Kaunia, Vol.XIV, Num.1, April 2018, pp. 5~8
ISSN 1829-5266 (paper), ISSN 2301-8550 (online)
Available online at http://ejournal.uin-suka.ac.id/saintek/kaunia

Histology Media with Integration-Interconnection Content in Biology Learning

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Abstract

This study aims to find out the histological structure of testes and ovaries in marmot (Cavia cobaya), and determine the effect of histology media with integration-interconnection content to student learning result. This study included Quasi Experimental research with non equivalent control group design. The sample was selected using purposive sampling technique and using two classes, experimental class given treatment histology media with integration-interconnection content, and control class with normal learning. The data collection instrument uses multiple choice test data (pretest and posttest). Data analysis techniques uses descriptive analysis for histology and t-test statistics. The results of the research have shown that 1) the histological structure of testicular marmots (Cavia cobaya) consists of spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, sperm, Sertoli cells and Leydig cells. While the histological structure of ovaries marmots (Cavia cobaya) consists of primordial follicles, primary follicles, secondary follicles, tertiary follicles, atresia follicles, cortex and medulla. 2) Based on the statistical t-test obtained a significance value of 0.00 which means 0.00 <0.05, so the use of histology media with integration-interconnection content positively affects student learning result.

***Keywords**: Histology Media, Integration-Interconnection, Learning Result.*

Introduction

The human reproductive system consists of male and female reproductive systems. The male reproductive system consists of penis, scrotum, testis, epididymis, vas deferen, urethra and accessory glands, while the female reproductive system consists of ovaries, oviduk, uterus, and vagina (Marimbi, 2010). In addition to discuss human reproductive organs, reproductive system content in biology learning also discusses the process of gamete cell formation which consists spermatogenesis process and oogenesis process. The material is quite difficult to understand by the students because the process occurs in the channels and genitals of both males and females that can not be observed with the naked eye (Widyana, 2013). Human reproductive system is a content that is considered abstract during the learning process, as students only heard the explanation from the teacher without knowing what the truly reproductive system is (Widyana, 2013). Monotonous learning like this tends to make students passive in the learning process. A passive student in learning make the learning experience becomes less memorable and less meaningful, this implies the low ability of students.

These problems indicate the need of innovation in learning. The alternative that can be used is histology media. Histologic preparations are objects that can only be seen through microscope to know the structure or shape of the tissue inside. Histologic preparations will help students to understand the anatomical structure. The use of these histologic preparation represents the observation of reproductive organs in humans. The use of histology media is essential to give knowledge and immediate experience about the body or specific parts of organs in animals and plants. Histologic preparations are used to represent a problem presented in the lesson. Such problems will improve students' skills to solve problems and seek solutions coherently.

In Act No. 20 of 2003, on the National Education System states that through education besides forming a smart student, another important point is to make students who are faithful and devout to God Almighty and have a noble character, so understanding of spiritual attitudes is needed related to the learners' attitude building. One of the efforts to realize the function of national education is the need for an integration-interconnection approach that seeks to connect religious science with social sciences, humanities, and theology in a common pattern as an

interconnected entity (Mu'thasim, 2006). Biological material (reproductive system) is integrated to the verses in Qur'an, then the biology content that has been mastered by the students is drawn to the divine region (divinity). Histology media with integration-interconnection content is expected to assist students in understanding the concept of biology so as to increase students' thinking ability and improve the faith and piety of students to Allah SWT.

Based on the description the problem that can be drawn is how to make histology media and whether histology slide media with integration-interconnection content can affect biology learning?

Method

The first research was to make histology slide, as for making preparation covering several processes namely, dissection, fixation, trimming, dehydration, clearing, infiltration, embedding, sectioning, staining, and mounting (Suntoro, 1983). The results of ovarian and testis histology marmot (*Cavia cobaya*) were analyzed descriptively. Furthermore, histology results will be tested in experimental research.

The second research is experimental research using quasy experimental design. The research was conducted in MTs N 6 Sleman class IX academic year 2017/2018. The subjects of the study were the students of class IX (C, D,), consisting 52 students. The research design is as follows (Sugiyono, 2015).

Table 1. Illustration of Non-equivalent Control Group Design Research Design.

Group	Pretest	Treatment	Post-test
Histology Medium With Content Integration-Interconnection	O1	X1	O2
Control	O1	-	O2

The data analyzed in this research is N-Gain value. Analysis of N-Gain data was used to determine the effect of treatment on learning result. Furthermore, the data is tested by t-test statistical test (Santoso, 2011).

Discussion

Based on the research that has been done, there are two types of histology preparations; histology of testicle and ovary in marmot (*Cavia cobaya*). The description of histology preparations is as Figure 1 and Figure 2.

Based on the observations, in cross section of testicular histology slide showed several stages of the spermatogenesis process, known by the presence of spermatogonia – the parent cell located in the base of germinal epithelial, right above the basilar membrane (Yatim, 1996). Each spermatogonium undergoes mitotic division and forms a cell which the size increasing and becomes the primary spermatocyte. After that the first meiotic division occurs and produces smaller cells called the secondary spermatocytes. Secondary Spermatocytes have 23 chromosomes (22+ X or 22 + Y) with 2N DNA. Secondary spermatocytes separates chromatids of each chromosome and produce two haploid cells called spermatids. Spermatids will differentiate as the sperm cells (Eroschenko, 2002). In addition to spermatogenic cells in testicular preparations there are Leydig cells and Sertoli cells. Leydig cells produce testosterone, which works for the development of secondary male sex features. While Sertoli cells functionate as supporting cell. Sertoli cells are pyramid or columnar cells that partially wrap cells from the spermatogenic lineage (Mascher, 2011).

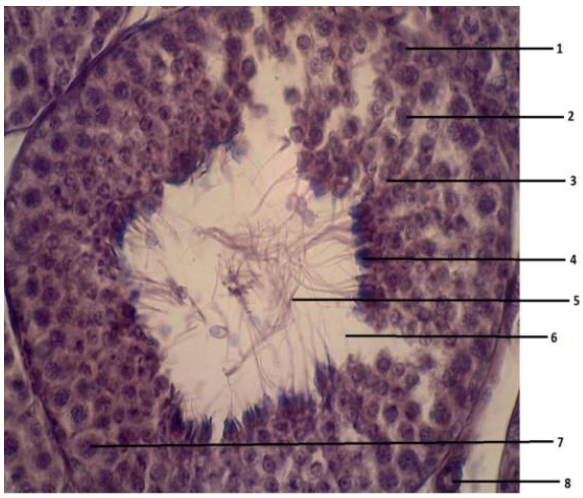

Figure 1. Cross section of the testicles of marmots: spermatogonia (1), primary spermatocytes (2), secondary spermatocytes (3), spermatids (4), sperm (5), lumen (6), Sertoli cells (7), Leydig cells (8).

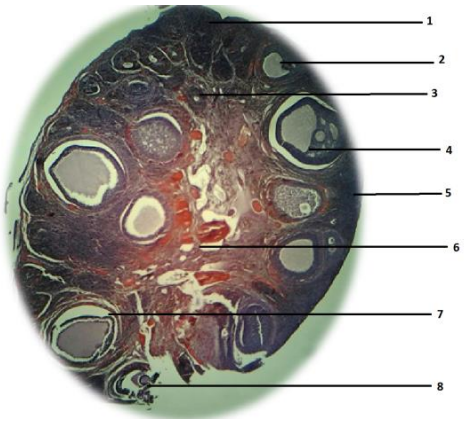

Figure 2. Cross section of the ovaries of marmots: primordial follicles (1), secondary follicles (2), primary follicles (3), tertiary follicles (4), cortex (5), medulla (6), atresia follicles (7), ovum (8).

ISSN 1829-5266 (paper), ISSN 2301-8550 (online)

While on the preparation of histology ovarium there are some parts that are found that is medulla and cortex. Medulla is found in the middle of the ovary. This section can be found ties and blood vessels. While in the area of the ovarian cortex there is an oocyte surrounded by follicle cells and forming an egg follicle. The ovaries consist of an interstitial connective tissue called the stroma. Among the stroma there are follicles. The follicle contains egg (oocyte) in various growth rates. The growth rates of follicles consists primordial follicles, primary follicles, secondary follicles, tertiary follicles and follicular atresia (Geneser, 1994).

The second research used three treatments for each class. Treatment was performed by applying learning histology media with integration-interconnection content for the experimental class and control class with normal learning. The class with treatment was given problems using histology slide and students directed to solve the problems orderly and systematic. Then the teacher gives the important points and presents the verses of the Qur'an regarding the formation of sperm. It aims to provide Islamic values to students in biology learning. As for some verses of the Qur'an that are integrated with biological material (reproductive system) i.e. Q.S Al-Insan verses 2 on the formation of sperm. In addition, this material also related to Q.S Al-Mukmin verses 12-14 on the creation of humans derived from semen.

Based on the N-gain statistic test in the experimental and control class that has been done, it shows that the sig value is 0.00. This shows that the value is less than 0.05 which is where the two classes have differences. The results from the calculation of the average score between the experimental class and the control is as follows:

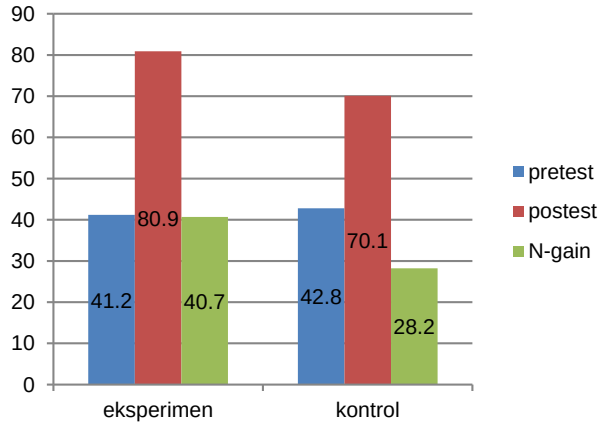

Figure 3. Average Pretest, Postest, and N-gain Comparison of Experiment Class with Control Class.

The results show that before the treatment both classes are given a pretest. The result of the pretest score analysis shows that the experimental and control classes had the same initial conditions. After being given different treatment in both classes then they were given a postest. The posttest and N-gain results show that the experimental class has an average value higher than the control class. These results indicate that the treatment given to the experimental class has a positive effect on student learning outcomes. This is because the experimental class students experience different learning experiences and activities by applying an interconnection-integrated histology media, while the control class does not experiences learning changes. It causes the students tend to be passive because they only listen and record during the learning process. Passive students in learning leads to low student learning outcomes.

This is reinforced by Cholisoh's research (2014) which states that teacher-oriented learning is lessable to provide space to students, besides the application of conventional learning model causes students tend to obtain information/knowledge from teachers only, so that knowledge obtained by students is very limited. The existence of large group discussions causes certain students to be active in learning, while other students are silent and only limited to a number of active students only. Thus many students are less involved in learning so that student learning outcomes obtained are low.

The purpose of using histologic media with integration-interconnection content is to make it easier for students to understand the material. Through concrete preparations, students will be more interested in actively participating in learning. This is in accordance with the phrase (Budiawati, 2013) that states there are some advantages on using biology learning media in the form of slide preparation: a) generate motivation to learn; b) repeating what has been learned; c) facilitate the introduction of objects d) activate student responses; e) provide immediate feedback, and f) can be used at all times for biological learning.

Through practice and observation directly observing the process of gametogenesis in histology slide media, students will form new ideas that enrich their intellectual and learning will be more attached and meaningful. In addition, by correlating learning with religious values, students will more easily understand, believe and live the science as a whole. This is because there is no dichotomy between the values of cultural science and religious values. The existence of interconnection integration learning will add meaningfulness in the learning process, add to the conceptual learning experience, and can foster student attractiveness (Noor, 2012).

Conclusion

Based on the results of research that has been done then can be drawn conclusion as follows:

1. The histologic structure of testicular marmots (*Cavia cobaya*) consists of spermatogonia, primary

spermatocytes, secondary spermatocytes, spermatids, sperm, Sertoli cells and Leydig cells. While the histological structure of the marmot ovarium (*Cavia cobaya*) consists of primordial follicles, primary follicles, secondary follicles, tertiary follicles, atresia follicles, cortex and medulla.

2. Histology media affect student learning result. This is seen from the result of t-test with significance 0.000 which means that probability <0,05.
3. Histologic media can be used in integration-interconnection learning.

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