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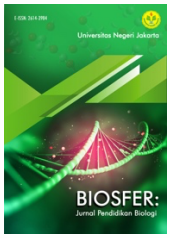

The use of instructional media in the excretory system: a study on the perspectives of teachers and eleventh grade students of senior high school

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ARTICLE INFO

Article history
Received: 28 Juny 2022
Revised: 27 July 2023
Accepted: 08 August 2023

Keywords:
Guru Biologi
Identifikasi
Media Pembelajaran
Sistem Ekskresi
SMA

ABSTRACT

Selection of learning media can affect the learning process that takes place in class. In addition, teachers are required to have the ability to use instructional media. This study aims to find out the types of learning media and how teachers get the learning media used in excretion system material. This survey research involved class XI students of public and private high schools in Palembang City, Indonesia. Samples of students were taken using the Stratified Cluster Random Sampling technique based on Accreditation A (266), Accreditation B (80) and Accreditation C (25) (n = 371) from 11 high schools in Palembang City. The sample of teachers was taken from the schools that were sampled in this study (Accreditation A 10 teachers, Accreditation B 3 teachers and Accreditation C 1 teacher) (n=14). The instrument used in this study was a questionnaire sheet for students and teachers. Questionnaire sheets were developed by taking into account learning indicators. The results of the student questionnaire showed that students were more interested in audio-visual and visual media. The audio-visual media that students like is learning videos, while the visual media that is preferred is the use of real objects and artificial objects. Meanwhile, the learning media most often used by teachers are audio-visual media and visual media. Students give a positive response to the media used by the teacher, even though the teacher does not develop the learning media himself. The results of this study are expected to assist teachers in choosing suitable learning media for use in biology lessons on excretory system material.

Dewi, S. P., Anggraini, L., & Tibrani, M. M. (2023). The use of instructional media in the excretory system: a study on the perspectives of teachers and eleventh grade students of senior high school. *Biosfer: Jurnal Pendidikan Biologi, 16(*2), 286-295. https://doi.org/10.21009/biosferjpb.27901

INTRODUCTION

A good learning process can influence the quality of education in Indonesia. The quality of education in Indonesia is still the center of attention. This is because there are still many obstacles that affect the improvement of the quality of education in Indonesia. One of them is the limited learning resources that can facilitate students to learn and the lack of skilled teaching staff in managing the teaching and learning process in schools (Mbiydzenyuy & Silungwe, 2020; Hill, et al., 2015; Okongo, et al., 2015; Che Ku Mohd & Shahbodin, 2021). One of the efforts that can be made to improve the quality of education is to utilize the various types of learning media that can be used. Learning media is a tool that can be used as a tool to convey knowledge to support the learning process in schools (Tofonao, et al., 2019; Kustyarini, et al., 2020). Learning media is anything that can be used to channel messages from the sender to the recipient of the message (Lusiyani & Anindya, 2021).

Learning media can be grouped into several types. Learning media can be grouped into human-based media (teachers, instructors, tutors, role-playing, group activities, field trips), print-based media (books, guides, exercise books, work aids, and loose sheets), visual-based media (books, charts, graphs, maps, pictures, transparencies, slides), audio-visual-based media (videos, films, slide tape programs, television), computer-based media (computer-assisted teaching, interactive videos, hypertext) (Musyaddad &Suyanto, 2019). Through learning media that is quite diverse, it is hoped that the message will be conveyed by the teacher. Learning media has a very important role in learning, including helping to synchronize the subject matter to be delivered, clarifying the subject matter and making it more interesting, making the learning process more interactive, increasing the efficiency of allocating learning time, and improving the quality of learning outcomes (Tafonao, et al. al., 2019). The use of teaching media for the teaching and learning process can generate new desires and interests, generate motivation and stimulate learning activities, and even bring psychological influences on students (Waris & Susilo, 2014; Nofitasari, et al., 2021; Sukenda, et al. ., 2019; Aroyandini & Aloysius, 2020). The use of learning media that students like can improve student learning outcomes (Yuliansih, et al., 2021). Therefore, it is important to identify the various types of learning media that are preferred by students in order to increase students' motivation and desire to learn so that they can help students understand the concepts being taught and improve student learning outcomes.

Basic competencies in each material describe the minimum abilities that must be mastered by students through the learning process. These basic competencies are revealed to be specific learning indicators and learning objectives and must be achieved by students in each face-to-face meeting that takes place in class. The achievement of learning objectives to meet the desired learning indicators and basic competencies requires the help of learning media as a tool that can be used to make it easier for students to understand the material being studied. In addition, this learning media can also assist students in constructing students' understanding related to the subject matter (Noris et al., 2023; Saadah et al., 2022; Warsodirejo & Budianto, 2020).

Previous research revealed that learning outcomes in the excretory system were still low. As many as 68.64% of students still have not completed this material. The low learning achievement is caused by the difficulties experienced by students in understanding the material and concepts provided by the teacher. Students also experience difficulties in solving high-level questions. Learning difficulties experienced by students can be seen in indicators of abnormalities or diseases in human organs (Simorangkir, et al., 2020). Of course, these difficulties can be overcome by using the right learning media to help students and teachers in the learning process in class (Andini & Saifuddin, 2023).

Learning media is not only in the interests of students, but also in the interests of teachers. Choosing media or developing learning media is one of the skills that must be possessed by teachers to carry out the learning process in schools (Marpanaji, et al, 2018; Tafonao, et al., 2019). Mastery of media and learning resources is an indicator of professional competence that must be possessed by teachers. Teacher professional competence is a set of abilities that must be owned by a teacher so that he can carry out teaching assignments successfully. Therefore teachers are required to be able to create and develop instructional media that can be delivered precisely and clearly to facilitate students' understanding of the material being studied and to help teachers achieve the expected learning objectives.

METHODS

Research Design

This research is a survey research (Wallen, et al., 2015). In survey research, special treatment was not carried out on the research sample to obtain the desired data. This study aims to find out the types of media and how teachers get learning media used in excretory system material. This research was conducted in the city of Palembang.

Population and Samples

The population in this study were all students of Class XI IPA and all Biology teachers who taught excretion system material in class XI in Palembang City, Indonesia. School data was obtained from the Ministry of Education and Culture's school data site (https://sekolah.data.kemdikbud.go.id/). The total number registered with the Ministry of Education and Culture for Public High Schools in Palembang City is 23 schools with A accreditation and 1 school with B accreditation. Schools with C accreditation.

The technique for determining the number of samples in this study was multiple stratified cluster random sampling. Aspects taken into consideration in sampling were based on school status (public and private) and school accreditation (A, B, and C). Determination of the school sample involved in this study was determined using the convenience sampling technique. Based on the technique of determining the number of school samples, 9 schools were determined with a total of 371 students. Meanwhile, the sample of teachers involved were biology teachers from sample schools who were willing to be the sample in this study. Distribution of the number of students who were sampled in this study (n = 14). presented in Table 1.

Table 1

Number of Students' Interest in Learning Media

No.	School Code	Location	Status	Accreditation	Number of sample
1	SPu01	Ilir Barat 1	Public	A	74
2	SPu02	Ilir Timur 1	Public	A	99
3	SPu03	Gandus	Public	B	34
4	SPi01	Plaju	Private	A	34
5	SPi02	Seberang Ulu 2	Private	A	33
6	SPi03	Kemuning	Private	A	26
7	SPi04	Ilir Timur 2	Private	B	24
8	SPi05	Kalidoni	Private	B	22
9	SPi06	Ilir Timur 2	Private	C	25

Note: Pu = Public School, Pi = Private School, 01.. ect = serial number

Data Collection

The instrument used in this research is a questionnaire sheet. The student questionnaire sheet is an instrument designed to find out students' perspectives about the most interesting learning media used in Biology learning on excretory system material. Teacher questionnaire sheets are used to obtain data about the type of learning media, the origin of the media, and students' responses to the media used in excretory system learning. The student questionnaire used was a closed questionnaire with 9 alternative answers (Table 2). Students are allowed to choose more than one available answer. Meanwhile, the teacher's questionnaire sheet is an open questionnaire consisting of 24 questions (Table 3). The development of the questionnaire sheet pays attention to the learning indicators contained in the excretory system material. This questionnaire sheet is given to students online through the Google Form application. The use of the Google Form application was chosen by considering the learning process that was still ongoing online when data collection was carried out.

Table 2

Distribution of questions on student questionnaire sheets

No.	Topic	Question Number
1.	Location and structure of excretory organs	1
2.	Functions of the excretory organs	2
3.	Kidney work and the process of excreting urine	3
4.	Impaired kidney function	4
5.	Disorders and diseases related to the human excretory system	5

No.	Topic	Question Number
6.	Technology related to the prevention of disorders and disorders of the human excretory system	6
7.	Analysis of problems with kidney function disorders	7
8.	Investigation of impaired renal function	8

Table 3
Distribution of questions on the teacher's questionnaire

No.	Topic	Question Number
1	Media, media origin, and student responses to the concept of the location and structure of the excretory organs	1, 2, 3
2	Media, media origin and student responses to the concept of the function of the excretory organs	4, 5, 6
3	Media, media origin and student responses to the concept of the kidney work and the process of excreting urine	7, 8, 9
4	Media, media origin, and student responses to the concept of impaired kidney function	10, 11, 12
5	Media, media origins and student responses to the concept of disorders and diseases related to the human excretory system	13, 14, 15
6	Media, media origins, and student responses to technology concepts related to overcoming disorders and disorders of the human excretory system	16, 17, 18
7	Media, media origin and student responses to the concept of analyzing problems with kidney function disorders	19, 20, 21
8	Media, media origin and student responses to the concept of investigation regarding impaired kidney function	22, 23, 24

Procedure

This research was conducted through three stages, including making instruments, data collection, and data analysis. The questionnaire sheet instrument was made by referring to the learning indicators in the excretory system material. While the teacher's questionnaire was developed by focusing on the type of media used by the teacher, the origin of the media, and student responses after the teacher used the media. The process of collecting data on students and teachers is done online using Google Form. Dissemination of the questionnaire link is assisted by the teacher during the learning process. The data that has been collected is then analyzed.

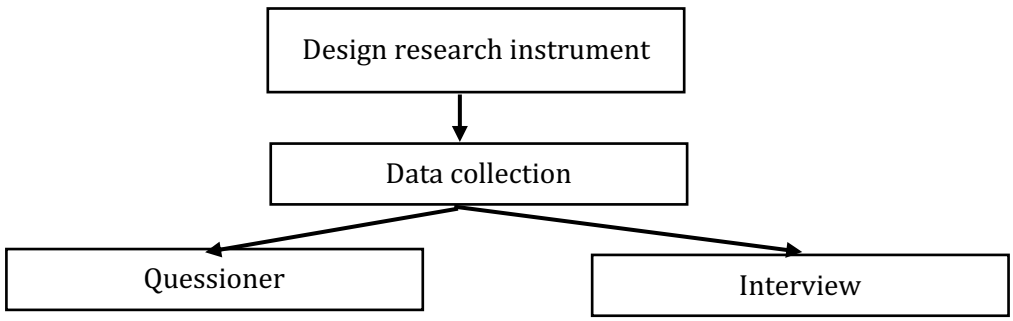

Figure 1. Research procedure

Data Analysis Techniques

The data obtained from students and teachers were then analyzed. The data sourced from the questionnaire is then calculated using a tally sheet to determine the percentage of interesting media types for students to use in learning excretion system material. Data from the teacher interview process were then converted into interview transcripts to be further described as research results.

RESULTS AND DISCUSSION

Learning media has a very important role. Learning media used by teachers can help students understand various concepts from the material being studied (Susanto, et al., 2022; Sukenda, 2019). The selection of learning media by the teacher must of course pay attention to the suitability of the type of

learning media chosen with the material presented (Marpanaji, et al., 2018). Research on learning media on excretory system material does not only involve teachers but also students. This study aims to determine the types that can make students interested and know about how to get learning media used by teachers. The development of this research instrument was carried out by taking into account the learning indicators contained in the excretory system material. This research was carried out in eleven schools including public and private in the city of Palembang and carried out online and offline based on the needs and requests of schools and respondents because at the time of field research some schools had implemented hybrid learning. The results of the research from 371 students in the city of Palembang are shown in Table 4. While the results of the teacher's questionnaire are presented in Table 5.

Table 4
Number of Students' Interest in Learning Media

No	Topic	Media		
		Audio	Visual	Audio Visual
1	Location and structure of excretory organs	24	98	177
2	Functions of the excretory organs	80	96	168
3	Kidney work and the process of excreting urine	32	93	171
4	Impaired kidney function	22	93	158
5	Disorders and diseases related to the human excretory system	16	94	177
6	Technology related to the prevention of disorders and disorders of the human excretory system	11	93	184
7	Analysis of problems with kidney function disorders	16	95	172
8	Investigation of impaired renal function	18	91	177

Table 5
Types of media, media origin and student responses from the media used in the excretory system material

Topic	Type of media		Origin of media		Students' respons	
Location and structure of excretory organs	Visual	8	Ready to use	17	Interested	13
	Audio-visual	9	Teachers make their own media	5	Easy to understand material	3
					Motivated	3
Functions of the excretory organs	visual	8	Ready to use	16	Interested	12
	Audio-visual	9	Teachers make their own media	3	Easy to understand material	4
					Motivated	4
Kidney work and the process of excreting urine	Visual	7	Ready to use	16	Interested	11
	Audio-visual	10	Teachers make their own media	2	Easy to understand material	4
					Motivated	3
Impaired kidney function	Visual	8	Ready to use	15	Interested	13
	Audio-visual	10	Teachers make their own media	3	Easy to understand material	4
					Motivated	3
Disorders and diseases related to the human excretory system	Visual	7	Ready to use	13	Interested	11
	Audio-visual	9	Teachers make their own media	3	Easy to understand material	3
					Motivated	3
Technology related to the prevention of disorders and disorders of the human excretory system	visual	6	Ready to use	11	Interested	10
	Audio-visual	9	Teachers make their own media	4	Easy to understand material	3
					Motivated	3

Topic	Type of media		Origin of media		Students' respons	
Analysis of problems with kidney function disorders	visual	8	Ready to use	8	Interested	10
	Audio-visual	5	Teachers make their own media	4	Easy to understand material	3
Investigation of impaired renal function	Visual	6	Ready to use	14	Interested	14
	Audio-visual	10	Teachers make their own media	2	Easy to understand material	2

In this study, the learning media used were divided into 3 groups, namely audio media (voice notes), visual media (images, GIFs, printed books, e-books, real objects, and artificial objects), and audio-visual media (videos). learning and powerpoint). The results of this study indicate that the most preferred learning media by students is audio-visual media compared to visual media and audio media. The audio-visual media was favored by students on each learning indicator. The results of the questionnaire given to the teacher also showed that the learning media most often used to teach the concept of the excretory system was audio-visual media. In addition to using audio-visual learning media, teachers also use visual learning media. Visual media are also widely chosen by students to be the preferred media in studying the concept of the excretory system. This shows that the learning media used by the teacher is in accordance with the learning media preferred by students. This can be caused by the use of audio-visual media can not only help students who are inclined to their visual abilities but also students who excel in their audio abilities.

Video learning is the type of audio-visual media most favored by students in learning the excretory system. Learning videos are believed to be able to help students visualize various concepts that are being studied by students (Fan, et al., 2018). This is related to the many abstract biological concepts that are difficult for students to understand (Cimer, et al., 2012). In addition, the use of learning videos can help students to overcome the misconceptions experienced by students regarding the concepts being studied (Cherif, et al., 2014). The use of learning videos can encourage meaningful learning, because learning videos can combine various media, including text, images, sounds that can make it easier for students to understand learning effectively (Tarigan, et al., 2021). The use of learning video media has increased during the Covid-19 pandemic when compared to learning before the pandemic. Learning videos are very helpful for students in understanding concepts and information, assisting students in completing assigned tasks and preparing for assessments carried out by teachers (Breslyn, et al., 2022). In addition to learning videos, powerpoint slides are also audio-visual media preferred by students to be used in learning the excretory system material. The use of powerpoint slides is expected to encourage active and creative learning. On the powerpoint slides developed by the teacher, the teacher can not only enter writing but can also add animations, videos, pictures and others that make students interested and help students understand the concepts given (Cahyandaru & Surjono, 2019; Gurbuz, et al., 2010). The results of previous studies showed the use of learning videos had the same good results as the use of visual media in the form of real objects (Olatoye, 2017).

Visual media is also the preferred media by students and is often used by teachers in the learning process. The use of visual media in Biology learning, especially the excretory system. The visual media intended in this study include pictures, moving pictures, printed books, e-books, real objects and artificial objects. The visual media used can help students understand the concept being studied because it is able to attract students to study the concept thoroughly (Sukenda, et al., 2019). The types of visual media that are preferred by students are real objects and artificial objects. The use of real objects in learning is an ideal medium in Biology learning so that it can provide a learning experience that encourages students to develop hands-on skills, scientific abilities and science process skills. This media helps students to make observations and explore scientific phenomena and directs students to conduct experiments. Biology learning by utilizing real objects is also proven to make it easier for students to understand the material being studied. In addition, this media raises student interest and motivation in learning (Anazifa, 2021; Hakim & Suratsih, 2019). Dale's theory explains that student participation in hands-on-centered learning can help students understand the material as much as 70% (Davis & Summers, 2015). The results of previous research showed that the use of real objects in the implementation of Biology learning the excretory system concept had a significant effect on increasing students' understanding of concepts (Hakim & Suratsih, 2019). However, in some concepts the use of real objects in Biology learning is difficult to apply so it must be replaced with artificial objects.

The use of artificial objects as a medium for learning Biology is also widely chosen by students as the preferred medium to be used in learning the concept of the excretory system. Artificial objects that can be used in Biology learning the concept of the excretory system include charts or other 3D media. The use of 3D media can not only improve student learning outcomes but also improve students' visual spatial intelligence (Fatmawati, 2021; Susilawati & Ermayanti, 2019; Atikah, et al., 2018; Suprapto, et al., 2018; Ermayanti, et al., 2018). This 3D media helps students to visualize the concept of the learning process. This media really helps students to understand concepts related to structure and function in systems related to anatomy and physiology (Atikah, et al., 2018). Visual media can help students to hit objects, distinguish sizes, shapes, colors, and use their visual abilities to predict locations (Fatmawati, 2019). The use of visual media in the form of artificial objects also allows students to be able to touch and feel how the structure is being studied (Atikah, et al., 2018). This media can not only be developed by the teacher but students can also be involved in the development of this media by conducting thorough observations. The development of 3D media carried out by students with the assistance of teachers has been proven to improve students' creative abilities (Suprapto, et al., 2018).

Audio-visual media and visual media are the types of media most favored by students and also the most frequently used by teachers to carry out Biology learning on the concept of the excretory system. The teacher shows a tendency to use media that are already available for use in the learning process. The tendency to use the available media is due to the limited knowledge and time that teachers have to develop learning media (Herlinda, et al., 2019). The learning videos used by teachers mostly come from Youtube or other applications that provide related videos. The Youtube application makes it possible for other teachers who have developed learning videos to share them for free to other teachers who need these learning videos (Capati, 2020). While the visual media used are media that are already available in schools, for example charts or artificial objects. However, teachers can also create their own visual media that will be used in learning, for example by creating 3D objects.

The use of audio-visual media and visual media showed a positive response from students after the teacher used the media. Student responses indicate that students are interested and motivated by the use of this learning media. In addition, the use of this media also helps students to understand the concept of the excretory system being studied. This study is in accordance with previous research which explains that the use of audio-visual learning media attracts students' attention, is fun, increases student concentration, motivates students, makes students feel more fun in the learning process and reduces student learning anxiety (Maziriri, et al., 2019; Abbas & Qassim, 2020). The use of audio-visual media is also not limited to higher education levels, but also shows good effectiveness at the secondary and basic education levels (Koto, 2020; Abah, et al., 2019).

The type of media that students do not really like is audio media when compared to visual media and audio visual media. This can be caused because audio learning media makes students bored more quickly because it is too monotonous. The use of audio media also cannot help students more easily understand the concept of the excretory system being studied. In this study, voice notes were grouped into audio media. The use of audio media still has good benefits for students if it is combined with a cooperative learning model. The results of previous studies show that the application of cooperative learning with audio media has a significant influence on student learning outcomes (Ardianto, et al., 2021). However, the use of audio media in Biology learning cannot maximize learning if it is not followed by a learning model or method that can encourage students to be more active compared to improving language skills (Aryanata, et al., 2022). Dale's theory explains that a person tends to remember only 20% of the concepts he hears (Davis & Summers, 2015). Excretory system concepts require learning media that can help students visualize concepts so that they are easy to understand. The concept of structure and function in the excretory system requires the support of visual media, while concepts related to processes would be better supported by audio-visual media or moving visual media that will help students understand the physiological processes that occur in the urine formation process.

CONCLUSION

Research on learning media used in Biology learning on the concept of an excretory system shows that audio-visual media and visual media are the most preferred learning media by students. Audio-visual media and visual media are also media used by teachers in learning the excretory system. This shows that the learning media used by the teacher is in accordance with the learning media preferred by students. Learning videos are the most preferred audio-visual media by students, while

the visual media that students prefer include real objects and artificial objects. The results of this study also show that teachers tend to use the media that are already available compared to developing their own learning media. Limited knowledge, skills, and time constraints are factors that cause teachers not to develop their own learning media. However, students showed good responses, including students becoming interested in learning, making it easier for students to understand the material, and making students more motivated to be active in the learning process. Students do not show interest in using audio media in learning Biology on the excretory system. The results of this study also indicate that teachers do not use audio media in learning. The use of audio media may have good implications if it is followed by a learning approach that can encourage students to be more active in the learning process.

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