 Kedungpring class XI IPA TP 2022/2023.

Data collection used validation questionnaire, teacher responses questionnaire and student response questionnaires.

This study uses two data analysis techniques ie descriptive and quantitative analyses. 1) analysis of sheet data from study experts in form of qualitative data based on suggestions and feedback. This analyzed is in descriptive form and the results used for revision in refinement. 2) analysis of sheet data expert validation is in the form of quantitative data score, assessment obtained from results charging experts.

The obtained percentage is based on calculation score according to Likert scale ( Riduwan , 2013) with information scale evaluation For validation expert ie "5" is very good value , "4" is good , "3" is enough good , "2" is worth No good , and "1" is very Absolutely not Good

**Table 2.** Rating Scale Criteria

Value Weight	Category
5	Very good
4	Good
3	Enough Good
2	No Good
1	Absolutely not Good

From material expert validation, media experts , design experts and student respond, determined from sum from all point question . Amount each validator is changed as percentage

Suharsimi Arikunto (2013:285) explains For knowing ranking of final mark on item concerned , amount of the mark must be shared with amount of respondents who answered the questionnaire<sup>7</sup>.

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

Information

- $P$  : Validation percentage
- $\sum x$  : Total the average score obtained
- $\sum x_i$  : Total maximum score obtained

Obtained data is processed with *rating-* scale, obtained raw data is in form of number and then interpreted in qualitative understanding. The following is appropriateness category based on *rating-scale*.

**Table 3** Eligibility Level Criteria

Percentage	Category
$80 \leq \text{score} \leq 100$	Very worth it
$60 \leq \text{score} \leq 80$	worthy
$40 \leq \text{score} \leq 60$	Enough worthy
$20 \leq \text{score} \leq 40$	Not worth it

<sup>7</sup> Arikunto, Suharsimi. 2013. *Prosedur Penelitian Suatu Pendekatan Praktek*. Yogyakarta: Rineka Cipta

---

$0 \leq \text{score} \leq 20$

No worthy

---

(Adaptation from Arikunto: 2013)

## Results and Discussion

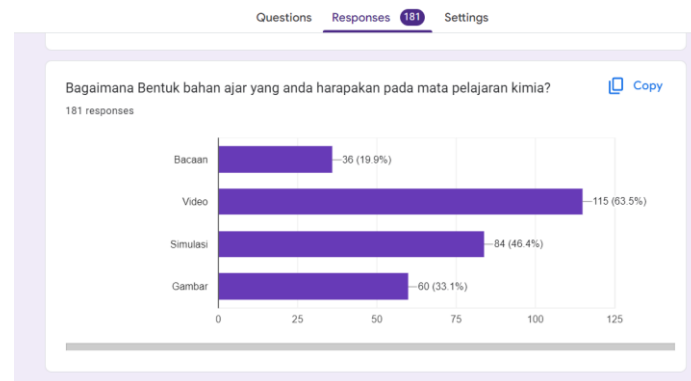
Type research developed by researcher is development Study using the ADDIE model (*Analysis, Design, Develop, Implement, Evaluation*). Developed product is an e- module based differentiation in chemistry class XI SMA acids and bases solution material”.

Based on development study carried out, obtained results of study as following.

### *Analysis*

A number of step done on this stage namely validation gap , determine instructional objective , educated participants analysis, available source audit, recommend of needs , and compile product management plan.

Based on survey of data through questionnaire via google form was obtained results that participant need teaching materials in the form of e- modules. Various content interested by educated participant is in form reading material, videos, pictures, simulations and practice activities.



**Figure 1 Response participant educate about interesting teaching material**

### *Design*

After carrying out analysis stage, the next is planning. The procedure used in this stage are 1) do task inventorisatation , 2) compose objectives , and 3) generate a testing strategy .

Module design describes the whole connection between part in the e- module. Module design is made to make easier the module manufacturing process and it works as guide in e- module creation. Existing E - module design made is like picture following .

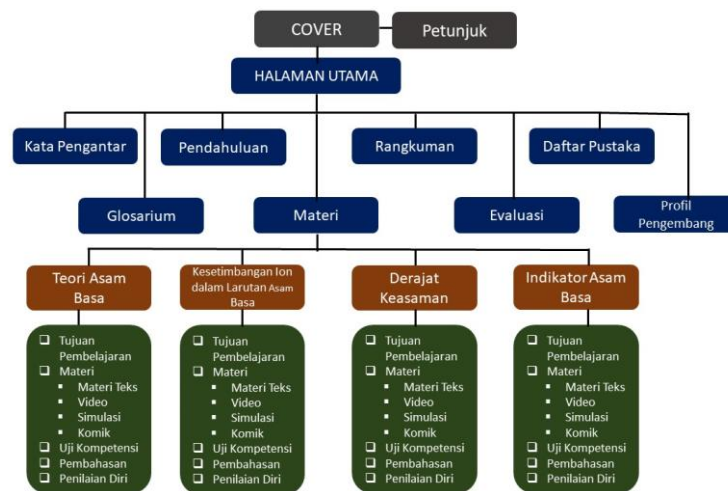


Figure 2 Design based E-Module Differentiation

. Material in the e- module is arranged from various reference. Material in form of document enclose pictures. For material in form of videos and simulations made in form of video outline script, materials in form of comic made in form of script comic. Pictures collected from personal document as well as look for sources on the internet and compiled use canva online application.

Validation in the study is in form of questionnaire (*check list*) for design expert, media experts and material experts. On this stage, it was started with drafting grid questionnaire and arrangement questionnaire. Result of stage This is evaluation to aspect design, media and materials toward the quality exist in the e-module based on differentiation developed.

### Development

Steps performed in development stages are 1) develop initial product, 2) select and develop supporting media, 3) develop response instruments of participant students , develop experts and colleagues validation instruments, 5) do revision and 6) trial run .

E- module was developed using power point, canva and Ispring suite 10. For making picture design uses canva and for making content uses power point whereas For making competency test questions and discussion use *quiz* on Ispring suite 10 as well as self-evaluation uses *interactions*. Module was developed from existing design made before. As for the components of module started from page opener, page main, glossary, introduction, pages material, summary, evaluation and bibliography.

The resulting e-module is in html 5 form, html link can be shared directly. On the research, researcher used supporting application that is *format factory*, for shrink video size, *web to apk* for changing html links to apk . Apk easily shared through whatsapp or email and easy to be installed on the participant's smartphone. The APKs can be accessed by participant by offline. Video format was created in youtube link to reduce APK size. Videos can be seen by participant by online.

Instrument of validation was developed from existing grid made. Instrument was developed by media experts, design experts, material expert and colleague.

### Implementation

Big trials group is the stage of implementation of the e- module which was conducted on 30 participants at SMA Negeri 1 Kedungpring Class XI.

## Evaluation

After doing trials evaluation to know the quality of developed product namely e- module based differentiation in chemistry class XI SMA acid bases solution material, the evaluation was done from the results of validation of material expert, design expert, media experts , and colleague responses as well as results of testing on participants.

Evaluation results is in the form of quantitative data and translated with qualitative description. Data from evaluation will be shown on the data analysis stage.

## Analysis and Discussion

The results of beginning development in the form of draft 1 is carried out eligibility testing. Appropriateness of development product was seen from validation results. Validation covers material aspect, design and media aspect. The validity of the e- module high school chemistry based differentiation was developed and defined from percentage of score obtained from charging questionnaire with Likert scale. Percentage of validation results was counted using formula.

Based on exposure of evaluation results from material expert from questionnaire contains 22 items instruments using scale linkert with highest mark 5 and lowest 1. The results of calculation of validation from material expert each aspect can be seen in the following table.

**Table 4.** Material Expert Validation Results for Each Aspect

No	Aspects assessed _	Earned Score
1	Content Eligibility	33
2	Appropriateness Presentation	19
3	Language	34
4	Differentiation	19
Amount score obtained _		105
Amount maximum		110
Percentage		95.4
Category		Very worth it

Amount of score of acquisition of validation results from material expert is 105 of score a maximum of 110, then after doing the calculation percentage gain validation is 95.4%. After converted with feasibility scale in Table 3.3, the e- module included as very decent qualification.

Based on exposure results of evaluation from design expert, the validation calculation results from design expert each aspect can be seen in the following table.

**Table 5** Design Expert Validation Results for Each Aspect

No	Aspects assessed _	Earned Score
1	Appearance screen	39
2	Consistency	20
3	Graphics	51
4	Presentation	20
Amount score obtained _		130
Amount maximum		140
Percentage		92.9
Category		Very worth it

Amount score acquisition of validation results from design expert is 130 of score a maximum of 140, then the validation calculation percentage gain is 92.9%. Percentage converted feasibility scale in Table 3.3, e- module includes in very decent qualification.

Based on exposure evaluation results from media expert as listed in Table 4.6, it can be determined percentage e- module achievement level. Questionnaire contains 20 items of instrument using linkert scale with highest mark 5 and lowest 1.

Calculation of validation results result from media experts each aspect can be seen in the table following.

**Table 6** Media Expert Validation Results for Each Aspect

No	Aspects assessed _	Earned Score
1	Technology	52
2	Appearance	27
3	Benefits	15
Amount score obtained _		94
Amount maximum		100
Percentage		92.9
Category		Very worth it

Amount score acquisition of validation results from media expert is 94 of score a maximum of 100, validation calculation percentage gain is 94 %. Percentage after converted with feasibility scale in Table 3.3, e- module included in very decent qualification.

As for comments from material expert, design expert is presented in table 7

**Table 7** Suggestions and Validator Comments on E-Module

Validators	Comment
Material validators	E- module Already worthy use
Design Validator	Media already innovative and worthy used without revision
Media Validators	Developed e - module worthy used as a research instrument thesis (S2)

Based on exposure results evaluation from response data Friend colleague a total of 3 people, as listed Table 3, then can specify percentage level e-module achievement. Calculation results validation Friend colleague each aspect can seen in the table following .

**Table 8** Validation Results Friend Colleagues on Each Aspect

No	Aspects assessed _	Earned Score		
		R1	R2	R3
1	Content Eligibility	50	49	49
2	Language	20	19	19
3	Benefits	43	45	44
4	Graphics	27	28	28
Amount score obtained _		145	146	145
Average score		145.3		
Amount maximum		150		
Average percentage		96.9		



Category

Very worth it

Average gain is 145.3 with score max 150, validation calculation percentage of average gain is 96.9%. Percentage after converted with feasibility scale in Table 3, e- module included in very decent qualification.

As for comments from Friend Colleagues is presented in table 9

**Table 9** Suggestions and Friend Colleagues Comments on E-Module

Validator	Komentar
Responden 1	This e-module is very good, close to perfect, hopefully it will be useful to make it easier for students to learn chemistry
Responden 2	This e-module is very innovative because it provides material in the form of readings, videos, pictures and simulations. His suggestion is that the material in comic form be enlarged because the writing is too small.
Responden 3	The development of this E-module inspired me because it makes it easier for students to find references. Hopefully soon a similar module will be made in other chemicals

On the rubric comments and suggestions, one colleague suggested improvement in letters size on comics so revision of the module *draft 1* was done. Hence that revision of the module become *drafts 2*.

The results of calculation of student response in the small group test can be seen in the following table.

**Table 10** Test Results Small Group

No	Aspect	Earned Score					
		K1	K2	K3	K4	K5	K6
1	Presentation	19	18	18	19	19	19
2	Material	37	37	38	39	38	38
3	Language	15	14	14	15	15	15
4	Benefit	22	22	22	25	25	25
Amount score obtained _		92	91	92	98	97	97
Average score		94.5					
Maximum score		100					
Percentage		94.5 %					
Category		Very worth it					

Average score on small trials group consist of 6 people is 94 with score maximum 100. After doing calculation, validation acquisition percentage is 94.5%.

As for comments from small group is presented in table 11

**Table 9** Suggestions and Small Group Comments on E-Module

Responden	Komentar
Learner 1	Actually the whole is good, easy to understand, interesting. However, in some parts it is still monotonous, such as a white background and there are still some that lack pictures
Learner 2	Overall the application (material) is quite complete and easy as a learning medium. However, in my opinion, the appearance of the menus on the main page can be linked or given an acid and base icon.
Learner 3	Material points are made of different colors so you don't get bored quickly.
Learner 4	In writing the material may be given a more diverse color so as not to get bored quickly
Learner 5	All parts of the application are good, interesting and easy to understand. To make the appearance as attractive as possible
Learner 6	The color menu page is made more attractive. Icons can be given

Based on data on suggestions and comments, there are a number of suggestion from participant need to be noticed that is repairing menu design color in order to avoid monotone as well as adding icons to e- module. So that it was done e- module repairing as draft 3.

. Calculation results of big trials group can be seen in the following table.

**Table 10** Test Results Group Big

No	Aspect	Average Score
1	Presentation	141.5
2	Material	141.9
3	Language	144.7
4	Benefit	144.6
	Average score	143,1
	Amount maximum	150
	Percentage	95.4
	Category	Very worth it

average number on big trials group is 95.4 of score a maximum of 100. After doing calculation, the percentage of validation gain is 95.4%. Percentage converted feasibility scale in Table 3.3, e- module included in very decent qualification.

The result of big trial group is the ending of the results of the study. The ending result is also results of product evaluation. The whole evaluation of product appropriateness can be seen in the following table.

**Table 11** Evaluation Results e-Module Validation and Testing

Stages	Subject	Percentage (%)	Eligibility Level Qualification
Material Expert Validation	1 senior teacher	95.4	Very worth it

Design Expert Validation	1 Lecturer	92.9	Very worth it
Media Expert Validation	1 Lecturer	94.0	Very worth it
Friends Test colleague	3 Master	96.9	Very worth it
Trials Small Group	6 Participants educate	94.5	Very worth it
Trials Group Big	30 Participants educate	95.4	Very worth it

### Revision Product

. Revision of development research product, e-module development based-differentiation acid bases material, was done 2 (two) times, as following:

Revision I is revision after validation expert . Validation results from material expert, design expert and media experts, there is no revision. But any suggestions given by colleague related size comic letter. The following picture is revision *draft 1*.

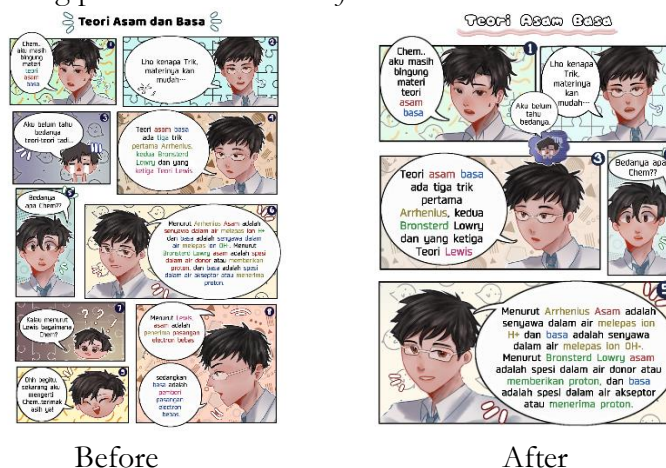


Figure 3 Result of Revision I

Revision II is revision based on suggestion and feedback from participant on small trials group. Some suggestions and input are changing color and giving icons on the material menu . Revision II result is presented in the following table .

Table 12 Results of Revision II

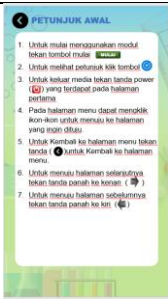
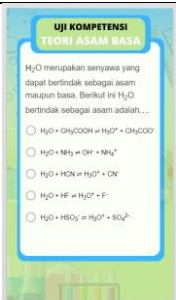



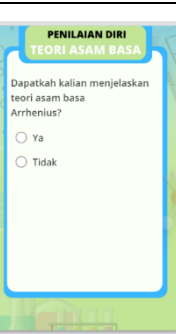
No	Revisi on	Before	After
----	-----------	--------	-------


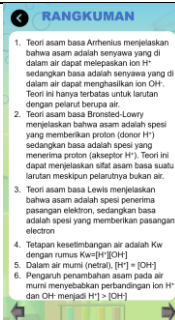

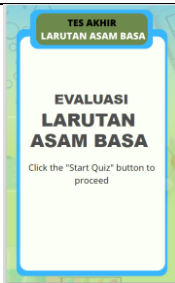


1. Main menu display			3. Material menu display animation		
2. Appearance material menu page			4. on matter reading only writing		


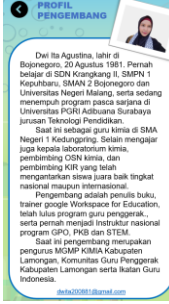
The final product is results of development of e-module based differentiation acids and bases solution material. E- module will be used in supporting acids and bases material learning. The following is study of final product of the e- module.

Table 4.13 Final Product Review

No.	Page	Picture	Information	No.	Page	Picture	Information
1	Opening Page		Opening page is page consist of title of e-module and contained knob start, circle with arrow usually used as hint icons and buttons indicated exit with the power symbol.	9	Material Comic		This material is appropriate for students who like visual display

2	Instructions page		Instructions page is containing instruction of using e-module. Instructions page clarifies existing icon function in the e-module .	10	Competency Test		Each sub-subject consist of competency test to measure the student's ability
3	Main page		main page contain about the menus: preface , glossary , introduction , material , summary , evaluation , bibliography and developer profile	11	Key answers and discussion		Answers and discussion provided for student in order to study more
4	Material		this page is the main content of the e-module . On the page, there are four main material discussed in the e-module .	12	Evaluation Self		Self-evaluation can be found in each sub-topic of discussion .

5	Material menu		Every material shows menu page that contains objective of learning, material in form of texts / readings, videos, simulations, comics, competency tests, discussions and self-assessments.	13	Summary		Summary contains material summary from all part of acids and bases solution material
6	Material in form reading		This material is appropriate for students who like reading	14	Evaluation Page		Evaluation page is page used to measure the ability of students in mastering e-module. In this page, there is key answer to know the correct answer of the evaluation
7	Material in video form		This material is appropriate for students who like watching and listening	15	Bibliography		this page contain of book and other libraries that play a role in e-module development.

8	Material simulaton	 <p>This material is appropriate for students who like trying (learning by doing)</p>	16	Profile Developer	 <p>Profile page contain of profile of developer of e- module based difference in acids and bases solution material</p>
---	--------------------	--	----	-------------------	--

## Conclusion

Based on research results and data analysis, the conclusions is as following:

1. Based on results of material, design, and media appropriateness trials, e- module based difference in acids and bases solution material is very worthy to used.
2. Based on colleague response, e- module based difference in acids and bases solution material is very worthy to used.
3. Based on participant response of both from small trial group and big trials group show e- module based differentiation in acids and bases solution material is very worthy to used

## References

- Arikunto, Suharsimi. *Prosedur Penelitian Suatu Pendekatan Praktek*. Yogyakarta: Rineka Cipta, 2013.
- Asrori, Mohammad. *Psikologi Pembelajaran*. Bandung: Wacana Prima, 2007.
- Branch, Robert Maribe. *Instructional Design The ADDIE Approach*. London: Springer New York Dordrecht Heidelberg London, 2009. <https://link.springer.com/book/10.1007/978-0-387-09506-6>.
- Faiz, A., Pratama, A., & Kurniawaty, I. "Pembelajaran Berdiferensiasi dalam Program Guru Penggerak pada Modul 2.1." *Jurnal Basicedu* 6, no. 2 (2022): 2846-2853. <https://doi.org/10.31004/basicedu.v6i2.2504>.
- Fatirul, Achmad Noor dan Winarto, Bambang. *Bahan Ajar Instructional Development Desight*. Surabaya: Adibuana University Press, 2022.
- Firmandari, Sri. Fatirul, N.A., & Waluyo, D.A. "Pengembangan E-Modul berbasis PTT Interaktif Dengan Model ADDIE Menggunakan Google Classroom." *JEMS (Jurnal Edukasi Matematika dan Sains)* 10, no. 1 (2022): 9-14. <https://creativecommons.org/licenses/by-sa/4.0/>.
- Kementerian Pendidikan dan Kebudayaan. *Panduan Praktis Penyusunan E-modul*. Jakarta: Direktorat Pembinaan Sekolah Menengah Atas Dirjen Pendidikan Dasar dan Menengah Kementerian Pendidikan dan Kebudayaan, 2017.
- Moore, John T. *Kimia for Dummies*. Klaten: Pakaraya, 2008.



- Puspitasari, V, Rufi'I, Waluyo, J. "Pengembangan Perangkat Pembelajaran Dengan Model Diferensiasi Menggunakan Book Creator Untuk Pembelajaran Bipa Di Kelas Yang Memiliki Kemampuan Beragam." *Jurnal Pendidikan dan Pembelajaran Sains Indonesia* 4, no. 2 (2020). <https://doi.org/10.23887/jppsi.v4i2.38498>.
- Rusli, M., Hermawan D. & Supuwuningsih, NN. *Multimedia Pembelajaran yang Inovatif Prinsip Dasar & Model Pengembangan*. Yogyakarta: ANDI, 2017.
- Sudjana, Nana dan Ahmad Rivai. *Teknologi Pengajaran*. Bandung: Sinar Baru Algensindo, 2007.
- Sugiono. *Metode Penelitian dan Pengembangan*. Bandung: Alfabeta, 2017.
- Suryani, N., Setiawan, A., & Putria. *Media Pembelajaran Inovatif dan Pengembangannya*. Bandung: Remaja Rosdakarya, 2018.
- Tomlinson, Carol A & Mc.Tighe, J. *Integrating differentiated instruction and understanding by design: connecting content and kids*. Alexandria, VA: ASCD, 2006.
- Tomlinson, C. A. *How to Differentiate instruction in mixed-ability classrooms 2nd Ed*. Alexandria, VA: ASCD, 2001.