Feasibility of Based Augmented Reality Devices Discovery Learning on Students Learning Outcomes in Morphology of Wijaya Kusuma Flower (*Epiphyllum anguliger*)

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Feasibility of Based Augmented Reality Devices Discovery Learning on Students Learning Outcomes in Morphology of Wijaya Kusuma Flower (*Epiphyllum anguliger*)

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Abstract. This study aims to describe the feasibility of Augmented reality devices which include validity, student learning outcomes, and students response to discovery learning based devices on a morphological material of the flowering plant Wijaya Kusuma (*Epiphyllum anguliger*). This research is the development of augmented reality device models. The target of this study is a learning tool that includes, lesson plans, student worksheets, handouts, and evaluation questions on the morphological material of Wijaya Kusuma flowers (*Epiphyllum anguliger*). Data collection method uses validation questionnaire with the checklist model, observation method, test and student response questionnaire. The results showed the feasibility of the device with a total average of 3.3 with good criteria. Student learning outcomes obtained an average value of 3.08 with the predicate Good (B), learning outcomes during the learning process take place, namely knowledge assessment obtained 85% per cent with good predicate, attitude assessment obtained percentage 95% very good predicate and only 5% predicate Good, and skills assessment obtained an average percentage of 90% with a very good predicate (SB). Student response to the appropriateness of the device gets an average total percentage of 95.6% with the criteria of "very strong"

1. Introduction

The use of technology in educational practice followed by gaps and faces many difficulties. This fact makes technology a big challenge for the needs and orientation of each education system [1].

Learning in the 21st century is directed at preparing students to have the ability to think critically, creatively, innovatively, problem-solving, communication, collaboration, literacy in science and technology. The presence of technology in learning is a challenge for education [2]. Learning to use technology has many advantages, namely in the form of more effective time, learning material becomes

more accessible, attractive, and inexpensive. Also, students can learn more confidently in their way, and students have more opportunities to explore because they motivated by the presence of technology in the learning process [3]. That is relevant to the nature of biology according to Carin & Sund which refers to 4 aspects, namely: process, product, attitude and technology [4]. Technology in the field of multimedia that is developing at this time is *Augmented Reality* or better known as Reality added in Indonesian. *Augmented Reality* is a technology that combines two-dimensional and three-dimensional virtual objects into a real three-dimensional environment and then projects these virtual objects in real time.

The advantage of this *Augmented Reality* method is an attractive visual appearance because it can display 3D objects that seem to exist in a real environment. The *Augmented Reality* method also has the advantage of being interactive because it uses markers to display certain 3D objects that directed to the webcam. Also, the application of the concepts used is expected to increase students' reasoning and imagination [5]. Based on previous studies, according to Lee[6], [7], *Augmented Reality* is very potential and exciting, inspiring, and motivates students because users can explore and control from a variety of different perspectives, which not previously considered as a consideration in education.

Discovery Learning is a way of teaching that involves students in the process of mental activities through exchanging opinions, with discussions, seminars, reading on their own, so that children can learn by themselves (Roestiyah, 1991). In *discovery learning (discovery)* activities or learning that designed in such a way that students can find concepts and principles through their mental processes. According to Budiningsih [8], *discovery learning* is understanding concepts, meanings, and relationships, through an intuitive method to finally conclude. In finding ideas, students observe, classify, make guesses, explain, draw conclusions and so on to see some concepts or principles.

According to Muslimin [9] interpreting the handout as a sheet (or several sheets) of paper containing the tasks or tests given by educators to students. According to Oemar Hamalik[10], learning outcomes are the abilities that students have after receiving their learning experience.

The purpose of this research is to: describe the feasibility of *augmented reality* learning devices based *discovery learning* on floral morphology of the Wijaya Kusuma (*Epiphyllum anguliger*) which includes validity, student learning outcomes, and student response to *discovery learning* based learning.

2. Method

This research develops learning tools by referring to the device development model research suggested by Thiagarajan, Semmel, and Semmel [11] namely the 4-D model (define, design, develop, and disseminate) consisting of the following 4 stages: 1) Stage determine (definition), 2) Stage of design (planning), 3) Stage of development (development), and 4) Stage of disseminating (dissemination)[12]. The target of this discovery learning augmented reality learning device is 20 students of grade VII of Sedati Sidoarjo 2 State Junior High School in the 2017-2018 school year.

3. Result And Discussion

After the device was reviewed, the device was validated by two expert lecturers and one practitioner or a science teacher at Sedati Sidoarjo 2 Junior High School. Validation includes RPP, LKS, handouts, and evaluation questions. Validation results can be seen briefly in Table 1 as follows:

Table 1 Device Validation Results Based on Discovery Learning.

No	Device	Average Validation Score	Criteria
1	RPP	3,5	Good
2	LKS	3,4	Good
3	*Handout*	3,3	Good
4	Evaluation Questions	3,0	Good
Total Average		3,3	Good

Information:
1.0 - 1.5 Not Good / Not Valid
1.6 - 2.5 Less / Less Valid
2.6 - 3.5 Good / Fairly Valid
3.6 - 4.0 Very Good / Valid

The results of the average validation score on the learning devices that have been developed are RPP categorized as good with a total average value of 3.5 with a percentage of 85.6%, Student Worksheets (LKS) get an overall average score of 3, 4 with a rate of 82% categorized as good, while handouts classified as good by getting a total average score of 3.3 with a percentage of 88.4%, and evaluation questions are also categorized as good getting an overall average score of 3.0 with a rate at 80.5%. Based on the results of the validation, the learning device was considered feasible to be used in limited trials.

Based on the results of the validation, the average score on evaluation questions is lower than the average rating of other devices. That happened because according to one of the validators, the evaluation question was considered to be less displaying the suitability and accuracy regarding the material presented with current developments, and the relevance of depth and difficulty to the level of student development.

The results of the attitude assessment include two things, namely spiritual and social attitudes. Evaluation of mental positions obtained by self-assessment techniques, while the effects of social assessments obtained by indirect observation techniques by asking for help from other educators and carried out during learning takes place in limited trials using *discovery learning* tools. The results of attitude values are the average of the combined benefits of spiritual and social attitudes obtained. Students can categorise as "Completed" if they reach ≥ Good (G). The results of student attitude assessment can see in Table 2.

Table 2 Attitudes Student Assessment.

No	Student's name	Value	Predicate	Category
1	Student 1	3.66	A-	Complete
2	Student 2	3.71	A-	Complete
3	Student 3	3.64	A-	Complete
4	Student 4	3.61	A-	Complete
5	Student 5	3.66	A-	Complete
6	Student 6	3.73	A-	Complete
7	Student 7	3.88	A	Complete
8	Student 8	3.83	A-	Complete
9	Student 9	3.69	A-	Complete
10	Student 10	3.77	A-	Complete
11	Student 11	3.88	A	Complete
12	Student 12	3.70	A-	Complete
13	Student 13	3.85	A	Complete
14	Student 14	3.44	B+	Complete
15	Student 15	3.62	A-	Complete
16	Student 16	3.85	A	Complete
17	Student 17	3.85	A	Complete
18	Student 18	3.64	A-	Complete
19	Student 19	3.74	A-	Complete
20	Student 20	3.80	A-	Complete
Total Average		3.73	A-	Complete

Attitude assessment includes two assesments, namely spiritual and social evaluation. The spiritual assessment uses self-assessment techniques where students are asked to judge themselves honestly and

according to what they have done. The social review uses observation assessment techniques with the help of observers. From the results of data analysis obtained 19 students get results with a very good predicate, but there is one student with a proper predicate. This happened because the students were considered low on the aspect of social assessment, accuracy, perseverance and responsibility by the observer, this was because the students were less thorough, and lacked diligence in observation during the experiment, and lack of accountability in the practicum tools so that the weapons broken because too lots of jokes with friends. The results of student knowledge assessment can see in Table 3.

Table 3 Assessment of Knowledge Students

No	Student's name	Value	Predicate	Category
1	Student 1	3.27	B+	Complete
2	Student 2	3,11	B	Complete
3	Student 3	3.10	B	Complete
4	Student 4	2.24	C+	Uncomplete
5	Student 5	3.25	B+	Complete
6	Student 6	3.55	A-	Complete
7	Student 7	3.17	B	Complete
8	Student 8	2.71	B-	Complete
9	Student 9	3.37	B+	Complete
10	Student 10	3,18	B+	Complete
11	Student 11	3.23	B+	Complete
12	Student 12	3,22	B+	Complete
13	Student 13	3.05	B	Complete
14	Student 14	3.44	B+	Complete
15	Student 15	3	B	Complete
16	Student 16	3.22	B+	Complete
17	Student 17	2.49	C+	Uncomplete
18	Student 18	3.33	B+	Complete
19	Student 19	3.25	B+	Complete
20	Student 20	2.42	C+	Uncomplete
Total Average		3.08	B+	Complete

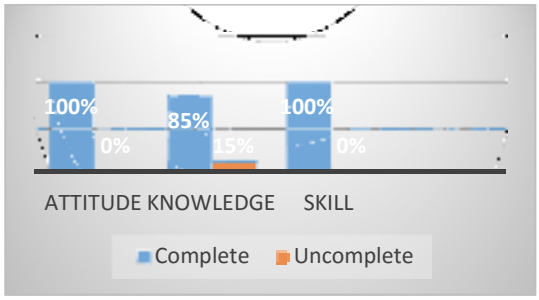
Skills assessment results obtained by indirect observation techniques by asking for help from other educators and carried out during learning takes place in a limited trial using augmented reality devices based on discovery learning. This assessment is used to assess the achievement of competencies that require students to conduct practicum following work procedures, use of practicum tools, and observations. Students can categorise as "Completed" if they reach a value of 66 2.66 (B-). The results of student skills assessment can see in Table 4. Based on the results of data analysis, student learning outcomes obtained 17 students got results with complete categories, and three students got results with incomplete grades.

Table 4 Assessment Skills Students

No	Student's name	Value	Predicate	Category
1	Student 1	3.7	A-	Complete
2	Student 2	3.6	A-	Complete
3	Student 3	3.7	A-	Complete
4	Student 4	3.8	A-	Complete
5	Student 5	3.4	B+	Complete
6	Student 6	3.5	B+	Complete
7	Student 7	3.8	A-	Complete
8	Student 8	3.7	A-	Complete
9	Student 9	3.6	A-	Complete

No	Student's name	Value	Predicate	Category
10	Student 10	3.8	A-	Complete
11	Student 11	3.9	A	Complete
12	Student 12	3.6	A-	Complete
13	Student 13	3.7	A-	Complete
14	Student 14	3.8	A-	Complete
15	Student 15	3.6	A-	Complete
16	Student 16	3.7	A-	Complete
17	Student 17	3.7	A-	Complete
18	Student 18	3.8	A-	Complete
19	Student 19	3.9	A	Complete
20	Student 20	3.9	A	Complete
Total Average		3,71	A-	Complete

From the results of the data above, learning outcomes assessment of attitudes obtained data on the number of students who complete the learning by 100%, based on student knowledge assessment data obtained 85% of students complete and students who are not perfect in learning by 15%, and based on student skills assessment data obtained data on the number of students who complete learning by 100%. The percentage of student completeness can see from the following bar diagram.



Graph 1 Percentage of Student Learning Outcomes.

Based on the criteria of *discovery learning* based devices are said to be feasible if in the assessment of students' attitudes reach <2.33 criteria Good (B), if in the assessment of student knowledge the average value of all students> 2.66 with the title B- and if in the assessment students' skills achieve indicator scores with an average percentage of ≥ 61% with the criteria of Good (B). From the results of data analysis, the development of augmented reality learning tools based on discovery learning is said to be feasible through learning outcomes assessment attitudes obtained 19 students get Very Good criteria (SB), and only one student gets the criteria of Good (B). Based on the assessment data of students' knowledge, the average score of all students was 3.08 with the criteria of Good (B). Based on student skills assessment data obtained indicator scores with a total average of 3.71, an average percentage of 90% with Very Good criteria (SB). Assessment of student learning outcomes includes three evaluations, namely: assessment of attitudes, knowledge, and skills. Attitude or affective, and skill or psychomotor assessment is carried out during the learning process, while expertise or cognitive evaluation carried out when learning ends through a test method consisting of multiple choice questions, and descriptions.

Table 5 Results Response-Based Discovery Learning

No	Opinion Description	Feasibility Percentage	Criteria
1.	The learning activities that I followed were new to me	100%	Very Strong
2.	The learning activities that I followed were interesting and fun	100%	Very Strong

No	Opinion Description	Feasibility Percentage	Criteria
3.	The learning activities that I followed can cause the desire to investigate myself.	88.4%	Very Strong
4.	The learning activities that I follow the train to make questions.	86.8%	Very Strong
5.	The learning that done is related to the things that I see, think, and the things that I experience in everyday life.	77.5%	Strong
6.	The learning that done gives me the opportunity to identify problems that are in line with the lesson material and formulate in the form of hypotheses.	100%	Very Strong
7.	Through the LKS gave, I can do scientific work through simple experiments in groups.	100%	Very Strong
8.	By forming a group, I can ask each other questions and dare to convey/refute opinions.	92.9%	Very Strong
9.	Through the LKS provided, I can prove whether or not a hypothesis is correct.	100%	Very Strong
10.	*The handouts provided can help me in developing my concept-finding skills in critical and creative thinking.*	100%	Very Strong
11.	*The handouts provided can help me in linking the material learned with everyday life and motivating me to learn.*	100%	Very Strong
12.	I am more enthusiastic about following the learning process in class.	92.5%	Very Strong
13.	During the learning activities, I have always felt grateful for the gifts and favours that God has given in this life.	100%	Very Strong
14.	During the learning activities, I have a sense of responsibility for the tasks that have given.	100%	Very Strong
Total Average		95.6%	Very Strong

Information:
0.01% - 20.99% Very Poor
21.00% - 40.99% Less Strong
41.00% - 60.99% Strong enough
61.00% - 80.99% Strong
81.00% - 100.00% Very Strong

4. Conclusion

This study produced *augmented reality* learning devices based *discovery learning* on the morphological of Wijaya Kusuma flower (*Epiphyllum anguliger*) class VII junior high school which is theoretically and empirically feasible. *Augmented reality* learning devices based discovery learning on a morphological of Wijaya Kusuma flower (*Epiphyllum anguliger*) are declared probably possible with a total average of 3.3 with the "good" criteria based on the assessment of the feasibility of the devices assessed by validators. *Augmented reality* learning device based *discovery learning* on morphology of Wijaya Kusuma flower (*Epiphyllum anguliger*) is declared to be very empirically feasible by obtaining an average score of all students at 3.08 with the title Good (B), learning outcomes during the learning process namely the attitude assessment obtained a percentage of 95% Very Good predicate, and skills assessment obtained an average percentage of 90% with the title Very Good (SB). Student responses to the feasibility of discovery learning-based learning devices get a total average percentage of 95.6% with the criteria of "very strong".

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