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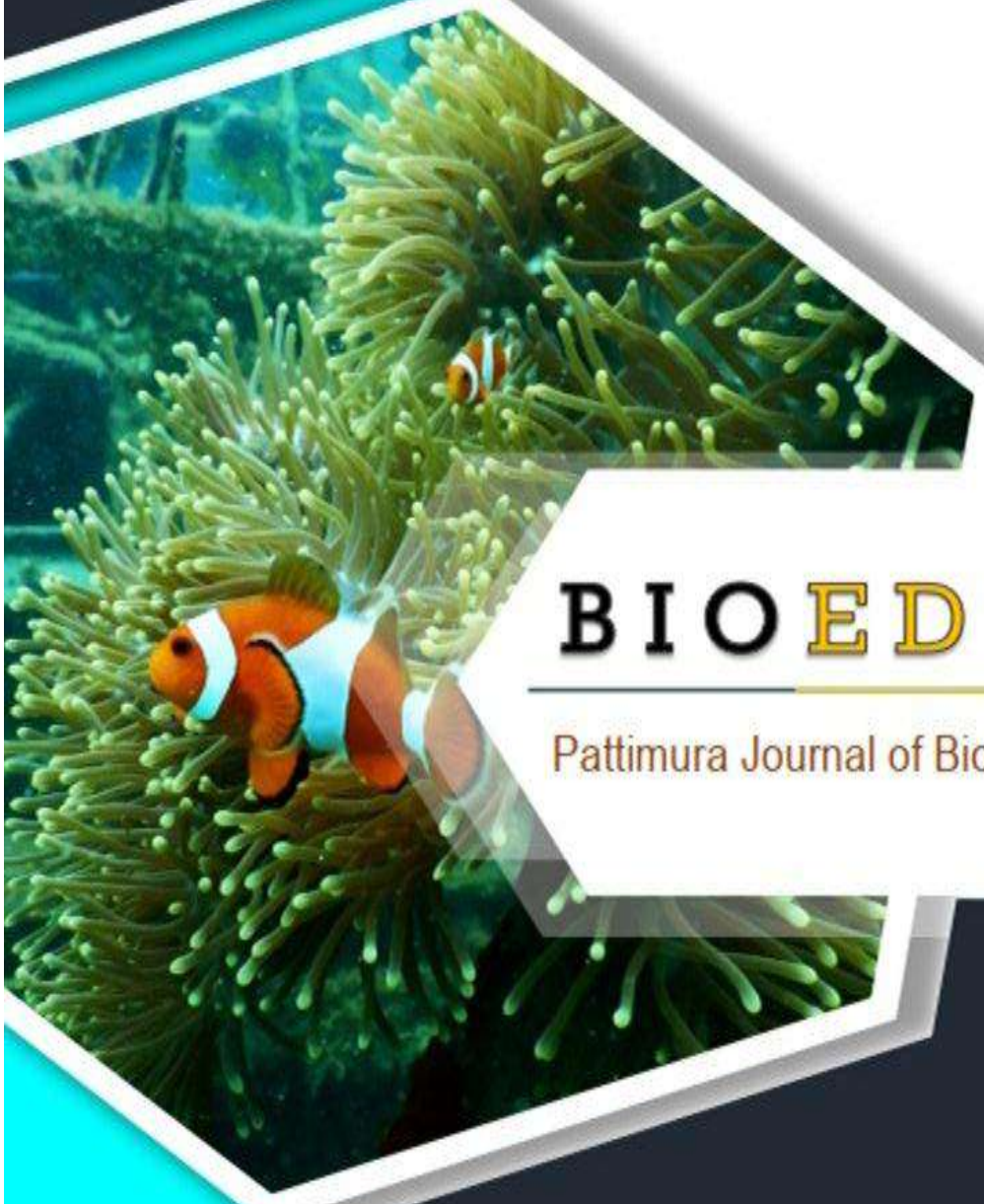

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Research Article

The effect of black cumin oil (*Nigella sativa*) on the reproduction of male Wistar rats

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ABSTRACT

Nigella sativa oil is antioxidant compound has the effect that serves to prevent cellular damage. The effect of Nigella sativa oil in the motility and total count of spermatozoa wistar rats. Experimental research with the design of post test only control group design. Wistar rats consists of 24 head and divided into 4 groups consist of control and treatment group. The control group was distilled. The first treatment was of Nigella sativa oil everydays as much with dose 150 mg/kgbw, 250 mg/kgbw, and 350 mg/kgbw, for 16 days, . Statistic test for motility and count of sperm wistar rats use the Kruskal-Wallis followed by Mann Whitney test. Avarage value of motility in the control (21.67±9.832) its lower than treatment. In dose 350 mg/kgbw its highest (52.33±13.292) compare in the treatment 250 mg/kgbw (40.67±17.512) and 150 mg/kgbw (30.67±8.165). avarage value of count sperm in the control (130.83±41.877) its lower than treatments. In dose 350 mg/kgbw its highest (199.67±23.480) compare in the treatment 250 mg/kgbw (187.50±74.538) and 150 mg/kgbw (140.83±32.568). Administration of Nigella sativa oil occur to enhancement motility and number of spermatozoa wistar rats.

Keywords: Nigella sativa, motility, count of spermatozoa

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INTRODUCTION

The male reproductive system consists of the hypothalamus, anterior pituitary and testes. Disorders of each of these organs can cause infertility and reduce secondary sexual characteristics. Disorders of the testes can affect the Leydig cells and the Sertoli cells which play a role in the production of testosterone and the maturation of spermatozoa. Damage to the male reproductive system can lead to infertility (Roychoudhury et al. 2021). Infertility is a condition in which the wife does not get pregnant after more than one year of regular sexual intercourse without using a contraceptive method. The main cause of male infertility in developing countries is spermatogenesis (Anshuka et al. 2021). Male infertility is caused by low sperm motility (asthenozoospermia), the number of spermatozoa (oligoszoopermia), sperm morphological abnormalities (teratozoospermia) (Zhang et al. 2021). Nigella sativa has compounds that have antioxidant effects. The physiological function of antioxidants is

to prevent damage to cellular components due to free radicals (Salima et al. 2021). The production of free radicals occurs continuously in all cells as part of normal cell function. If there is excessive free radical production, it will cause oxidative stress (Marija et al. 2021). Oxidative stress plays an important role in the pathophysiology of various diseases (Zhang et al. 2021). Based on the results of research, Nigella sativa is useful as an antioxidant, anticancer, anti-inflammatory, anti-cholesterol, antihistamine, antibiotic, immunomodulator and so on. The oil content of nigella sativa consists of alpha pinen (13.75%), limonene (2.55%), p-cymen (43.58%), carvacrol (2.53%), tymoquinone (1.65%), Linoleic acid (25%), oleic acid (12%), palmitic acid (2.84%), stearic acid (0.34%), linoleic acid (0.35%) and meristid acid (0.35%), carbohydrates, fats, vitamins, mineral elements, protein, unsaturated fatty acids such as linoleic, oleic and essential fatty acids such as phospholipids, phosphatidylcholine, phosphatidyletholamin, phosphatidyl serine, calcium, iron and potassium (Sanaz et al. 2021).

Research of Nigella sativa was able to improve the quality of spermatozoa in several experimental animals. This is evidenced by research which states that there is an increase in testosterone levels, sperm motility, seminal vesicle weight, and spermatozoa quality in rats with hyperlipedemia (Kristian et al. 2021). This study aims to determine the distribution of nigella sativa oil on the motility and number of spermatozoa in male Wistar rats.

METHODS

This research is a laboratory experimental study. The research design used experimental design. Randomized posttest only control group design using experimental animals as research objects. The research process lasted for 40 days starting January 27 to March 6, 2021 using 24 Wistar rats. Motility and sperm count examination were carried out at the laboratory Biology Universitas Pattimura. The experimental animals were adapted to cages for 1 week and divided into 4 groups consisting of a control group of 6 male wistar rats given distilled water and a treatment group of 3 groups which were given oil nigella sativa for 16 days. Consisting of group 1 with a dose of 150 mg/kgbw, group 2 dose of 250 mg/kgbw, and group 3 dose of 350 mg/kgbw. The results of the examination and calculation of research data were analyzed using a Program SPSS 20 for windows. The significance value in this study is that the analyzed variables have a p value <0.05.

RESULTS AND DISCUSSION

Observation of motility and number of spermatozoa

After the treatment of nigella sativa oil for 16 days, male wistar rats were take analysis of motility and number of spermatozoa. Wistar rat were anesthetized with ether then their defferent ducts were taken by clamping the ampulla of the defferent ducts and cauda epididymis, then cut approximately 1 cm from the cauda epididymis clamp and defferent ducts, after being cut they were sorted and collected for sperm fluid then mixed with EBSS as much as 2 milli microns. examination of spermatozoa with 100 X magnification at 18-240^0 C room temperature, the examination was carried out with 3 fields of view. Observation of Wistar rat spermatozoa can be seen in Figure 1.

Figure 1. Observation of Wistar rat spermatozoa (100 x Magnification)

Motility of spermatozoa

the number of spermatozoa

The results showed of the nigella sativa oil to male Wistar rats was able to increase the motility and number of spermatozoa. The results of the analysis can be seen in table 1.

Table 1. Results of analysis motility of spermatozoa

Treatment	Mean ± Std. Deviation
Control	21.67±9.832
150 mg/kgbw	30.67±8.165
250 mg/ kgbw	40.67±17.512
350 mg/ kgbw	52.33±13.292

Average value of motility spermatozoa in the control group was 21.67±9.832) lower than the three treatments of nigella sativa oil. In treatment 350 mg/kgbw is much higher (52.33±13,292) compared to treatment 250 mg/kgbw (40.67±17,512) and treatment 150 mg/kgbw (30.67±8,165). This study shows that giving negella sativa oil at a dose of 350 mg/kgbw for 16 days can increase motility of spermatozoa in male Wistar rats. To determine the difference in motility of spermatozoa in each treatment of nigella sativa oil for 16 days, a Mann-Whitney test was performed. The results of the Mann-Whitney test analysis can be seen in table 2.

Table 2. Mann-Whitney of motility Spermatozoa

Group	Treatment	P value
Control	150 mg/ kgbw	0.115
	250 mg/ kgbw	0.137
	350 mg/kgbw*	0.021
150 mg/kgbw	250 mg/ kgbw	0.104
	350 mg/ kgbw*	0.002
250 mg/ kgbw	350 mg/ kgbw*	0.005

Significant P < 0.05

Based on the table, it can be seen that in the control with a dose of 350 mg/kgbw (p = 0.021) there was a significant difference (p <0.05), while the control was with a dose of 150 mg/kgbw (p = 0.115) and 250 mg/kgbw (0.137).) there is no significant difference. In dose 150 mg/kgbw with the dose 350 mg/kgbw (p = 0.002) and the dose 250 mg/kgbw with a dose of 350 mg/kgbw (p = 0.005) there was a significant difference.

Table 3. Results of analysis number of spermatozoa

Treatment	Rata-Rata ± Std. Deviasi
Control	130.83±41.877
150 mg/kgbw	140.83±32.568
250 mg/ kgbw	187.50±74.538
350 mg/ kgbw	199.67±23.480

Average number of spermatozoa in the control (130.83±41.877) was much lower than that in the treatment of nigella sativa oil. The average higher number of spermatozoa was found in the dose 350 mg/kgbw (199.67±23.480), followed by the dose 250 mg/kgbw (187.50±74.538) and the dose 150 mg/kgbw (140.83±32.568). This study indicated that the provision of nigella sativa oil increased the number of spermatozoa. The treatment of nigella sativa oil to rats for 16 days was then analyzed using the Mann-Whitney test. The results of the Mann-Whitney test analysis can be seen in table 4.

Table 4. Mann-Whitney test for the number of spermatozoa

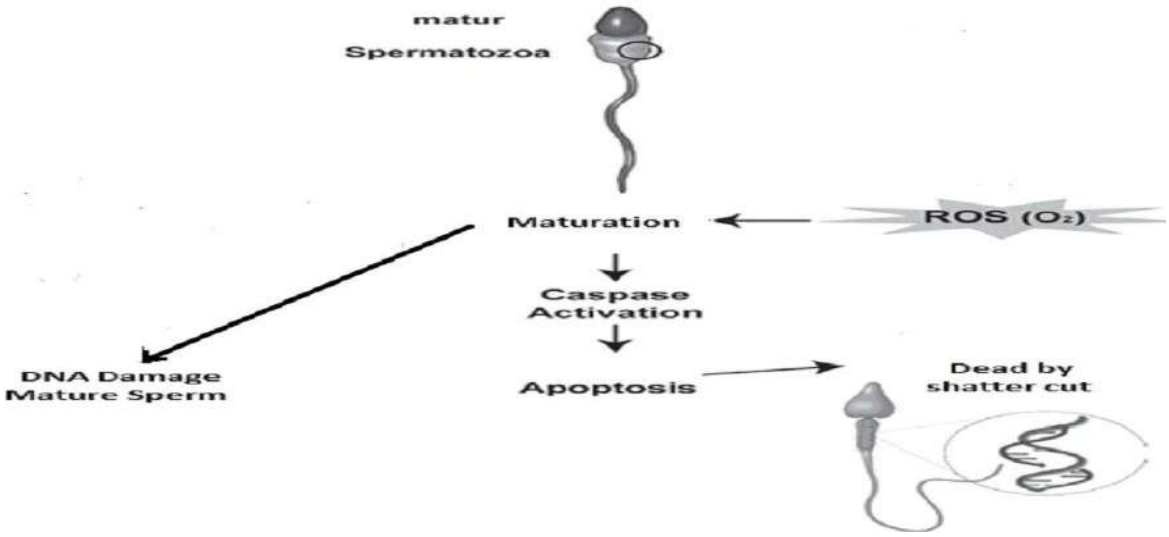
Group	Dose	P value
Control	150 mg/ kgbw	0.215
	250 mg/ kgbw	0.337
	350 mg/ kgbw*	0.019
150 mg/kgbw	250 mg/ kgbw	0.404
	350 mg/ kgbw*	0.009
250 mg/kgbw	350 mg/ kgbw*	0.012

Based on the table above, it can be seen that in the control with a dose of 350 mg/kgbw (p = 0.019) there was a significant difference (p <0.05), control with a dose of 150 mg/kgbw (p = 0.215) and a dose 250 mg/kgbw (0.337).) there is not significant difference. In the dose 150 mg/kgBB with the dose 350 mg/kgbw (p = 0.009) and the dose 250 mg/kgbw with a dose 350 mg/kgbw (p = 0.012) there was a significant difference.

DISCUSSION

The low number of motility and number of spermatoza in the control group compared to the treatment of nigella sativa oil was due to the cytochrome P450s enzymes present in the animal body biologically causing the production of ROS (Seungjin et al. 2020). Excessive production of ROS causes oxidative stress which affects antioxidant enzymes which consist of enzymatic components of the body's defense system, such as superoxide dismutase (SOD), catalase, glutathione peroxidase (GPx) and glutathione-stransferase (GST) (Alugoju et al. 2015). In wistar rate that were not given nigella sativa oil caused an increase in ROS compounds. ROS plays a role in oxidative stress such as superoxide (O2-), hydrogen peroxide (H2O2), peroxyl (ROO-), hydroxyl (OH-) and nitrogen oxide derivatives such as (NO-), peroxinitate (ONOO-) (Elisa et al. 2021). Increased ROS in the tissue that produces spermatozoa can cause abnormal spermatozoa. In addition, free radicals also stimulate apoptosis by involving a series of events that occur both in the cytoplasm and in the cell nucleus (Ismail et al. 2020). In the cytoplasm it activates caspase and in the cell nucleus chromatin condensation occurs, the nuclear sheath breaks and DNA fragmentation occurs for subsequent apoptosis (Ralf & Kristian, 2020). Oxidative stress and apoptosis are involved in mediating the DNA damage of spermatozoa. Intact spermatozoa DNA is an important condition for fertilization. Spermatozoa DNA damage is closely related to sperm function and male infertility. Spermatozoa in infertile men have been shown to have abnormal sperm (Ralf & Kristian, 2020).

Figure 2. Role of ROS on Spermatozoa DNA Damage (Ralf & Kristian, 2020).



The body has its own mechanism that can neutralize the dangers of free radicals with an antioxidant system, but if free radicals exceed the amount of antioxidants in the body it will cause cell damage (Zhang et al. 2021). The results of nigella sativa oil to male wistar rats in this study were higher than that of the control group. This is because Nigella sativa oil has antioxidant and immunodulatory effects where the physiological function is to prevent cellular damage due to free radicals and can repair cellular damage. Antioxidants play a role by catalyzing free radicals by the enzymes SOD catalase and peroxidase, binding pro-oxidants and cleaning ROS in the body's metabolism. Nigella sativa oil has thymoquinone compounds that act as immunodulators and antioxidants by activating antioxidant enzymes such as superoxide dismutase (SOD), catalase, glutathione peroxidase (GPx) and glutathione-Stransferase (GST) (Mehdi et al. 2020).

CONCLUSION

The administration of Nigella sativa oil at a dose of 350 mg/kgbw for 16 days increased the motility and the number of spermatozoa was higher than the dose of 250 mg/kgbw and 150 mg/kgbw in male Wistar rats.

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Research Article

Association patterns of seagrass with gastropods types in the intertidal zone of coastal waters, Suli village, Salahutu district, Ambon Island

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ABSTRACT

Seagrass beds play an important role in coastal aquatic ecosystems and are one of the tidal areas that are widely used by the community as a forum for the interests of educational institutions in research activities, conservation of various marine biota. Ecologically, the seagrass ecosystem acts as a shelter and a place to eat various marine biota, including gastropods. The purpose of this research is not only to explore the diversity of gastropods, but also to examine the interactions of gastropod species, both between the same species and between different species in a community of seagrass ecosystems. the diversity index calculation shows the diversity index value H = 3.982 > 3, this means that the diversity of gastropod species is quite good. The results of the basic analysis obtained the calculated X^2 value of 0.656, > X^2_{table} with a significant level of 0.05%. There is an association relationship between seagrass ecosystems and the types of gastropods that live in seagrass ecosystems in coastal waters of Suli Village, Ambon.

Keywords: Gastropod, seagrass, , association

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INTRODUCTION

The sea and coastal waters of Maluku Province, especially Ambon Island, have natural phenomena with the characteristics of their seagrass ecosystems, in addition to the content of marine biological resources with a diversity of gastropods that have high economic value. Gastropod marine biota as a community in seagrass ecosystems shows association patterns in the form of stratified structures in functional patterns related to associations between gastropod species, reproductive behavior and food webs in seagrass ecosystems in the intertidal zone of marine and coastal waters. Yudi Wahyudin et al. (2016) say that one of the seagrass ecosystems with its characteristics and in it there are interactions between seagrass ecosystems and various marine biota. This interaction forms a balance of the marine and coastal waters environment. The seagrass ecosystem is one of the important components as a constituent of coastal ecosystems along with mangroves and coral reefs. Seagrass ecosystems do not get too much attention, even though seagrass ecosystems provide sufficient nursery ground, feeding ground, nutrient circulation and others. Even seagrass ecosystems have

strong relationships and are associated with several unique organisms and species unique surroundings, such as gastropods and other marine biota, all of which depend on seagrass ecosystems.

Seagrass beds play an important role in coastal aquatic ecosystems and are one of the intertidal areas that are widely used by people in coastal areas, including the Salahutu District, Ambon Island. Coastal waters with their own seagrass ecosystem are widely used as a place for the interests of educational institutions in research, conservation, education and tourism activities. seagrass ecosystem in this area needs to get attention. The seagrass ecosystem has an ecological function, such as a place to live and find food, a place for spawning and in it there are associations of various marine biota and form a community. The interaction and association of various marine biota allows the ecosystem to have good potential for marine resources, such as various types of gastropods and the movement of various marine biota to be in the seagrass ecosystem area. Mahifal. (2010) Explains that the seagrass ecosystem is an aquatic area that needs to be protected because it has aquatic resources with various interests, both research, conservation and a place to meet the needs of people's lives.

Concept of community is very important in an ecosystem, because community is a principle that emphasizes the regularity of various types of marine biota that exist in seagrass ecosystems, such as interaction between marine biota and the aquatic environment in seagrass ecosystems. Mikael P. (2005) that among the various types of organisms that make up a community, only a few species show real control in the functioning of the community. Thus, the relative importance of gastropods in seagrass ecosystems is not determined by their taxonomic position, but by their number, size, reproduction, and interactions between each other or association with seagrass ecosystems in coastal and marine waters. According to Junita Supusepa. (2018) that in ecological studies such as the interactions between species or associations that are most important are the benefits of the organism for the benefit of humans as some types of gastropods have significant value economy because various types can be consumed as a substitute for animal protein. In addition, the shell can be used as a decoration material (sofenier), generally shelled animals This serves as a source of food that is taken from the meat for consumption. As a type of gastropod, it plays a role as an ecological controller in coastal ecosystems, especially in seagrass ecosystems.

Measurement of the level of association between gastropods and marine ecosystems by observing and calculating the relationship between garopod species and environmental factors physical, chemical, and biological, in the intertidal zone of the coastal waters of Suli Village, Ambon Island. This association greatly determines the population and community of gastropod species as well as their diversity and dominance a species of gastropods and the association pattern between gastropods and seagrass ecosystems. Tuaputty H. (2020) say that in the intertidal zone the coastal waters of Suli Village, Ambon Island have physical and chemical conditions such as salinity 30-34‰, temperature 28- 29 ^{0}C, pH 6,7 - 7.2. The existence of these fluctuations due to coastal waters greatly determines the existence of marine life. Tebiari (2021) say that the physical-chemical conditions of coastal waters occur due to coastal tides, changes in temperature, salinity, pH, and wind. This phenomenal cause the gastropod a characteristic feature. In generally, gastropods are found in physical and chemical conditions such as temperatures of 25 –32^{0}C, salinity optimal for gastropod life is in the range of 28–34% and requires a pH of 7.2 – 8.1 for gastropod survival and reproduction.

The life of various types of gastropods in the intertidal zone of the seagrass ecosystem is strongly influenced by the conditions of the aquatic environment, both physical, chemical and biological. Batau. (2017) say that in addition to physical and chemical factors also influence the presence of gastropods as macrobenthos is the availability of nutrients or organic materials in the seagrass ecosystem, so that there is interaction or association as an effort to move gastropods to keep getting food sources for life. gastropods to form a stable community in the seagrass ecosystem which can lead to associations between various gastropod species and the seagrass ecosystem. The study of gastropod associations with seagrass ecosystems is not only related to physical and chemical factors but also to biological factors. this can determine a community of gastropod species and their existence both as a food source and as an ecological factor in preparing the food chain for life in the ecosystem seagrass meadow. Hitalessy et al. (2015) say that species association is a reciprocal relationship between species in a community and can be used to predict community composition.

The presence or absence of associations of gastropod species in a community can indicate the level of diversity in the community of these gastropod species. A high level of association of gastropod species will indicate a high diversity of gastropod species in a community. The purpose of this research is not only to explore the diversity of gastropods, but also to examine the interactions of gastropod species, both between the same species and between different species in a community of seagrass ecosystems.

METHODS

This research is a descriptive study make a survey of the presence of various types of gastropods in the seagrass ecosystem by observing the association pattern between seagrassin the intertidal zone of coastal waters, Suli Village, Ambon Island, conducted in March-April 2021. Sampling was carried out using a transect line, each transect was made of 5 quadrants with a size of 4 m2 and physical and chemical factors were measured. To determine The diversity of gastropod species found in each quadrant was analyzed using the Shannon-Weaver formula (Odum 2005), namely:

$$H = - \sum_{ni=1}^{S} \left(\frac{ni}{N} x \text{Log}^2 \frac{ni}{N}\right)$$

H = index of species diversity,
ni = Number of individuals I,
N = Total number of individuals of all species.
Interpretation of the level of diversity, among others:
H < 1 community is in an unstable state.
1 < H < 3 communities are in moderate condition,
H > 3 communities in good condition.
To determine the value of the association, calculations are carried out using a contingency table 1
.

Table 1. Analysis of association Shannon-Weaver

		Seagress		
		Yes	No	
Type of gastropods	Yes	a	B	m=a+b
	No	c	D	n=c+d
Number		r = a+c	s = b+d	N

Based on the contingency value, an analysis of the association pattern of gastropod species with the seagrass ecosystem was carried out using the X^2 (chi square) value with the formula,

$$X^2 = \sum \frac{(O - E)^2}{E}$$

To determine the type of positive or negative association, the expected contingency value is used with the Chi-square test formula (X^2) using the contingency value,

$$X^2 = \frac{N (ad - bc)^2}{(a+b) + (c +d) + (a +c) + (b+ d)}$$

RESULTS AND DISCUSSION

Environmental conditions in the intertidal zone overgrown with seagrass in the coastal waters of Suli Village, Ambon Island, show that the temperature in the seagrass ecosystem inhabited by various types of gastropods ranges from 28.3 0C - 29.5 2C. Water temperature conditions like this are very good for gastropods in finding food. This is in line with the results of Tangke's (2010) research that seawater temperatures in the range of 28 0C - 30 0C will occur photosynthesis by seaweed, thus allowing many marine biota to like seagrass beds. According to Osni Sesfao et al. (2019) that the water temperature in the intertidal zone ranges from 26 C - 30 C, it is very good for the existence of a population of gastropod species, especially in coastal water ecosystems, encouraging the growth of gastropod species.

Measurement of the acidity level (pH) of seawater in the seagrass ecosystem as a habitat for gastropod species in the intertidal zone of the waters of Suli Village, Salahutu District, Ambon Island shows a pH range of 6.8 - 7.2. The level of pH of sea water like this is very stable and allows the presence of various types of gastropods to live in seagrass ecosystems. According to Wijayanti. (2007) that the pH of seawater that supports mollusc life ranges from 5.7 - 8.4, and for live gastropods it is in the range of pH 5.8 - 8.3. According to Effendi

(2003) that the pH value of seawater is more than pH 5 and greater than pH 9 creates unfavorable water conditions for most marine biota such as macrobenthos.

The results of measurements of dissolved oxygen in seagrass ecosystems in the intertidal zone of coastal waters values is in the range of 5.8 - 6.5 mg/L. This dissolved oxygen condition is very possible for the life of gastropod species in the seagrass ecosystem. Oxygen condition dissolved ideal for marine life, including gastropods, with an oxygen content of at least 5 mg/L. Dissolved oxygen is a chemical variable that has a very important role for the life of aquatic biota as well as a limiting factor for the life of marine biota. According to Kepmen. (2004) the dissolved oxygen content for biota in waters is > 5 mg/L. According to Effendi. (2003) a dissolved oxygen content of at least 2 mg/L is sufficient to support the normal life of aquatic organisms. However, the best dissolved oxygen is 5 mg/L – 6 mg/L. The results of the measurement of chemical and physical factors in the coastal waters of Suli Village, Salahutu District, Ambon Island, which were carried out in each quadrant on the types of gastropods, obtained the results in table 1 as follows:

Table 1. Results of measurement of physical and chemical factors in each quadrant of seagrass in the coastal waters of Suli village, Salahutu district, Ambon island.

Seawater Parameters	Transect I					Transect II					$\sum^{Rata2}$
	5 quadrant					5 quadrant					
	1	2	3	4	5	1	2	3	4	5	
Temperature ^{0}C	29,2	29,5	28,5	28.5	29,0	29,4	28.5	28.5	28.5	29.0	28,9
pH	6,8	7,2	7,1	6,7	7,0	7.2	6.9	7.0	6,8	6,9	6,98
Salinity ‰	33	33	30	32	32	32	34	33	32	33	32,4
DO mg/L	6,0	5,8	5,9	6,2	6,0	6,5	6,0	6,2	6,2	6,2	6,0

Based on the data in table 1 above, it shows that the physical and chemical factors of the waters have an average seawater temperature of 28.9 ^{0}C, an average seawater pH of 6.98, an average seawater salinity of 32.4 ‰ and an average dissolved oxygen –average 6.0 mg/L. The condition of aquatic environmental factors like this is very good for the life of gastropod species in the seagrass ecosystem in the intertidal zone of Suli Village, Salahutu District, Ambon Island.

The presence of gastropod species found in seagrass ecosystems in the intertidal zone of coastal waters of Suli Village, Salahutu District, Ambon Island after identification, it turned out that the species found were Conus muriculatus Soweby, Conus spongeialis.Hwass, Conus coronatus Ggmelin, Conus lividus, Littoraria scabra, Polineces mammilla, Polinceces tumidus. Based on the number of each type of gastropod found and a performance index analysis was performed, the diversity index value was H = 3.982 > 3 . This shows that the community of gastropod species that live in seagrass ecosystems is very stable and good for growth because it is supported by aquatic environmental factors. The results of observations and identification of Gastropod species found on 2 transect lines with 10 quadrants in the seagrass ecosystem in the intertidal zone of coastal waters, Suli Village, Ambon Island, can be seen in table 2 below.

Table 2. Results of Observation of Gastropod Types on 2 Transect Lines of Seagrass Ecosystems in Each Quadrant in the Coastal Waters of Suli Village, Salahutu District, Ambon Island

Types of Gastropods	Transect I					Transect II				
	quadrant					quadrant				
	1	2	3	4	5	6	7	8	9	10
Conus muriculatus Soweby	✓			✓		✓		✓		✓
Conus sponsialis .Hwass		✓		✓					✓	
Conus coronatus Ggmelin	✓	✓			✓		✓			
Conus lividus			✓		✓				✓	
Littoraria scabra	✓		✓			✓				
Polineces mammilla				✓						✓
Polineces Tumidus	✓				✓		✓		✓	

The results of the identification and calculation of gastropod species found in seagrass ecosystems on two transect lines with 10 quadrants in the itertidal zone of coastal waters, Suli Village, Salahitu District, can be described in the table for calculating the diversity index shannon-weaver, (Odum 2005) in table 3 below.

Table 3. Calculation of garopoda diversity found in 10 quadrants in seagrass ecosystems in coastal waters, Suli village, Salahutu district, Ambon island

Spesies	Ni	Pi =n/N	Log Pi	Log Pi x Log Pi
Conus muriculatus Soweby	9	0,191	-0,718	-0,527
Conus sponsialis .Hwass	5	0,106	-0,974	-0,868
Conus coronatus Ggmelin	7	0,148	-0,829	-0,681
Conus lividus	8	0,170	-0,769	-0,599
Littoraria scabra	6	0,127	-0,896	-0,769
Polineces mammilla	3	0,063	-1,200	-1.137
Polineces Tumidus	8	0,170	-0,769	-0,599
- ∑	47			-3,982
	3.982			

Based on the data from the calculation of the diversity index in table 3, it shows that the value of the diversity index is H = 3.982 > 3. this shows that the diversity of gastropod species is quite good. the community of gastropod species in seagrass ecosystems is quite stable in the intertidal zone of coastal waters in Suli village, Salahu village, Ambon Island. Analysis of the association pattern of gastropod species with seagrass beds in the intertidal zone there according to the calculation with the hope contingency formula is shown in table 4 below

Table 4. Calculation of association types of gastrooda with seagrass beds based on expected contingency values

		Seagress		
		Yes	No	
Type of gastropods	Yes	21	11	m= a + b = 32
	No	8	7	n = c + d = 15
Number		r = a + c =29	s = b +d =18	N = 47

Based on the contingent values in table 4, calculations are carried out for each expected contingent frequency value, namely E a = rm/N or Ea = 19.7. E b = ms/N or Eb= 12.2, E c = rn/N or Ec = 9.2, E d = sn/N or Ed= 5.7. Next to determine the pattern the relationship between the types of gastropods and the seagrass ecosystem, the chi square value was calculated. The results of the chi square calculation to determine the association between the types of gastropods and the seagrass ecosystem are shown in table 5 below:

Table 5. Calculation results of the association between seagrass ecosystems and Gastropod species.

No	Quadrant	O	E	O - E	$(O-E)^2$	$\sum \frac{(O-E)^2}{E}$
1	Seagrass ecosystem quadrant with types of gastropods	21	19.7	1.3	1.69	0,0857
2	Seagrass ecosystem quadrant without types of gastropods	11	12.2	-1.2	1.44	0,1180
3	Gastropods without a seagrass ecosystem	8	9.2	- 1,2	1.44	0,1565
4	Quadrant not seagrass ecosystem and types of gastropods	7	5.7	1,3	1,69	0,2964
		47	46,8	0,2	6,26	X^2 =0,656

Based on the data in table 5 shows that the calculated X^2 value is 0.656, > X^2 table with a significant level of 0.05% with db = 1 obtained a value of 0.016, then X^2 value is 0.656 > X^2_{table} 0.016, so it can be said that there is an association relationship between seagrass ecosystems with the types of gastropods that live in the seagrass ecosystem of the coastal waters of Suli Village, Ambon Island. The determine type of association or association pattern between gastropod species and seagrass or seagrass ecosystems, make use Chi-square test.

$$X^2 = \frac{N\,(ad - bc)^2}{(a+b) + (c+d) + (a+c) + (b+d)}$$

$$X^2 = \frac{47\,(60)^2}{29+18+32+15}$$

$X^2 = 1.8$

The results of the Chi-square calculation show that there is positive association pattern between seagrass beds and gastropod species in the coastal waters of Suli Village, Salahutu District, Ambon Island

CONCLUSION

Seagrass ecosystems in the intertidal zone of coastal waters of Suli Village, Salahutu Subdistrict, Ambon Island, have good water conditions, this is evidenced by the level of diversity of gatropoda species with index H = 3.9 81 > 3. So it can be said that the community in the ecosystem is still stable, because it is supported by physical and chemical factors of the waters as well as biological factors that allow positive interactions to occur. There is an association of communalism, namely the interaction between the types of gastropods that live in the seagrass ecosystem in the coastal waters of Suli Village, Salahutu District, Ambon Island, which is mutually beneficial between the two species.

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Research Article

Effect of learning management system on online learning becouse Covid-19: Study and learning courses students of biology education program, Pattimura University

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ABSTRACT

The problem of education in this digital era is that there is still a lack of teaching staff or lecturers expressing creative and innovative ideas in the form of books, or scientific works, learning models, teaching materials as solutions in learning digital technology. The knowledge and skills of Learning Management Systems for Biology Education students at the University of Pattimura in exploring and mastering the concept of Learning and Teaching are indispensable in the online learning process through the zoom meeting and whatsapp program during the covid-19. The analysis of variance test for the F_{value} of 2065,198 with the significance of the calculated F is 0.000 and the mean squared value is 1673,000, > Partial squared value of 0.989. This means that there is an influence of mastery and skills of the Learning Management System on the learning outcomes of learning and learning subjects through online learning during the Covid-19 pandemic in Semester VI Students of the Biology Education Program, Faculty of Teacher Training and Education, Pattimura University. there was success in improving learning achievement and learning outcomes in the Maluku region during the covid-19 pandemic, even though the lecture process was carried out online or online using the zoom meeting and whatsapp program. in dealing with the spread of covid 19 in the Mauku Region.

Keywords: Skilled of learning, system management, knowledge learn, study.

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INTRODUCTION

Changes in the world of education towards the digital era occur in the world of learning or lectures in universities. This change in educational civilization demands that lecturers and students master 21st century skills, namely being able to understand and utilize information and communication technology. Education carried out through the learning process or lectures conducted by a lecturer plays a very important and strategic role in building students' thinking skills so that they are knowledgeable and have skills, namely technology and media literacy, effective communication, critical of thinking, problem solving, and collaboration. The problem of education in this digital era is that there is still a lack of teachers or lecturers coming up with creative and innovative ideas in the form of books, or scientific works, learning models, teaching materials as solutions in learning digital technology. According to Munir (2017) the potential of students needs to be developed to improve

the teaching and learning process based on information and communication technology because computer literacy and gadgets are now adequate. The potential of these students must be balanced by the University in providing programs to improve the teaching and learning process through the learning management system (LMS) to master the concepts of learning and learning subjects. Therefore, students need to be invited to think smart in mastering and using this learning management system.

Mastery of learning for lecturers in the digital era and faced with the Covid-19 pandemic condition is a necessity or necessity, if you want to be considered authoritative in front of students in the lecture process. Candra Ronitua Gultom (2020) said that during the covid-19 pandemic, the solution for carrying out learning or lectures online was a must for every lecturer. Likewise, the lecture process at pattimura university is in accordance with the joint decision of the ministry of education and culture, the ministry of religion number 302/E.E2/KR/2020 which was issued on March 31, 2020. Thus, the lecture process for learning and learning courses followed by semester VI students of the Study Program Biology education uses the zoom meeting and whatsapp program. According to Dwi Sulisworo et al, (2020) that learning in universities during the covid-19 pandemic can be done through the Zoom Meeting application, WhatsApp, Google Classroom, Google Meet, and others.

The knowledge and skills of Learning Management Systems students of Biology Education in exploring and mastering the concept of Learning and Teaching are indispensable in the online learning process through zoom meeting and mastery of learning management systems that really help students master the concepts of learning and learning. According to Intan Firda Alifiyanti et al, (2018) that the use of the internet network in learning by using a learning management system actually contributes quite a lot in terms of utilization and allows students to access it anytime and anywhere through the ability to operate a learning management system with many types. and very broad benefits as an online network can also be monitored by parents, teachers and lecturers. The existence of students' abilities in utilizing the Learning Management System is expected to increase knowledge and learning achievement of learning and learning concepts.

The importance of online learning in the covid-9 pandemic conditions, the knowledge and skills of system management learning applications as a tool for the learning and learning lecture process will be effective and efficient. The purpose of this study was to determine the effect of mastery of learning management systems on learning outcomes of learning and learning subjects through online learning during the covid-19 pandemic in Semester VI students of the Biology Education Program, Faculty of Teacher Training and Education, Pattimura University.

METHODS

This research is descriptive-qualitative, which is to reveal the online lecture process through the zoom meeting and whatsapp program, then statistical tests are carried out on the mastery of learning management systems based on the established criteria score and assessment of learning outcomes in online learning and learning courses during the covid-19 pandemic in semester VI students of Biology Education Program, Faculty of Teacher Training and Education, Pattimura University. The implementation time of this research is 5 March to 5 July 2021, with 25 students as research subjects. To obtain accurate data, valid data collection steps are carried out using tests, and an assessment of knowledge and skills of learning management systems through assignments given to students during the online lecture process that takes 12 face-to-face online with the zoom meeting program and whatsapp.

RESULTS AND DISCUSSION

Based on the results of the assessment process and observations made on the tasks given to each student to obtain an overview related to the knowledge and skills of mastering ICT media, namely the use of Learning Management Systems to improve mastery of learning concepts obtained from 25 students as respondents. Mastery and skills of Learning Management Systems are assessed based on the assignments given and carried out and returned to students. The assessment is carried out based on frequency (f) and percentage (%) according to the criteria for the mastery score of knowledge and skills in learning management systems as shown in table 1. below.

Table. 1. Results of Frequency Analysis and Percentage of Mastery of Learning Management Skills from 25 Students Who Participate in Learning and Lectures Through Online Learning Models.

		Rating result											
Score	Criteria	Skilled in operating the Learning Program on the Internet		Skilled in Making Power Points, Learning Videos and Learning Animations		Skilled Looking for information and storing and sending information (data)		Skilled in operating a computer or gadget		Skilled in downloading and accessing various online programs		Final score	
		F	%	F	%	F	%	F	%	F	%	F	%
90 -100	Very good	2	8	2	8	1	4	2	8	1	4	8	32
80-88,9	Good	1	4	1	4	1	4	2	8	2	8	7	28
70-79,9	Enough	2	8	1	4	2	8	1	4	2	8	8	32
60-69,9	Less	0	0	0	0	0	0	1	4	1	4	2	8
0 < 59,9	Bad	0	0	0	0	0	0	0	0	0	0	0	0
	Amount	5	20	4	16	3	12	7	28	6	24	25	100

Based on the data in table 1. above, it can be explained that 32% of students' skills on learning management systems are very good, 28% are good skills, 32% are sufficient and only 8% are lacking. The measure the mastery of the learning concept material, a test was carried out to assess the level of mastery of the material by 25 students according to the mastery criteria score, then an overview of the mastery of learning concepts was obtained, as shown in table 2. below.

Table. 2. The results of the knowledge assessment of learning concepts based on frequency and percentage and according to the criteria score for the level of student knowledge through online learning.

		Rating result											
Score	Score	The Nature of Learning		Principles of Learning		Learning Models and Methods		Design Learning		Develop an Assessment Plan		Final score	
		F	%	F	%	F	%	F	%	F	%	F	%
90 -100	Very good	2	8	2	8	1	4	2	8	1	4	8	32
80-88,9	Good	2	8	3	12	3	12	1	4	0	0	9	36
70-79,9	Enough	0	0	1	4	2	8	1	4	1	4	5	20
60-69,9	Less	0	0	1	4	0	0	1	4	1	4	3	12
0 < 59,9	Bad	0	0	0	0	0	0	0	0	0	0	0	0
	Amount	4	16	7	28	6	24	5	20	3	12	25	100

Based on the data above, it can be explained that of the 25 students who mastered the material or concepts of learning according to the score of the assessment results, it can be described as follows: (1) students have knowledge with very good score criteria as much as 32%, (2) students have knowledge the concept of learning with good score criteria as much as 36%, (3) students who have knowledge of learning concepts with sufficient criteria as much as 20%, (4) students who have knowledge of learning concepts with less score criteria as much as 12%. Based on the results of the assessment of knowledge and skills of Learning Management Systems as well as the results of the assessment of the mastery of knowledge of learning concepts from 25 students, it make of analysis of variance (Anova). it is shown in table 3.

Table 3. Anova results of knowledge and skills on student success in carrying out tasks for study and learning courses

Analysis of Variance (Anova)									
Source	Dependent Variable	Type III Sum of Squares	df	Mean Squares	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Corrected Model	Cognitive	.000[a]	0	.	.	.	.000	.000	.
	LMS	.000[b]	0	.	.	.	.000	.000	.
Intercept	Cognitive	167281.000	1	1673.000	2065.198	.000	.989	2065.198	1.000
	LMS	161604.000	1	161604.000	1523.368	.000	.984	1523.368	1.000
Error	Cognitive	1944.000	24	81.000					
	LMS	2546.000	24	106.083					
Total	Cognitive	169225.000	25						
	LMS	164150.000	25						
Corrected Total	Cognitive	1944.000	24						
	LMS	2546.000	24						

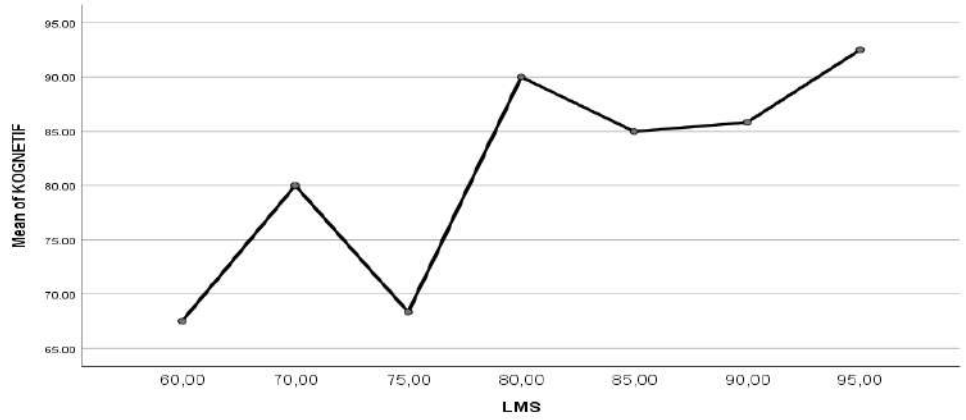
a. R Squared = ,000 (Adjusted R Squared = ,000)

b. R Squared = ,000 (Adjusted R Squared = ,000)

c. Computed using alpha = ,05

a. Dependent Variable: KOGNETIF
b. Model = Intercept, LMS (Learning manajement system)

Based on table 3.1, it can be explained that the value of F_{count} is 2065,198 with a significance of calculated F is 0.000 and the mean squared value is 1673,000, > Partial squared value of 0.989. This means that the research hypothesis is accepted (there is an effect) on the mastery of the Learning Management System on the learning outcomes of learning subjects through online learning during the covid-19 pandemic in Semester VI Students of the Biology Education Program, Pattimura University. In accordance with the description of the influence of Lerning Management System knowledge and skills owned by students and also the level of knowledge of learning concepts, a graph is obtained which explains that the better the Learning Management System skills, the better the mastery of learning concepts. This can be seen in graph 1.



Based on the data in the graph above, it can be explained that the higher the knowledge and skills of Lerning Management Systems that students have, they can master the concept of learning and learning and can complete the learning and learning process well through online learning using the Zoom meeting program, and WhatsApp.

DISCUSSION

The development of internet technology has led to various new applications, including the zoom meeting application for the lecture process. One of the benefits of applying internet technology in learning is as a means of direct face-to-face substitute learning in the form of online application. From the results of the assessment of all students, both individually and in groups during the lecture process with the zoom meeting program, it shows that there is a balance between student knowledge of learning and skills in implementing learning management systems by students with very good criteria scores. This is in accordance with Setya Raharja. (2011) that mastery of Learning Management Systems can be used to understand lecture material properly and correctly online, and it is easy to understand the relationship of each concept to the material being studied, besides that students can access the material and its storage. and submit assignments on time via online to the lecturer, so that the lecturer can assess knowledge through the assignments gived.

The level of student knowledge in understanding learning materials during the lecture process is thought to be due to the ability to operate the Learning Management System. Yusring Sanusi. (2016) explained that several online learning theories that are commonly used as references are constructivism, cognitive and behaviorism, these three theories are always interesting to look at. Online learning through with the Zoom meeting program turns out to be an inspiration for students in finding teaching materials, carrying out assignments. According to Munir. (2010) Lerning Management System contains materials in pedagogic and professional competencies, as well as skills related to packaging (text, animation, video, sound, download various programs), given as learning competency development. learning management system offers learning innovations that include innovations in the field of information and communication technology, especially those based on virtual through web online learning, multimedia and video conferencing. Learning management system is a web-based learning developed dynamically. According to Taofik Muhammad. (2017) the level of mastery of System Management Learning will result in mastery of different materials in various information received and worked on. The ability of students to utilize learning management systems is needed, especially the ability of collaborative learning which is a structured and systematic instructional strategy in which students work together, it can be in the form of dialogue, negotiation of arguments to solve the problems they are working on.

The results of this study are in accordance with Septian Nur Ika Trisnawati. (2019) revealing that the ability of the Learning Management System skills possessed by students will greatly affect success in improving learning achievement and learning outcomes.Based on the results of analysis and study of learning theories carried out during the online lecture process through online, it turns out that the higher the ability to master the Learning Management System, the higher the knowledge possessed by students.

CONCLUSION

There is an influence on the mastery of the Learning Management System on the learning outcomes of learning courses through online learning during the covid-19 pandemic in the sixth semester students of the biology education program, faculty of teacher training and education, Pattimura University.

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Research Article

Effect availability of biology learning facilities and resources on students' motivation and learning achievement at Madrasah Aliyah BPD Iha-Kulur

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ABSTRACT

Madarasah Aliyah BPD Iha-Kulur is one of the schools at the high school level under the Ministry of Religion but the pattern of development refers to the Ministry of National Education. therefore these schools are required to comply with various regulations regulated by the Ministry of National Education. The purpose of this study was to determine the effect of the availability of biology learning facilities on students' motivation and learning achievement. This study uses a type of quantitative research. Located at Madrasah Aliyah BPD Iha–Kulur. On december 2020 - February 2021. Population in this study were students of class XII IPA totaling 110 and only taking a sample of 21% of the total population. Sampling technique using probability sampling technique. The instrument used in this study was a questionnaire, while the data analysis used multiple regression analysis. The show that the availability of biology learning facilities has a positive and significant influence on students' motivation and learning outcomes. The availability of biology learning facilities greatly determines student learning outcomes.

Keywords: Facilities, learning resources, motivation, learning achievement

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INTRODUCTION

The development of science and technology that is growing rapidly, has resulted in changes in various fields including education. Improving the quality of education can be carried out by making improvements and updates for the success of education. School as a formal educational institution is a means in order to achieve the success of the education. Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System Article 18 regulates that Madrasah Aliyah is part of the upper secondary education system in national education. The existence of Madrasah Aliyah is confirmed by the Decree of the Minister of Education and Culture Mendikbud Number 0489/U/1992 which states that Madrasah Aliyah is a Public High School with Islamic characteristics which is organized by the Ministry of Religion. Madarasah Aliyah BPD Iha-Kulur is one of the high school-level schools under the auspices of the Ministry of Religion but implements the national curriculum. In addition, following various regulations regulated by the Ministry of National Education. The difference is in the development of Islamic religious education and other religious activities.

Teachers have a tough task in delivering materials and completing the same subject matter and the number of hours of lessons in Madrasah Aliyah BPD Iha–Kulur is less when compared to public schools. Whereas students are required to be motivated and compete to be the same as students in other schools. Tirtonegoro, stated, Learning achievement is an assessment of the results of learning activities expressed in the form of symbols, letters, numbers, and sentences that can reflect the learning outcomes that have been achieved by each child in a certain period. Lela Camellia (2016), said that learning achievement is evidence of the success that has been achieved by someone. Miarso explained that learning is an activity either with the guidance of the teaching staff or with their own efforts. The presence of teachers in learning activities is intended to make learning smoother, easier, more fun, and more successful. As for students, learning is basically to gain knowledge, skills, and attitudes anywhere, anytime, and with anything, because learning resources are everywhere and varied and of various types. The quality of the interaction of students with learning resources greatly affects learning outcomes. Thus, there is a very big difference between students who have high intensity in the use of learning resources and students who have low intensity in utilizing learning resources (Supriadi, 2015).

Learning facilities are defined as something that can facilitate and expedite the implementation of learning. Facilities can be equated with infrastructure. Educational facilities are all facilities needed in the teaching and learning process, both movable and immovable so that the achievement of educational goals can run smoothly, regularly, effectively, and efficiently (Arikunto &Yuliana, 2008). Meanwhile, Barnawi & Arifin (2012) stated that educational facilities are all equipment, materials and furniture that are directly used in the education process in schools. Learning facilities can be classified into 3, namely (1) Consumable or not (consumable and durable), (2) Moving or not (moving and not moving), (3) Relationships in the learning process (lesson tools, teaching aids, and learning media). Heryati & Muhsin (2014). According to Percival and Ellington in Supriadi, (2015) said that in conventional learning models, and of the many available learning resources, it turns out that only textbooks are learning resources that are used other than the teaching staff themselves. Meanwhile, various learning resources in general have not been used optimally.

In our country, it can be found that the use of teaching materials and textbooks in learning is very dominant when compared to learning resources such as libraries, laboratories, field studies, slides, internet, computers, and others. However, nowadays the use of computers in learning has shown a significant increase. Learning resources are sources of knowledge that have various dimensions. Learning resources are reviewed narrowly, namely learning resources included in books or printed materials, such as magazines, bulletins and so on, while the broad meaning is in the form of learning tools that can present messages and can be heard or seen, such as radio, television and so on. others (Suhirman, 2018). Learning resources are something that can contain messages to be presented through the use of tools. Learning resources can also mean everything that is intentionally designed or available that is used both individually and in groups to make or help students learn. In learning resources there are several main components that support these learning resources, namely: a). messages which are lessons/information that is passed on by other components in the form of ideas, facts, meanings, data, etc., b). Components People / humans as storage, processing, and presenter of messages, c). Component tool something that is used to convey messages stored in the material, d). Component techniques routine procedures or guidelines that are prepared for using materials, equipment, people, and the environment to convey messages (Abd Hafiz, 2011).

Motivation and learning according to Uno (2014) are two things that influence each other. So that learning activities need motivation in students, because according to Gray in Majid (2013) defines motivation as a number of processes that are internal and external to an individual that causes an attitude of enthusiasm and persistence in carrying out certain activities. While the nature of learning motivation according to Uno (2014) is internal and external encouragement to students who are learning to make changes in behavior. Learning motivation is needed in a learning process, so that students have enthusiasm in achieving educational goals. Based on this opinion, it can be concluded that motivation is a force that drives individual activities to carry out an activity to achieve goals. So learning motivation is the overall driving force both within and from outside the student by creating a series of efforts to provide certain conditions that ensure continuity and provide direction to learning activities, so that the goals desired by the learning subject can be achieved.

Based on the results of interviews and initial observations that the author conducted on 2 biology teachers and several students (unstructured interviews) it is known that in conducting biology learning, teachers are often constrained by the lack of learning resources in this case related to learning facilities, including the absence of library facilities, laboratories, school wifi and also the lack of supporting facilities for learning biology in the classroom. Biology learning carried out in the classroom is also manual and does not use learning support tools such as LCD projectors, even the absence of electricity facilities so that it affects the quality of education in the Huamual sub-district, West Seram Regency. Due to the lack of learning facilities faced by Madrasah BPD Iha-Kulur, the creativity of the teachers, especially biology teachers, is always demanded in designing learning and utilizing various available learning resources in order to improve the quality of education.

Based on this description, it can be seen that the availability of learning facilities and resources is also highly expected to support student learning at Madrasah Aliyah BPD Iha–Kulur, especially in biology subjects. Hopefully with all the limitations faced by the Madrasah Aliyah BPD Iha-Kulur school, it will not spark the enthusiasm and motivation of the students in achieving proud achievements. Therefore, as regional children who are sensitive and care about the development of education in the area, researchers feel called and consider it necessary to conduct research with the title "The Effect of Availability of Biology Learning Facilities and Resources on Student Motivation and Learning Achievement at Madrasah Aliyah BPD Iha-Kulur".

METHOD

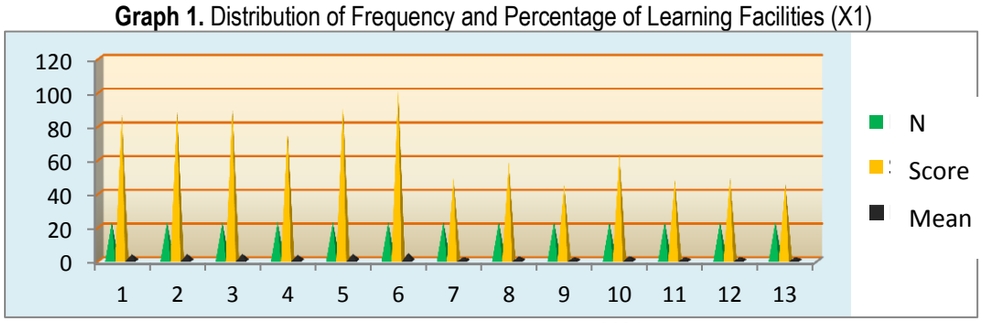
This research is quantitative, using the inferential test. This research is intended to dig up factual information about the influence of availability of biological learning resources on student motivation and learning achievement at Madarasah Aliyah BPD Iha-Kulur. This research was conducted on December 14, 2020–January 14, 2021. The population in this study were all students of Madarasah Aliyah BPD Iha-Kulur, totaling 110 people consisting of 3 classes. The sample in this study was taken using probability sampling technique, with a total sample consisting of 23 students of class XII Science.

RESULTS AND DISCUSSION

Distribution of Learning Facilities Questionnaire (X1)

The distribution of learning facility data (X1) in this study obtained through the provision of questionnaires to students of class XII Science Madrasah Aliyah BPD Iha–Kulur can be seen in the following graph:

Graph 1. Distribution of Frequency and Percentage of Learning Facilities (X1)

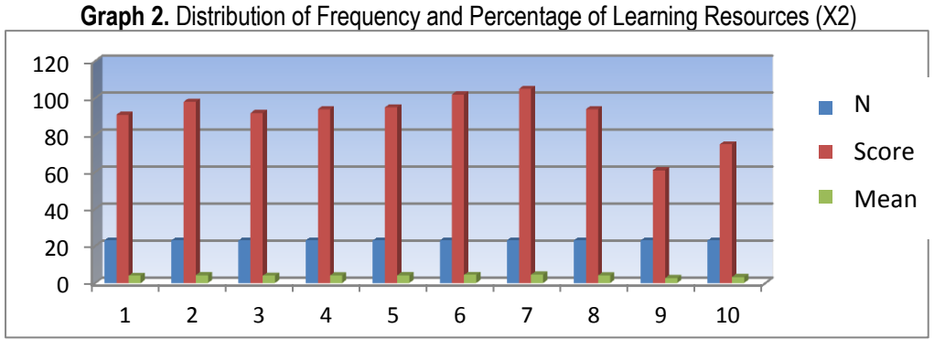


Data analysis questionnaire 2021

Distribution of Learning Resources Questionnaire (X2)

The distribution of learning source data (X2) in this study obtained through the provision of questionnaires to students of class XII Science Madrasah Aliyah BPD Iha-Kulur can be seen in the following graph:

Graph 2. Distribution of Frequency and Percentage of Learning Resources (X2)

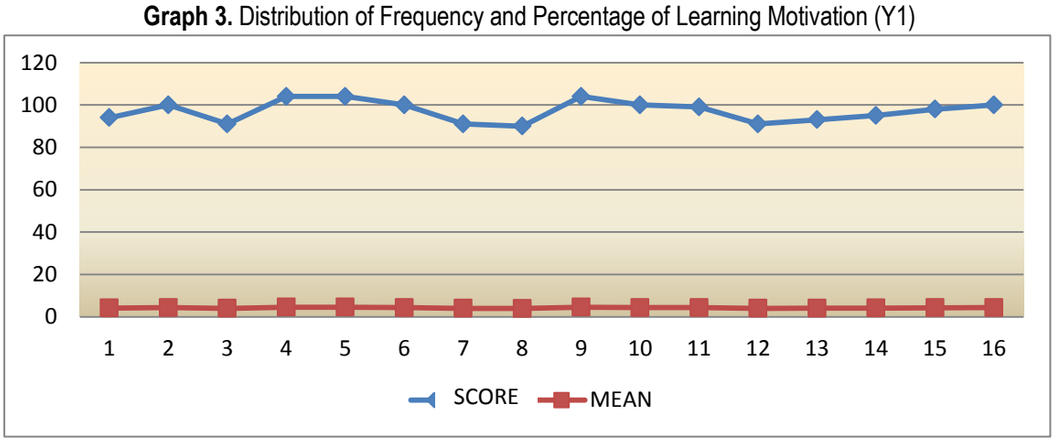


Data analysis questionnaire 2021

Distribution of Learning Motivation Questionnaire (Y1)

The distribution of learning motivation data (Y1) in this study obtained through the provision of questionnaires to students of class XII Science Madrasah Aliyah BPD Iha-Kulur can be seen in the following graph:

Graph 3. Distribution of Frequency and Percentage of Learning Motivation (Y1)



Learning Achievement (Y2)

The distribution of class XII science achievement level categories can be seen in the following table:

Table 2. Distribution of Variable Categories of Learning Achievement Level

No	Norm	Category	The number of students	Percentage %
1	81,04 < X	high	5	21,73%
2	75,48 < X < 81,04	medium	15	62,21%
3	X < 75,48	low	3	14,28%
	Amount		**23**	**100%**

Data analysis questionnaire 2021

In Table 2 it can be seen that there are 3 students (14.28%) in the low category, 15 students (62.21%) in the medium category, and 5 students (21.73%) in the high category. After the data from the measurement of learning

facilities were associated with learning motivation and then processed using SPSS for windows, the results of simple regression analysis can be seen in the following table:

Table 3. Regression Equation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	32.137	1.626		19.769	.000
Learning Facilities X1	.905	.041	.979	21.860	.000

a. Dependent Variable: Motivation to learn Y1

Based on the table above, the regression equation is obtained,
$Y_1 = 32{,}137 + 0{,}905\ X_1 + e$
The regression results can be interpreted as follows:

a) The constant/intercept (α) of 32.137 means that without the influence of learning facilities, the learning motivation is very low.
b) The regression coefficient for learning facilities variable (X1) is 0.905, which means that learning facilities have a positive influence on learning motivation (Y1). If the student learning facilities at Madrash aliyah BPD Iha-kulur are increased, the students' learning motivation will also increase.

From the results of the t-test calculation of the effect of learning facilities on learning motivation, the t-count results are 21,860 with a significance value of 0.000 <0.05, meaning that learning facilities have a positive and significant effect on learning motivation of students in class XII Science Madrasah Aliyah BPD Iha-kulur. The R2 (R square) test obtained results of 0.958 or 95.8%, which means that the contribution of the influence of learning facilities to learning motivation is 95.8% while the remaining 4.2% is influenced by other factors. Other factors in question are not derived from the variables studied.

The influence of learning resources (X2) on students' learning motivation (Y1)
Regression Equation Test (T)

Table 4 . Regression Equation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	16.673	2.325		7.171	.000
	Learning Facilities X2	1.291	.059	.979	21.920	.000

a. Dependent Variable: : Motivation to learn Y1

Based on the table above, the regression equation is obtained, namely:
$Y1 = 16{,}673 + 1{,}291\ X1 + e$
The regression results can be interpreted as follows:

1. The constant/intercept (α) of 16.673 means that without the influence of learning resources, the learning motivation is very low.
2. Regression coefficient of learning resources variable (X1) of 1.291 means that learning resources have a positive influence on learning motivation (Y). If student learning resources increase, then student learning motivation will also increase.

From the results of the calculation of the t-test of 21,920 with a significance value of 0.000 <0.05, it means that learning resources have a positive and significant effect on students' learning motivation. The R2 (R square) test obtained results of 0.958 or 95.8%, which means that the contribution of the influence of learning resources on learning motivation is 95.8% while the remaining 4.2% is influenced by other factors.

The influence of learning facilities (X1) and learning resources (X2) on students' learning motivation (Y1).
F-Test Equation

From the results of the F-test calculation of the effect of learning facilities and learning resources on students' learning motivation, the F-test results are as follows.

Table 5. Results of F-test of Effects (X1) and (X2) on (Y1)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	178.239	2	89.120	329.295	.000[b]
	Residual	5.413	20	.271		
	Total	183.652	22			

a. Dependent Variable: Motivation to learn Y1
b. Predictors: (Constant), X2 Learning Resources, X1 Learning Facilities

In the table above, it can be seen that the F-test value is 329.295 with a significance of 0.000 <0.05, meaning that learning facilities and student learning resources simultaneously have a positive and significant effect on student learning motivation. Based on the R2 (R square) test, the results were 0.971 or 97.1%, which means that

the contribution of the availability of facilities and biological learning resources to students' learning motivation is 97.1% while the rest is influenced by other factors.

The effect of learning facilities (X1) on student achievement (Y2)
Regression Equation Test (T)

Table 6. Regression equation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	45.766	2.769		16.525	.000
	Learning Facilities X1	.830	.071	.932	11.769	.000

a. Dependent Variable: Prestasi Belajar Y2

Based on the table above, the regression equation is obtained, namely:
$Y_1 = 45{,}766 + 0{,}830\ X_1 + e$
The regression results can be interpreted as follows:
1. The constant/intercept (α) of 45,766 means that without the influence of learning facilities, the learning achievement is very low.
2. The regression coefficient for learning facilities variable (X1) is 0.830, which means that learning facilities have a positive influence on learning achievement (Y1). If student learning facilities increase, student learning achievement will also increase.

The result of the t-test calculation is 45,766 with a significance value of 0.000 <0.05, meaning that learning facilities have a positive and significant effect on student achievement. The R2 (R square) test obtained results of 0.868 or 86.8%, which means that the contribution of the influence of learning facilities to learning achievement is 86.8% while the remaining 13.2% is influenced by other factors.

The effect of learning resources (X2) on learning achievement (Y2)
Regression Equation Test (T)

Table 7. Regression Equation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	30.712	3.440		8.928	.000
	Learning Resources X2	1.206	.087	.949	13.844	.000

a. Dependent Variable: Learning achievement Y2

Based on the table above, the regression equation is obtained, namely:
$Y1 = 30{,}712 + 1{,}206\ X1 + e$
The regression results can be interpreted as follows:
1. The constant/intercept (α) of 30.712 means that without the influence of learning resources, the learning achievement is very low.
2. Regression coefficient of learning resources variable (X1) of 1.206 means learning resources have a positive influence on learning achievement (Y). If student learning resources increase, student learning achievement will also increase.

The results of the t-test calculation are 13,844 with a significance value of 0.000 <0.05, meaning that learning resources have a positive and significant effect on student achievement. The R2 (R square) test obtained results of 0.901 or 90.1%, which means that the contribution of the influence of learning resources on learning achievement is 90.1% while the remaining 9.9% is influenced by other factors. Other factors in question are not derived from the variables studied.

Effect of learning facilities (X1) and learning resources (X2) on student achievement (Y2)
F-Test Equation

From the results of the F-test calculation the effect of learning facilities and learning resources on student achievement, the F-count results are as follows.

Table 8. Results of F-Calculate

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	153.767	2	76.884	92.255	.000[b]
	Residual	16.668	20	.833		
	Total	170.435	22			

a. Dependent Variable: Learning achievement Y2
b. Predictors: (Constant), X2 Learning Resources, X1 Learning Facilities

In the table above, it can be seen that the F-count is 92.255 with a significance of 0.000 <0.05, meaning that learning facilities and student learning resources simultaneously have a positive and significant effect on student achievement. The R2 (R square) test obtained results of 0.902 or 90.2%, which means that the contribution of the availability of facilities and biological learning resources to student learning achievement is 90.2% while the rest is influenced by other factors.

DISCUSSION

The Effect of Availability of Learning Facilities on Students' Learning Motivation

The data on the distribution of the learning facilities questionnaire as the X1 variable obtained through giving questionnaires to the students of Madrasah Aliyah BPD Iha-Kulur as respondents in this study can be seen that the results of the learning facility questionnaire have a score range of 45-102. The highest score obtained by students is 102 and the lowest score is 102. obtained by students is 45. Based on the table that has been analyzed shows that the average value of the overall score of respondents' answers is (69.23) while the average value of the overall mean is (3.01). Thus, it can be concluded that the availability of learning facilities at Madrasah Aliyah BPD Iha-Kulur is still in the LESS category. Based on the results obtained in this study, the regression coefficient of the facility variable (X1) of 0.905 means that learning facilities have a positive influence on learning motivation (Y1). If student learning facilities increase, then student learning motivation will also increase. while the results of the t-test calculation of the effect of learning facilities on learning motivation obtained t-count results of 21,860 with a significance value of 0.000 <0.05, meaning that learning facilities have a positive and significant effect on learning motivation.

Based on the R2 (R square) test in this study, the results were 0.958 or 95.8%, which means that the contribution of the influence of learning facilities on students' learning motivation is very high. This shows that the influence of the availability of learning facilities in growing student motivation is very large. The results of this study are supported by research that has been put forward by Fahrul Rozi (2020) that learning facilities have a significant effect on the learning motivation of cadets of poltekip level II Correctional Management Study Program. Also Efendi Damanik (2019) that learning facilities partially have a positive and significant effect on student learning motivation at AMIK Tunas Bangsa Pematang Siantar can be seen from the value of t count > t table (2.390> 1.991). Isdayanti (2020) concluded that the results of the first hypothesis test showed a positive and significant direct influence between learning facilities on learning motivation. This means that, if school learning facilities are in good condition, it will increase students' learning.

The effect of availability of learning resources on students' learning motivation

Based on this study, the regression coefficient of the learning resource variable (X2) of 1.291 means that the learning resource has a positive influence on learning motivation (Y1). If student learning resources increase, then student learning motivation will also increase. While the results of the t-test calculation there is an influence of learning resources on learning motivation, which is 21,920 with a significance value of 0.000 <0.05, meaning that learning resources have a positive and significant effect on learning motivation.

Based on the R2 (R square) test in the study, the results obtained were 0.958 or 95.8%, which means that the contribution of the influence of the availability of learning resources on students' learning motivation is very high. This shows that the influence of the availability of learning resources in growing student motivation in Madrasah Aliyah BPD Iha-kulur is very large. The results of this study are in line with previous research conducted by Erwin Putera Permana 2018, which concluded that there was an effect of using social media as a learning resource on students' learning motivation. Madaul Lima Yudha's (2020) also concluded that learning resources had a positive and significant effect on students' learning motivation.

The influence of availability of biology learning facilities and resources on students' learning motivation

Based on the R2 (R square) test, the result is 0.971 or 97.1%, which means that there is an influence of learning facilities and learning resources on the motivation to learn biology by 97.1% while the rest is influenced by other factors. From the results of the calculation of the F test the effect of learning facilities and learning resources on the motivation to learn biology, the F-count is 329.295 with a significance value of 0.000 <0.05, meaning that learning facilities and learning resources have a positive and significant effect on learning motivation. The results of this study are in line with research conducted by Bahrudi Efendi (2019) which concluded that there was a simultaneous influence of facilities and learning environment on learning motivation at AMIK Tunas Bangsa Pematangsiantar.

The effect of availability learning facilities on biology learning achievement

Based on the results obtained in this study, the facility variable regression coefficient of 0.830 means that learning facilities have a positive influence on learning achievement. If student learning facilities increase, student learning achievement will also increase. while the results of the t-test calculation have the effect of learning facilities on learning achievement where the t-count results are 11.769 with a significance value of 0.000 <0.05, meaning that learning facilities have a positive and significant effect on learning achievement. Based on the R2 test (R square, the results obtained are 0.868 or 86.8%, which means that there is an influence of learning facilities on student learning achievement which is classified as very high. The results of this study are also in line with research conducted by Lela Camellia et al. (2016) which concluded that facilities learning has a partially significant effect on learning achievement.

The effect of availability learning resources on biology learning achievement

Referring to the results obtained in this study, the regression coefficient of learning resources of 1.206 means that learning resources have a positive influence on learning achievement. If student learning resources increase, student learning achievement will also increase. while the results of the t-test calculation have the effect of learning resources on learning achievement where the t-count results are 13,844 with a significance value of 0.000 <0.05, meaning that learning resources have a positive and significant effect on learning achievement. Meanwhile, based on the R2 (R square) test in this study, the results were 0.901 or 90.1%, which means that the contribution of the influence of the availability of learning resources on student achievement is very high. The results of this study are in line with previous research conducted by Pujawati (2016). There is a positive and significant effect of the availability of learning resources on learning outcomes. The same thing was explained by R. W. Rauf (2020) who concluded that learning resources had a significant effect on learning outcomes in subjects.

The influence of availability biology learning facilities and resources on student achievement

The results of the analysis of the R2 test (R square) obtained a value of 0.902 or 90.2%, which means that the contribution of the influence of learning facilities and learning resources to biology learning achievement is 90.2% while the rest is influenced by other factors. From the results of the F-test calculation, there is an effect of learning facilities and learning resources on biology learning achievement. this is indicated by the F-count value of 92.255 with a significance value of 0.000 <0.05, meaning that learning facilities and learning resources have a positive and significant effect on learning achievement.

CONCLUSION

1. The availability of biology learning facilities has a significant positive effect on students' learning motivation.
2. The availability of biology learning resources has a positive and significant effect on students' learning motivation.
3. The availability of biology learning facilities and resources has a positive and significant effect on students' learning motivation.
4. The availability of biology learning facilities has a positive and significant effect on student achievement.
5. The availability of biology learning resources has a positive and significant effect on student achievement.
6. The availability of biology learning facilities and resources has a positive and significant effect on student achievement.

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Research Article

Viscosity and organoleptic test of gude bean soy sauce (Cajanus cajan L.)

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ABSTRACT

Gude nuts are known as wooden nuts on Kisar Island, which is an area that uses wood nuts as food. This study aims to determine the viscosity value and organoleptic test of pigeon pea sauce based on the weight of the beans. This research was conducted in February – March 2021 at the Laboratory of the Biology Education Study Program, Pattimura University, Ambon and a viscosity test at the Ambon Industrial Standardization and Research Institute (Baristand) using an experimental research type and the research design used was a completely randomized design (RAL), using 3 treatments, namely the weight of pigeon pea 150 g, 300 g and 450 g and using 2 replications to obtain 6 samples. This study showed that the weight of pigeon pea had an effect on the viscosity and organoleptic of soy sauce. From the viscosity analysis, the highest viscosity was obtained, namely 608.065 cp with a weight of 450 g pigeon pea, while for pigeon pea 300 g 411.065 cp and 150 g gude beans at 141 cp and organoleptic test obtained the average value of the texture of soy sauce on the treatment of pigeon pea and soy sauce 450 g pigeon pea 300 g with an average value of 4 (very thick) and peanut gude 150 g with an average value of 3 (thick). In the flavor of pigeon pea sauce 300 g and 150 g have an average value of 3 (fragrant), while for the treatment of 450 g peanuts is 4 (very fragrant). The color of the soy sauce in the pigeon pea sauce treatment was 450 g and 300 g with an average value of 4 (very black), and the 150 g peanut sauce treatment was 3 (black). In the treatment of 450 g of pigeon pea sauce and 300 g of pigeon pea sauce, the average value was 3 (sweet). For 150 g of pigeon pea soy sauce, on average the panelists gave a score of 2 (less sweet). There is an influence on the viscosity because the weight of the nuts used is different. while the organoleptic test showed a thick, fragrant, less sweet, and sweet taste.

Keywords: Cajanus cajan L. soy sauce, viscosity, organoleptic.

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Introduction

Indonesia has various types of nuts that can grow well. Some local beans can be found in remote areas and used for food needs. Nuts have been planted in Indonesia for hundreds of years. This plant consists of various types, such as soybeans, green beans, peanuts, and various types of vegetable beans such as winged beans, peas, long beans and green beans (Primiani & Pujiati, 2016). Based on the nuts that exist in Indonesia, one of the nuts that is

interesting to study is the gude bean (Cajanus cajan L.). Gude bean is an annual plant and has advantages over other local legumes, including drought tolerance, resistance to fall and the pods are not easy to break, but are sensitive to pod destroying pests, require a lot of sunlight and cannot tolerate humid conditions (Mas'ud et al. 1993). Gude beans have good nutrition, tolerant of environmental stress, high biomass production which can be used to improve nutrient availability and soil moisture (Maintang et al, 2014). Gude nuts are known as wooden nuts on Kisar Island, which is an area that uses wood nuts as food ingredients. Practically, the people of Kisar Island plant this wood bean as a fence which is planted together with other secondary crops such as corn. Empirically, the people of Kisar Island use these wood nuts as food, both young and old wood nuts can be boiled together with corn and can also be used as compote (Eclesia danisa, 2020). Every 100 g of gude beans generally contains 336 kcal of energy, 20.7 g of protein, 62 g of carbohydrates, 1.4 g of fat, 12.2 g of water content (Dewi, 2010). Gude bean seeds consist of 85% cotyledons, 14% seed coat and about 1% embryo and contain a variety of dietary nutrients (Saxena et al, 2010).

Soy sauce in the community is generally made from soybeans. Soybean as a raw material for making soy sauce is currently experiencing an increase in prices, causing an imbalance in meeting vegetable protein. Soy sauce is a liquid resulting from the fermentation of high protein vegetable or animal ingredients in a salt solution. Soy sauce is usually consumed with the staple food of rice, vegetables, meat, poultry, and fish (Meilly Kusumadewi, 2011). One of the efforts to reduce dependence on soybeans in making soy sauce, and the price is still affordable by all levels of society, then there must be another alternative, namely by using gude beans to make soy sauce. For this reason, it is necessary to test the viscosity on peanut sauce, which is a characteristic characteristic of sweet soy sauce and this is related to its quality. Sweet soy sauce that is watery or has a low level of viscosity is said to be of poor quality. Viscosity is an important parameter in soy sauce products, because it can be used as a control or processing control (Erliani Ginting et al, 2014). The tool used in the viscosity test is a viscometer which functions to measure the viscosity of a liquid (Wanta widiantara et al, 2018).

Organoleptic testing has an important role in the application of quality, because it can provide an indication of spoilage, quality deterioration, and other damage to the product. Organoleptic test is an assessment method using only the human senses. Organoleptic assessment is the most widely used method because it is easier and faster to do, does not require a lot of equipment and the results of measurements and observations are also quickly obtained. The organoleptic test concerns the taste, aroma, texture and color of food and beverages that will be assessed by the panelists. (Harni Sepriyani & Rosa Devitria 2018). The purpose of this study was to determine the viscosity and organolepticity of gude (Cajanus cajan L.) soy sauce based on the weight of the beans.

METHODS

This type of research is experimental, namely research that is used to determine the effect of the independent variable on the dependent variable under controlled conditions. In order for conditions to be controlled, experimental research uses a control group and is carried out in a laboratory. This research was carried out in the basic biology laboratory of the Biology Education Program, Pattimura University, Ambon on 20 February – 21 March 2021.

Treatment procedure

1. Sorting.

   Samples were prepared, old pods were weighed as much as 3 g. Furthermore, the gude bean seeds are separated from the pods by pressing until the pods are broken after separating the seeds from the pods then separated by color and dried using a fan for 3 to 4 days. After the beans are dry, the separation between the wrinkled and good beans is carried out again, the old beans are weighed as much as 900 g using an analog scale.
2. Washing

   Prepare the tools that will be used for sterilization. Weigh the beans as much as 150 g, 300 g and 450 g. Put the beans in a bowl and wash them using running water. Prepare 3 sterilized aluminum basins then add nuts in a 1:3 ratio. The beans are soaked and then covered with aluminum foil for 22 hours.
3. Boiling

   The results of the immersion were drained using an aluminum filter and then washed with aqua water 3 times. Prepare 3 stoves and 3 pots. Add water in a ratio of 1:8. Put the beans at the same time into the boiling water and keep the temperature at 70^{0} C, then wait until the texture of the beans softens. Drain the beans using an aluminum sieve until no water remains.

4. Mushrooming

   Prepare a tray lined with a napkin, then pour the nuts on top. Dry using a tissue until completely dry. Weigh the fungus Aspergillius sojae using an analytical balance as much as 0.3% (0.45 g, 0.90 g, and 1.35 g). Sprinkle the mushrooms according to the weight of the beans then stir gently using a spoon until the mushrooms are evenly distributed. Cover each tray with coffee paper for 2 days.

5. Salting

   Weigh the coarse salt using a digital scale as much as 20% and adjusted for the weight of the beans. Dissolve the salt with water in an Erlenmeyer flask. Pour the nuts into each jar, then add the salt solution to it. Incubation at 28^{o} C-30^{o} C for 30 days.

6. Cooking

   The results of fermentation are filtered through a filter, the dregs are removed and the filtrate is used. The filtrate was cooked with 15 g of lemongrass seasoning, 550 g of brown sugar, 1 g of bay leaf, 1 g of lime leaves, 20 g of galangal, 5 g of kluwak, and 1 g of star anise. The mixture was cooked for 1 hour at 70^{o}C and stirred with a wooden stirrer clockwise until thickened and not foamy. Next, it is filtered using a filter.

7. Bottling

   Bottling using a clean bottle, then the soy sauce liquid is put into the bottle and tightly closed, after that the sample is ready to be tested for viscosity and the level of public preference.

8. Viscosity test

   Viscosity is a statement of the resistance of a liquid to flow. The unit of viscosity is the poise (1 poise = 100 cP). The higher the viscosity, the greater the resistance of the liquid in question. Carrageenan solution with a concentration of 1.5% is heated in a boiling water bath while stirring regularly until the temperature reaches 75ºC. Viscosity was measured with a Brookfiel Viscometer.

9. Organoleptic test

   The data collected for the physical quality variable of soy sauce includes 4 parameters, namely color, texture, aroma and taste of soy sauce. The data collected for each parameter is score data obtained from 15 panelists based on soy sauce organoleptic criteria.

Data analysis

The data obtained from this study were analyzed using SPSS 20, namely one-way ANOVA analysis. If it shows significant results, it is continued with the LSD (Least Significance Different).

RESULTS AND DISCUSSION

Table 1. Results of soy sauce viscosity test

sample code	Total (centipoise)	Average
A1	153, 62 cP	141 cP
A2	128, 38 cP	
B1	420, 38 cP	411, 065 cP
B2	401, 75 cP	
C1	586,25 cP	608,065 cP
C2	629,88 cP	

Information :
A : gude peanuts 150
B : gude peanuts 300 g
C : gude peanuts 450 g

Based on the test results in Table 1, it shows that the viscosity test results for peanut gude sauce on each sample based on the weight of the beans, namely gude beans 150 g, gude beans 300 g, and gude beans 450 g were different. The highest viscosity was 608.065 cp with a weight of 450 g gude nuts, while for gude beans 300 g 411.065 cp and 150 g gude nuts were 141 cp and was the lowest viscosity.

Table 2. Anova test of soy sauce viscosity

Viscosity	Sum of Squares	Mean Square	F	Sig.
Between Groups	219929.212	109964.606	228.481	0.001

Within Groups	1443.856	481.285
Total	221373.068	

The results of the ANOVA test in table 2 show that there is a significant difference in the viscosity of peanut gude soy sauce (0.001). therefore continued with the Least Significance Different (LSD) test.

Table 3. Viscosity test LSD .

(I) dosis	(J) dosis	Mean Difference (I-J	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
150 grams	300 g	-270.06500*	.001	-339.8822	-200.2478
	450 g	-467.06500*	.000	-536.8822	-397.2478
300 grams	150 g	270.06500*	.001	200.2478	339.8822
	450 g	-197.00000*	.003	-266.8172	-127.1828

The results of this study showed that the viscosity test of Kacang gude based on the weight of the beans showed significant differences at the doses of 150 g, 300 g and 450 g. Viscosity test based on the weight of peanuts showed that the more peanuts used, namely 450 g, the higher the viscosity of soy sauce by 608.065 cP, while for gude beans 300 g had a viscosity value of 411.065 cP, and the lowest viscosity in 150 g gude beans was 141 cP. This is because the carbohydrate and protein content in every 100 g of gude beans generally contains 62.78 g carbohydrates and 21.69 g protein (Lim, 2012). This happens because the protein is a reversal or folding process that occurs in the layer of protein molecules, especially when the protein solution has approached the isoelectric pH, and eventually the protein will agglomerate and precipitate. This clumping and deposition causes the viscosity to increase (Khodijah, 2003). As for carbohydrates, the viscosity will be high in the process of making soy sauce, namely carbohydrates from beans are broken down into simple sugars through a fermentation process. During the koji fermentation process, carbohydrates are broken down into simpler bonds, namely glucose and the breakdown of other chemical components becomes simpler (Budi Santoso et al, 2018). According to Nugraheni (2013), the thickness of sweet soy sauce is also influenced by the processing (cooking) process to reach a certain level of viscosity. In terms of the cooking time, the difficulty faced is to accurately estimate when the cooking process stops in relation to the estimated viscosity that has been achieved. The viscosity (thickness) that occurs is also due to the addition of brown sugar which causes the formation of a gel because the sugar is mixed with the gude nut filtrate, a melting process occurs.

Table 4. Organoleptic test results of gude peanut soy sauce 150 grams

No	Panelist	Soy sauce texture	Smell of soy sauce	soy sauce color	Soy sauce taste
1	SK	3	3	4	2
2	YR	4	4	3	3
3	AR	3	3	4	2
4	YD	3	3	3	2
5	AR	4	3	3	3
6	RK	2	4	4	2
7	DS	4	4	4	3
8	SS	3	3	3	2
9	SD	4	4	3	3
10	RD	3	3	3	2
11	RT	2	3	3	3
12	EE	3	3	3	2
13	RHY	3	3	3	3
14	ET	4	3	3	2
15	HK	3	3	3	2
Total		48	49	48	36
Average		3	3	3	2

Based on the results of the preference test in Table 4, Peanut gude soy sauce 150 g has an average value of 3 (thick) for the texture of the soy sauce, while the aroma of soy sauce gets an average value of 3 (fragrant), and an average value of 3 (black) on the color of the soy sauce. , and for the soy sauce taste, the 150 g of peanut gude soy sauce has a lower value than the 300 g and 450 g of peanut gude, namely 2 (less sweet) for the soy sauce taste.

Table 5. Organoleptic test results of peanut gude soy sauce 300 grams

No	panelist	Soy sauce texture	Smell of soy sauce	Soy sauce color	Soy sauce taste
1	SK	4	3	4	3
2	YR	4	4	4	3
3	AR	3	4	3	2
4	YD	4	3	4	4
5	AR	3	4	4	3
6	RK	4	4	3	4
7	DS	3	3	4	3
8	SS	3	3	3	2
9	SD	3	3	3	4
10	RD	4	3	4	3
11	RT	3	3	4	4
12	EE	4	3	4	2
13	RHY	3	4	3	3
14	ET	4	3	3	4
15	HK	3	4	3	4
Total		52	51	53	48
Average		4	3	4	3

Based on the results of the preference test in table 5, peanut gude sauce 300 g gets an average value of 4 (very thick) for the texture of soy sauce, while the aroma of soy sauce has an average value of 3 (fragrant), and a value of 4 (very black) on the color of the soy sauce, and an average value of 3 (sweet) for the taste of soy sauce.

Table 6. Organoleptic test results of gude peanut soy sauce 450 g

No	Panelist	Soy sauce texture	Smell of soy sauce	soy sauce color	Soy sauce taste
1	SK	4	4	4	4
2	YR	4	4	3	3
3	AR	4	4	4	3
4	YD	3	3	4	4
5	AR	4	3	4	3
6	RK	3	4	4	3
7	DS	4	4	3	4
8	SS	3	3	4	3
9	SD	4	4	4	4
10	RD	3	3	4	3
11	RT	4	4	3	4
12	EE	3	3	3	4
13	RHY	4	3	3	3
14	ET	3	3	4	4
15	HK	4	3	4	4
Total		54	54	52	55
Average		4	3	4	3

Based on the results of the preference test in Table 6, peanut sauce gude 450 g has an average value of 4 (very thick) for the texture of soy sauce, while the aroma of soy sauce has an average value of 3 (fragrant), and the average value of soy sauce color gets an average value. the highest average was 4 (very black) of 150 g peanut sauce and 300 g peanut sauce, and the average value was 3 (sweet) for the taste of soy sauce.

Soy sauce texture

Panelists preferred the texture of soy sauce in the treatment of 450 g of peanut sauce and gude peanut sauce of 300 g, with the average being 4 (very thick). This is because the panelists prefer soy sauce with a very thick texture, the very thick texture of soy sauce is caused by the number of nuts used, so the texture of the soy sauce becomes very thick, this also happens because of the addition of brown sugar which causes a gel to form because sugar is mixed with With water, there is a melting process and the texture of the soy sauce depends on the duration of the soy sauce maturation after being given seasonings (Ikrima, 2018). Texture is a sensation associated with touch or touch. Texture is also considered as important as smell, taste and aroma because it affects the image of food (Darni Lamusu, 2015). The resulting texture in the mouth is one of the parameters that determine consumer preferences for food products (Sinaga, 2007). The watery texture of the soy sauce or the low level of viscosity is said to be of poor quality. Therefore, the texture of soy sauce, namely viscosity, is an important parameter in soy sauce products, because it can be used as a control or control of the processing process (Nugraheni, 2008).

Smell of soy sauce

Panelists prefer the aroma of soy sauce in the treatment of gude beans 300 g and 150 g which have an average value of 3 (fragrant), this is because the panelists do not really like soy sauce with a strong aroma. Because the fewer nuts are used, the aroma of gude beans is not too strong, because in gude beans it contains protease inhibitor enzymes. The protease inhibitor enzyme causes the distinctive smell of gude beans, and will cause a pungent aroma in foods, including soy sauce. For the treatment of 450 g peanuts, the average value given by the panelists was 4 (very fragrant). This is because the more nuts are used, the stronger the distinctive aroma of the gude beans will be. Therefore, if the number of beans used is higher, then in the salt fermentation stage (moromi) types of bacteria and yeasts will grow which will produce compounds by fermenting simple sugars and amino acids into lactic acid, acetic acid, and lactic acid. succinate which causes soy sauce to have a distinctive smell (Ikrima, 2018). According to Zuhrina (2011), the aroma spread by food is a very strong attraction and is able to stimulate the sense of smell so that it arouses the appetite. The emergence of the aroma of food is caused by the formation of volatile compounds as a result or reaction due to the work of enzymes or can also be formed without the help of enzyme reactions. Another factor is the natural interaction between the components of the aroma and the nutritional components in the meal such as carbohydrates, proteins and fats and the very relative consumer acceptance.

Soy sauce color

Panelists preferred the color of soy sauce in the 450 g and 300 g of peanut gude soy sauce with an average value of 4 (very black), because on average the panelists preferred soy sauce with a very black color. The color of soy sauce is obtained because gude beans are black, black beans are obtained from anthocyanin pigments. Anthocyanins belong to a class of flavonoid compounds synthesized through phenylpropanoids, odorless and almost tasteless, contributing to a mild astringent sensation. Anthocyanins are pigments responsible for the red, purple and blue colors in fruits, vegetables, and some cereals. Anthocyanins can be used as a source of natural dyes and have antioxidant capacity (Satyatama, 2008). Therefore, the higher the number of nuts used, the darker the color of the soy sauce. According to Wade &Travis (2008), color is very important in assessing a food product because it is one of the parameters of consideration in choosing food. If the color is not attractive or does not match the color it should be, the consumer becomes less interested in consuming the food. Interest in food can be influenced by its color and texture. In the 150 g peanut soy sauce treatment, the average panelist gave a score for the soy sauce color parameter, namely 3 (black). This is because the less peanuts used, the less black the color of the soy sauce, so that the panelists did not like the 150 g gude peanut sauce with the black soy sauce color on average. The blackish brown color in soy sauce can be obtained from kluwak, brown sugar/palm which is used as a sweetener, and the browning reaction that occurs during salt fermentation during stage II fermentation (Suprapti, 2005).

Soy sauce taste

The most preferred taste assessment by the panelists was in the treatment of 450 g of gude peanut sauce and 300 g of gude peanut sauce, with an average value of 3 (sweet). This shows that on average the panelists prefer soy sauce with a sweet taste, because the higher the number of nuts added, the moromi fermentation will produce amino acids, peptides, and organic acids that play a role in enriching the flavor and aroma (Astuti, 2016). The complexity of a taste is produced by the diversity of natural perceptions. Taste is influenced by three factors, namely smell, taste, and oral stimulation (hot and cold). The first factor can be detected by the sense of smell and the last two factors can be detected by sensory cells on the tongue (Wahidah, 2010). In 150 g of peanut gude soy sauce, on average the panelists gave a score of 2 (less sweet). This is because the panelists prefer soy sauce with a sweet taste, because

the fewer nuts used, which is 150, the less flavored moromi is produced during fermentation. In making soy sauce, spices and brown sugar are also added to raw soy sauce which acts as a taste enhancer, contains antibiotics, antimicrobial substances, antioxidants and vitamins. The brown sugar used aims to make the color of the soy sauce turn dark brown and give the soy sauce a taste and aroma (Ikriami Elma R, 2018).

CONCLUSION

1. Results of the viscosity test of Kacang gude soy sauce based on the weight of the peanut, there is an effect on the viscosity because the weight of the nuts used is different, namely, Peanut Gude 150 g, Peanut gude 300 g, and Peanut gude 450 g with the highest viscosity of 608.065 cp with the weight of peanuts 450 g for gude beans, while for 300 g gude beans, 411.065 cp and 150 g gude beans were 141 cp and were the lowest viscosity.
2. Organoleptic test of gude peanut sauce 150 g had an average value of 3 (thick) for the texture of the soy sauce, the aroma of soy sauce got an average value of 3 (fragrant), and an average value of 3 (black) on the color of the soy sauce, and for the taste. The soy sauce in Peanut Gude Sauce 150 g has a lower value than the Peanut Gude soy sauce of 300 g and 450 g, which is 2 on average (less sweet) for the taste of soy sauce. Peanut gude soy sauce 300 g got an average value of 4 (very thick) for the texture of the soy sauce, while the aroma of soy sauce had an average value of 3 (fragrant), and an average value of 4 (very black) on the color of the soy sauce, and an average value of 4 (very black). average 3 (sweet) for soy sauce. Peanut gude soy sauce 450 g has an average value of 4 (very thick) for the texture of soy sauce, while the aroma of soy sauce has an average value of 4 (very fragrant), and the average value of soy sauce color gets the highest value of 4 (very black) from soy sauce. peanut gude 150 g and peanut sauce gude 300 g, and a value of 3 (sweet) for the taste of soy sauce.

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Research Article

The effect of use environmental based practicum methods on students' cognitive, interest, and effective learning outcomes at public school 11 Southeast Maluku and Anugerah Christian High School

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ABSTRACT

The function of national education is to shape the character and civilization of the nation, while developing the potential of students to be faithful, devoted, have noble character, be capable, creative, independent, democratic, and responsible. This study was to determine whether there is an effect of using environmental-based practicum methods on the identification of the types of protists on cognitive learning outcomes, interest in learning, and students' affective values. The method used in this research is quasi-experimental. (1) The effect of cognitive learning outcomes, the value of t count is greater than t table (27.793 > 2,000), (21.145 > 2.001). (2) The effect of interest in learning, the value of t count is greater than the value of t table (42.268 > 2,000), (36.030 > 2.001). (3) The effect of students' affective scores: the t-count value is greater than the t-table value (20,044 > 2,000), (30,734 > 2,001). There is a significant effect of using environmental-based practicum methods on cognitive learning outcomes, interest in learning, and affective values

Keywords: Method, practicum, environment.

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INTRODUCTION

Education is a planned effort with full awareness in order to realize the learning process with the aim that students can actively develop their potential (Suci, 2015). The function of national education is to shape the character and civilization of the nation while developing the potential of students to be faithful, devoted, noble, capable, creative, independent, democratic, responsible is the goal of national education (Nisa, 2017). Talking about education, it cannot be separated from what is called learning. Learning is a process used in an educational institution to distribute and share knowledge (Nisa, 2017). According to Sanjaya (2005), learning is a process of interaction between humans and humans or humans and the environment, so that the goals that have been set will be achieved. So that the material taught to students is easy to understand, in the teaching process the teacher must

pay attention to learning methods, one of which is the environment-based practicum method. Environmental-based learning is a learning that uses learning objects as real experiences Juairiah, et al (2014).

Practicum is a subsystem of learning that provides opportunities for students to get real experience in increasing students' understanding of theory. According to Suharso (2011), practicum is teaching that aims to give students the opportunity to test and implement what is learned in theory. An example of material that requires the pacticum method is the identification of the types of protists. The objectives/benefits of the practicum method include: (1) practicum activities can train skills, (2) practicum activities provide opportunities for students to apply and integrate their knowledge and skills in practice, (3) practicum activities prove something scientifically/do scientific inquiry, (4) appreciate the knowledge and skills of inquiry (Susanti, 2013). There are four reasons regarding the importance of practicum activities, including: (1) Practicum generates learning motivation, (2) Practicum generates basic skills in conducting experiments, (3) Practicum becomes a vehicle for learning scientific approaches, (4) Practicum supports subject matter (Rustaman, 2003).

The results of observations at the State High School 11 Southeast Maluku and Anugerah Vocational High School obtained: (1) Biology learning carried out by teachers is only limited to the transfer of information, students are not given the opportunity to think scientifically, (2) Emphasis on delivering material from textbooks that exists so that students only memorize, (3) teacher-centered teaching methods cause students to be passive, less trained in science/scientific, (4) students rarely do practicum due to limited tools and materials in the laboratory, (5) lack of creativity of eye teachers lessons to overcome the limitations of infrastructure by utilizing existing environmental resources (natural resources) as learning media or practicum materials. Based on the explanation, the researcher felt the need to use an environment-based practicum method in the identification of the types of protists that were expected to improve students' cognitive, interest, and affective learning outcomes.

METHODS

This study uses a quasi-experimental research method by giving treatment to the experimental group while the control group as a comparison. The population is all students of Southeast Maluku State 11 Senior High School and Anugerah Vocational High School, totaling 342 students and the sample is all class X students, totaling 122 students. The data collection techniques are as follows: (a) Observation, (b) Research design, (c) Literature study, (d) Making research instruments, (e) Grouping samples, (f) Carrying out evaluations, (g) Implementing practicum at coastal locations , forest and home environment, (h) Giving posttest, (i) Filling out questionnaires, (j) processing data, (k) Summarizing the results of the study.

RESULTS AND DISCUSSION

This study aims to see whether there is an effect of using environmental-based practicum methods on students' cognitive, interest and affective learning outcomes. At the data analysis stage, several stages were carried out, namely: analysis of students' post test scores, analysis of questionnaire scores and analysis of observation sheets of students' affective values.

Table 1. The results of data analysis on the effect of environmental-based practicum methods on cognitive learning outcomes of State High School 11 Southeast Maluku students

Independent sample test

	Leven's test for equallity variance		t-test for equality of means						
	F	sig	T	df	Sig-(2-tailed)	Mean difference	Std error difference	95% confidence interval difference	
								lower	Upper
Equal variaces assumed	0.169	0.683	-27.793	60	0.00	-32.670	1.175	-35.221	-30.31
Aqual variances not assumed			-27.894	59.87	0.00	-32.670	1.171	-35.013	-30.32

Based on the results in Table 1. the calculated t value is greater than the t table value (27,793 > 2,000) and Sig. (2-tailed) = 0.000 < 0.05, which means that there is a significant effect of using environmental-based practicum methods on cognitive learning outcomes.

Table 2. Results of data analysis on the effect of environmental-based practicum methods on cognitive learning outcomes of Anugerah Vocational High School students

Independent sample test

	Leven's test for equallity variance		t-test for equality of means						
	F	sig	T	df	Sig-(2-tailed)	Mean difference	Std error difference	95% confidence interval difference	
								lower	Upper
Equal variaces assumed	0.115	0.73	-21.14	58	0.00	-25.70	1.21	-28.13	-23.26
Aqual variances not assumed			-21.14	56.42	0.00	-25.70	1.21	-28.13	-23.26

Based on the results in Table 2. shows that the value of t count is greater than the value of t table (21.145 > 2.001) and Sig. (2-tailed) = 0.000 < 0.05, it means that there is a significant effect from the use of this method.

Table 3. The results of data analysis on the influence of environmental-based practicum methods on the learning interest of students at State High School 11 Southeast Maluku

Independent sample test

	Leven's test for equallity variance		t-test for equality of means						
	F	sig	T	df	Sig-(2-tailed)	Mean difference	Std error difference	95% confidence interval difference	
								lower	Upper
Equal variaces assumed	1.94	0.94	-42.26	60	0.00	-37.14	0.87	-38.90	-35.39
Aqual variances not assumed			-42.26	59.78	0.00	-37.14	0.87	-38.89	-35.39

Based on the results in Table 4, the calculated t value is greater than the t table value (42.268> 2,000) and Sig. (2-tailed) = 0.000 < 0.05, meaning that there is a significant effect from the use of this method.

Table 4. Results of data analysis on the effect of environmental-based practicum methods on the learning interest of Anugerah Vocational High School students

Independent sample test

	Leven's test for equallity variance		t-test for equality of means						
	F	sig	T	df	Sig-(2-tailed)	Mean difference	Std error difference	95% confidence interval difference	
								lower	Upper

Equal variaces assumed	1.34	0.25	-36.03	58	0.00	-37.14	1.03	-39.48	-35.32
Aqual variances not assumed			-36.03	56.33	0.00	-37.14	1.03	-39.48	-35.32

Based on the results in Table 4. shows that the value of t count is greater than the value of t table (36.030 > 2.001) and Sig. (2-tailed) = 0.000 < 0.05, it means that there is a significant influence from the use of this practicum method.

Table 5. Results of data analysis on the effect of environmental-based practicum methods on the affective values of State 11 Senior High School students Southeast Maluku

Independent sample test

	Leven's test for equallity variance		t-test for equality of means						
	F	sig	T	df	Sig-(2-tailed)	Mean difference	Std error difference	95% confidence interval difference	
								lower	Upper
Equal variaces assumed	4.29	0.43	-24.04	60	0.00	-26.55	1.10	-28.76	-24.34
Aqual variances not assumed			-23.75	50.69	0.00	-26.55	1.11	-28.79	-24.30

Based on the results in Table 5. shows that the value of |t count is greater than the value of t table (20,044 > 2,000) and Sig. (2-tailed) = 0.000 < 0.05, meaning that there is a significant effect from the use of this method.

Table 6. Results of data analysis on the effect of environmental-based practicum methods on the affective values of Anugerah Vocational High School

Independent sample test

	Leven's test for equallity variance		t-test for equality of means						
	F	sig	T	Df	Sig-(2-tailed)	Mean difference	Std error difference	95% confidence interval difference	
								lower	Upper
Equal variaces assumed	7.73	0.007	-30.73	58	0.00	-30.45	0.99	-32.43	-28.46
Aqual variances not assumed			-30.73	50.10	0.00	-30.45	0.99	-32.44	-28.46

Based on the results in Table 6. It shows that the t-count value is greater than the t-table value (30,734 > 2.001) and Sig. (2-tailed) = 0.000 < 0.05, meaning that there is a significant effect from the use of this method. This is in line with the opinion of Dedi Aryadi (2011), who said that student learning outcomes using environmental-based practicum methods were higher than those using the lecture method, especially on protist material. Ani Hastuti (2013), stated that learning practicum methods can improve learning outcomes and in line with previous research, researchers also found that learning practicum methods with materials in everyday life can improve student learning outcomes.

Based on the results of hypothesis testing, it shows that the use of environment-based practicum methods is very influential in increasing student interest in learning in this study. This increase in student interest in learning is also

evidenced by the results of the questionnaire, namely that most students strongly agree to the application of the environment-based practicum method because it can provide opportunities for students themselves to be active in solving a problem in learning. According to Crow (2012), one of the factors that influence interest is that stimuli that come from the environment or scope that are in accordance with one's desires or needs will easily generate interest. The stimulus can be in the form of varied learning methods, for example, environmental-based practicum methods. Amelia (2011), said that practicum activities can improve scientific learning and improve students' affective domains. In addition, Mulyasa (2003), said that using practical learning can increase student activity which is an affective aspect. effectiveness of using environment-based practicum methods is that it results in a higher speed of student understanding in lessons, students become more creative and affective learning outcomes increase (Sugiono, 2007).

CONCLUSION

The conclusion that can be drawn is that there is a significant effect from the use of environmental-based practicum methods with the identification of the types of protists, on cognitive learning outcomes, interests and affective values students of State 11 High School Southeast Maluku and Anugerah Christian High School.

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