Development of insectarium media combined with QR code on animalia subject for the ten-grade students

Fakhirah Maulidya [ID] *, Zulkarnaim , Ainul Uyuni Taufiq

Biology Education Study, Universitas Islam Negeri Alauddin Makassar, Indonesia

* Corresponding author: fakhirahmaulidya@gmail.com

Article Info	ABSTRACT
	Insectarium media combined with QR code referred to this research was learning media based of technology created that can also be used on smartphone. This research aims to develop learning media and determine students' response to insectarium combined with QR code that appropriate to be used as learning media in the kingdom Animalia. The method used is research and development with a design ADDIE model which consists of five stages in the form of analyzing, design, develop, implement, and evaluate. Research subjects is the ten-grade students who took animalia's' kingdom courses, the academic year 2021/2022 of the SMA Negeri 02 Bombana. The research instrument used was validation questionnaire, test items, students and teacher questionnaire. The result of insectarium combined with QR code validity level got 3.76 score as a very valid categorize from the material and design experts, the effectiveness level got very effective categorized by 89% percentage, the practically level by students and the teacher response is 89.83% categorized as very practical. The result obtained it was concluded that insectarium combined with QR code was suitable for use as a medium in school and there needs to be implemented to see achievement.

INTRODUCTION

Education is a common activity carried out in life, because wherever and whenever the educational process can occur. In essence, education is an effort to change humans to become cultured and noble. A science needs to be studied in depth as education should be implemented so that the process can be carried out properly and appropriately. If an education is carried out without the idea of knowledge, it will result in failure to achieve educational goals (Hasan, 2021a).

The learning and teaching process consist of five important components that influence each other, namely objectives, materials, methods, media, and learning evaluation. The selection of the type of learning media is closely related to the teaching method to be used, so it can be said that one of the main functions of learning media is as a teaching aid that also influences motivation, conditions, and the learning environment (Falahudin, 2014).

Based on the result of observations and interviews at SMA Negeri 02 Bombana, information was obtained from educators who teach biology in ten-grade that the availability of learning media at the school was very limited. Package books can only be used during biology class hours so students do not have handbooks that can be used for independent study, besides that learning using a projector cannot be used because there is no electricity available from 06.30 am to 15.00 pm. Therefore, the media used in these schools are still conventional, namely textbooks and blackboards which make most students unable to contextually understand the material presented.

The lack of learning media is an obstacle or difficulty for educators in teaching. The media is an important part of communication, namely as a messenger from correspondents to respondents. The use of media in the learning process helps students understand more deeply about the things being studied (Miftah, 2013). One of the benchmarks used in selecting media is the need to pay attention to the appropriateness of the media to be used in learning. Unsmooth learning can occur if the selected media is not appropriate, so that it can affect the learning and teaching process. This is in line with whether or not students are able to accept and use learning media to achieve satisfactory learning outcomes (Sutiah, 2018).

Generation Z of those born 1995-2012 refer to the short attention span as "acquired attention deficit disorder" because their brains are now wired to comprehend complex visual images. Therefore, a visual approach to teaching that includes graphics, animations or video clips is effective (Mosca et al, 2019). Visual media has the characteristic of being a media category whose form can be in the form of original objects, both living and inanimate (dead), and can be in the form of imitations of the original objects that represent them (At-Taubany & Suseno, 2017). The use of visual media can facilitate students' understanding, strengthen memory, and attract students' attention and interest (Kustandi et al, 2021).

Considering that the students who will be faced are part of a generation that cannot escape technology, and tend to prefer visual media. Biology learning media options that can be offered based on the problems experienced by these students are the development of insectarium learning media combined with QR code technology. This insectarium is combined using a QR code which can display an e-poster in the form of an explanation regarding classification, habitat, morphology, anatomy, role, digestive system, respiratory system, and reproduction (metamorphosis).

Insectarium is one of the visual media which has characteristics as a category of media that has the form concrete of original objects in the form of preserved insects (Pribadi, 2017). By using concrete media, students find it easier to understand the learning process as it provides real experiences and generates questions or ideas. Using concrete media invites students to observe directly the object being studied, which will later improve student learning outcomes, especially on factual knowledge. In learning with a scientific approach, innovative media-assisted learning activity innovations will be applied at the observing stage. Observing in a scientific way is when students are trained to use the five senses to obtain information (Fischer et al, 2020). There is a big tendency that students will learn better if the environment is created naturally, learning will be more meaningful if the child experiences what he is learning, not knowing it (Primiani & Susianingsih, 2010).

Until now there has been no research conducted insectarium development that combined with QR code technology related to the conditions that occur in animalias' subjects, such as research by Edo Dannyta Sampe Toding, et.al namely the development of insectarium media as

high school learning media, research by Gita Erdi Utami that is development of media using insectariums as learning media for class X students of SMA Negeri 1 Perbaungan, and research by Dewi (2015) that is development of an insectarium combined by a guidebook for making insect collections as a practicum medium for class X SMA/MA students. Accordingly, on previous research, this is the basis for research on the development of insectarium learning media combined with QR code technology. This study aims to test the validity, effectiveness, and practicality of insectarium learning media combined with QR code to improve students' ability to identify insect species.

RESEARCH METHODS

Research Design

The form of research conducted in this research is research & development. research and development methods are research used to produce certain products and test the effectiveness of these products (Sugiyono, 2014). The model used in the research refers to Tegeh, Jampel, & Pudjawan (2014) namely the analysis, design, development, implementation, evaluate model (ADDIE). According to Aldoobie (2015) ADDIE is an approach that helps instructional designers, any content's developer, or even teachers to create an efficient, effective teaching design.

Population and Samples

The population in this study were all class of X MIPA grade consist of 2 classes with a total of 54 students and 2 science teachers in SMA Negeri 02 Bombana. The class samples were one class X MIPA 2 consist of 28 students and 1 biology teacher. The sampling technique was purposive sampling. This purposive sampling was used after consideration from the teacher, seeing that class X MIPA 2 students had good learning adjustments. In addition, class X MIPA 2 is studying animalia and will enter the insect sub-chapter.

Instruments

The instruments used are learning media validation sheet to find out product validity data, student responses questionnaire form and teacher response questionnaire form to obtain product practically data, and test item in the form of multiple choice of 15 questions to obtain the product effectiveness data.

Procedures

The analysis phase begins with an analysis of the needs of students related to the learning media used. The design and development stage is carried out by designing and developing the prototype of insectarium combined with QR code by a validation process by an expert validator. Product development results are implemented on the ten-grade students to see the effectiveness of the media. After that, the product was evaluated by the students and teacher input. This development research procedure follows the steps of the ADDIE development model by Branch (2009) which can be seen in Figure 1.
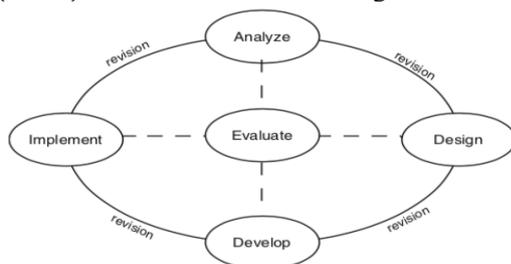

Figure 1. ADDIE model development flowchart.

Data Analysis

Data obtained, then analyzed descriptively. The data obtained from the results of the validation sheet, test items, and response questionnaires are arranged in tabular form to facilitate identification. Data from the instrument were obtained from the recapitulation of the results of the expert validator's assessment, students test result, and response questionnaires. The average obtained is then interpreted, validity criteria in Table 1, effectiveness in Table 2, and practicality in Table 3.

Table 1. The validity Category

Mean	Category
V > 3.4	Very Valid
2.8 < V ≤ 3.4	Valid
2.2 < V ≤ 2.8	Quite Valid
1.6 < V ≤ 2.2	Less Valid
V ≤ 1.6	Invalid

(Hartanto, 2020)

The effectiveness of the media is known if the score obtained touches the KKM score set at the school (score ≥ 70). Learning is said to be successful classically if at least 81% of students achieve a complete score as can be seen from the interpretation of the categories in Table 2.

Table 2. The effectiveness Category

Mean	Category
> 80	Very Effective
> 60 – 80	Effective
> 40 – 60	Quite Effective
> 20 – 40	Less Effective
≤ 20	ineffective

(Hasan, 2021b)

Table 3. The practically Category

Mean	Category
81% – 100%	Very Practical
61% – 80%	Practical
41% – 60%	Quite Practical
21% – 40%	Less Practical
0 – 20%	Impractical

(Akbar, 2013)

RESULTS

The product in the form of a book of plant morphological characteristics that was developed was tested for validity based on the results of research from a team of experts as validators. The validation of the insectarium combined with QR code was carried out by a team of experts consisting of 2 lecturers who are experienced in teaching kingdom animalia especially insect anatomy jund morphology, and conducting related research. All comments have been used in the revision of the insectarium. The results of the validation of insectarium combined with QR code by two validators are shown in Table 4.

Table 4. Validation results

Assessment Aspects	Score	Category
Display	3.87	Very Valid
Insecta Material	3.50	Very Valid
Renewal	4.00	Very Valid
Scale	3.50	Very Valid
Technical Quality	3.75	Very Valid
Language	4.00	Very Valid
Term Use	3.75	Very Valid
Mean	3.76	Very Valid

According to learning outcomes in the Table 5, it was found that out of a total of 28 students, 25 students were declared complete in the learning process with a percentage of 89%, while the other 3 students were declared incomplete with a percentage of 11%. Students are declared complete in the learning process if the scores obtained reach the KKM that has been set at the school where the research is carried out where the KKM score is set with a value of 70.

Table 5. Effectiveness results

Score	Types of Assessments	Sum	Percentage
70-100	Completed learners	25 learners	89%
0-69	Incomplete learners	3 learners	11%
	Mean	28 learners	100%

The practicality of the insectarium combined with QR code can be seen in Table 6. The percentage of response results obtained from the educator response questionnaire was 94.28% and the response results from the student response questionnaire was 85.39%, so that the accumulated results of the two respondents obtained an average percentage the total average is 89.83% with the very practical category.

Table 6. Practical results

Types of Assessments	Score	Category
Teacher Response	94.28%	Very Practical
Student Response	85.39%	Very Practical
Mean	89.83%	Very Practical

DISCUSSION

The use of learning media also helps students to absorb the same material as others so that it creates the same perception between one student and another, and can improve student learning outcomes more optimally. Insectarium learning media combined with QR code can be used in the learning process after going through the validation stage (Nurita, 2018). One of the criteria for quality learning media is having a high level of validity, where the product developed can be used to measure the results of the learning that will be carried out (Mustami, 2015).

Based on the results of the media validity test analysis that has been carried out, insectarium learning media combined with QR code technology has an average value of 3.76 in the very valid

category as can be seen in table 1. The aspects that are considered in the validation of learning media are the construction of content or material, language, completeness or presentation techniques, integration, and benefits or uses (Mustami et al, 2017).

Insectarium learning media combined with the developed QR code technology are categorized as very valid in terms of several aspects such as the suitability of the media with KD and learning objectives, the suitability of the media with the needs of students, the suitability of the material, and the consistency between parts of the media. In addition, all the components presented in the learning media are suitable for use in the learning process both in terms of design or structure and in terms of language. In accordance with what was stated by Dwijayani (2017), the developed learning media is classified as very valid due to several factors, the media is in accordance with the curriculum guidance, it is able to motivate students in learning that is adapted to the level of development of students, and learning activities focused on students that make it easier for students to reinvent a concept. Also, in accordance with Haviz (2013), that learning media has two aspects so that it is said to be valid: (1) Content validation, if the product is said to be developed having an adequate theoretical basis; (2) Construct validation, if all product components are related to each other consistently.

After validation, the media is used in the classroom to test its effectiveness. It was obtained that the percentage of completeness of classical students' learning outcomes was 89% which was included in the very effective category. Insectarium learning media combined with QR code is very effective to be used in the learning process because the percentage of students' completeness in classical learning is more than 80%. This is in accordance with the theory of Widoyoko (2017) which states that if at least 80% of students score above the KKM (Minimum Completeness Criteria), then the learning media is effectively applied in the learning process.

Besides being able to support learning achievement, this insectarium media is presented in the form of preserved original (concrete) animals, so as to build students' curiosity. Students are very enthusiastic in learning because the concrete media presented attracts attention, students more easily accept learning, are more active in the learning process by using this concrete media. students are also able to understand the learning process well (Destrinelli et al, 2018).

Based on the results of the practicality test analysis which includes aspects of appearance, convenience and achievement of learning objectives, insectarium learning media combined with QR code obtained an average total score of the respondents, namely 89.83%, which is in the very practical category. Learning media is said to be practical if the results of the practicality test of the learning media developed get a positive response from educators and students with practical minimum criteria (Nasution et al, 2017). The practicality of product development refers to users' likes and can be used easily under normal conditions (Haviz, 2013). Similar opinion was expressed by Mustami et al (2019), that students' learning interest is based on the ease of using the product as a result of developing learning activities so that learning objectives can be achieved where students respond positively to learning activities that use the material developed so that students can understand material and actively involved in the learning process.

CONCLUSION

The results of this research showed that the developed of insectarium learning media combined with QR Code Technology had a very valid level by the experts teams that has 3,76 score, the student study result had a very effective category by 89% percentage, the practically level by students and teacher response is very practically by 89.83% percentage. All these results proved that the insectarium learning media combined with QR code in X MIPA 2 grade at SMA Negeri 02 Bombana is appropriate to use. The researcher hopes that the results of this research can be an

alternative to both online and offline learning. In addition, this research can be of assistance for further research on insectarium learning media.

REFERENCES

Akbar, S. (2013). *Instrumen perangkat pembelajaran. Bandung*: Remaja Rosdakarya.

Aldoobie, N. (2015). ADDIE model. *American International Journal of Contemporary Research, 5*(6), 68-72. Retrieved from http://www.aijcrnet.com/journals/Vol_5_No_6_December_2015/10.pdf

At-Taubany, T.I.B. & Suseno, H. (2017). *Desain pengembangan kurikulum 2013 di madrasah*. Jakarta: Kencana.

Branch, R. M. (2009). *Instructional design: The ADDIE approach*. USA: Springer.

Destrinelli, D., Hayati, D.K., & Sawinty, E. (2018). Pengembangan media konkret pada pembelajaran tema lingkungan kelas III sekolah dasar. *Jurnal Gentala Pendidikan Dasar, 3*(2), 313-333. Retrieved from https://doi.org/10.22437/gentala.v3i2.6754

Dewi, N. (2015). Pengembangan insektarium disertai buku pedoman pembuatan koleksi serangga sebagai media praktikum untuk siswa kelas X SMA/MA. Yogyakarta.

Dwijayani, N.M. (2017). Pengembangan media pembelajaran ICARE. *Kreano: Jurnal Matematika Kreatif-Inovatif, 8*(2), 126-132. Retrieved from https://doi.org/10.15294/kreano.v8i2.10014

Falahudin, I. (2014). Pemanfaatan media dalam pembelajaran. *Jurnal Lingkar Widyaiswara, 1*(4), 104-117. Retrieved from https://juliwi.com/published/E0104/Paper0104_104-117.pdf

Fischer, B.C., Rotter, S., Schubert, J., Marx-Stoelting, P., & Solecki, R. (2020). Recommendations for international harmonization, implementation, and further development of suitable scientific approaches regarding the assessment of mixture effects. *Food and Chemical Toxicology, 141*(4), 1-6. Retrieved from https://doi.org/10.1016/j.fct.2020.111388

Hartanto, S. (2020). *Mobalean maning (model pembelajaran berbasis lean manufacturing)*. Yogyakarta: Deepublish.

Hasan, M. (2021a). *Landasan pendidikan*. Klaten: Tahta Media Group.

Hasan, M. (2021b) *Pengembangan media pembelajaran*. Klaten: Tahta Media Group.

Haviz, M. (2013). Research and development; Penelitian di bidang kependidikan yang inovatif, produktif dan bermakna. *Jurnal Ta'dib, 16*(1), 28-43. Retrieved from http://dx.doi.org/10.31958/jt.v16i1.235

Kustandi, C., Farhan, M., Zianadezdha, A., Fitri, A., & L.N. (2021). Pemanfaatan media visual dalam tercapainya tujuan pembelajaran. *Akademika: Jurnal Teknologi Pendidikan, 10*(02), 291-299. Retrieved from https://doi.org/10.34005/akademika.v10i02.1402

Miftah, M. (2013). Fungsi, dan peran media pembelajaran sebagai upaya peningkatan kemampuan belajar siswa. *Kwangsan: Jurnal Teknologi Pendidikan, 1*(2), 95-105. Retrieved from https://doi.org/10.31800/jtp.kw.v1n2.p95--105

Mosca, J.B., Curtis, K.P., & Savoth, P.G. (2019). New approaches to learning for generation Z. *Journal of Business Diversity, 19*(3), 66-74. Retrieved from https://doi.org/10.33423/jbd.v19i3.2214

Mustami, M.K. (2015). *Metodologi penelitian pendidikan*. Yogyakarta: Aynat Publishing.

Mustami, M.K., Suyuti, M., & Maryam. (2017). Validitas, kepraktisan, dan efektifitas perangkat pembelajaran biologi integrasi spiritual islam. *Jurnal Al-Qalam, 23*(1), 73-74. Retrieved from http://dx.doi.org/10.31969/alq.v23i1.392

Mustami, M.K., Syamsudduha, S., Safei., & Ismail M.I. (2019). Validity, practicality, and effectiveness development of biology textbooks integrated with augmented reality on high

school students. *International Journal of Technology Enhanced Learning 11*(2), 187-200. Retrieved from https://doi.org/10.1504/IJTEL.2019.098789

Nasution, S.H., Anwar, L., Sudirman, S., & Susiswo, S. (2017). Pengembangan media pembelajaran untuk mendukung kemampuan penalaran spasial siswa pada topik dimensi tiga kelas X. *Jurnal Keguruan Dan Ilmu Pendidikan, 4*(2), 903–913. Retrieved from https://journals.ukitoraja.ac.id/index.php/jkip/article/view/66

Nurita, T. (2018). Pengembangan media pembelajaran untuk meningkatkan hasil belajar siswa. *Jurnal MISYKAT, 3*(1), 171-187.

Pribadi, B.A. (2017). *Media & teknologi dalam pembelajaran Edisi pertama*. Jakarta: Kencana, 2017.

Primiani, C.N., & Susianingsih, M.D. (2010). Meningkatkan aktivitas dan prestasi belajar biologi melalui pendekatan kontekstual dengan media herbarium dan insektarium. *Paedagogia, 13*(1), 55-60. Retrieved from https://jurnal.uns.ac.id/paedagogia/article/view/35986

Sugiyono. (2013). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta.

Sutiah. (2018). *Pengembangan media pembelajaran pendidikan agama islam*. Sidoarjo: Nizamia Learning Center.

Tegeh, I.M., Jampel, I.N., & Pudjawan, K. (2014). *Model penelitian pengembangan*. Yogyakarta: Graha Ilmu.

Widoyoko, S. E. P. (2014). *Evaluasi program pembelajaran panduan praktis bagi pendidik dan calon pendidik*. Yogyakarta: Pustaka Pelajar.