JPMIPA, 22 (1), 2021, 35-44

Jurnal Pendidikan MIPA

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jurnal.fkip.unila.ac.id/index.php/jpp/

The Development of Plant E-Atlas for Acid-Base Test Indicators as Supporting Teaching Materials During the Covid-19 Pandemic

Raddina Aprilia Putri*, Endang Susantini, Titik Taufikurohmah

Postgraduate School of Science Education, State University of Surabaya, Indonesia.

Abstract: This research is a type of research and development. Plant E-Atlas for Acid –Base Test Indicators was developed with the aim of being used as interactive teaching material especially in the online learning process during the Covid-19 pandemic. The E-Atlas development procedure uses the Dick and Carrey model. Eligibility Levels of the E-Atlas are evaluated based on the assessment of experts and field practitioners. The effectiveness of the practicality of the E-Atlas is analyzed based on the responses of the E-Atlas users. The respondents were students at the grade X SMK Kesehatan Yannas Husada Bangkalan SMK. The average feasibility score of the E-Atlas is 90.18% with very valid criteria and 89.08% with reliable criteria. Practicality of the E-Atlas obtained an average score of 86.10%. The results of research and development of the E-Atlas show that the E-Atlas designed can be used to support online learning. In addition, the results of the assessments of experts, educational practitioners, and respondents show that the E-Atlas contains content to train Scientific Reasoning Skill.

Keywords: Plant E-Atlas, online learning, scientific reasoning

Abstrak: *Penelitian ini merupakan jenis penelitian dan pengembangan (RnD). E-Atlas Tumbuhan Indikator Uji Asam-basa dikembangkan dengan tujuan untuk digunakan sebagai bahan ajar interkatif , khususnya pada proses pembelajaran online. Prosedur pengembangan E-Atlas menggunakan Model pengembangan Dick and Carrey. Tingkat Kelayakan E-Atlas dievaluasi berdasarkan penilaian para ahli dan praktisi lapangan. Keefektifan kepraktisan E-Atlas dianalisa berdasarkan respon dari para pengguna E-Atlas. Responden dalam penelitian ini adalah siswa kelas X SMK Kesehatan Yannas Husada Bangkalan. Rata-rata skor kelayakan E-Atlas adalah 90,18% dengan kriteria sangat valid dan 89,08% dengan kriteria reliabel. Kepraktisan E-Atlas memperoleh skor rata-rata 86,10%. Hasil penelitian dan pengembangan E-Atlas menunjukkan bahwa E-Atlas yang dirancang dapat digunakan untuk mendukung pembelajaran online. Selain itu, hasil penilaian para ahli, praktisi lapangan, dan responden menunjukkan bahwa E-Atlas memuat konten untuk melatih scientific reasoning skill.*

Kata kunci: *Plant E-Atlas, pembelajaran online, penalaran ilmiah.*

▪ INTRODUCTION

The learning process makes an important contribution in transferring knowledge. Teachers are the forefront of supporting the learning process. Meanwhile, schools are places that facilitate teaching and learning activities (Rahmawati et al., 2020). The direct interaction between teachers and students that occurs in school and the application of learning models and materials are aspects that affect the quality of the learning process (Saraswati & Mertayasa, 2020). However, 2020 will give a new color to the world of education. The global COVID-19 outbreak has revolutionized all aspects in various fields, including health, social, economic, and education. The governments of several countries require the public to pay attention to health protocols, such as social

Raddina Aprilia Putri et al.
*Corresponding Email:
raddina.109016@mhs.unesa.ac.id

DOI: http://dx.doi.org/10.23960/jpmipa/v22i1.pp35-44
Received: 01 March 2021
Accepted: 04 April 2021

distancing to reduce the spread of COVID-19. This rule disrupts the normal functioning of learning in schools and universities (Reimers et al., 2020). The application of social distancing requires that learning activities in schools be replaced with technology-based online learning which is carried out in the homes of each student. The online learning process has big differences in subjects that contain practicum activities or other psychomotor activities.

Chemistry is one of the subjects that cannot be separated from practicum activities in the laboratory. The process of practicum activities can train students to build cognitive structures so that the material being studied becomes more meaningful (Mulatsih, 2020). The online learning process which is implemented in 2020, makes it difficult for students to carry out practicum in the laboratory. This policy will have an impact on the process of achieving psychomotor competence, especially the ability to do practicum (Frima et al., 2020). In line with this, the ability of students to obtain meaningful learning through the process of proving a theory that has been learned will be disrupted. Basically, the online learning process is not only conveying material and assignments through modules. However, interactive teaching materials are needed that can indirectly bridge the delivery of information from a teacher to students (Giatman et al., 2020). E-Atlas is the right choice to be used as an online learning solution in chemistry subjects (Guidote, 2020).

Atlas is one of the teaching materials that provides a variety of explanations accompanied by color images. Atlas can be used as a source of support for practicum activities as well as media for confirmation in carrying out the analysis process for problem solving (Kusuma et al., 2018). E-Atlas is one of the processes of developing Electronic Atlas teaching materials which are packaged in an application format (Setiawati et al., 2019). Plants E-Atlas of Acid-Base Test Indicator is an example of an atlas within the scope of scientific studies that can be used in the learning process. Acid-Base Test Indicator Plant E-Atlas is an example of developing an Atlas to facilitate the online learning process in chemistry subjects. The E-Atlas of Acid-Base Test Indicator Plants is one of the teaching materials which not only contains various explanations and theories, but is equipped with simple experimental procedures accompanied by interactive images.

The Acid-Base Test Indicator Plant E-Atlas presents several plants that have potential as natural indicators and are equipped with their morphology and phytochemical content. In addition, E-Atlas also presents methods for doing simple practicum that can be done at home. The features presented in the Plant E-Atlas of Acid-Base test indicators can indirectly facilitate the online learning process during the COVID-19 pandemic. Through the Acid-Base Test Indicator E-Atlas, students can get information related to acid-base theory, plants that have potential as natural indicators, as well as simple practicum procedures for testing acid-base compounds using plants. Basically, an Atlas is a teaching material that serves to increase understanding of concepts and direct students to higher-order thinking (Lestari, 2016).

The development of a Plant E-Atlas that can be an Acid-Base test indicator is a teaching material needed in the implementation of the online learning process during the COVID-19 pandemic. Application of the Plant E-Atlas Acid-Base test indicator can help students to continue to train and develop skills to do practicum, even though they do not do it in the school laboratory. The use of E-Atlas teaching materials for Acid-Base test indicators, indirectly will also lead students to practice scientific reasoning

skills. This is possible because in the development of the E-Atlas it also contains features to train students' scientific reasoning skills.

▪ METHOD

This research is a Research and Development (RnD). The development design used is the Dick and Carrey Model which has 10 stages. The research design applied is a one-shot case study, namely by processing and analyzing the results of student responses and student learning outcomes. The research and development process of E-Atlas: Plant Acid-Base Test Indicators was carried out for approximately 6 months, from June 2020 to November 2020. The population in this study were students of SMK Kesehatan Yannas Husada Bangkalan. The sample used was class XA students. The research and development process is carried out in the 1st semester of the 2020/2021 school year. The development procedure is adjusted according to each stage of the Dick and Carrey (2015) development model.

The Ten stages of the Dick and Carrey development model are described as follows: **Formulating General Learning Objectives.** This stage refers to the elaboration of KI (Core Competencies) and the selection of KD (Basic Competencies) which are closely related to the practicum process in the laboratory. In this study, the selected KDs are described below. KD 3.4 Understand the properties of acid, base and salt with several indicators. KD 4.4 Shows the properties of acidic, base, and salt with several indicators. **Performing Learning Analysis.** The purpose of the learning analysis stage is to determine the extent to which the skills and abilities will be trained and developed. This, can be reached by formulating Indicators and Learning Objectives, based on Core Competencies and Basic Competencies. **Conducting Student Characteristics Analysis.** This stage refers to the process of identifying students' cognitive characteristics and abilities. The main purpose of this third stage, to design the presentation of the material in the product being developed; so that it can be accepted by students' thinking abilities. **Formulating Specific Goals.** At this stage, the specific goals formulated are the goals that you want to achieve after using the developed product. The specific purpose formulated is to train students' skills in carrying out the practical process and scientific reasoning of students, especially during the COVID-19 pandemic after being given an Atlas: Plant Acid-Base Test indicators. **Developing Assessment Instruments.** The assessment instrument developed refers to the specific objectives to be trained or achieved. **Developing Learning Strategies.** Learning strategies are chosen to support the achievement of product application in achieving specific goals. **Developing and Selecting Learning Materials.** This stage designs the learning implementation process, such as the preparation of lesson plans and syllabus. **Designing and Implementing Formative Evaluations.** Formative evaluation aims to collect data related to the strengths and weaknesses of the product being developed. In addition, it is also based on the results of student responses. **Revising Learning Materials.** This stage aims to improve the products developed in accordance with the results of validation by validators and responses from respondents. **Designing and Implementing a Summative Evaluation.** Summative evaluation aims to assess the effectiveness of the product being developed, such as the results of training on special abilities from samples after the application of the developed product. In this study, summative evaluation was shown to determine the level of effectiveness of the Atlas of Plants Acid-Base Test Indicator to train students' skills in practicing and scientific reasoning.

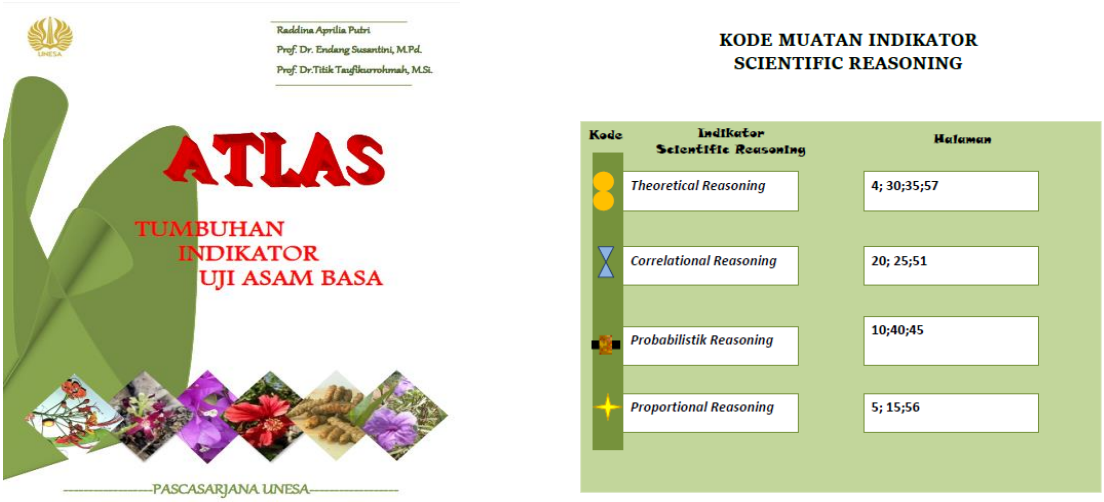
The data analysis technique used to obtain the main picture of the product being developed as well as student learning outcomes tests and practical skills tests are described as follows. **Data analysis techniques for device validity.** This analysis technique is aimed at measuring the feasibility of learning devices, especially the products being developed. The devices that have been validated by the validator are calculated. Meanwhile, The reliability test used in this research and development is the Borich formula (Percentage Agreement). The test reliability in order to determine the extent to which the product can be trusted. **The developed product practicality analysis technique**. The practicality of the product developed refers to Formula 3.1 and Formula 3.2 used to determine the average percentage.

▪ RESULT AND DISCUSSION

Development of the Plant E-Atlas for Acid-Base Test Indicators is focused on testing materials for acid-base compounds using various indicators, especially natural indicators. Plants that have a fairly striking color can be used as a natural indicator to test acid-base compounds (Andarias, 2018). The following are some of the plants presented in the Plant Atlas of Acid-Base Compound Indicators as potential natural indicators. Flamboyant (*Delonix regia*), Red Spinach (*Amaranthus tricolor*), Four o'clock flowers (*Mirabilis jalapa L*), Mulberry (*Morus alba*), Turmeric (*Curcuma longa L*), Hibiscus Flower (*Hibiscus rosa sinensis*), Reulia Flower (*Reulia simplex*), Bougenvil Flower (*Bougenvilleas spectabilis willd*), Dragon Fruit (*Hylocereus undatus*), Belimbing Wuluh (*Averhoa bilimbil L*), Purple Cabbage (*Brassica oleracea va. Capita L*).

The Plant E-Atlas for Acid-Base Test Indicator is one example of the form of innovation and development of several types of atlases in general. Basically, Atlas only contains social studies-based content such as the geographical location of a place (Hong & Lee, 2016). The Plant E-Atlas Acid-Base Test Indicator provides a variety of information regarding the scientific classification, morphology, and phytochemical content of several plants that have potential as natural indicators. The scientific information presented in the Atlas refers to the application form of the botanical Atlas (Wulansari, 2015). Some of the other features presented in the Plant E-Atlas of Acid-Base Test Indicators are the procedure and results of testing for acid-base compounds from several natural indicators.

The features presented in the Acid-Base Indicator E-Atlas are very effective in helping students understand the acid-base compound testing material during online learning. In line with this, students can also carry out simple experiments through the experimental procedures presented in the Acid-Base Test Indicator Plant E-Atlas. Basically, Atlas is one of the teaching materials that presents a variety of images with very informative exposure and can be used as a supplement for practicing (Kusuma et al., 2018). E-Atlas is an example of teaching materials that can make it easier for students to understand material without intensive guidance from the teacher (Setiawati et al., 2019).



(a) (b)

Figure 1. (a) E-Atlas home/front page (cover)**,** (b) Scientific reasoning indicator features

The front page of Plant E-Atlas of the Acid-Base Test Indicator presented in Figure 1(a) indirectly provides information to students that certain plants can be used as natural indicators. Besides being designed based on the Atlas Botany concept, the various information presented in the Atlas is also packaged by paying attention to four indicators from scientific reasoning. Based on Figure 1(b), there are four indicators of scientific reasoning that are presented in the Plant E-Atlas of Acid-Base Test Indicator. Based on this, the Atlas can basically be used as a reference basis for practicing reasoning skills (Fitriyati et al., 2017).

Figure 3. Whole image of plant morphology as potential natural indicators

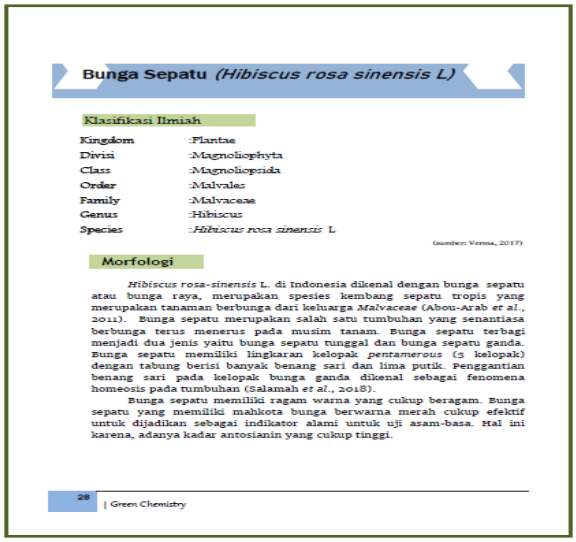


Figure 4. Description of scientific classification and plant morphology as potential natural indicators

The variety of scientific information presented in the Plant E-Atlas of Acid-Base Test Indicators, besides aiming to convey material about acid-base testing with several indicators. The E-Atlas of Acid-Base Test Indicators also aims as a teaching material

that helps students to learn meaningfully. The presentation of various features, such as complete images of natural indicator plants, classification, morphology, and supported by phytochemical studies contained in these plants, will provide a variety of in-depth information for students (Solika et al., 2017). Figure 2 shows the intact morphology of a plant tree that has potential as a natural indicator. Presentation of pictures of whole trees from plants that have the potential as natural indicators can help students to recognize and find out the shape of these plants. In Figure 3, students will be brought to know more about scientific classification and descriptions of plant morphology as potential natural indicators. The presentation of the information in Figure 4 will help students to find out the characteristics of plant parts that have the potential as natural indicators. In line with this, it is supported by the presentation of Figure 5, so that students can analyze the reasons why these plants can be used as natural indicators.

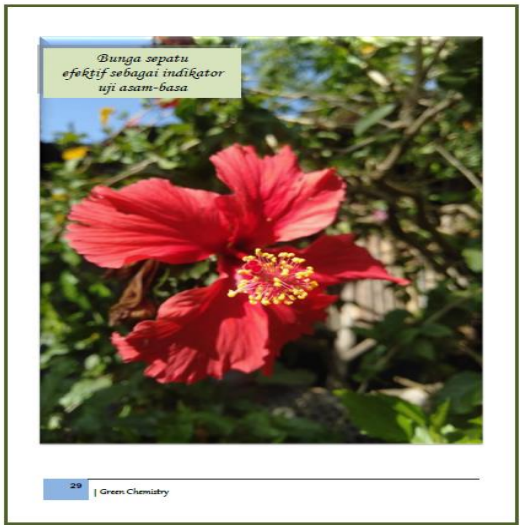


Figure 4. Part of the Hibiscus flower, which is effective as a natural indicator

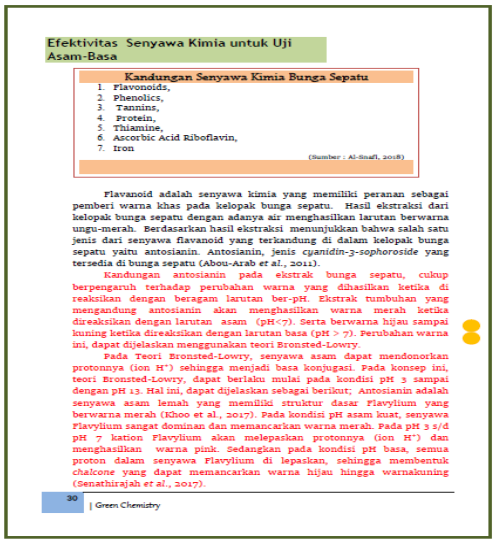


Figure 5. Description of the phytochemical content of Hibiscus flowers and its effectiveness as natural indicators

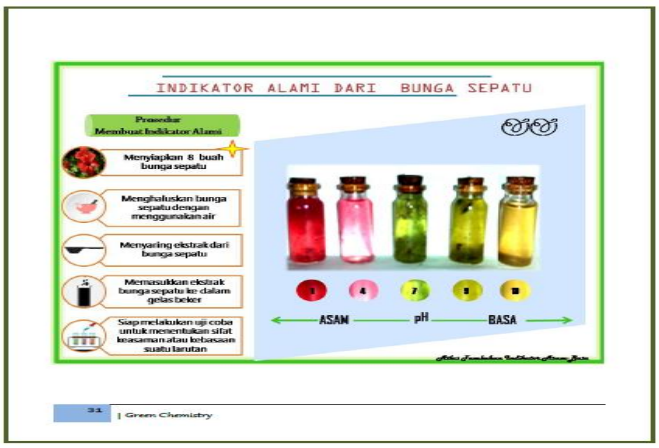


Figure 6. The Procedure for Making Natural Indicators from Some Plants

Learning during the Covid-19 pandemic requires science teachers, such as chemistry teachers to pay attention to students' psychomotor abilities in carrying out

practicum activities. Presentation of the experimental procedure as shown in Figure 7 will make it easier for students to conduct acid-base compound test experiments in their respective homes. The use of the Acid-Base Test Indicator Atlas is one of the bases of reference for providing information to students that the experimental or practicum process does not always use chemicals. Plants as natural indicators of acid-base tests can provide in-depth information to students to take advantage of natural materials that are easily found in the surrounding environment, either in testing compounds or solutions that are assumed to be acid-base (Kurniati et al., 2017).

The quality of the development of the Plant E-Atlas Acid-Base Test Indicator will be evaluated based on the evaluation of the validator (experts and field practitioners) as well as the assessment of Atlas users. The validity test can provide very useful information for assessing the quality and feasibility of an instrument (Md Ghazali, 2016)Teaching materials can be widely used after going through the validation process and meeting the validity standards of experts and field practitioners (Fidyah, 2016). The level of validity and reliability of the Plant E-Atlas of Acid-Base Test Indicators presented in Table 1 shows very valid criteria with a score of 90.18% and also reliable with a score of 97.62%. The seven main aspects to assess the feasibility level of the Plant E-Atlas of Natural Acid-Base Test indicators include Front Page, Topic, Image Presentation, Language Feasibility, Characteristics of Scientific Reasoning Skills, Feasibility as Online Learning Teaching Materials, and the feasibility of Presentation of Material.

Table 1. Recapitulation of E-Atlas feasibility data validation of plant indicators for acid-base compounds test

No.	Assessment Aspects	Average Assesment Score	
		Validity (%)	**Reliability (%)**
1	Front page	91.67	85.71
2	Topics	91.67	83.81
3	Image Presentation	91.67	90.48
4	Language Eligibility	83.33	95.24
5	Characteristics of Scientific Reasoning Skills	93.05	88.10
6	Content eligibility	91.67	97.14
7	Feasibility of Material Presentation	87.50	97.62
	Average	90.18	89.08
	Criteria	Very Valid	Reliable

The aspects of the feasibility assessment are presented in Table 1 showing their relationship with the main components of the Atlas preparation. Basically, the preparation of an Atlas according to Wahyuninditas (2016) must comply with the following components, namely; Title, Foreword, Table of Contents, Instructions for Use of Atlas, Contents of Atlas (Variety of Photos / Pictures and their descriptions), Bibliography, and Glossary. Based on the results of the assessment of the validators, it shows that the Plant E-Atlas of Acid-Base Test Indicators has a characteristic load of Scientific Reasoning Skills. As well as the feasibility of presenting the content on the E-Atlas can be used as teaching material that can be applied to the online learning process. Teaching materials that can be used to support online learning should actually present a series of solutions that can improve students' cognitive and psychomotor skills (Mulatsih, 2020). The high feasibility score obtained in the presentation of the

characteristics of the Scientific Reasoning Skill shows that the Plant E-Atlas of Acid-Base Test Indicators can train students' cognitive as well as psychomotor skills. Scientific Reasoning Skill is a logical reasoning ability that can be used to support the learning process in various conditions (Bao et al., 2018). The average scientific reasoning ability is still low. During this pandemic, students' scientific reasoning skills also need to be improved (Fischer et al., 2014). Students who have moderate or high scientific reasoning skills can be used to solve scientific problems logicall. The development of scientific reasoning skills on science material has been shown to be a better predictor of student success in understanding science concepts, such as acid-base material (Kambeyo, 2017). In line with this, it indicates the teacher to apply an E-Atlas such as the Acid-Base Test Indicator Plant E-Atlas in the online learning process.

The E-Atlas of Acid-Base Test Indicator Plants developed can be known for their effectiveness as supporting teaching materials during the Covid-19 pandemic through the results of responses from class X students from SMK (Vocational Schools). The results of student responses to determine the level of effectiveness of the Plant E-Atlas of Acid-Base Test Indicators which are presented in Table 2 show an average score of 86.10%. In line with this, it shows that the criteria of the practical level of the E-Atlas Plant Acid-Base Test Indicator are very practical and in accordance with the needs of students.

Table 2. Recapitulation of E-Atlas practicality data for acid-base test indicators

No	Assessment Aspects	Statement Item Number	Practicality Level (%)
1	Display Presentation	1,2,6	90.00
2	Content Presentation	3,4,5,7,14	85.33
3	Scientific Reasoning Characteristics	8,9,10,11,12,13,15,16,17	82.96
Average			86.10
Criteria			Very Practical

The practicality of the Acid-Base Test Indicator Plant E-Atlas shows that students need interactive teaching materials to help students understand the learning material. Giatman et al. (2020) explain that teaching materials designed with attention to the content of training in understanding concepts and psychomotor skills can help teachers to convey information indirectly to students. The development of the Acid-Base Test Indicator Plant E-Atlas greatly helps students to understand the concept of testing acid-base compounds in different ways and is very effective for students. Based on the question indicator on the aspect of content presentation assessment and scientific reasoning characteristics, it shows that the Plant E-Atlas of Acid-Base Test Indicators is a teaching material for scientific study. Hong & Lee (2016) emphasized that Atlas is an interactive teaching material that presents information related to scientific phenomena.

The various features available in the Acid-Base Indicator Plant E-Atlas are the main key as teaching materials that can be applied during the Covid-19 pandemic. The low form of direct interaction between teachers and students requires the use of teaching materials that can bridge it (Chen et al., 2020). E-Atlas of Plants The acid-base test indicator can be the answer to several things that are urgently needed in the online learning process during the Covid-19 pandemic. This assumption is supported by the results of the validity of the validators and the responses of students as potential users of the Acid-Base Test Indicator Plant E-Atlas.

▪ CONCLUSION

Research and development of the Acid-Base Test Indicator Plant E-Atlas shows that the E-Atlas designed can be used to support online learning. In addition, the results of the assessments of experts, educational practitioners, and respondents show that the Plant E-Atlas of Acid-Base Test Indicators contains Scientific Reasoning Skill content. Plant E-Atlas of Acid-Base Test Indicator get a high level of validity and reliability. The average score of the validity of the E-Atlas is 90.18% and the average score of reliability is 89.08%. Meanwhile, the level of E-Atlas practicality based on the respondents' assessment showed an average score of 86.10%.

▪ REFERENCES

Ananda Saraswati, N. L. P., & Mertayasa, I. N. E. (2020). Chemistry practicum learning during the covid-19 pandemic: Qualitative content analysis of the trends in the utilization of online technology. *Wahana Matematika Dan Sains: Jurnal Matematika, Sains, Dan Pembelajaran.*, *14*(2), 144–161.

Andarias, S. H. (2018). Potential of plant organs as acid-base indicators. *Sang Pencerah*, *4*(2), 64–69.

Bao, L., Xiao, Y., Koenig, K., & Han, J. (2018). Validity evaluation of the Lawson classroom test of scientific reasoning. *Physical Review Physics Education Research*, *14*(2), 20106.

Chen, K., Chen, Y., Ling, Y., & Lin, J. (2020). The individual experience of online chemistry teacher education in China: Coping with COVID-19 pandemic. *Journal of Chemical Education*, *97*(9), 3265–3270.

Dick, W., & Carey, L. (2015). *The Systematic Design Of Instruction* (Eight Edit). Pearson. www.ablongman.com.

Fidyah, A. I. (2016). Development of an atlas of fern flora As A Means Of Identification. *Jurnal Berkala Ilmiah Pendidikan Biologi*, *5*(3), 327–332.

Fitriyati, I., Hidayat, A., & Munzil. (2017). Development of IPA Learning Tools to Improve High Level Thinking Ability and Scientific Reasoning of Junior High School Students. *Jurnal Pembelajaran Sains*, *1*(1), 27–34.

Fischer, F., Kollar, I., Ufer, S., Sodian, B., & Hussmann, H. (2014). Scientific Reasoning and Argumentation: Advancing an Interdisciplinary Research Agenda in Education. *Scientific Reasoning and Argumentation: Advancing an Interdisciplinary Research Agenda in Education*, *2*(3), 28–45.

Frima, F. K., Novita, S., Nurfaizi, M. R., Widodo, R., & Husen, M. (2020). Application of Remote Practicum on the Topic of Microbial Growth in the Covid-19 Emergency at the Sumatra Institute of Technology. *Jurnal Pendidikan Sains (Jps)*, *8*(2), 102.

Giatman, M., Siswati, S., & Basri, I. Y. (2020). Online Learning Quality Control in the Pandemic Covid-19 Era in Indonesia. *Journal of Nonformal Education*, *6*(2), 168–175.

Guidote, A. J. M. (2020). Teaching college chemistry in the time of COVID-19 pandemic: A personal account of teaching in the old normal vs. the new normal. *Kimika*, *31*(1), 70–75.

Hong, J. E., & Lee, H. K. (2016). The Use of Middle School Atlases in the Social Studies Classroom in South Korea. *International Journal of Geospatial and Environmental Research*, *3*(1), 2.

Kambeyo, L. (2017). Scientific Reasoning Skills : a Theoretical Background on Science. *NERA Journal*, *14*(January 2017), 40–64.

Kurniati., T., Kurniasih., D., & S.M.D., P. (2017). The test of the dye on extracts of dragon fruit (Hylocereus polyrhizus) and cengkodok (Melastoma malabathricum) as a natural indicator. *Ar-Razi Jurnal Ilmiah*, *5*(1), 2503–4448.

Kusuma, R. D., Rohman, F., & Syamsuri, I. (2018). The Development of Atlas biodiversity based on local potential for vocational students majoring in Agriculture. *Jurnal*

Pendidikan, *3*, 296–301.

Lestari, T. P. (2016). Characteristics analysis of Dragon Fruit Extract Skin Betacyanin Of Hylocereus Polyrhizus and Hylocereus Undatus with test of Stability Organoleptic Jelly as Atlas Media. *Jurnal Pendidikan Biologi Indonesia*, *2*(1), 78–87.

Md Ghazali, Nor Hasnida. 2016. "A Reliability and Validity of an Instrument to Evaluate the School-Based Assessment System : A Pilot Study." *International Journal of Evaluation and Research in Education* 5(2):148–57.

Mulatsih, B. (2020). Penerapan aplikasi google classroom , google form , dan quizizz dalam pembelajaran kimia di masa pandemi Covid-19 Application of Google Classroom , Google Form and Quizizz in Chemical Learning During the Covid-19 Pandemic. *Ideguru: Jurnal Karya Ilmiah Guru*, *5*(1), 16–26.

Rahmawati, N. R., Rosida, F. E., & Kholidin, F. I. (2020). Analysis of basic learning during pandemi In Madrasah Ibtidaiyah. *SITTAH: Journal of Primary Education*, *1*(2), 139–148.

Reimers, F., Schleicher, A., Saavedra, J., & Tuominen, S. (2020). Supporting the continuation of teaching and learning during the COVID-19 pandemic. Annotated resources for online learning. *OECD* 1–38.

Setiawati, D. A., Setiati, N., & Pribadi, T. A. (2019). The development of E-Atlas learning media based on mobile learning on cells structure concept. *Journal of Biology Education*, *8*(1), 15–25.

Solika, M., Wisanti, & Rachmadiarti, F. (2017). The development of Plant Diversity Atlas: Fabales, Apocynales, and Magnoliales as A Means of Identification. *Bioedu. Berkala Ilmiah Pendidikan Biologi*, *6*(1), 21–30.

Wahyunindita, V. (2016). The development of Flora diversity Atlas in State University of Surabaya as a means of identification. *BioEdu, 5*(3), 344-351.

Wulansari, L. D. (2015). The Development of Plant Diversity Atlas: Euphorbiales, Myrtales, And Solanales as A Means of Identification. *BioEdu*, *4*(3), 21–30.