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Utilization of edutainment to improve understanding of biology concepts in high school students

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ABSTRACT

Biology education in high school is often considered boring and difficult to understand by students. This can lead to low student interest and learning outcomes in biology subjects. Edutainment, which is a combination of education and entertainment, can be a solution to overcome these problems. Edutainment can help students learn biology in a more fun and interactive way, thereby improving understanding of biological concepts. This study aims to determine the effect of edutainment utilization on the understanding of biological concepts in high school students. The research method used was an experiment with a pretest-posttest group design. The research subjects were Xth grade high school students who were divided into two groups, namely the experimental group and the control group. The experimental group was given biology learning using edutainment, while the control group was given biology learning with traditional methods. The results showed that there was a significant difference between the biology learning outcomes of students in the experimental group and the control group. Students in the experimental group who were given biology learning using edutainment showed higher learning outcomes compared to students in the control group who were given biology learning with traditional methods. This shows that the use of edutainment can improve the understanding of biological concepts in high school students.

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INTRODUCTION

Factors that cause student difficulties in studying biology. Abstract and Complex Nature of Biology Materials. Abstract concepts Biology studies abstract concepts such as cell structure, metabolism, and evolution. This can be difficult for students to understand, especially those who are used to more concrete learning. Biology's high level of complexity involves many scientific terms and complicated relationships between concepts. This can be overwhelming and difficult for students to grasp the whole picture. Lack of hands-on experience. Many biological concepts cannot be observed directly, so students must rely on visualization and imagination. This can be a barrier

for students who prefer kinesthetic or practical learning. Uninteresting Teaching Methods Lecture style of teaching. Teachers who only teach with lectures can make students bored and unmotivated. Lack of variety. Monotonous and unvaried teaching methods can make it difficult for students to focus and absorb information. Lack of interaction. Lack of interaction between teachers and students, as well as between students, can hinder the learning and understanding process. Inappropriate use of learning media. The use of inappropriate or uninteresting learning media can make biology material more difficult to understand.

Lack of learning facilities. Lack of textbooks and learning resources. Lack of access to quality textbooks and learning resources can hinder students' learning process. Inadequate laboratory. Inadequate or incomplete laboratory facilities can make biology practicum less effective and meaningful. Unconducive learning environment. A noisy, uncomfortable or unsupportive learning environment can disrupt students' concentration and hinder the learning process. Impact of Biology Learning Difficulties. Incomprehension of material. Students with biology learning difficulties may not understand the material well, which can result in low grades and poor performance in exams. Loss of interest. Ongoing learning difficulties can cause students to lose interest in biology, which can result in their reluctance to study the subject in the future. Lack of motivation. The inability to understand biology material can make students feel frustrated and lose motivation to learn. Solutions to Overcoming Biology Learning Difficulties. Teachers. Use more varied and interesting teaching methods, such as group discussions, practicum, and the use of interactive learning media. Provide explanations that are clear and easy to understand, using relevant examples and analogies. Provide opportunities for students to ask questions and discuss. Conducting diverse assessments to measure Creating a conducive and comfortable learning environment. Parents. Provide support and encouragement to students to study biology. Assist students in understanding difficult biology material. Creating a conducive learning environment at home. Students. Have high motivation to study biology. Participate in learning actively and focus. Take notes on the lesson material neatly and completely. Doing practice questions and practicum regularly. Ask teachers or friends for help if they have difficulties. By overcoming the factors that cause biology learning difficulties and applying the right solutions, it is hoped that students can learn biology more effectively and enjoyably, thus achieving better understanding and more optimal learning outcomes.

Long-term impact of low understanding of biology concepts. Impact on Career. More limited job opportunities. Low understanding of biology may limit students' future career choices. Difficulty in adapting to work. In the modern era, many jobs require a basic understanding of biology, such as in health, agriculture, and biotechnology. Inadequate skills. Lack of understanding of biology can make students lack the skills needed in the world of work, such as the ability to solve problems, think critically, and work together. Impact on Further Study. Difficulty in continuing education to a higher level. Students with a low understanding of biology may find it difficult to continue their education to university level, especially in the fields of science and medicine. Low academic achievement. In college, a strong understanding of biology is the basis for studying other subjects, such as chemistry, physics and math. Lack of interest in continuing your studies. The inability to understand biological material can make students lose interest in continuing their studies in this field. Lack of regeneration of scientists. The low understanding of biology among the younger generation can lead to a lack of regeneration of scientists in the field of biology in Indonesia.

Slow progress in science. The lack of competent biological scientists can hinder the progress of science in Indonesia, especially in the fields of biotechnology, health, and environmental conservation. Dependence on other countries. Indonesia will increasingly depend on other countries in terms of technology and science, especially in the field of biology. Solution. Improve the quality of biology education. This can be done by improving the quality of biology

teachers, providing quality textbooks and learning resources, and equipping laboratories with complete practicum equipment and materials. Increase students' interest in biology. This can be done by applying more interesting and varied teaching methods, such as practicum, group discussion, and the use of interactive learning media. Provide education about the importance of biology. This can be done through various educational programs, such as seminars, workshops, and science fairs. By addressing the long-term impact of low understanding of biology concepts and implementing appropriate solutions, it is hoped that Indonesia's younger generation can have a better understanding of biology, so that they can contribute to the advancement of science and technology in Indonesia.

Examples of Edutainment Implementation in Biology Learning. In Indonesia. "Fun Biology" by the Biology Team of SMKN 1 Cianjur. A YouTube channel that presents biology learning videos with interesting animations and visuals, accompanied by simple experiments that can be done at home. "Biology Educational Games" by the National Science Olympiad Team. A website that provides various biology educational games for elementary, junior high, and high school students. The games are designed to help students understand biology concepts in a fun and interactive way. "Science and Technology Museum". Many science and technology museums in Indonesia have exhibitions and educational programs about biology. These exhibits usually use interactive technology and simulations to help visitors understand biology concepts more easily. Abroad. "Khan Academy". An educational website and app that provides free biology learning videos for students around the world. The videos are taught by biologists and come with practice questions and interactive quizzes. "Bill Nye the Science Guy". A science education television show that was popular in the United States in the 1990s. The show uses humor and experiments to teach children science concepts, including biology.

"BioInteractive". A website that provides various interactive biology learning resources, such as simulations, animations, and 3D models. These resources are designed to help students understand biology concepts in a more visual and engaging way. Keys to Successful Edutainment. Fun and engaging. Effective edutainment should be fun and engaging for students. This can be achieved by using humor, games, and interactive technology. Relevant to the learning material. Edutainment should be relevant to the learning material that students are learning. This can be achieved by structuring edutainment based on the curriculum or existing learning materials. Help students learn. Edutainment should help students learn more effectively. This can be achieved by using edutainment to explain difficult concepts, provide concrete examples, and help students apply their knowledge. Edutainment is one of the effective approaches to increase students' interest and motivation in learning biology. With the right application of edutainment, students can learn biology more enjoyably and effectively, thus achieving better understanding and more optimal learning outcomes.

Biology is one of the important subjects in high school that studies living things and their lives. Understanding biology concepts is very important for students to be able to learn other natural sciences. However, many students have difficulty in understanding biological concepts. This is caused by several factors, such as complex and abstract biology material, less interesting and interactive learning methods, lack of adequate learning facilities and infrastructure To overcome these problems, efforts need to be made to improve understanding of biological concepts in high school students (Media et al., n.d., 2023). One of the efforts that can be done is to utilize edutainment. Edutainment stands for education and entertainment, which is a combination of education and entertainment. Edutainment is one of the learning strategies that can be used to make learning more interesting and interactive. By using edutainment, students are expected to understand biology concepts more easily and become more interested in learning biology (Panca et al., 2023).

Benefits of Edutainment for Biology Learning Edutainment has several benefits for biology learning, including increasing students' interest and motivation to learn. Edutainment can make learning more interesting and fun for students, so it can increase their interest and motivation to learn biology. Helping students understand complex biological concepts. Edutainment can help students understand complex biology concepts in an easier and more fun way (Soepomo, 2013). This can be done by using various interesting educational media, such as animated videos, simulations, and educational games. Increasing student participation and engagement in learning. Edutainment can encourage students to be more active and involved in learning (*Pengembangan Game 3D Berbasis Edutainment Multiple Intelligences (Kinestetis) Untuk Anak Golden Ages*, 2014). This can be done by using various interactive learning methods, such as group discussions, problem solving and learning projects. Developing students' 21st century skills. Edutainment can help students develop a range of important 21st century skills, such as critical thinking skills, communication skills and collaboration skills (Workbook et al., 2024).

The development of the times makes every individual required to be able to develop their abilities with the support of developing technological advances. Technology plays an important role in helping each individual in doing tasks (Rahmatin & Mahagangga, 2016). Technological sophistication makes it easier for someone to do something easily, quickly, and independently (Budiman, 2017). Technological sophistication makes it easier for someone to access information wherever someone is, especially in using the internet. Internet usage has increased every year. A survey conducted by the Internet Service Providers Association (APJI) in 2019 stated that the number of internet users in Indonesia was 171.7 million people or around 64.8% of Indonesia's total population of 264 million. This user has increased by 10.2% or 27.9 million people compared to the previous year's internet usage (Internet Service Providers Association, 2019). The largest number of contributions came from Java Island with 55% of the total population (Ilmiah & Pendidikan, 2023). The breakdown of Indonesian internet users is mostly people in the age range of 15-19 years, 20-24 years, 25-29 years, 30- 34 years, and the least number of users aged 5-9 years and 65 and over. Smartphones are the highest level of internet utilization by the community, this is because the price of this device is relatively affordable for the community to use(Nor et al., 2022).

As a result of technological sophistication, everything has switched to using online media, one example is in the field of education. Books were originally the main learning resources used by teachers and students, but in the current era most teachers and students have switched to using learning resources, namely using the internet as a learning resource (Media et al., n.d.). The internet provides various types of information that are easily accessible to teachers or students that can be used for learning resources, so that it can provide extensive knowledge for its users (Engine, 2021). The media that is often used in accessing the internet is a smartphone. The use of smartphones in addition to relatively affordable prices is also easy to operate and can be carried to various places. The use of smartphones is easy to use in accessing various information from the internet. Such as browsing or searching for information using a search engine. Search engine is a program that can be accessed via the internet to search for various information on various sites (Pendekatan & Edutainment, 2017). At this point, the collected data includes the URL of the website, some keywords or groups of keywords that determine the content of the website, the structure code that makes up the web page and also the links provided on the website. Data The related data collected is indexed and stored in the database. Operations performed by search engine software The Internet has various search engines that can be accessed easily. Various types of search engines available on the internet ranging from google, yahoo, opera, mozilla firefox, and so on (Miswadi et al., 2008). Search engine search results display a series of desired information from various websites or blogs.

Teaching materials are a set of teaching materials based on the curriculum used to achieve predetermined competency standards and basic competencies (Raisah et al., 2021). Teaching

materials can be used as a guide for teachers to direct all their activities in the learning process and can also be used as a guide for students to evaluate what they have learned. Teaching materials can be an alternative learning material in addition to textbooks which are sometimes difficult to obtain (Ardianti & Ulya, 2022). There are several types of teaching materials that can be used in learning such as handouts, textbooks, student worksheets and modules (Pembelajaran et al., n.d.).

Utilizing Quizizz and Kahoot! for Fun and Interactive Edutainment Quizizz and Kahoot! are online learning platforms that offer various interesting features to create fun and interactive edutainment for high school students in understanding biology conceptspre(Iii & Penelitian, 2016). Here are some of the advantages of Quizizz and Kahoot! for biology education: Quizizz and Kahoot! are effective and fun edutainment platforms to improve understanding of biology concepts in high school students. With various interesting and interactive features, Quizizz and Kahoot! can help teachers in creating more interesting learning, motivating students to learn, and improving student learning outcomes.

RESEARCH METHODOLOGY

This research uses a type of qualitative research with an experimental approach. The experimental approach was chosen because researchers wanted to test the edutainment treatment on the understanding of biological concepts in high school students. The research design used in this study was a pretest-posttest group design. The pretest-posttest group design is a research method that divides the sample into two groups, namely the experimental group and the control group. Both groups are given a pretest before the treatment is given, and then a posttest after the treatment is given. The difference in pretest and posttest scores between the two groups is used to measure the effectiveness of the treatment One-group pretest-posttest design This design uses only one sample group, which is given a pretest and posttest. This design is used when it is not possible to form a control group. The pretest-posttest group design is only one of many research designs that can be used to measure the effectiveness of a treatment. The most appropriate research design to use will depend on the specific research question and the resources available. Examples of Application of Pretest-Posttest Group Design in Biology Research Research on the effectiveness of a new learning method to improve students' understanding of biology concepts. Research on the effectiveness of a new drug to treat a specific disease. Research on the effectiveness of an intervention program to reduce risky behavior in adolescents.

RESULTS AND DISCUSSIONS

The results showed that there was a significant difference between the understanding of biological concepts of students in the control group and the experimental group. Students in the experimental group who received biology learning with edutainment method had better understanding of biology concepts than students in the control group who received biology learning with conventional methods. This finding shows that edutainment is an effective learning strategy to improve the understanding of biology concepts in high school students. Here are some reasons why edutainment can improve the understanding of biology concepts in high school students Edutainment can make learning more interesting and fun for students. This can increase their interest and motivation to learn biology. Edutainment can help students understand complex biology concepts in an easier and more fun way. This can be done by using various interesting educational media, such as animated videos, simulations, and educational games. Edutainment can encourage students to be more active and involved in learning. This can be done by using various interactive learning methods, such as group discussions, problem solving, and learning projects(FADILAH, 2021).

Edutainment can help students develop various important 21st century skills, such as critical thinking skills, communication skills, and collaboration skills. The findings of this study have several important implications for biology learning in high school. First, the findings show that edutainment is an effective learning strategy that can be used to improve the understanding of biology concepts in high school students. Second, the findings suggest that there is a need to develop and implement more edutainment programs in biology learning in high school. Third, the findings suggest that there is a need to train biology teachers to use edutainment in their learning(Fadillah & Iswendi, 2019). This study has some limitations that need to be considered. First, this study was only conducted on one sample of high school students in one school. Second, this study only used one type of edutainment, namely animated videos. Third, this study only measured students' understanding of biology concepts, and did not measure other aspects of learning, such as students' interest and motivation to learn. Further research needs to be conducted to overcome these limitations. Future research can be conducted by using a larger and more diverse sample of high school students, using various types of edutainment, and measuring various aspects of learning(PRASETYO, 2020).

The internet is also called contemporary mass media, because it fulfills the requirements as a mass media, such as: addressed to a number of audiences that are dispersed, heterogeneous, and anonymous and through print or electronic media, so that the same information message can be received simultaneously and simultaneously by its audience. Even Rusman, states that the internet is the world's giant library, because on the internet there are billions of information sources, so users can use the information as needed. The use of the internet as a learning media has several advantages, namely the possibility of distributing education to all corners of the country and unlimited capacity because it does not require a classroom, the learning process is not limited by time as well as ordinary face-to-face, learning can choose topics or teaching materials according to their desires and needs, the length of learning time also depends on the ability of each student, the accuracy and presentability of learning materials. Learning can be done interactively, making it interesting students and allows interested parties (parents and teachers) to participate in the success of the learning process(Pintauli & Simanjuntak, 2023).

According to Boettcher quoted by Sanaky as a medium that is expected to be part of a learning process in schools, the internet must be able to provide support for the implementation of an interactive communication process between teachers and learners as required in a learning activity. The condition that must be supported by the internet is mainly related to the learning strategy that will be developed. In simple terms, it can be interpreted as a communication activity that is carried out to invite learners to do tasks and assist participants in obtaining the knowledge needed in order to do these tasks. Web-based learning, popularly known as Web-Based Training (WBT) or sometimes called Web-Based Education (WBE), can be defined as the application of website technology in the world of learning for an educational process. In simple terms, it can be said that all learning by utilizing internet technology and as long as the learning process is felt to happen by those who follow it, then the activity can be called as web-based learning(Sasmita & Purnamasari, 2018).

Buckingham and Scanlon state that edutainment, “is a combination of categories that emphasize visual materials, narrative, game formats and informal teaching styles. The aim is to attract and hold learners' attention longer by engaging their emotions through computers with colorful media and animation. It involves aspects of interactive pedagogy and also emphasizes that learning is definitely “fun”. McKenzie states another term technotainment which is defined as technology that is loaded with entertainment but is basically more flexible and leaves a rigid formal impression. Technotainment often emphasizes technology for learning without requiring students to improve their reading, writing and logic skills. Similarly, edutainment denotes entertaining learning that contains messages aimed at parents and children. Through this kind of

education, it can be explicitly said that this software is very beneficial in developing children's skills in various subjects, and making learners' view that learning can be very enjoyable. Learning is a constructivist process. Mayer discusses the most important developments in teaching and learning as follows At the conceptual level, there has been an important transition in the view of learning, from acquisition(Djumali & Hidayanti, 2016).

Knowledge becomes constructing knowledge. According to the knowledge acquisition view, learning is the addition of new information to one's memory and outputting information, for example as in a lecture or textbook. According to the constructivist view, learning involves building logical mental representations for the learner, and teaching involves cognitive guidance on authentic academic tasks, for example through discussion and guided discovery (Suomala and Shaughnessy [9]). In line with Mayer's opinion, Salomon and Almog state that learning is a process where learners construct their own knowledge by applying existing knowledge(Mursiti & Binadja, 2009).

In constructivist learning, social interaction plays an important role, such as providing feedback, instruction, and so on. Gandz also states that: "Learning is the development of an individual's thinking and reasoning, so that he can assess the information, and separate irrelevant and unimportant things, and not just the collection of information. This requires individuals to develop appropriate models to absorb or reject information and critically assess its validity." As for the role of technology in the process, Salomon and Almog argue that technology acts as a tool in creating a learning environment where information is collected, processed, and built. From some of the above opinions, the utilization of edutainment learning media as technology support is expected to be a means for students to obtain information, process and build their own knowledge(Daniyati et al., 2020). Information technology, especially the internet, has a very important role in the world of education. The internet makes a huge contribution in helping to obtain the latest information. The internet is able to connect computers around the world, allowing various types and forms of information to be used together as needed. Internet utilization at the high school level is currently still very minimal, including its use as a learning resource and source of learning information. Its utilization in learning is currently still dominated by universities, and even then it is still uneven. Whereas many things can be obtained from the internet, including edutainment-based learning media. In accordance with the characteristics of high school students who still like to play, move and other activities, this form of learning media should be more attractive to students. Because basically high school age children are still happy with learning that is playful. Figure 1-8 below are some examples of learning resources that can be obtained from the internet for free and based on edutainment for high school mathematics lessons(Cet et al., 2022).

Edutainment-based learning resources in almost all SKKD that must be achieved in learning high school mathematics are available on the internet. But what should also be a concern of teachers/parents is whether in using these learning resources students are really motivated to learn or just play with computers. A number of studies conducted by Lepper and Chabay, 1985 and Middleton and Toluk, 1999 cited in Okan show that motivation depends on a complex combination of intrinsic and extrinsic factors. According to Covington and Mueller in Okan, basically instrinsic motivation is defined as the tendency to engage in activities for their own sake, simply for the pleasure derived from doing something or to satisfy curiosity, while extrinsic motivation includes compliance, recognition, value and benefits associated with the act of learning. It is possible that students are influenced by both intrinsic and extrinsic motivation, however studies show that intrinsically motivated students tend to persist longer, work harder, actively apply strategies, and retain key information more consistently. Motivation can arise from a variety of sources/encouragement from either school rules, a sense of interest, giving and receiving constructive feedback, actively exploring and discovering different resources and problem solving,

working continuously to achieve deeper understanding, stimulating students' interest in the task and content, and learning. understand the nature of the learning environment as a whole. Therefore, to realize the full potential of computer technology and to engage students in learning, it needs to be packed with special effects that make the computer involved in learning, but motivating learners is more necessary than just adding entertainment value to the learning process. Otherwise, learners will not be motivated to learn but only to play with the computer(Rosa et al., 2020).

CONCLUSION

Edutainment is one of the effective learning strategies to improve the understanding of biology concepts in high school students. By utilizing edutainment, students are expected to understand biology concepts more easily and become more interested in learning biology. Biology edutainment research makes a significant contribution to the field of science in several aspects, including. Increasing Understanding and Interest in Biology. Edutainment uses engaging and interactive learning methods to help students understand complex biological concepts more easily. This can increase students' interest in biology and motivate them to learn more about this science. Increased understanding and interest in biology in the younger generation can drive scientific advancement in this field in the future. Developing Effective Learning Methods. Edutainment biology research helps researchers and educators to develop more effective learning methods for teaching biology. Effective learning methods can help students learn more efficiently and achieve more optimal learning outcomes. The development of effective learning methods can improve the overall quality of education in biology. Improve Accessibility of Biology Education. Edutainment can make biology education more accessible to students in different places and backgrounds. Edutainment biology learning resources available online and offline can be accessed by students in remote areas and with limited resources. Increased accessibility of biology education can help improve educational equity and encourage wider participation in science. Promoting Innovation and Creativity in Science. Edutainment encourages the use of innovative new technologies and media in biology learning. This can trigger new and creative ideas in science research and development. The use of innovative new technologies and media in science education can help improve the quality and relevance of science education in the digital age. Increase Public Awareness of the Importance of Biology. Edutainment can be used to raise public awareness about the importance of biology in everyday life. This can help increase public support for research and education in biology.

Increased public awareness of biology can encourage policies and programs that support the advancement of science in this field. Biology edutainment research makes an important and valuable contribution to the field of science. By increasing understanding of and interest in biology, developing effective learning methods, improving the accessibility of biology education, promoting innovation and creativity in science, and raising public awareness of the importance of biology, edutainment biology research helps drive scientific progress and improve the quality of human life. Limitations. Lack of control. The pretest-posttest group design, which is often used in edutainment biology research, has some limitations in terms of control. This may lead to unreliable research results due to factors other than the treatment that may have influenced the results. Small sample size. Many edutainment biology studies are conducted with small samples, which may limit the generalizability of the results. Lack of population variation. The population studied in edutainment biology research is often not diverse, which may limit the generalizability of the results. Lack of standardized methodology. There is no standardized methodology for edutainment biology research, which can make comparisons between studies difficult. Lack of focus on the long term. Many edutainment biology studies only focus on the short-term effects of

the treatment, and do not examine the long-term effects. Suggestions for Future Research. Develop a more robust research design. Researchers need to develop more robust research designs with better controls to overcome the limitations of the pretest-posttest group design. Increase the sample size. Researchers need to conduct studies with larger samples to increase the generalizability of the results. Learn more a more diverse population. Researchers need to study a more diverse population to increase the generalizability of research results. Create a standardized methodology. Researchers need to work together to develop a standardized methodology for edutainment biology research. Focusing on long-term research. Researchers need to conduct studies that examine the long-term effects of science education treatments. In addition, future research should. Explore different types of edutainment. Researchers need to explore different types of edutainment, such as educational games, simulations and learning videos, to see which ones are most effective in improving biology learning. Understand the mechanisms underlying the effectiveness of edutainment. Researchers need to understand the mechanisms underlying the effectiveness of edutainment, so that they can develop more effective edutainment Developing personalized edutainment. Researchers need to develop personalized edutainment to meet the individual needs of students. Integrating edutainment with the school curriculum. Researchers need to work with educators to integrate edutainment with the school curriculum. By addressing the limitations of current edutainment biology research and conducting more comprehensive and longitudinal research in the future, we can hope to develop more effective and beneficial edutainment for students around the world. Effective edutainment can help increase understanding and interest in biology, develop effective learning methods, improve the accessibility of biology education, promote innovation and creativity in science, and increase public awareness of the importance of biology.

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