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Review Analysis of Animated Test Questions Towards Understanding Concepts in Physics Learning

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Abstract

This study aims to (1) Analyze the application used for making animated test questions. (2) Analyzing the use of animated test questions based on education level. (3) Analyzing the use of animated format test questions based on physics learning materials. (4) Analyzing the use of animated test questions on students' understanding of physics concepts. This study uses a systematic review method using 16 national and international journal articles from 2010-2022. The results of this study showed that: (1) The application used to make test questions in animation format is very large, but Macromedia Flash is more often used. (2) Animation test questions are widely applied or used at the Senior High School level. (3) For material in physics learning, animated test questions are more often applied to the concept of light refraction. (4) Animation test questions can help students to improve their understanding of concepts. The study results show that the animated format test questions affect students' conceptual understanding. However, in reality, when carrying out the test, the format of the questions presented is still in the form of a paper, and a test is in the form of an arguments. Teachers do not know how the influence of the use of animated test questions on students' understanding of concepts, as well as what applications can be used in making animated test questions.

INTRODUCTION

Learning is closely related to the interaction between the nature and behaviour of individuals who are complex with the surrounding environment [1]. The learning process is a system of unity of elements between one another, and both have a relationship; both interactions occur to achieve a result according to maximum expectations and based on what is intended [2]. Learning can be concluded as a conscious activity carried out by someone continuously, which can change the attitude or behaviour of that person towards a better one.

During the learning process, the teacher does not just provide the material but must explain the concepts of the material. A concept is an idea or idea that has meaning. Someone is said to have a concept that someone who has a clear understanding and in accordance with the real meaning [3]. Conceptual knowledge is knowledge that is understanding, definition, characteristics, and components of an object. But in reality, in a learning process, not all students can get an understanding of a concept correctly. So many students have a different understanding of physics experts in general [4].

Understanding the concept is an element that is very influential in physics [5]. Conceptual understanding is the competence in mastering the various materials studied, where students not only know but can tell or express the concept and deliver more easily obtained understanding and can implement it. By carrying out the teaching and learning process, teachers are expected to be able to

improve students' understanding of concepts. Understanding student concepts is important to measure, especially in physics learning. For this assessment, an evaluation process is usually carried out through organizing tests, which are also called assessments.

Assessment is a medium that sequentially, assists the teacher when monitoring students [6]. In order to reveal students' mastery of concepts, assessment is not only about revealing the concepts that have been acquired but also about the stages of development of how a concept is achieved [7]. Assessment can provide an assessment of not only the results but also the learning process of students and their learning progress. In this 21st century, science and technology are developing very fast. The professional nature of teachers is not enough to teach competence to students but to manage information and the environment to provide facilities for learning activities, one of which is through enriching learning media sources so that they can help achieve the goals of 21st-century learning.

The main goal of 21st-century learning is to develop students' learning competencies and support their development as independent and active learners [8]. 21st-century learning requires everything to be technology-based to balance the demands of the millennial era so that students gain habits with today's life skills. Teachers can utilize this to present evaluations using animated test questions.

The animation itself is an image that occurs with movement that has been formed through several collections of images with a regular arrangement according to the flow of movement in each increase in the count of time [9]. Animation is also known as a series of images with sequential arrangement or recognized together as frames [10]. Objects in the image can be in the form of special effects or colour, writing, drawing, or photography. Using animated test questions can increase students' understanding of concepts. Animation has advantages, which can attract students' attention due to the presence of matching and harmonious movements. By using animation during assessment, it can help or make it easier to describe the meaning of the questions presented.

In research by Dancy, M., and Beichner, R. in 2006 regarding the study of the use of items in the form of animation to evaluate the understanding of physics concepts [11]. This study is a test format to evaluate the understanding of the concept of force and motion in physics learning. For this purpose, the researcher has changed a number of questions about motion packaged in a static format on the FCI (Force Concept Inventory) with an animated format. The results of his study showed that with the items packaged in the form of animation, the results of the test of understanding the concept of motion can increase from before.

There are indications that for a number of problems related to dynamic phenomena, such as the phenomenon of object motion, some test items can be very beneficial when packaged in animation format. Many have researched this issue, but none have been summarized in a review; it will be discussed and explored thoroughly by presenting the following objectives: (1) What are the applications used for making animated test questions? (2) At what level of education can animated questions be used? (3) In what material can animated test questions be used? (4) Does using animated test questions have an impact on students' understanding of physics concepts?

RESEARCH METHODS

The research was conducted using the Systematic review method, using a research instrument in the form of a summary of the information needed and written in tabular form. The importance of conducting a systematic review in order to find configurations in in-depth investigations also puts new research activities accordingly [12,13] and is a procedure used in the social sciences. Systematic review also has the aim of providing answers to questions that are more focused, relevant, and specific. This systematic review also looks for research results, reduces bias through reviews, synthesizes results, and identifies gaps through research [14]. This research is descriptive research classified as library research, which concludes several relevant research journals and theories that are already available. In this study, researchers can search for data through journal websites that are easily accessible through Google Scholar and ScienceDirect. In accordance with the title to be studied from the range of 2010-2022. The results of the research are synthesized or in the form of narrative techniques (Qualitative Techniques), which are qualitatively descriptive. From the search

results that were carried out, 16 articles were obtained using the keyword animation question format. Furthermore, all articles that meet the requirements or criteria are further analyzed using Prisma Flow in Figure 1.

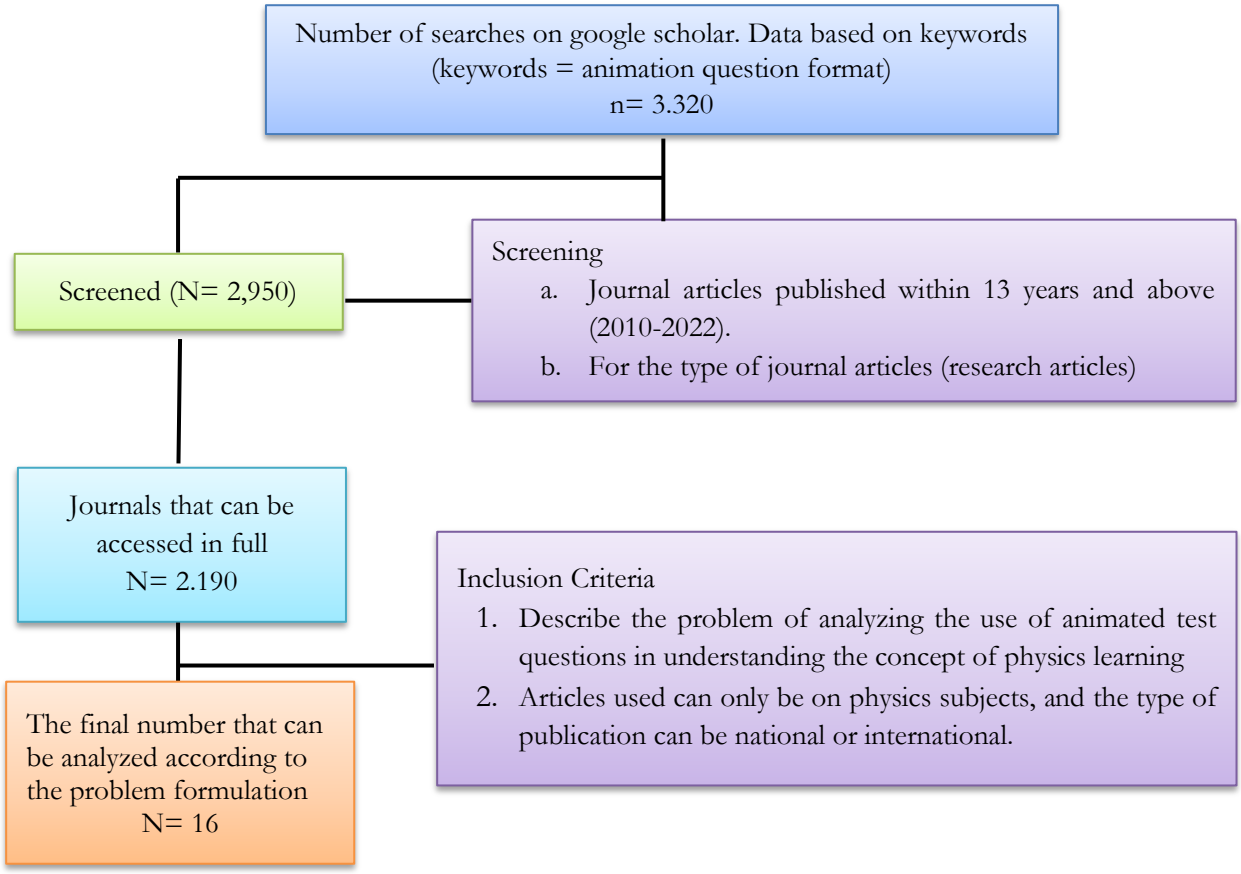

Figure 1. Systematic Review Algorithm Using PRISMA Flow

RESULTS AND DISCUSSION

The results of the research that has been carried out include information on analyzing the use of animated format test questions at the educational level, analyzing the use of animated format test questions on physics learning materials, analyzing applications that are often used in making animated test questions and analyzing the use of animated format test questions on students' understanding of physics concepts. All articles collected have been analyzed and synthesized with the following results.

1. Analysis of the application used for the creation of animated test questions

Table 1. Group of Articles by Animation Creation Application

Application	Article Code	Amount	Percentage %
Macromedia Flash	A1[15], A2[16], A6[17], A8[18], A11[19], A13[20], A15[21], A16[22]	8	72,8
Animator Physlet	A3[23]	1	9
Hot Potatpes	A9[24]	1	9
Bloom Digital Assessment	A10[25]	1	9
Total		11	100

Based on the data in the table, the Macromedia Flash application is more often used to create animated format test questions with the number of articles, as many as 8 out of 11 journal articles that meet the criteria for the first objective. Macromedia Flash is a graphics program that is needed for motion or motion and is equipped with a scrip for programming (action scrip). This program allows the creation of animated interactive media games. The advantages of this application are that the features offered can be created separately at runtime, reducing the use of frames (complex animation with only one frame) [26]. From the journals that have been grouped above, it is found that Macromedia Flash users still exist now because of the easy and easy way to use it.

2. Analysis of animation test question usage by education level

Table 2. Article Groups by Education Level

Education Level	Article Code	Amount	Percentage %
Senior High School	A1[15], A3[23], A5[27], A6[17], A7[28], A12[29], A14[30], A15[21], A16[22]	9	56,3
University	A2[16], A4[31], A10[25], A13[18]	4	25
Junior High School	A9[24], A11[19]	2	12,5
Elementary School	A8[18]	1	6,2
	Total	16	100

The article data in the table concludes that for the senior high school level, animation format questions are more needed for concept understanding. At the high school level, there are many physics problems related to motion that require graphics or animations to describe the motion. The number of articles obtained also evidences this; as many as 9 out of 16 journal articles meet the criteria for the second objective.

3. Analysis of the use of animated format test questions based on physics learning materials

Table 3. Group of Articles based on Physics Learning Materials

Content	Article Code	Amount	Percentage %
Concept of Refraction of Light	A1, A3, A5, A6, A11, A16	6	42,8
Circle Subject Matter	A8, A9	2	14,3
Rotational Kinematics and Dynamics	A10, A15	2	14,3
Bernoulli's Law	A4	1	7,1
Regular Straight Motion and Regularly Changing Straight Motion	A2	1	7,1
Circular Motion	A12	1	7,1
Mechanical Energy	A3	1	7,1
Total		14	100

The third result of the research is an analysis of the use of animated format test questions based on physics learning materials. Based on this objective, it is obtained that for the Light Concept Material, using animated format test questions will have a greater effect on students' understanding of concepts.

4. Analysis of the use of animated test questions on students' understanding of physics concepts

Table 4. Article Group Use of Animated Format Test Questions on Concept Understanding

Content	Article Code
Animated images on the test can improve students' understanding of concepts compared to test questions whose images are presented statically (moving images).	A1
The animation format (images presented in motion) can help students solve concept-understanding test questions on GLB and GLBB materials.	A2
Test questions in the experimental class with animation format (moving images) on understanding the concept of light get a higher test score than the control class.	A3
Questions in the animation format can significantly improve the results of the light refraction concept understanding test compared to the use of items in the paper and pencil test format.	A5
The concept understanding of students who took the test using animated assessment is better than that of students who took the paper and pencil test.	A6
Students are greatly helped to understand the meaning of the questions when conducting tests using animated format test questions on the concept of light.	A11
The experimental class students' light concept understanding test scores were significantly better than the control class. Supported by hypothesis testing (Wilcoxon test) with the results of Zcount (4.45) greater than Ztabel (1.96).	A16

In the first objective, the analysis of applications that are often used when creating animated test questions found that Macromedia Flash applications are more often used. Because the Macromedia Flash application is easier for beginners to use, the Macromedia Flash application also has the advantage that the features presented can be made separately at runtime and can reduce the use of frames [32]. From the journals that have been grouped above, it is found that Macromedia Flash users still exist today because of the easy way to use it. The purpose of the second study was to analyze the use of animated test questions based on the level of education; it was found that the Senior High School education level needed more test questions presented in an animated format for concept understanding tests. Because the concepts and material described at the Senior High School level are more in-depth, there is a need for a mature understanding of the concepts so that concept errors do not occur.

The third research objective is to analyze the use of animated format test questions based on physics learning materials obtained for light concept material. Using animated test questions will have a greater effect on students' understanding of concepts. The use of several items in the animation format on a large scale can improve the test results of understanding the concept of refraction of light [27]. This tendency occurs because using several items in the animation format can provide assertiveness to the purpose of the problem in question because it can provide visualization of the propagation of various rays both in the refraction stage of light or in the stage of forming shadows of objects. For the fourth objective, 7 out of 16 articles stated that using animated test questions would greatly help students understand the concept of the content and the purpose of the question. Because when the test is conducted, students are more likely to misread or misinterpret static questions with words and pictures than questions with information conveyed in animation. By using animation, students can be helped to understand the concept or purpose of the question [16]. We can apply the animated test question format to CBT and can increase student interest when taking tests or exams.

CONCLUSIONS

Based on the results of the review research that has been carried out systematically on the literature, it can be concluded that: (1) There are many applications used to create animated format test questions, but Macromedia Flash applications are more often used because they are easy to use for beginners and there are many free templates available; (2) Animated test questions are widely applied or used at the Senior High School level; this is because many materials require images of

motion that cannot be seen directly by the pseudo-eye, which requires animation to describe the motion; (3) For material in physics learning, the use of test questions in the format of animated questions is more often applied to the Concept of Light Refraction because this will be very helpful for understanding the concepts and intentions of the test questions; (4) By using animated test questions, students will be helped to understand the meaning of the question and then be able to improve their understanding of the concept.

REFERENCE

[1] Mudjiono, D, "Belajar dan Pembelajaran", Jakarta: Rineka Cipta, pp. , 2008.

[2] Sanjaya, W, "Strategi Pembelajaran: Berorientasi Standar Proses Pendidikan". Kencana Prenada Media Group, pp. , 2008.

[3] Zulfiani,. Feronika, T., & Suartini, K, "Strategi Pembelajaran Sains*",* Ciputat: Lembaga Penelitian UIN Jakarta, pp. 2009.

[4] Suparno, P, " Miskonsepsi dan Perubahan Konsep dalam Pendidikan Fisika", Jakarta: Grasindo, pp. , 2013.

[5] Novitasari, D. Sri W W dan Sri, R, B, S, "Pemahaman Konsep Dalam Fisika", *Silampari Jurnal Pendidikan Ilmu Fisika,* vol 3, pp. 39-57, 2021.

[6] Wiggins, G, "A True Test: Toward More Authentic and Equitable Assessment", *Phi Delta Kappan*, Vol 70 no 9, pp. 703-713, 1984.

[7] Marzano, R.J. *et al,* "Assessing Student Outcomes : Performance Assessment Using the Dimensions of Learning Model", Alexandria: Association for Supervision and Curricullum Development, pp. , 1994.

[8] Yulkifli, Ningrum, M. V., Indrasari, W, "The Validity of Student Worksheet Using Inquiry-Based Learning Model with Science Process Skill Approach for Physics Learning of High School", *JPPPF (Jurnal Penelitian dan Pengembangan Pendidikan Fisika)*, Vol 5, no 2, pp. 155-162, 2019.

[9] Silitonga, M. K., & Rosyida, S, "Animasi Interaktif Sebagai Media Sosialisasi Indonesia Tsunami Early Warning System (Inatews)", *Jurnal Sistem Informasi Stmik Antar Bangsa*, vol IV, no 2, pp. 200–207, 2015.

[10] Firmansyah, A.,& Kurniawan, M.P, "Pembuatan Film Animasi 2d Menggunakan Metode Frame By Frame Berjudul "Kancil dan Siput", *Data Manajeman Dan Teknologi Informasi,* vol 14, no 4, pp. 10-13, 2013.

[11] Dancy, Melissa.H & Beichner, Robert. (2006). *Impact of Animation on Assessment of Conceptual Understanding in Physics. The American Physical Society.* 2,010104(7).

[12] Humphrey, "Trait and Behavioral Theories of Leadership: An Integration and Meta-Analytic Test of Their Relative Validity", *Person Psychology,* vol 64, pp. 7-52, 2011.

[13] Kitchenham, "Procedures for Performing Systematic Review", *Join Technical Report,* pp. 1-28, 2004.

[14] Torgerson, "Systematic Review", London: International Publishing Group, pp. 2003.

[15] Suhandi, Andi., Setiawan, Agus., Samsudin, Achmad, " Pengaruh Format Soal Dalam Bentuk Animasi Terhadap Validitas dan Reliabilitas Tes Pemahaman Konsep Pembiasan Cahaya", *Berkala Fisik,. Vol 13*, No 2, pp. E25-E30, 2010.

[16] Dancy, Melissa.H & Beichner, Robert, "Impact of Animation on Assessment of Conceptual Understanding in Physics", *The American Physical Society,* vol 2, no 7, pp. 1-10, 2006.

[17] Salim, Kalbin & Tiawa Dayang Hjh, "Pemanfaatan Instrumen Penilaian Format Animasi Untuk Pemahaman Konsep Pembiasan Cahaya Bagi Siswa SMA", *Seminar Nasional Matematika dan Statistika,* pp. 2014

[18] Yasa, Dwi Arnrlia., Suastika, Ketut., Zubaidah, Rr., Siti Alisa Nur, "Pengembangan E-Evaluation Berbasis Aplikasi Hot Potatoes Untuk Siswa Kelas V Sekolah Dasar", *Jurnal Ilmiah Sekolah Dasar,* Vol 4, No 1, pp. , 2020.

[19] Anggraeni, Retno Dian., Kustijono, Rudy, "Pengembangan Media Animasi Fisika Pada Materi Cahaya Dengan Aplikasi Flash Berbasis Android. *Jurnal Pendidikan Fisika dan Aplikasinya,* Vol 3 no 1, pp. , 2013.

[20] Su a, King-Dow., Yeh, Shih-Chuan, "Effective Assessment of Integrated Animations to Explore College Student's Physics Learning Performances", *Procedia – Social and Behavioral Sciences,* vol 176, pp. 588 – 595, 2015.

[21] Kusumadjati, Adhi., Supriyati, Yetti., Permana A Handjoko, "Pengembangan Instrumens Penilaian Pembelajaran Fisika Berbasis Animasi Flash Pada Materi Dinamika Rotasi di SMA", *Prosiding Seminar Nasional Fisika (E- Journal) SNF,* pp. ,2015.

[22] Samsudin, Achmad, "Implementasi "ASSAF" Terhadap Capaian Pemahaman Konsep Cahaya", *Jurnal Penelitian Pendidikan,* pp.

[23] Salim, Kalbin & Tiawa Dayang Hjh, "The Use of Instrument to Measure Student's Understanding of The Concept of Light Refraction Using Animation Slide Show for Secondary School Students", *International Journal for Innovation Education and Research,* pp. , 2014.

[24] Syarifuddin, Azhar. Setianingsih, Rini, "Pengembangan Instrumen Bloom Digital Assessment (BDA) Pada Materi Pokok Lingkaran Di Kelas VIII", *MATH Edunesa.* Pp. 2012.

[25] Arifian, Dimas., Jeffry, Handhika., Suparmi, "Analisis Konsepsi Mahasiswa Dalam Menyelesaikan Presentasi Soal Model Statis-Dinamis Pokok Bahasan Kinematika Dan Dinamika", *Seminar Nasional Pendidikan Fisika II 2016. FPMIPA, IKIP PGRI Madiun,* pp. , 2016.

[26] Madcoms. (2003). *Pemrograman Borland Delphi 7*. Yogyakarta: Andi.

[27] Suhandi, Andi., Nur, Muhammad., "Pengaruh Butir Soal dalam Format Animasi terhadap Hasil Tes Pemahaman Konsep Pembiasan Cahaya", *Jurnal Pengajaran MIPA,* vol 15, no 1 , pp. 40-44, 2010.

[28] Rendy, Zilan Zalila., Bakri, Fauzi., Permana, A Handjoko., Muliyati, Dewi, "Pengembangan Piranti Lunak Tes Berbasis Computer (CBT-Software) Untuk Mata Pelajaran Fisika SMA", *Prosiding Seminar Nasional Fisika (E Journal) SNF 2015.* Vol IV, pp. ,2015.

[29] Anggraini, Dian., Suyatna, Agus., Sesunan, Feriansyah, "Studi Perbandingan Hasil Belajar Fisika Antara Penggunaan Gambar Bergerak Dengan Gambar Statis", *Jurnal Pembelajaran Fisika*, pp. ,2018.

[30] Ugwuanyi, Christian Sunday., Ikeh, Elochukwu Francis., Orji, Ifeanyi Emmanuel, "Assessment of The Efficacies of Two Modes of Computer Assisted Instructional Package on Students Academic Achievement in Physics", *AJSTM,* vol 3, pp. 2017.

[31] Nur'aini, D A., Lestari, P D., Kurniawan B R, "Pengembangan Assessment Formatif Berbasis Computer Untuk Mengetahui Penguasaan Konsep Siswa Pada Materi Hukum Bernoulli", *Jurnal Riset Pendidikan Fisik,* vol 5, no 2, pp. 106-112, 2020.

[32] Florio, Chris, "ActionScript 3.0 for Adobe Flash Professional CS5 Classroom in a Book", USA: Adobe, www. Adobepress.com, pp. , 2010.