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Development of Assessment for Learning Through the Educandy Application for High Schools Biology Learning

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ABSTRACT

This research-based paper specifically aims to develop, describe and analyze and implement student assessment design products at the secondary school level which are integrated with digital education technology for learning biology with assessment for learning (AFL) format. In this study, the developed AFL design product was resulted in a valid and steady conclusion and became an alternative solution that could be implemented in the post-covid-19 pandemic for high school biology learning. This development research employs the ADDIE model which consists of analysis, design, development, implementation and evaluation stages. The chosen subjects of assessing the AFL design and instruments are lecturers of educational evaluation subject and three expert lecturers consist of one evaluation expert, one media expert, and one biological content expert. Such formulated review and input from expert lecturers serve as a validation of the AFL design instruments and products. In this research-based paper, the researchers describe how the process of making and assessing the feasibility of AFL for high schools biology learning and its implementation when submitted to the Subject Teacher Forum (STF) of Natural Sciences Subject in Subrayon 5 Gunung Halu, Cililin District, West Bandung Regency. Based on the findings of research and development of AFL biology learning in high schools in forms of assessments among the media experts, material experts, teacher evaluation and experts responses, as well as the results of implementation observations in the field, it can be concluded that AFL Biology learning with Educandy application is declared "feasible and effective" to be utilized in the learning process for high schools. The implication of such formulated research is to provide an alternative integrative learning approach for biology learning through the use of AFL Educandy for post-covid-19 pandemic learning.

Keywords: *assessment for learning, educandy, high schools biology learning*

INTRODUCTION

The development of science and technology in the era of globalization which is growing rapidly in this century, as well as the need for technology in the learning process are crucial matters that teachers shall be be able to innovate using technology in learning, and conducting any variety of assessments. Such factual technological change requires teachers to possess a deeper understanding on digital pedagogy, this is because there is a need for the integration of technology during the teaching and learning process in accordance with the latest developments in education. Teachers and students across the globe have profoundly entered the digital climate where most educational activities and related matters cannot be separated from the influence of digital technology applications. The attitudes and behavior of students in daily life including those related to the assessment carried out are also affected by the digital climate. The importance of mastering information and communication technology that is integrated with learning for

prospective biology teacher students (Maryanti, 2017). So far, prospective biology teacher students are mostly directed to develop teaching materials that are integrated with digital technology. Assessment is an integral part that cannot be separated in the learning process, so prospective biology teacher students need to master the techniques and how to make assessments that are integrated with digital technology.

Assessment can be defined as the collection of evidence carried out intentionally, structured, systematically, and continuously and is used to assess student competencies that have been achieved during the learning processes. Assessments are used by students, parents and teachers to receive feedback on improving outcomes. Assessments can also assist teachers in making decisions about student needs, and guide the planning of learning programs. Therefore, the assessment becomes evidence of student learning outcomes from daily activities and becomes an integrated part of the teaching and learning process program. Students shall change passive learning behavior in acquiring knowledge to become active learners and this is based on his book J.Gardner, 2012. The learners become more aware when they are learning, and when they are not. One class, which was later taught by a teacher who did not emphasize assessment for learning, surprised the teacher with students complaining: " look, we told you we didn't understand this. But, why did you go to the next topic?". Based on such obvious issue, it is therefore argued that assessment for learning is necessary in order to anticipate misunderstandings during the learning process. Assessment literacy has an understanding as an ability to understand the principles of assessment. As the nature of science exists as a product and as a process, in the assessment of learning there is an assessment of the product or learning outcomes and the assessment of the learning process. Assessment of the learning process is known as assessment (Rustaman, 2005) The unification of assessment in learning will be in a good position if the teacher has good assessment literacy, because the teacher will be able to choose and implement appropriate forms of assessment, in accordance with learning (Volante & Fazio, 2007). Electronic assessment offers solutions that can train students' skills in accordance with the development of information and communication technology (Gathuri, Luvanda, Matende & Kumundi, 2014). To improve information literacy in the 21st century through the development of assessment for learning can be done by teachers. Because one aspect of teacher skills is mastering technology. Biology teacher candidates are the forerunners of biology teachers who in the future will teach and become biology teachers with the skills that must be possessed in accordance with 21st century skills. And therefore, the integrated content is made by biology students as an initial exercise in debriefing them to face digitalization. Assessment for learning the benefits of integrating assessment with teaching are clear and there is an emerging consensus in research for conditions for effective assessment, including frequent testing immediately after instruction, accumulated requests, and immediate feedback after testing, assessment is neglected in teacher education and there is evidence that the practice in schools today is far from these ideals.

One of the factors that support the technology-based learning process is using an application in the form of media that can increase student motivation thus they can stay focused on more conducive learning activities, namely by using e-learning-based learning media, e-learning is an example of the use of information technology and communication used to facilitate a learning process. The e-learning used is the educandy application. The application media is included in the online learning evaluation. The use of this application can be accessed individually and easily used as an assessment for learning and can be used as an interactive learning media. With the current technological facilities, especially the internet, making assessments can be made online through the educandy application. This application can be used to create quizzes, match / match, anagrams, random words, word searches, or grouping. This application contains 18 templates that can be accessed free of charge (Septiana, 2021). Educandy is a type of application that can create fun online games yet at the same time it possesses a direct evaluation material when the learning process takes place on the learning materials that have been delivered. The games

created are still in the context of learning yet it does not not make the learners get bored of learning because of the displayed variations (Lestari, 2020). Through this formulated educational game, Educandy allows the educators to create cool and fun interactive learning games in minutes. Students can directly enter the application without having to create an account and teachers can simply design learning by asking questions. The games made are still in the context of learning but cannot cause boredom. This game can be used when learning directly in class or indirectly or online learning. Games are usually liked by students when they feel bored, bored and stressed (Huang, 2013). Educandy application, different from previous applications, Educandy application has more interesting features and various games, evaluation is not only in the form of questions but can also be in the form of puzzle games, matchmaking, remembering, etc. Educandy is a web-based application that has the slogan "making learning sweeter". Educandy can be used to create fun online games (Lestari,2021). The existence of educational games makes learning more varied and also fun. Based on several references and interviews, this interactive game showed significant results and was very liked by students because it was very exciting, where the process is intended to send a link to be opened by students and then the students complete the task according to the given instructions, and the result turned out that students were more motivated to learn and wanted to keep learning. According to most students, learning while playing with gadgets is very fun. Educandy users can access their learning through the tutorials that have been provided. Figure 1 is the product of AFL results through the educandy application for high school students.

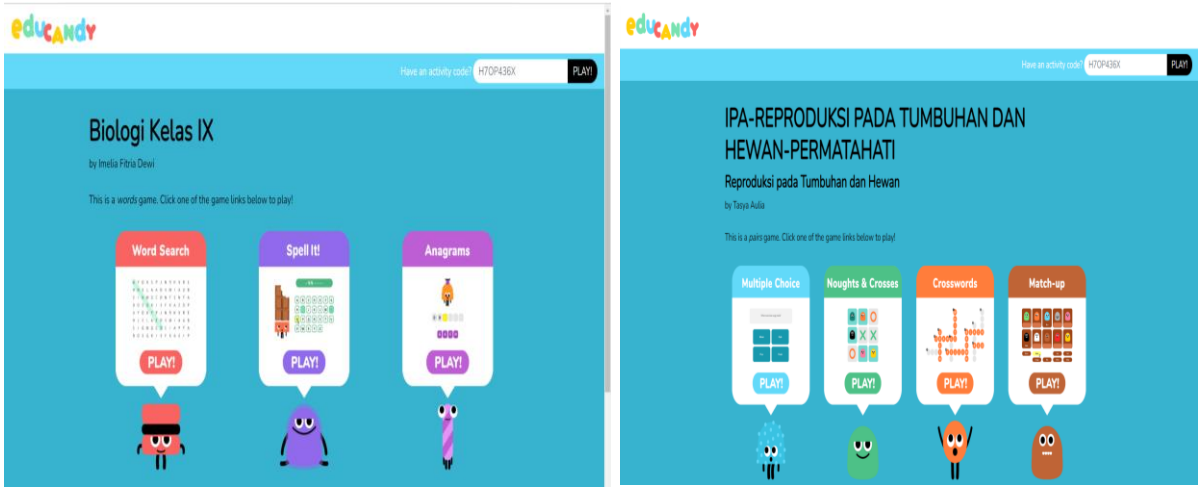

Figure 1. Examples of AFL products for high school biology learning with The Educandy Application

Teachers can also make their own content as assignments. While Educandy is almost the same as a web application or can be accessed via smartphones to create quizzes or games based on each material according to the content that will be created by the teacher. The type of game in educandy involves users, for example, the teacher can create unlimited interactive games. There are many features for making interactive learning materials and as assessment during the learning process and thus it is expected that it can help prospective teachers, especially biology students, to be able to equip the skills of prospective teachers in particular to equip assessment literacy for prospective biology teachers to produce assessment products for learning activities.

The product used is the output of biology education information technology and information development lectures. Digital technology plays an important role in the digital era, and has become an integrated part of education, changing the way students learn (Sa'adah, S.,2020). Biology teacher candidates are able to use ICT (Technology) Information and Communication) as a source learning, teachers are also required to be able to create creative learning and innovative and integrated with ICT (Maryanti, S., 2018). The target to be achieved in this course is after attending lectures on the development of technology and educational

informatics in biology learning with various methods and approaches, especially related to educandy, prospective biology teacher students have qualified abilities in developing skill competencies to utilize and create interactive and integrated modern communication information-based learning media and can apply it as an assessment especially assessment for learning for high school students to test the feasibility and quality of the developed media. The assessment for learning product through the Educandy application that has been collected will be carried out and applied to junior and senior high school students to be tested for the feasibility and quality of the product and thus it can be used as a reference for high school biology learning. Based on this background, a research has been conducted with the title "Development of Assessment For Learning through the Educandy Application for Biology Learning in High Schools". This research-based paper specifically aims to develop, describe and analyze and implement student assessment design products at the secondary school level which are integrated with digital education technology for learning biology with assessment for learning (AFL) format.

METHODOLOGY

This research-based paper is a type of Design and Development (D&D) research design which aims to produce an assessment for learning (AFL) product especially for biology learning in high schools. By using a descriptive method to determine physical development without using a strictly formulated hypothesis. Researchers develop an AFL product for high school biology learning through the educandy application. Research and development method is used to design learning products in the form of AFL which is used in learning biology through Educandy application. This learning product can be pre-existing which is then systematically refined to produce a learning product that meets certain standards, known as effective, efficient, and quality.

In simple term, "Research and Development" is defined as a research method that aims to seek, find, improve, develop, produce products, test products, until a standardized product is produced according to the established indicators. In other words as a research method that aims to "produce a superior product" which is preceded by "preliminary research" before the product is developed. This is performed to ensure that the developed product is the definite product that is needed (Yuberti. 2014). Through such formulated method, it is expected that the resulting learning product can meet certain standards, such as effective, efficient, and quality.

Effectiveness is a measure of product excellence in achieving learning objectives/competencies in accordance with criteria/indicators or learning completeness standards that have been previously set by schools, institutions, or the government. Efficient, meaning that the product developed is able to guarantee that in terms of time, cost, and energy required to achieve certain learning objectives/competencies, it is shorter, cheaper, and lighter when compared to using previous learning products. Quality, meaning that the products developed must meet industry standards from various aspects. In addition, one considerable matter from the quality aspect apart from meeting industry standards is the safety in using the product and it is not harmful to the health of users (Yuberti, 2014).

Design and Development are commonly used to study a process of design, development and evaluation with the aim of forming an empirical basis for creating products and tools for both learning and non-learning activities and creating or improving models that govern its development (Richey, R. C. 2014). The focus in D&D research includes analysis, planning, production, and/or evaluation. D&D research can also be referred to as a way of creating procedures, techniques, and or tools based on methodical analysis of a specific case.

The research procedure used by the researcher is based on the ADDIE model which stands for Analysis, Design, Development or Production, Implementation or Delivery, and Evaluations (Davis, A. L. (2013). The ADDIE model is a model that is considered more rational

and more complete than other models. Based on what has been described this development model can be used for various forms of product development such as models, assessment development, learning strategies, learning methods, media and teaching materials and can be applied in curricula that teach knowledge, skills or attitudes. The ADDIE model consists of 5 steps which can be described as follows.

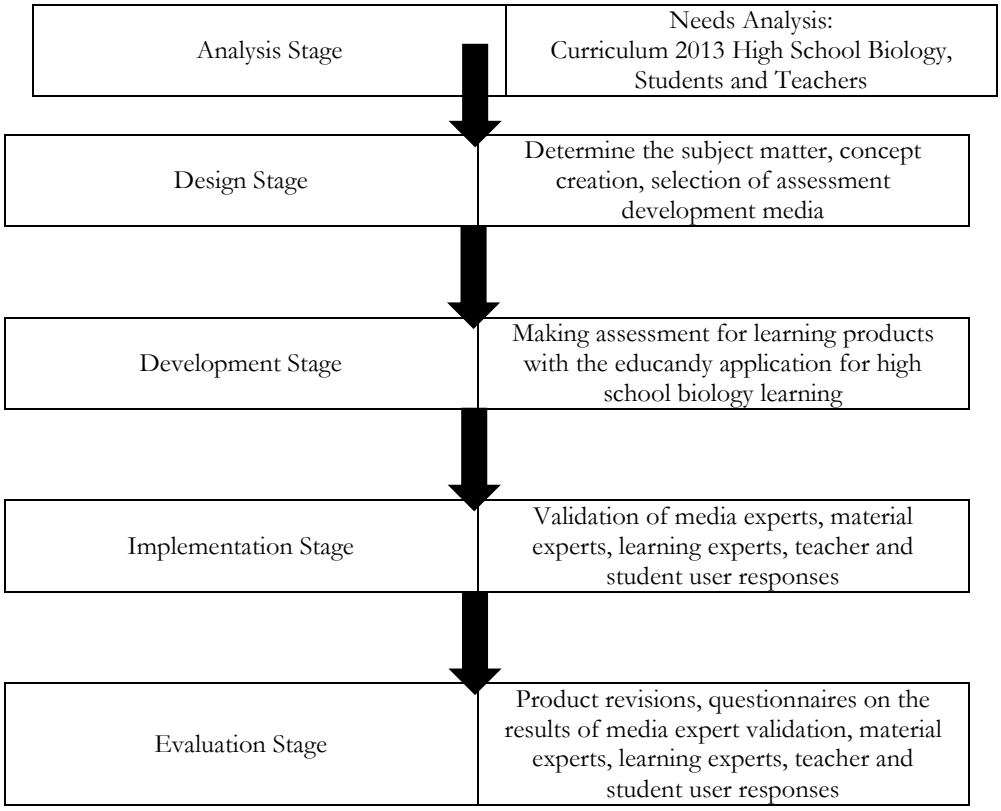

Figure 2. Research plan stages

The ADDIE model is one of the learning designs that has the point of view that learning occurs based on the context, and students form or construct their own learning as a function of their own learning experiences from various situations that have been done. (Rayanto,Y.H, Sugianti (2020)). This AFL is relevant to the addie model because it provides direct experience for students to practice understanding the content provided by the teacher.

FINDINGS AND DISCUSSION

Design and Product Assessment for Learning (AFL) for High School Biology Learning

This stage is conducted to design and develop AFL products for high school biology learning that have been created and implemented. The AFL products for high school biology learning, both for junior high school biology and high school biology, can be presented in the following table. The steps for creating content through Educandy are described in the below Figure 2.

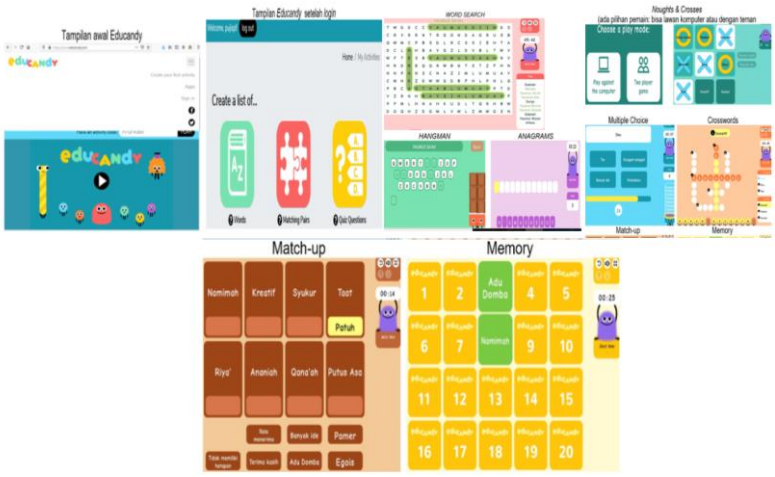

Figure 3. Stages of Making Educandy and the choice of game results for the students

Biological content packaged in the form of games through the educandy web-based application can be used to make online games fun and exciting. The games made are still in the context of learning but not boring. This game can be given to students during the learning process to strengthen the content of the material being studied to make it easier to understand. Students commonly enjoy this game and they often open it when they feel bored and stressed. The existence of educandy games in the learning process as an assessment for learning makes the learning process more varied, interactive and fun. Game-assisted learning on the educandy application can increase student motivation in learning (Amelia, 2021).

Table 1. AFL educandy products for high school biology learning

No.	Junior High School Biology (SMP)	Senior High School Biology (SMA)
1	2 Biology Concept SMP Grade VII	16 Biology Concept SMA Grade X
2	4 Biology Concept SMP Grade VIII	14 Biology Concept SMA Grade XI
3	3 Biology Concept SMP Grade IX	13 Biology Concept SMA Grade XII

In the table that presents the biological concepts of junior and senior high school, it can be stated that not all formulated concepts are integrated with educandy, especially in the concept of junior high school. Concepts that are made integrative with educandy are prioritized from needs analysis during observation at school. Mastery of concepts needs to be balanced with qualified learning tools in order to facilitate students in learning. This is in line with Ramdani's (2021) statement that Mastery of students' concepts of a material being studied affects critical thinking skills. It is necesssary to remember that all forms of critical thinking are impossible without the main component, known as mastery of concepts. Mastery of concepts is received through a test tool that measures students' conceptual understanding through student learning test components for both assessment and evaluation at the end of the learning process. Mastery of concepts is necessary for successful learning. In connection with that, students' mastery of concepts is expected to be able to manage cognitive skills and thus improvements can be made in further learning (Lestari et al, 2019; Sulistyowati, 2012; Ihsan et al, 2019). In accordance with this statement, AFL through this educandy application can support the learning process and correct deficiencies in previous learning.

Validation of AFL Products for High School Biology Learning

Before AFL Educandy for high school biology learning was tested in learning activities, then first AFL Educandy was assessed by three experts in the fields of evaluation, media, content to ensure the feasibility of its use in high school biology learning activities. The three validators are experts in their respective fields and hence content and media as learning resources can be applied to students through teachers. Table 2 Summarizing the results of expert validation of AFL Educandy for high school biology learning.

Table 2. Expert validation results on AFL educandy for high school biology learning

Assessment Aspect	Assessment Indicator	Assessment result
AFL Media Quality	Readability, question construction, suitability of the question with the material, level of difficulty, ease of use, and student learning experience	The three validators stated that the stages of AFL Educandy for high school biology learning were adequate for learning. However, it needs further affirmation and reinforcement for student learning independence through this AFL facility with Educandy
Design Validation	Order of presentation, Completeness of Information, Use of Fonts: Type and Size, Layout, Illustration, graphics and pictures, display design	The three validators stated that illustrations, graphics and pictures provided sufficient and supported the learning process through AFL Education for high school biology learning
Content Eligibility	Conformity with learning achievement, material accuracy, suitability with student needs, suitability with teaching material needs, correctness of learning material substance, benefits for adding insight and presentation	The three validators stated that the phenomena presented were related to sharpening the integration of knowledge through AFL Educandy for high school biology learning
Language Validation	Readability, Clarity of Information, Conformity with good and correct Indonesian language rules and use of language effectively and efficiently (Clear and Brief)	The three validators stated that the grammar used in AFL Education for high school biology learning was in good criteria and could be used

Table 2 demonstrated 4 aspects of the assessment, namely AFL media quality, design validation, content feasibility and linguistic validation. The validator provides a review of the four aspects asked stating it is feasible to be given to students. Techniques in AFL learning can be inserted after learning which can be done online or done outside school hours.

Implementation of AFL to High School Biology Teacher STF

In practice, teachers are always faced with three things, namely evaluation, assessment, and measurement (Farida, 2017). And therefore, the assessment in this case the assessment for learning needs to be carried out simultaneously. Assessment literacy refers to familiarity with factors that affect the quality of assessment. Teachers should have assessment literacy to identify their students' learning strengths and weaknesses properly (Zolfaghari,2016). The importance of this research is to be implemented so that ready-made digital assessment products can be used by science teachers, especially biology subjects. Workshop activities and mentoring on the use of AFL educandy have been carried out for high school biology learning. This activity is carried out with face-to-face events through material delivery activities, demonstrations, discussions, practices. This activity was attended by 21 teachers who joined the Subject Teacher Forum (STF) of Natural Sciences Subject Sub Rayon 5 Gunung Halu, Cilinin District, West Bandung Regency.

Speaker who fills and guides this activity is Mrs. Sri Maryanti, M.Pd who conveyed the Strategy for implementing AFL Educandy in biology learning in the new normal era. In general, the activities went well and smoothly. Face-to-face meetings with lecture, workshop and discussion methods facilitated by MGMP IPA Sub Rayon 5 Gunung Halu, Cilinin District, West Bandung Regency, were actively running well.

Figure 4. Activity documentation

This activity is referred to an effort to facilitate the implementation of creative learning in utilizing AFL Educandy for high school biology learning. Broadly speaking, the respondents who participated in the workshop and assisted in the use of AFL Educandy in secondary school biology lessons gave positive results and there was an interest in implementing AFL Educandy in accordance with the material presented. To be able to provide an overview of effectiveness, it can be reviewed in table 3 below.

Table 3. Recapitulation of questionnaire response results workshop participants using AFL educandy for high school biology learning

Category	Less (%)	Average (%)	Good (%)	Excellent (%)
The usefulness of the content presented is for increasing the pursuit of skills with the integration of technology through the use of AFL Educandy	0	0	40	60
Compatibility with learning content that supports the achievement of learning independence with AFL Education	0	0	55	45
Effectiveness of AFL Educandy content development for high school biology learning offered	0	0	75	25
The effectiveness of the training method with the achieved objectives, especially the use of AFL Educandy for high school biology learning	0	0	85	15
Support for increasing students' understanding of the implementation of AFL Education for high school biology learning	0	0	55	45

It can be seen in thick 1 that the category with the highest presentation is in the field of Content Usefulness which is presented to increase pursuing skills with technology integration through the use of AFL Education. However, it is necessary to address and improve the effectiveness of developing AFL Educandy content with the achievement of goals and learning independence for students. Educandy is an educational game-based learning In line with the research results of I Fitriati et al 2021 that learning using a digital game approach is considered more effective in evaluating and motivating students to gain knowledge compared to using a non-game application approach. And to sum up, when the implementation of the results of content creation through educandy is favored by the teachers which will later be implemented to students as an assessment of the learning process. Assessment for learning through educandy is part of the teacher's effort to make it easier for students to understand the material because it is done in a fun way in terms of assessment because it involves games. that are diverse and include digital assessments.

CONCLUSION

Based on the results of research and development of AFL Educandy for high school biology learning in the form of assessments from media experts, material experts, learning experts, linguists, teacher responses and the results of implementation observations in the field, it can be

concluded that AFL Educandy for high school biology learning is stated " feasible and effective" to be used in the biology learning process for high schools. And therefore, for learning with biological content, educandy-assisted learning can be applied for assessment as an understanding assessment material during the learning process. The learning process by involving educandy games as an assessment for learning becomes more varied, interactive and fun learning.

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REFERENCES

Adiguna, F. A., Madu, S., & Okulaja, A. A. (2015). Effects of Computer Based Instructional Strategy on Students' Academic Achievement in Senior Secondary School Biology in Ogun State Nigeria. Atlantic, 1(1), 1-7.

Amelia, N. C., Zulhelmi, Z., Syaflita, D., & Siswanti, Y. (2021). Analisis Motivasi Belajar Peserta Didik melalui Penerapan Model Pembelajaran POE Berbantuan Game Edukasi Berbasis Aplikasi Educandy di SMPN 25 Pekanbaru. *DIFFRACTION*, *3*(2), 56-61.

Anonim. 2007. Paket Pelatihan. Asesmen dan Evaluasi. Tersedia: http://mbeproject.net/pelatihan3-6.pdf [11 Agustus 2010]

Davis, A. L. (2013). Using Instructional Design Principles to Develop Effective Information Literacy Instruction: The ADDIE Model. *College & Research Libraries News*, *74*(4), 205-207.

Efendi, R., Rustaman, N. Y., & Kaniawati, I. (2017, February). Profile of Prospective Physics Teachers on Assessment Literacy. *In Journal of Physics: Conference Series* (Vol. 812, No. 1, p. 012061). IOP Publishing.

Farida, I (2017). Evaluasi Pembelajaran. Bandung : Rosdakarya

Gardner, J (2012). Assesment and Learning. Sage Publications

Gathuri, J. W., Luvanda, A., Matende, S., & Kumundi, S. (2014). Impersonation Challenges Associated With E-Assessment of University Students. *Journal of Information Engineering and Applications*, 4 (7), 60-68.

Huang, W. H. Y., & Soman, D. (2013). Gamification of Education. *Report Series: Behavioural Economics in Action*, *29*, 11-12.

I.Fitriati. R. Purnamasari Dkk (2021). Implementasi Digital Game Based Learning menggunakan Aplikasi Educandy untuk Evaluasi dan Motivasi Belajar Mahasiswa Bima. Vol. 1 No. 1 (2021): *Prosiding Penelitian Dan Pengabdian 2021*, Isbn: 978-623-6535-49-3

Lestari, S. P. (2020, November 12). Asyik dengan Educandy. Retrieved Maret 10, 2021, from kemenag.go.id.

Lestari, S., Mursali, S., & Royani, I. (2019). Pengaruh Model Pembelajaran Langsung Berbasis Praktikum terhadap Keterampilan Proses Sains dan Kemampuan Berpikir Kritis Siswa. *Bioscientist: Jurnal Ilmiah Biologi*,6(1), 54-62.

Lestari, W., & Saputra, E. R. (2021). Telaah Penggunaan Games Digital sebagai Evaluasi Pembelajaran Masa Kini. *Jurnal Pendidikan Hayati*, *7*(2).

Ma'muroh, H. (2014). Pembuatan Instrumen Evaluasi Pembelajaran IPA Terpadu Berbasis ICT untuk Mengukur Kompetensi Siswa SMP Kelas VIII. *Pillar Of Physics Education*, 3(1).

Maryanti, S. (2017, November). Profil Pemanfaatan Teknologi Informasi dan Komunikasi (TIK) sebagai Media Pengembangan Bahan Ajar Digital oleh Calon Guru Biologi. In *Prosiding seminar nasional pendidikan IPA "TPACK: Optimalisasi pemanfaatan ICT untuk meningkatkan profesionalisme guru dalam pembelajaran IPA". FMIPA UNY*.

Maryanti, S., & trie Kurniawan, D. (2018). Pengembangan Media Pembelajaran Video Animasi Stop Motion untuk Pembelajaran Biologi dengan Aplikasi Picpac. *Jurnal BIOEDUIN: Program Studi Pendidikan Biologi*, *8*(1), 26-33.

Milligan, S., Griffin, P., Care, E., Slater, H., Harding, S., & Scoular, C. (2014). The Assessment and Teaching Of 21st Century Skills Mooc. Retrieved July 2014.

Prayogi, R. D. (2020). Kecakapan Abad 21: Kompetensi Digital Pendidik Masa Depan. *Manajemen Pendidikan*, 14(2).

Ramdani, A., Jufri, A.W., Jamaludin, J.,& Setiadi, D. (2020). Kemampuan Berpikir Kritis dan Penguasaan Konsep Dasar IPA Peserta Didik. *Jurnal Penelitian Pendidikan IPA, 6*(1), 119-124.

Rayanto,Y.H, Sugianti (2020). Penelitian Pengembangan Model ADDIE dan R2D2: Teori & Praktek. Pasuruan : Lembaga academic dan research institute.

Redecker, C., & Johannessen, Ø. (2013). Changing Assessment—Towards A New Assessment Paradigm Using ICT. *European Journal Of Education*, 48(1), 79-96.

Richey, R. C., & Klein, J. D. (2014). Design and Development Research. In *Handbook of Research on Educational Communications and Technology* (pp. 141-150). Springer, New York, NY.

Rustaman, N.Y. (2005). Strategi Belajar Mengajar Biologi. Malang : Universitas Negeri Malang.

Sa'adah, S., Maryanti, S., Maspupah, M., & Mas' ud, A. (2020). Literasi Digital Mahasiswa Calon Guru Biologi dalam Menyusun Bahan Ajar Berbasis Audio Visual.

Septiana, Y. A. (2021). Pengembangan Media Pembelajaran Interaktif menggunakan Game Educandy dan Video Animasi Kine Master dan Animaker pada Pembelajaran Pengenalan Kosakata Anggota Tubuh dan Panca Indra beserta Fungsi dan Cara Perawatannya. *EduStream: Jurnal Pendidikan Dasar*, *5*(2).

Sole, F. B., & Anggraeni, D. M. (2018). Inovasi Pembelajaran Elektronik dan Tantangan Guru Abad 21. *Jurnal Penelitian dan Pengkajian Ilmu Pendidikan: E-Saintika*, 2(1), 10-18.

Volante, L & Fazio, X. 2007. Exploring Teacher Candidates' Assessment Literacy: Implications for Teacher Education Reform and Professional Development. *Journal of Education* 30, 3 : 749-770.

Wiliam, D. (2011). What is Assessment for Learning?. *Studies in Educational Evaluation*, *37*(1), 3-14.

Wulan, A. R., Isnaeni, A., & Solihat, R. (2018). Penggunaan Asesmen Elektronik Berbasis Edmodo sebagai Assessment for Learning Keterampilan Abad 21. *Indonesian Journal of Educational Assessment-Vol*, *2*(1).

Yang, K. T., Wang, T. H., & Chiu, M. H. (2015). Study The Effectiveness of Technology-Enhanced Interactive Teaching Environment on Student Learning of Junior High School Biology. *Eurasia Journal Of Mathematics, Science & Technology Education*, 11(2), 263-275.

Yuberti, Y. (2014). "Penelitian dan Pengembangan" yang Belum Diminati dan Perspektifnya. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *3*(2), 1-15.

Zolfaghari, F., & Ahmadi, A. (2016). Assessment Literacy Components Across Subject Matters. *Cogent Education*, *3*(1), 1252561.