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CatFish Breeding Module Using *Chromolaena odorata* Extract for Aquaculture Students at Vocational High Schools

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Abstract: Modules are very important components in the learning process to support student learning achievements. This study was carried out to develop a learning module for fish breeding courses using *Chromolaena odorata* extract at aquaculture vocational high schools (SMK) in Aceh. The purpose of the developed module is to increase student achievement of concept understanding and also for catfish breeding. Study was conducted for 70 respondents at SMK Ummul Ayman 2 as treatment school and SMK Negeri 1 Meureubo as control School. Modules are built using the ADDIE model principles, involving aspects of Analysis, Design, Development, Implementation and Evaluation. the results of the study provide strong evidence that the catfish breeding module using *Chromolaena odorata* extract is an effective way to improve students' knowledge and skills in catfish breeding. The module is also effective in helping even the lowest-performing students to improve their knowledge and skills. However, further studies are needed to confirm these findings and to investigate the long-term effects of the module.

Keywords: *Learning Module, Catfish Breeding, Chromolaena odorata Extract, Aquaculture*.

1. Introduction

Catfish is a popular food fish in Indonesia. It is a freshwater fish that is commercially bred and farmed in the country. Catfish is rich in nutritional content, including omega 3 fats, protein, vitamin B, vitamin D, iron, and so on. The most common type of catfish in Indonesia is the walking catfish. Walking catfish are named for their ability to walk on land using their pectoral fins. They are a hardy species that can tolerate a wide range of water conditions. This makes them well-suited for aquaculture, and they are one of the most widely produced fish in Indonesia (Lovell et al., 1978), Catfish is a versatile fish that can be cooked in a variety of ways. It is often fried, but it can also be steamed, grilled, or baked. Catfish is a popular ingredient in Indonesian cuisine, and it is used in a variety of dishes, such as pecel lele, a dish of fried catfish served with a spicy peanut sauce. In addition to being a popular food fish, catfish is also an important source of income for many Indonesians. The catfish aquaculture industry is a major contributor to the Indonesian economy, and it employs millions of people(Rimmer et al., 2013).

Catfish is a sustainable food source, and it can be produced with a relatively low environmental impact. This makes it a good choice for people who are looking for a healthy and environmentally friendly food option (Belton et al., 2011). Here are some of the benefits of eating catfish: Catfish is a good source of protein, Catfish is a good source of omega-3 fatty acids. Catfish is a low-fat fish and Catfish is a sustainable food source. If you are looking for a healthy and delicious fish to eat, catfish is a good option. It is a versatile fish that can be cooked in a variety of ways, and it is a good source of nutrients (Kari et al., 2020).

Indonesia as a country with a tropical climate where most of its territory is waters has natural potential which provides great opportunities as fish suppliers, both sea water fish and fresh water fish in the international market (Rizal & Anna, 2019). The increase in the production of fish farming in freshwater ponds is quite rapid, which is around 11 percent every year and one of the popular freshwater fish for cultivation is catfish (Iswanto, 2013). Modules are teaching materials that are systematically designed so that students can independently learn from the material (Nurdyansyah, 2018). stated that spawning results in African catfish (*Clarias sp.*) farming do not always go as expected, as many eggs die before hatching (Omitogun et al., 2012). The bacteria are produced from dead and decaying eggs so that the number of bacteria increases. Nursabrina in her baccalaureate thesis, she found that *Aeromonas Hydrophilia* and Genus *Pseudomonas* bacteria were most commonly found in catfish ponds (Nursabrina, 2021).

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Modules are teaching materials that are systematically designed so that students can independently learn from the material [7]. While Arif also explains that in its function as teaching material in the teaching and learning process, the module is structured with several components which cover the introduction, learning activities, and closing A learning module is a self-contained unit of instruction that can be used to teach a specific concept or skill (Arif & Mukhaiyar, 2020). Learning modules are typically designed to be completed in a short period of time, such as a few hours or a day. They can be used in a variety of settings, including traditional classrooms, online courses, and corporate training programs (Hudgins, 1974).

Learning modules typically include the following components: Introduction: This section provides an overview of the topic that will be covered in the module (Kennedy, 2006). Learning objectives: This section lists the specific skills or knowledge that students will be able to demonstrate after completing the module. Content: This section provides the information that students need to learn the topic. The content can be presented in a variety of formats, such as text, images, videos, and interactive exercises. Assessment: This section provides students with an opportunity to demonstrate their learning. The assessment can be a quiz, a test, or a performance task. Reflection: This section provides students with an opportunity to reflect on their learning and identify areas where they need additional practice.

Learning modules can be a valuable tool for students of all ages. They can help students to learn new concepts and skills in a self-directed way (Smedley, 2007). Learning modules can also be used to supplement traditional classroom instruction or to provide students with additional practice. Learning modules can be a valuable tool for students of all ages. By following these tips, you can create effective learning modules that will help your students to learn and grow (Nokelainen, 2006).

Here are some of the benefits of using the catfish breeding module using *Chromolaena odorata* extract. help students develop the skills they need to successfully breed catfish. provide students with hands-on experience in catfish breeding. help students develop critical thinking skills related to catfish breeding. help students develop problem-solving skills related to catfish breeding. Overall, the catfish breeding module using *Chromolaena odorata* extract is a promising tool for improving aquaculture skills among students. The module is well-designed and easy to follow, and it provides students with the knowledge and skills they need to successfully breed catfish. This study was conducted to see the effectiveness of the catfish breeding module using *Chromolaena odorata* extract for students in the field of aquaculture.

2. Methodology

This study is a quantitative study carried out through a quasi-experimental design approach using pre- and post-test instruments as measuring tools. A study was carried out to examine the effects of using the catfish breeding module using *Chromolaena odorata* extract for students aquaculture at vocational high school in Aceh. Experimental Methods are specifically designed to see the effect of an action or treatment that is deliberately introduced and phenomena that exist. The study was conducted on 70 respondents at two vocational high schools (SMK), SMK Ummul Ayman 2 as treatment school and SMK Negeri 1 Meureubo as a control school. 35 respondents from control schools and 35 respondents from treatment schools. This study was carried out for 6 weeks starting in mid-January 2023 until the end of February 2023.

3. Module Development

The selection of a model for the development of teaching materials is important because it can expedite the process of developing materials which will pay attention to the important process of design (Nurhikmah et al., 2021). The development of the fish breeding module using *Chromolaena odorata* extract was divided into five phases based on the ADDIE model namely the Analysis Phase, Design Phase, Development Phase, Implementation Phase and Assessment Phase as shown Table 1.

Table 1: Module Development Phase uses the ADDIE model

	Components	Details
Phase 1	A – Analysis	Learning objective analysis Module target analysis Student freelance knowledge analysis Determination of teaching materials Determination of teaching rules
Phase 2	D – Development	Breeding Module Development Development of Test Instruments
Phase 3	I-Implementation E-Evaluation	Experimental execution Post exam

Figure 1. shown the cover is designed attractively so as to stimulate student interest in the module being built. The title and diagram displayed represent the contents of the module. for whom the module is built also needs to be explained a little in this section. The cover section of this module was rendered using Photoshop CS3. Laying out some tattoos such

as *Chromolaena odorata* leaves and the resulting extract as well as the process of stripping catfish eggs can represent the objectives of building the modules being built.

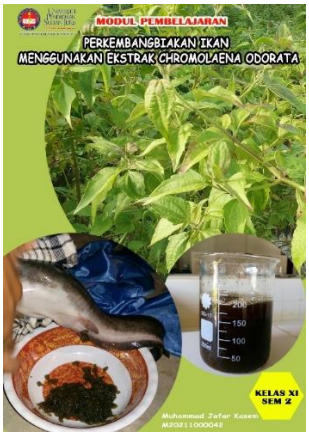

Fig. 1: Cover of the fish breeding module

Chromolaena odorata extract method was carried out by Palit et al., (2019), C. odorata leaves were taken, which are the parts of the leaves that start to grow, then the leaves were washed until they were clean, then dried. For treatment (K1), 100 g of *Chromolaena odorata* leaves were cut to about 2 cm, then sufficient water was added, then finely ground. After being mashed and then filtered, the dregs are then mixed and filtered again until only plant fiber remains. The extract is then made into 1 liter with water.

The other simple steps in making *Chromolaena odorata* extract are as shown *Figure 2*.

- Take *Chromolaena odorata* (seurapoh leaves) about 10 cm from the top.
- Weigh 100 grams of *Chromolaena odorata* (seurapoh leaves).
- Add 200 ml of water and mash or blend the ingredients until smooth
- Filter the results using coconut milk filter
- *Chromolaena odorata* (seurapoh leaf) extract is ready to use or store in the refrigerator.
- The best application dose is 0.6 ml/liter of hatching medium water.

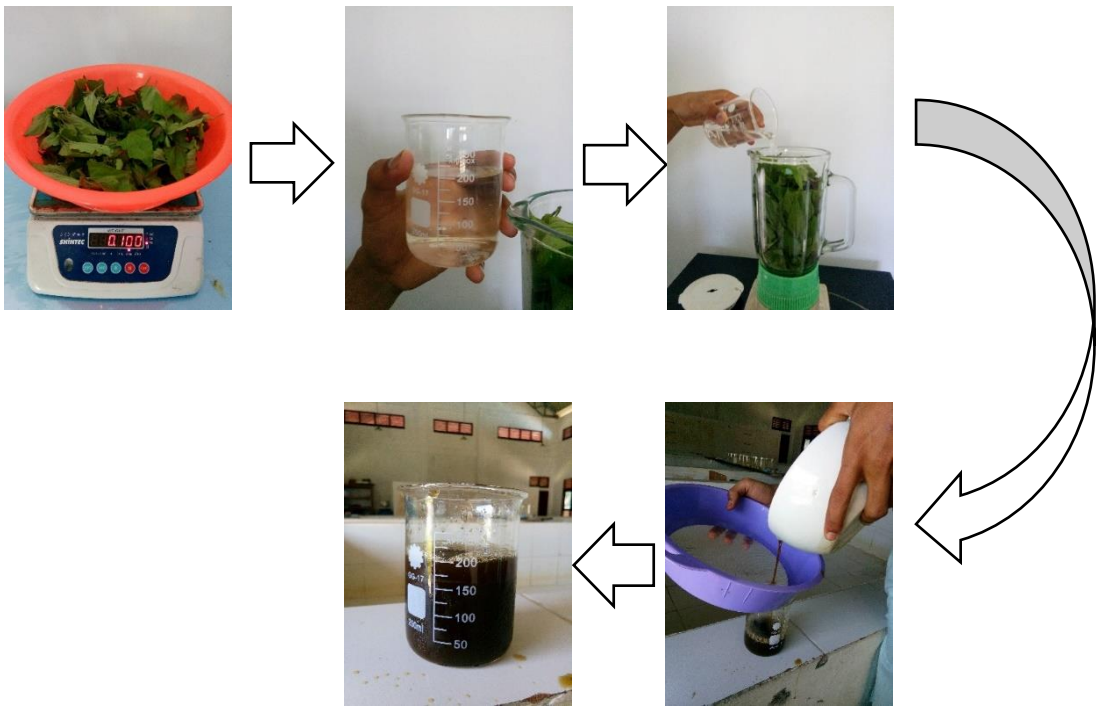

Fig. 2: The process of extract Chromolaena odorata

4. Data Analysis

4.1 Normality Test

Statistical analysis allows sample decisions to be generalized to the population after several conditions are met [17]. To carry out the analysis using inferential parametric statistics, all continuous data, such as intervals and ratios, should estimate normal distributions. The normality test was carried out to determine the appropriate method for testing the study hypothesis before the t-test was run. The shapiro-wilk (SW) normality test method was selected in this study. The results of the Shapiro-Wilk (SW) normality test are shown in the table below which was generated from the SPSS questionnaire.

Table 2: Shapiro – Wilk normality test

Group		Shapiro – Wilk		
		Statistics	df	Sig
Treatment	Pre	.951	35	.123
	Post	.964	35	.299
Control	Pre	.949	35	.108
	Post	.963	35	.284

Note, P > 0.05 = data spread close to normal (parametric statistics)
P < 0.05 = data not normally distributed (non-parametric statistics)

4.2 Hypothesis Research

This study has been carried out to answer several hypotheses that have been put forward. There are four hypotheses that have been reviewed as shown in the Table 3.

Table 3: Hypothesis research

	hypothesis
H1	There was no significant difference between the pre-treatment test marks using the catfish breeding module using *Chromolaena odorata* extract and the control pre-group test marks using conventional methods.
H2	There was no significant difference between the post-test markers by the treatment group using the catfish breeding module using *Chromolaena odorata* extract and the post-test control markers using conventional methods.
H3	There was no significant difference between the pre-test scores and post-test scores using conventional methods.
H4	There were no significant differences between the pre-test markers and the post-test markers in the treatment groups using the catfish breeding module using *Chromolaena odorata* extract.

4.2.1 There is no significant difference between the pre-treatment group test marks and the control pre-group test marks

Table 4 shown the data from the analysis of the pre-test conducted on 70 samples for the control group and the treatment group. The analysis found that the min scores and standard deviations for the two groups were nearly the same, namely the control group (M = 36.94, SD = 15.107) and the treatment group (M = 35.97, SD = 13.633). There were no significant differences between the two groups in terms of achievement on the pre-test than in the analysis performed. The conclusion that can be made is that the first hypothesis failed to be rejected, that is, there was no significant difference between the pre-treatment test marks and the control pre-group test marks against the pre-test before the intervention method was carried out in the canopy of catfish breeding using *Chromolaena odorata* extract.

Table 4: Data analysis of the t-test for the pre-exam

Group	N	Mean	Std. Deviation	M	Mean Deference	df	Sig. (2-tail)
Control	35	36.94	15.107	.971	.282	68	.778
Treatment	35	35.97	13.633				

Note, p < 0.05, N = 70

4.2.2 There is no significant difference between the post-test scores by the control group and the achievement of post-test scores by the treatment group

Table 5 shown that there is a significant difference between control group and treatment group achievement on the post exam. the min scores shown from the results of the analysis for post-test achievement were the control group (M = 59.43, SP = 15.606) and the treatment group (M = 71.11, SP = 15.111). The results of this study showed that the min score for the achievement of the treatment group was higher than the minimum score for the control group. The results of this

study also show that the second hypothesis is rejected, that is, there is a significant difference between the post-test markers by the control group and the achievement of the post-treated test markers after the intervention of the catfish breeding module using *Chromolaena odorata* extract was run.

Table 5: Data analysis - t test for post test

Group	N	Mean	Std. Deviation	M	Mean Deference	df	Sig. (2-tail)
Control	35	59.43	15.606	-11.686	-3.183	68	.002
Treatment	35	71.11	15.111				

Note, p < 0.05, N = 70

4.2.3 There is no significant difference between the achievement of pre-test marks and the achievement of post-test mark achievement

The third hypothesis is used to identify whether there is a significant difference in the pre- and post-test min scores on the achievement of control group markers. The t-test analysis for the pre and post control group test scores is shown in Table 6. data analysis using a leaning t-test where the comparison involves only one group.

Table 6: Data analysis of t-tests for pre- and post-control group examinations

Group	N	Mean	Std. Deviation	M	Mean Deference	df	Sig. (2-tail)
Pre	35	36.94	15.107	-5.543	-1.656	34	.102
Post	35	42.49	12.803				

Note, p < 0.05, N = 35

The results of the lean t-test analysis show that there is no significant difference between the min scores between the pre and post exams for the control group. The min score for the pre-control group was (M = 36.94, SD = 15.107) and the score for the post-control group was (M = 42.49, SD = 12.8.03). t = -1.656 and p > 0.05 = 0.102. Therefore, the third hypothesis is accepted, that is, there is no significant difference between the achievement of the pre-test marks and the achievement of the post-control test marks.

4.2.4 There is no significant difference between the achievement of pre-test scores and post-treatment group mark scores

The fourth hypothesis was used to determine whether there was a significant difference in the pre- and post-test min scores of the treatment groups. The t-test analysis results for the pre-test and post-test scores for the treatment pool are shown in Table 7. this data uses only a leaning t-test where the comparison only involves one set only.

Table 7: T-test analysis data for pre and post control group exams

Group	N	Mean	Std. Deviation	M	Mean Deference	df	Sig. (2-tail)
Pre	35	35.97	13.633	-35.143	-16.346	34	.000
Post	35	71.11	15.111				

Note, p < 0.05, N = 35

Analysis data from the results of the analysis in Table 7 above, it shows that there is a significant difference between the min pre and post exams for the treatment group, t (34) = -16.346, p < 0.05. This decision shows that the achievement for the treatment group sample taught using the catfish breeding module using *Chromolaena odorata* extract in the post-examination was higher than the pre-examination. Therefore, the fourth hypothesis for this study, namely that there was no significant difference between the pre-test and post-test for the treatment group after using the fish breeding module using *Chromolaena odorata* extract, failed to be rejected. Table 8. shows the overall results of the study findings in this module exams for pre and post control group exams.

Table 8: Results for hypothesis research

	Hypothesis	Result
H1	There was no significant difference between the pre-treatment test marks using the catfish breeding module using *Chromolaena odorata* extract and the control pre-group test marks using conventional methods.	Hypothesis accepted
H2	There was no significant difference between the post-test markers by the treatment group using the catfish breeding module using *Chromolaena odorata* extract and the post-test control markers using conventional methods.	Hypothesis rejected
H3	There was no significant difference between the pre-test scores and post-test scores using conventional methods.	Hypothesis accepted
H4	There were no significant differences between the pre-test markers and the post-test markers in the treatment groups using the catfish breeding module using *Chromolaena odorata* extract.	Hypothesis rejected

Based on the results of the study, the catfish breeding module using *Chromolaena odorata* extract was found to be effective in increasing the growth of catfish. The results of the study showed that there was a significant difference in the post-test markers between the treatment group using the catfish breeding module using *Chromolaena odorata* extract and the control group using conventional methods. The treatment group had a significantly higher mean score on the post-test than the control group. The results of the study also showed that there was no significant difference in the pre-test scores and post-test scores using conventional methods. This means that the conventional methods were not effective in increasing the growth of catfish. The results of the study suggest that the catfish breeding module using *Chromolaena odorata* extract is a more effective method of increasing the growth of catfish than conventional methods. The module is a low-cost and easy-to-use method that can be used by farmers to improve their catfish production. The study has several limitations. First, the study was conducted in a controlled environment and the results may not be generalizable to real-world conditions. Second, the study was conducted with a small sample size and the results may not be statistically significant. Third, the study did not measure the impact of the module on the quality of the catfish. Despite the limitations, the study provides evidence that the catfish breeding module using *Chromolaena odorata* extract is a promising method for increasing the growth of catfish. Further research is needed to confirm the findings of the study and to assess the impact of the module on the quality of the catfish.

5. Conclusion

The results of this study are promising and suggest that the fish breeding module using *Chromolaena odorata* extract can be an effective tool for improving aquaculture skills among students in Aceh. The module is well-designed and easy to follow, and it provides students with the knowledge and skills they need to successfully breed fish. The study also found that the module was effective in increasing student achievement, as measured by their scores on an aquaculture skills test. It is important to note that this study was conducted with a small sample size, and further research is needed to confirm the findings. However, the results of this study suggest that the fish breeding module using *Chromolaena odorata* extract has the potential to be a valuable tool for improving aquaculture skills among students in Aceh. Here are some additional thoughts on how the module could be used to improve student achievement: The module could be used as a supplement to traditional aquaculture instruction. The module could be used to provide students with hands-on experience in fish breeding. The module could be used to help students develop critical thinking skills related to aquaculture. The module could be used to help students develop problem-solving skills related to aquaculture. I hope that the findings of this study will encourage educators in Aceh to use the fish breeding module using *Chromolaena odorata* extract to improve student achievement in aquaculture. The study found that the module was effective in increasing student achievement, as measured by their scores on an aquaculture skills test. The study was conducted with a small sample size, and further research is needed to confirm the findings. However, the results of this study suggest that the catfish breeding module using *Chromolaena odorata* extract has the potential to be a valuable tool for improving aquaculture skills among students.

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