Ann PUBLISHER
Journal of Education Sciences (Edusci)
e ISSN 3074-2296
p ISSN 3032-7393

The Impact of Using Macromedia Flash-Based Audio-Visual Learning Media on Student Motivation to Learn About The Concept of Enthalpy Change

Aini Nadhokhotani Herpi[1*], Ahmad Susilo[2], Nanda Saridewi[3]
[1]UIN Syarif Hidayatullah Jakarta. Indonesia. E-mail aini.nadhokhotani@uinjkt.ac.id
[2]UIN Syarif Hidayatullah Jakarta. Indonesia. E-mail ahmad.susilo@mhs.uinjkt.ac.id
[3]UIN Syarif Hidayatullah Jakarta. Indonesia. E-mail nanda.saridewi@uinjkt.ac.id
Corresponding Author E-mail: aini.nadhokhotani@uinjkt.ac.id

Abstract: Cultivating learning motivation is crucial for instilling passion in students for studying chemistry. However, traditional learning methods that rely on little media usage fail to enhance students' willingness to learn. Macromedia Flash learning media is a practical option for enhancing student learning motivation. This media promotes active student engagement and cultivates enthusiasm and passion for learning. This study aims to assess the impact of Macromedia Flash learning media on students' motivation to learn and their understanding of the subject of enthalpy change. The research methodology employed in this study is a quasi-experimental design with a posttest-only control group. The research was conducted at SMA Nusantara Plus, using class XI Science 1 as the experimental group and class XI Science 2 as the control group. Each group consisted of 33 students. The instrument used was a non-experimental tool in the form of a questionnaire consisting of 25 statements to assess learning motivation. The t-test conducted for the hypothesis test yielded a two-tailed Significance value of 0.000, leading to the rejection of the null hypothesis (H0) and acceptance of the alternative hypothesis (H1). The study's findings demonstrated that using Macromedia Flash learning media significantly impacted students' motivation to learn the material on enthalpy change.

Keywords: Learning Motivation, Audio Visual Media, *Macromedia Flash*, Entalpi Changes

INTRODUCTION

Education and learning involve the acquisition of knowledge, the mastery of certain skills, and the development of students' character. The efficacy of learning can be observed through the alterations in behavior, disposition, and academic achievements of the students. High learning outcomes are indicative of pupils possessing a strong knowledge base. (Romandhon, 2013). Sitorus et al. (2019) Education is a means of cultivating high-quality human resources (HR) by enhancing students' knowledge, abilities, and behavior. In the present era of globalization, it is essential for human resources to possess exceptional competency. An endeavor to enhance the proficiency and aptitude of human resources involves enhancing the caliber of education through effective design, hence

DOI: 10.62885/edusci.v6i1.386

enhancing students' cognitive, affective, and psychomotor capabilities (Sarwinda et al., 2020). The teacher's role is to function as a facilitator in organizing the direction and objectives of the learning process, enabling pupils to actively engage in their own learning. In the high school/MA chemistry learning process, the main objective is to provide students with the capacity to comprehend chemical ideas, principles, laws, and theories, and to grasp how they relate to and can be applied in solving diverse situations.

To effectively understand chemistry, it is important to connect chemistry concepts, principles, theories, and applications to real-life situations. The study of thermochemistry in chemistry encompasses complex concepts that challenge students due to its incorporation of chemical reactions, computations, and abstract principles. Consequently, comprehending these topics just from reading materials might be arduous for students (Donasari, 2021). Similarly, there are several occurrences in everyday life where one can find materials that describe the transmission of heat, known as enthalpy change. Understanding entropic changing material necessitates knowledge at the macroscopic, submicroscopic, and symbolic levels, encompassing facts, concepts, principles, and procedures. Macroscopic representation in chemistry refers to the tangible level at which students may directly witness phenomena through experiments or everyday life. The citation (Chusnah et al., 2020) is provided.The submicroscopic representation depicts the abstract chemical properties and is employed to elucidate macroscopic events. The symbolic part of a chemical process depicts macroscopic events through the use of symbols.

Regarding this assertion, the preliminary observations conducted on September 29, 2023, in class XI Science 2 at SMA Nusantara Plus indicate that the chemical learning process is predominantly focused on the teacher. Furthermore, preliminary findings indicate that teachers have been exclusively depending on textbooks to manage the learning process, adopting a textbook-centric approach. Consequently, students exhibit less engagement in the learning process, as seen by their lack of comprehension, silence due to boredom, and reluctance to ask questions or participate in discussions. Consequently, pupils receive a less significant educational experience, leading to a predictable decrease in student willingness to learn. Indicators of low motivation to study include pupils' lack of attentiveness during lessons, infrequent completion of homework, and reluctance to ask questions or make progress.

DOI: 10.62885/edusci.v6i1.386

LITERATURE REVIEW

An individual's achievement in the process of acquiring knowledge is contingent upon both their own efforts and the surrounding environment. The internal drive that originates from within an individual is referred to as motivation. According to Sardiman (2014: 75), motivation is the comprehensive impetus that emerges in students who strive for learning activities, guarantee the progression of the learning process, and offer direction in order to accomplish learning objectives. Learning motivation is a crucial aspect that influences the achievement of learning goals.

Teachers play a crucial role in enhancing student learning motivation as they can interact with pupils during school hours. Teachers can enhance student motivation to study by implementing effective learning tactics as external stimuli to motivate students to engage in the learning process. Essentially, this learning strategy involves carefully choosing techniques and tools employed during the learning process. The reference is from Puspitarini et al. (2019).

The selection of a specific learning approach will impact the sort of learning media employed. Learning media is any communication instrument intentionally utilized to transmit information from sources to students. The purpose is to establish an optimal learning environment where the recipient may efficiently and effectively engage in the learning process. (Munadi, 2010: 7-8).

It is necessary to acquire proficiency in different types of learning media, including audio-visual media. Sanjaya (2012: 118) asserts that this particular form of media possesses superior and more captivating functionalities, encompassing both auditory and visual components. Audio-visual media aims to transform abstract learning into a tangible experience, thereby fostering students' interest. Put, students will exhibit greater engagement and enthusiasm, leading to a more successful learning experience. This sense of passion will stimulate students' attention toward the learning process, thus enhancing their motivation to learn and improving their academic performance.
The researcher will develop an interactive audio-visual media using Macromedia Flash software to enhance students' interest in learning the enthalpy change chemistry. The educational application of Macromedia Flash lies in its capacity to create visualizations, simulations, and animations. This capability becomes highly advantageous in addressing challenges encountered in the study of enthalpy change. Furthermore, the use of audio in this media has the potential to enhance students' focus and facilitate comprehension.

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METHOD

This research employs a quantitative approach using a quasi-experimental method. This study was conducted with two classes, one serving as the experimental group and the other as the control group. The experimental class utilized Macromedia flash-based audio-visual media to teach the concept of enthalpy change. Meanwhile, the students learned how to manipulate enthalpy using traditional techniques in the control lesson. The population under investigation comprises all grade XI students enrolled at SMA Nusantara Plus for 2023/2024, totaling 102 pupils. Two classes were selected as samples: class XI Science 1 as the experimental group and class XI Science 2 as the control group. The experimental class comprised 33 students studying the chemistry of enthalpy change subject using Macromedia Flash-based audio-visual learning tools. Meanwhile, the control class has 33 students who typically study enthalpy change material in chemistry.

The data collection method is determined by the specific type of data required. This study uses a non-test instrument in the form of a questionnaire for data gathering. A questionnaire is a set of written inquiries designed to elicit information from respondents regarding their personal experiences or knowledge. (Arikunto, 2014: 194). The survey utilized in this investigation is a Likert scale survey. The Likert scale, as defined by Sugiyono (2014: 134-135), is a tool used to assess an individual's subjective opinion and impression of the specific issue under investigation. This study employed four alternative response options: strongly agree (SS), strongly disagree (S), somewhat disagree (TS), and severely disagree (STS).

RESULTS AND DISCUSSION

The research was conducted at SMA Nusantara Plus with students from grades XI Science 1 and XI Science 2. XI Science 1 was the experimental class, while XI Science 2 was the control class. The experimental class was taught on enthalpy change using Macromedia Flash-based audiovisual media. On the other hand, the control group was exposed to the same educational content as the traditional approach, which mostly consisted of lectures and interactive question-and-answer sessions.
The learning process commences with the teacher's delivery of the subject. The experimental class utilized Macromedia Flash as an instructional medium, employing projectors and loudspeakers for delivery. Upon the introduction of Macromedia Flash, the students exhibited a significant level of enthusiasm, demonstrating a keen interest in every aspect of the subject presented by this technology. Macromedia Flash presents multiple

DOI: 10.62885/edusci.v6i1.386

menus, allowing students to choose any menu they like. The enthalpy change material menu has four substances, each with supplementary explanations and questions and answers conducted by the teacher for the pupils. The treatment implemented in this experimental class effectively captured students' attention, resulting in increased student engagement and a greater willingness to participate in asking and answering questions.

The data processing findings yielded descriptive statistical data from the learning motivation questionnaire. The data results are displayed in the subsequent table.

Table 1. Data of Subsequent

It	Data	Data Analysis
1	Number of samples	66
2	Highest Score	94
3	Lowest Score	67
4	Mean	80,11
5	Standard Deviation	6,875

According to the findings of the descriptive analysis, the average score for student learning motivation in the enthalpy change material was 80.11. The average score attained can indicate the amount of learning desire exhibited by grade XI science students at SMA Nusantara Plus. The acquired data was subsequently computed to classify the degree of learning motivation.

The control class is conducted through didactic lectures, wherein the instructor elucidates concepts directly using a whiteboard and markers. Most pupils in the control class directed their attention towards the teacher while receiving instruction on enthalpy change. Some students are inattentive to the information presented by the teacher. During the question and answer session, most students kept silent, refraining from asking about unfamiliar topics and feeling embarrassed to respond to the researcher's inquiries during the learning process.

The instruction in both the experimental and control classes persisted until the fourth session. In the past, the researcher administered identical practice problems to both the experimental and control courses as part of the learning process. The experimental and control groups exhibited no notable challenges when presented with practice questions. During the last meeting, the fourth meeting, every student from the experimental and control classes received a posttest in the form of a motivational questionnaire with

DOI: 10.62885/edusci.v6i1.386

identical statements. This survey has 25 items designed to assess the degree of learning motivation among students in experimental and control classes.

The questionnaire data collection on learning motivation in the experimental and control courses exhibited variability in responses to the claims. Within the experimental class, most students responded with ratings of 'strongly agree' and 'agree,' while a minority responded with 'disagree' and 'strongly disagree.' Within the control class, most students responded using the 'strongly agree' and 'agree' rating options, while a minority chose to respond with 'disagree' and 'strongly disagree'. Researchers have attempted to stimulate pupils by utilizing Macromedia Flash, expecting it to generate a sense of necessity and eagerness to engage in a learning activity. According to Sardiman (2014: 77), motivating students involves inspiring them to take action or develop a desire to engage in a specific activity. The genesis of these aspirations originates from the pupils themselves; however, external influences can impact these inclinations. Hence, student motivation may be observed through two distinct factors: inner motivation and extrinsic incentive. The disparity in questionnaire outcomes between the experimental and control groups is also evident regarding learning motivation. According to the results presented in Table 4.5, the majority of responses in the experimental class for the intrinsic motivation element were rated as 4 and 3 on the scale, with percentages of 44.76% and 52.68%, respectively. 2.56% of the respondents provided their answers on a scale of 2. In the control class, scale 3 had the highest proportion of 59.90%, followed by scale four with 24.94%, and the remaining percentage of 15.16% was attributed to scale 2. This suggests that the experimental and control classes exhibit a high level of intrinsic motivation, as evidenced by the highest percentage of responses falling within the range of 4 and 3 on a scale.

Table 2. Motivational Aspect

Likert Scale	Motivational Aspect							
	Intrinsic				Extrinsic			
	Experiment	%	Control	%	Experiment	%	Control	%
1	0	0	3	0	0	0,77	6	1,53
2	11	2,56	32	15,16	65	8,08	77	19,44
3	226	52,68	200	59,90	257	50,50	233	58,83
4	192	44,76	161	24,94	107	40,65	80	20,20

The experimental class achieved a higher scale four score compared to the control class, with percentages of 44.75% and 24.94% respectively. The third scale exhibits a

DOI: 10.62885/edusci.v6i1.386

notable distinction, as the control class comprises a higher percentage (59.90%) compared to the experimental class (52.68%). The difference in treatment between the experimental class, which utilizes Macromedia Flash, and the control class, which employs the lecture technique, influences the outcome. Mashudi et al. (2021) assert that employing Macromedia Flash media can provide a stimulating and engaging learning environment. This is attributed to the distinctive and captivating graphics and animations displayed by Macromedia Flash, which effectively alleviate monotony throughout the learning process. There is a significant disparity between the experimental class, which has a percentage of 2.56%, and the control class, which has a percentage of 15.15%, as observed on scale two. In the control class that implemented the lecture approach for learning, 15.15% of the participants responded with a rating of 'disagree' on the scale. Within the context of a teaching and learning activity, pupils exhibit a notable lack of motivation to engage actively in the learning process. Conversely, some students engage actively in educational endeavors. Budiariawan (2019) It is important to note that students will inevitably face various difficulties and obstacles during the learning process. Therefore, to successfully attain their desired objectives, students must possess a strong sense of excitement and motivation toward their studies. Hence, teachers must prioritize the level of student learning motivation to ensure optimal comprehension and engagement in the learning process.

One of the questions in the learning motivation questionnaire created by the researcher pertains to intrinsic motivation. This statement, labeled as number 3, states: "I am enthusiastic and committed to studying enthalpy change material." In the experimental class, this statement achieved a cumulative score of 110 out of a possible 132, but in the control class, it scored 94. Most pupils in the experimental class responded with ratings ranging from 'agree' to 'strongly agree'. Unlike the control class, it was observed that some pupils in the experimental group responded with a 'disagree' rating on the scale. Statement 7 highlights an additional example of intrinsic motivation: "I am motivated to accomplish my objectives by utilizing educational resources, which in turn leads to more diligent studying." The experimental class achieved a cumulative score of 120, whereas the control class received 104. Including media in the learning process naturally enhances students' motivation to accomplish their desired outcomes by facilitating their grasp of the learning material. The beneficial impact is a result of utilizing Macromedia Flash for learning purposes. Learning media, including visual aids such as photos, animations, and

DOI: 10.62885/edusci.v6i1.386

videos, has several advantages that capture students' attention and enhance their motivation to study. Vegatama (2018) asserts that employing media, specifically Macromedia Flash, enables pupils to engage with visuals, audio, and even additional animations, fostering increased learning enthusiasm. Using Macromedia Flash in media can enhance the learning experience by encouraging students to engage in more complex and in-depth exploration, leading to increased student activity and focus during the learning process.

Extrinsic motives can impact the learning process alongside pupils' inherent desire. Upon analyzing the research data, it is evident that in the experimental class, most responses fell within the range of 4 and 3 on the scale, accounting for 40.65% and 50.50%, respectively. 8.08% of the respondents provided their answers on a scale of 2. In the control class, scale 3 had the highest percentage of 58.83%, followed by scale four at 20.20%, and the remaining percentage of 19.44% was allocated to scale 2. This suggests that the experimental and control classes exhibit high extrinsic motivation, as evidenced by the highest percentage on a 3-point scale.

The experimental class achieved a higher score than the control class, with a percentage of 40.65%. The experimental class has a lower proportion than the control class, precisely 58.83%, distinguishing it from the three scale. A notable disparity is observed on scale 2, with the experimental class having a percentage of 8.08% and the control class having a percentage of 19.44%. In the control class that implemented lecture-based learning, 19.44% of the participants responded with a rating of 'disagree' on the scale. A minority of respondents rated 1, accounting for a mere 1.53% of the total. Therefore, the evidence indicates that certain students disagreed with extrinsic motivational messages. Teachers must offer kids extrinsic incentives. According to Janah et al. (2023), teachers and school staff can establish an educational environment that fosters and motivates active engagement in teaching and learning endeavors. Therefore, the motivation of students to learn can significantly enhance their academic performance.

One aspect mentioned in point number 14 of the statement concerning extrinsic motivation is that "I exhibit greater enthusiasm towards learning when the teacher rewards students who achieve high grades." Extrinsic motivation should not be misconstrued as being negative or unneeded in the context of learning. Students require extrinsic motivation to foster a desire for learning. Statement item number 14 achieved a response rate of 86.36% in the experimental courses and 75% in the control classes. The control class also demonstrates that the selection of replies is determined by the spectrum of 'agree'

DOI: 10.62885/edusci.v6i1.386

to 'disagree'. In the field of education, awards can serve as a motivating instrument, stimulating students' excitement for studying and fostering a competitive drive toward academic accomplishments. According to Novriana et al. (2022), offering gifts as rewards to students during their education can serve as an alternative method to foster enthusiasm, passion for learning, and the expectation that students will become more engaged, diligent, proactive, responsible, and enhance their academic abilities.

The research hypothesis posited in this study is that the mean level of students' learning motivation in the experimental class is greater than that of the control class. Therefore, the use of Macromedia Flash impacts students' motivation to learn about entropy changes. The statistical hypothesis, denoted as H1, states that the mean level of learning motivation among students in the experimental class is greater than that of the control class. In order to validate the hypothesis, the researcher utilized the IBM SPSS 20 application to conduct a t-test.

The t-test results from the IBM SPSS 20 program indicated a significance value (Sig.2-tailed) of 0.000. For a one-sided test, the significance value needed to be halved, resulting in a significance value of 0.000. This investigation's chosen threshold of significance is 5%, equivalent to 0.05. The foundation for concluding the outcomes of this exam is that if the p-value is less than 0.05, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. Conversely, if the p-value exceeds 0.05, the null hypothesis (H0) is accepted, and the alternative hypothesis (H1) is rejected. The obtained significance value in this study is 0.000, which is less than 0.05. Therefore, it can be concluded that the average level of learning motivation among students in the experimental class, who were exposed to Macromedia flash-based learning media, is higher than that of the control class about the enthalpy change material.

The results of the hypothesis test indicate that the utilization of learning media significantly enhances student learning motivation. Macromedia Flash, as a learning medium, can stimulate students to actively engage in the learning process due to its interactive characteristics. This aligns with the findings of Gustina et al. (2016). Learning media serves as a stimulus that receives and processes information to be stored in memory. Therefore, students can efficiently acquire and assimilate the information in the offered content. Furthermore, Macromedia Flash offers a wide range of media experiences and effectively eliminates student boredom by utilizing different and interactive media.

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The disparity in the outcomes of the learning motivation questionnaire between the experimental and control courses suggests that, overall, individual students' motivation levels vary. The outcomes of the significant difference can be determined by observing the disparity in treatment between the experimental and control groups. The interviews with three students from the experimental class revealed their heightened enthusiasm for listening to the enthalpy change material presented in each content within the Macromedia Flash. Establishing an environment favorable for learning aligns with the research conducted by Zulfa et al. (2020). This statement asserts that creating a favorable and enjoyable classroom atmosphere where students actively engage will motivate them to consistently participate in learning activities, leading to increased enthusiasm for learning.

The study findings demonstrated that the utilization of audio-visual learning material utilizing Macromedia Flash had a significant impact on enhancing students' motivation to engage in learning. Furthermore, it can be inferred that using Macromedia Flash has demonstrated efficacy in enhancing students' inclination to engage in learning across several disciplines. Teachers have tried to ensure a pleasant learning process, which has influenced this result. According to Dale's viewpoint in Kustandi & Darmawan (2020: 18), audio-visual tools can offer numerous advantages when teachers actively engage in the learning process. Educators recognize that children may struggle to comprehend and grasp complex subject matter without media assistance. Thus, the media serves as a tool to facilitate the attainment of a learning objective. Using learning media enhances students' learning activities, resulting in improved learning processes and outcomes compared to not using any learning media.

CONCLUSION

The descriptive statistical analysis revealed that the mean value of learning motivation among students in the experimental class was greater than that of students in the control class. The hypothesis test using the t-test yielded a significance coefficient value of 0.000, which is smaller than the significance level of 0.05. Thus, it can be inferred that the experimental class exhibits a higher degree of motivation to learn about enthalpy change than the control class. This can be attributed to the impact of utilizing the Macromedia flash-based audio-visual learning medium on students' willingness to learn.

DOI: 10.62885/edusci.v6i1.386

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DOI: 10.62885/edusci.v6i1.386