

Design of Online Animal Histology Atlas as a Learning Source

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Abstract. This study aims to (1) determine the structure of histology of various organ systems, (2) develop online animal histology atlas as a source of learning in high school/MA so as to facilitate students in studying animal tissue, (3) determine the quality of learning resources in the form of online animal histology atlas so worthy of being used as a learning resource for high school biology. Online animal histology atlas is made in several stages. First, photographing histology preparations at the Integrated Laboratory of UIN Sunan Kalijaga, UGM Animal Structure & Development Laboratory, and the Biology Laboratory of Kasihan State High School. Of the three laboratories, histology preparations were obtained from six organ systems, namely the nervous system, cardiovascular system, integumentary system, digestive system, respiratory system, and male and female reproductive systems. Second, design an online animal histology atlas website with HTML 5, CSS 3 and JavaScript programming languages, as well as with the help of Bootstrap framework, resulting in an online animal histology web atlas that has a responsive and attractive appearance. Online Atlas of Animal Histology was then tested on material experts, media experts, peer reviewers, biology teachers and students of MAN 3 Bantul. The results of online animal histology atlas quality assessment by material experts received a score of 90.7% with very good quality, 91.4% of media experts with very good quality, 90.47% peer reviewers with very good quality, biology teacher 87.43% with very good quality, and 84.7% students with very good quality. Thus, the quality of the online atlas entitled "Atlas of Animal Histology" with the address atlashistologi.com as a whole is very good quality and suitable for use as a learning resource.

Keywords: Animal Histology, Learning Resources , Online Atlas, Website

INTRODUCTION

Histology is the science that describes the structure of animals in detail and the relationship between organizing cells in tissues and their functions (Bevelander, 1998). Histology includes all aspects of tissue biology that discuss the mechanism of structure and cell structure in optimizing functions specific to each organ (Mescher, 2011). Each organ is composed of various networks. Finerty (1962) mentions four types of animal tissue, namely epithelial and glandular tissue, connective tissue, muscle tissue, and nerve tissue.

Animal tissue is one of the biological material that is quite complicated to study because of the very small size of the object, so that a tool is needed to be able to see and observe in detail. Animal tissue is one of the biological material that is quite complicated to study because of the very small size of the object, so that a tool is needed to be able to see and observe in detail. This can be overcome by making objects more tangible through practicum, namely by observing preparations of animal tissue directly using a microscope. However, the limitations of equipment and time, caused no optimal practicum activities (Angelina, 2013). In addition to using practicum, to overcome this can also be done by using learning resources that have good visualization (Wibowo, 2010). However, learning resources about better animal networks are not yet available in schools.

Atlas is a collection of information or data that is displayed more specifically, systematically and

interrelated both in analog and digital forms based on certain objects and accompanied by narratives (Ormeling, 2010). Technological developments will facilitate the making of atlases, both conventional and electronic. The making of atlas electronically will make it easier in terms of presenting data and redesigning data according to its development (Juwita, 2013). An online system is a computer system or device that is connected to a network (internet) and can be accessed (or ready for use) by a computer or other device (www.businessdictionary.com). Online Atlas means that atlas is made to be accessible with devices connected to the internet. Online Atlas has two main principles of knowledge management. First, the atlas in the form of a web can store knowledge digitally that can be uploaded online, so that every information can be maintained, categorized, analyzed, updated, and disseminated more efficiently. Second, online atlas can facilitate access to knowledge (Rozanah, 2013).

Animal networks have a wide range of material and have small object sizes. Based on this description the problem can be drawn, namely how the structure of histology in various organ systems, how the design of online animal histology atlas can meet good preparation criteria so as to facilitate students in studying animal histology, and how the quality of online animal histology atlas as one of the learning resources developed based on the assessment results by reviewers.

MATERIALS AND METHODS

Materials

The tools used in this study are microscopes, optilab cameras and computers. The material used in this study is slide/histology preparation.

Procedures

Research I

Research I consists of capturing and collecting preparat images, determining the design of an online atlas, and uploading atlases on web servers and web domains.

The first step of research I is the picture taking of animal tissue preparations and collecting image data. Animal tissue preparations contained in the Integrated Laboratory of UIN Sunan Kalijaga Yogyakarta, UGM Animal Structure and Development Laboratory, and the Biology Laboratory of State High School 1 Kasihan were observed using a light microscope, then taken pictures or photographed using the Optilab camera. Then the picture is categorized based on the type and class of the organ.

The second step is to determine the design of an animal histology atlas online. Atlas Online is created on a website using the HTML5 programming language, CSS3, and JavaScript, and is assisted by the framework Bootstrap. Hypertext Markup Language (HTML) is a language for displaying content on the Web. JavaScript is a script language that is attached to HTML code and processed on the client side. With this language the ability of HTML documents can become wider (Kadir, 2003). In addition, the bootstrap framework is used to make the web look more attractive and responsive. Bootstrap is a CSS framework that can be used to build web views. CSS or Cascading Style Sheet is a set of web programming code that functions to control several components on the web so that it looks uniform, structured, and organized (nn, 2015). To type codes from various programming languages can be done with a variety of tools special for typing script language code, one of which is the software Atom Text Editor developed by GitHub. Research I ended by uploading an atlas on the web server and web domain.

Research II

Research II is testing the quality of online animal histology atlas by material experts, media experts, peer reviewers, high school biology teachers, and high school students.

In the second study, the quality of online animal histology atlas was examined online by one material expert, one media expert, peer reviewer (5 biology or biological education students), 2 biology teachers from SMA/MA, and 10 students of SMA/MA. The criteria of the material expert is the lecturer of biology who teaches anatomy and histology courses. Media experts assess the feasibility of online animal histology atlas design when used as a learning resource and provide input for improving the design of animal histology

atlases online. Peer reviewers assess the overall components of the assessment and provide input as the basis for the revision of the animal histology atlas online. The criteria for the teacher who assess is the teacher who teaches biology and has a minimum educational background of S1. In addition to the teacher, animal histology atlas was online tested for students to obtain clarity of information about students' responses or impressions of products made. In this study 10 subjects were used with the provisions of students from class XI.

The research instrument used in this study was a closed questionnaire about the quality of animal histology atlases online. The quality of animal histology atlas is online viewed from several aspects which are then translated into indicators.

Data Analysis

In Research 1, qualitative descriptive data were analyzed. Whereas in research II, the analysis used was descriptive qualitative and quantitative, as a basis for improvement of online animal histology atlas.

RESULTS AND DISCUSSION

Design of Online Animal Histology Atlas

Animal Histology

From the results of research conducted at the Integrated Laboratory of UIN Sunan Kalijaga, Laboratory of Animal Structure and Development UGM and Laboratory of SMA 1 Kasihan obtained data from 21 slides of animal organs photographed with optilab cameras and cameras DSLRs with special lenses for microscopes. The results obtained are as follows:

- Nervous system: Cerebellum, spinal cord
- Cardiovascular system: Heart, arteries, veins
- Integumentary system: Skin
- Digestive system: Lingua, esophagus, stomach, small intestine, large intestine, liver
- Respiratory system: Trachea, lungs
- Reproductive system: Male reproductive system (testis, epididymis, vas deferens, penis), female reproductive system (ovary, fallopian tubes, uterus)

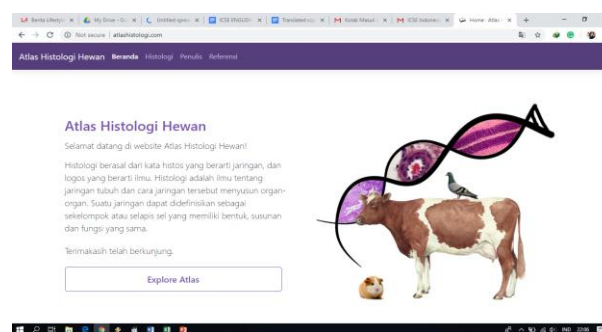


Figure 1. Display home website <http://atlashistologi.com>.

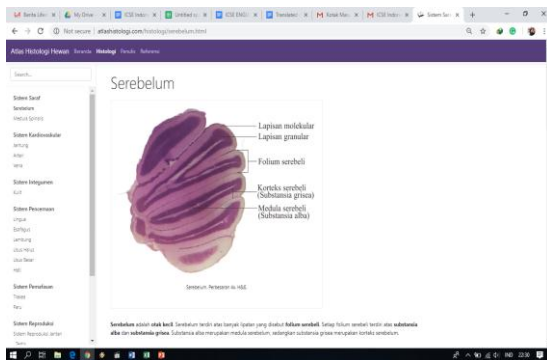


Figure 2. Display of cerebellum histology on <http://atlashistologi.com>.

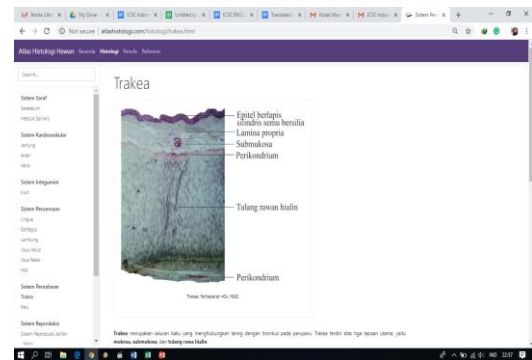


Figure 6. Display trachea histology on <http://atlashistologi.com>.

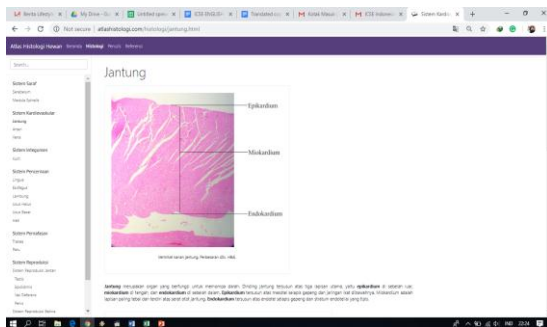


Figure 3. Display of heart histology on <http://atlashistologi.com>.

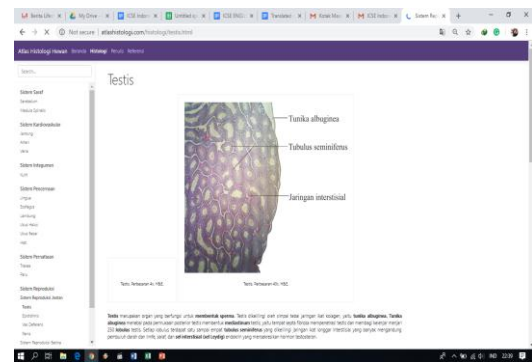


Figure 7. Display testis histology on <http://atlashistologi.com>.

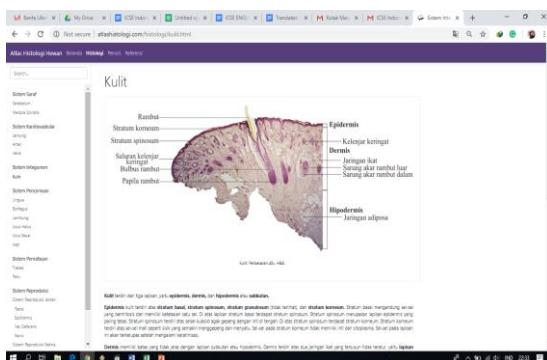


Figure 4. Display skin histology on <http://atlashistologi.com>.

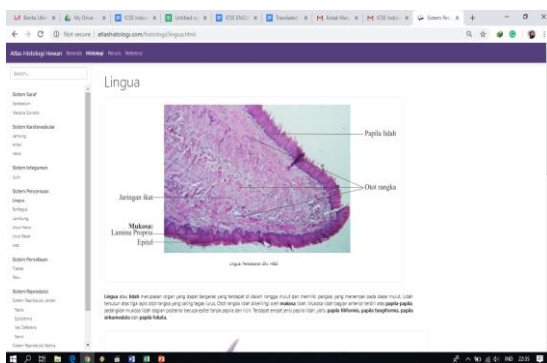


Figure 5. Display lingua histology on <http://atlashistologi.com>.

Design of Online Animal Histology Atlas

Researchers and developers develop atlases or learning resources for animal tissues in digital or online form. Although print media can be used independently, it cannot be used anywhere and anytime as well as online learning resources. The dominance of online animal histology atlas that researchers have developed is that the web is responsive. Responsive online animal histology Atlas of many platforms, meaning that the web page appearance will look neat, both mobile and desktop versions (Zakir, 2016). In addition, this website is integrated with GitHub so developers can focus on web development so as to accelerate the deployment process. Detailed stages of making online animal histology atlases including:

1. Process of creating a page for <http://atlashistologi.com>: (1) Making titles and meta; the titles and descriptions that appear on the search results of the website address in the search engine, (2) Call Bootstrap and cast CSS3, (3) Create Navbar, (4) Make Footer, (5) Make jumbotron images, (6) Make jumbotron text.
2. Website Creation Process <http://atlashistologi.com/author.html>
3. The process of creating a website page <http://atlashistologi.com/references.html>
4. The process of creating a website page <http://atlashistologi.com/histologi/>
5. The process of creating a website from one of the content page <http://atlashistologi.com/histologi/>
6. Process domain connection with Github.

The first step is to enter the domain hosting service <https://idwebhost.com/>. Then choose Domain → Domain Management menu. Then choose the Nameserver tab to change the Nameserver address. The next step is to select the Manager Tools tab by clicking the Manage DNS button. This is done so that when the user request to the address <http://atlashistologi.com/> it will be directed to the address 192.30.252.153 or 192.30.252.153 where the address points to the Github server. The histology of online animal histories that can be accessed in browsers is consulted with supervisors and media experts.

Description of Top View Online Animal Histology Analysis Online

Animal histology atlas is made with the Bootstrap framework, which is by using a template that is available at get.bootstrap.com. in accordance with the slogan of this framework is "Sleek, intuitive, and powerful front-end framework for faster and easier web development", which means that you can design a website more neatly, quickly and easily. In addition Bootstrap is also responsive to many platforms, meaning that the web page display using Bootstrap will appear to be neat, both mobile and desktop versions (Zakir, 2016).

Analysis Description Content of Online Animal Histology Atlas

By content, this online animal histology atlas contains histological images of various organs from various organ systems. Atlas online animal histology contains organ histology of the nervous system, cardiovascular system, integumentary system, digestive system, respiratory system, and male and female reproductive system. Online animal histology atlas is composed of images with various magnifications labeled with clue and description. On the home page there is an introduction of histology to the material contained in the web. The histology page also contains animal images and pictures of histological preparations as title reinforcement and as an illustration of the contents of the online animal histology atlas. At the beginning of the histology page there is a description that explains the outline of the web content. This is so that the reader knows what is contained on the web.

Product Feasibility Test

Material Experts Advice

Table 1. Inputs and suggestions from material experts.

No	Suggestion	Follow-up
1	It is recommended that the image be raised according to the width of the computer screen	The image is raised in resolution so that it can be displayed to the maximum according to the screen width or column length for images.

Table 2. Results of achievement assessment scores by subject matter experts.

Component	Ideal Highest Score	Score Result Assessment (x)	Percentage (%)	Quality
Feasibility material	40	36	90	Very Good
Linguistic	35	32	91.4	Very Good
Total	75	68	90.7	Very Good

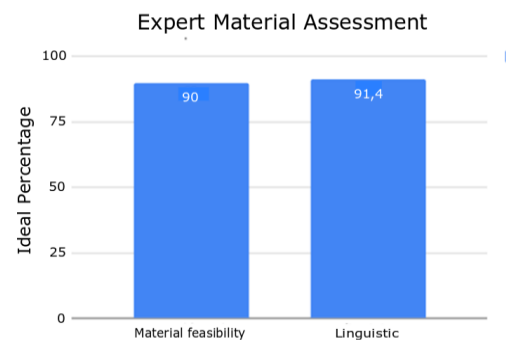


Figure 8. Diagram achievement assessment scores by material experts.

Media Experts Advice

Table 3. Input and suggestions from media experts.

No	Input and Suggestions	Follow up
1.	It is better to be given a picture on the home page so that the home page is more attractive and representative.	The home page is given animal pictures and animal tissue preparations
2.	It is recommended that the home page be given an introduction and the initial histology page is given an outline description of the contents of the animal histology atlas online.	The home page is given histological understanding. The histology start page is given an explanation of what is contained in the animal histology atlas online.
3.	We recommend that image can be enlarged when clicked	Not actionable

Table 4. Results of achievement assessment scores by media experts.

Component	Ideal Highest Score	Score Results Assessment (x)	Percentage (%)	Quality
Aspect presentation / display	70	64	91.4	Very Good

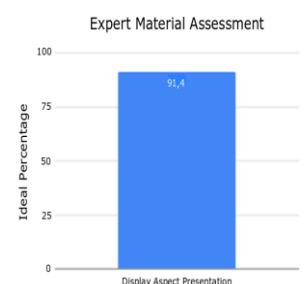


Figure 9. Diagram achievement assessment scores by media experts.

Peer Reviewer Advice

Table 5 Input and suggestion from peer reviewers.

No Input and suggestions	Follow-up
1. We recommend that the description be made flat right-left	Description has been made flat right-left
2. It is better to correct the wrong writing	Wrong writing has been corrected
3. It is recommended that the layout of the author's biodata be improved The author's biographies	have been corrected and moved under the photo with centered justification

Table 6. Achievement of assessment scores by peer reviewers.

Components	Ideal Highest Score	Score Results Assessment(x)	Percentage (%)	Quality
Material Feasibility	40	36.4	91	Very Good
Linguistics	35	32	91.3	Very Good
Apek of accomplishment	70	62.4	89.1	Very good
Total	145	130.8	90.47	Very good

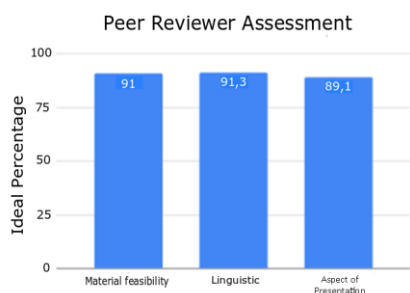


Figure 10 . Diagram achievement by peer assessment scores.

Biology Teacher Review

Table 7. Results of achievement assessment scores by biology teacher.

Component	Ideal Highest Score	Score Results Assessment(x)	Percentage (%)	Quality
Feasibility materials	45	38.5	85.6	Very Good
Linguistic	35	31, 5	90	Very Good
Implementation Aspect	15	13	86.7	Very Good
Total	95	83	87.43	Very Good

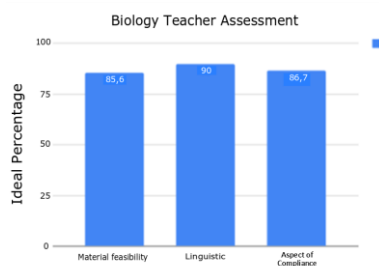


Figure 11. Score assessment diagram by biology teacher.

Scoring Student Assessment

Table 8. Achievement scores by students.

Components	Ideal Highest Score	Score Results Assessment(x)	Percentage (%)	Quality
Material eligibility	25	21.6	86.4	Very Good
Linguistics	15	12.3	82	Very Good
Apek of presentation/display	70	60.5	86.4	Very good
Implementation Aspect	15	13,2	88	Very good
Total	125	107.6	85.7	Very good

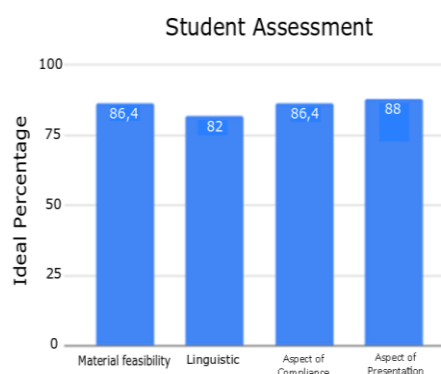


Figure 12. Student achievement score scoring diagram.

CONCLUSIONS

Based on observations of various animal tissue preparation in several laboratories, 21 kinds of organs were classified into 6 organ systems. In the nervous system, two preparations of the central nervous system are observed, namely the cerebellum and spinal cord. In the integumentary system, skin preparations are observed. In the cardiovascular system, heart, artery and venous preparations are observed. In the digestive system, lingua, esophagus, stomach, small intestine, large intestine, and liver are observed. The trachea and lungs are observed in the respiratory system. In the male reproductive system, testicular preparations, epididymis, vas deferens, and testes are observed. While the female reproductive system is observed ovarian preparations, fallopian tubes, and uterus. Each organ has a unique histological structure.

Research has succeeded in making an online Atlas entitled "Animal Histology Atlas" at the address <http://atlashistologi.com>.

The results of online animal histology atlas quality assessment by material experts received a score of 90.7% with very good quality, 91.4% by media experts with very good quality, 90.47% by peer reviewers with very good quality, biology teacher give 87.43% with

very good quality, and 84.7% by students with very good quality. Thus, the quality of the online atlas entitled "Atlas of Animal Histology" with the address <http://atlashistologi.com> as a whole is very good quality and suitable for use as a learning resource.

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