

THE EFFECT OF BUZZ GROUP BASED BLENDED LEARNING TO IMPROVE STUDENTS COGNITIVE LEARNING OUTCOMES ON THERMOCHEMICAL MATERIALS

Chaerul Hidayah*, Setia Rahmawan**

Universitas Islam Negeri (UIN) Sunan Kalijaga, Yogyakarta

E-mail: *chaerulhidayah11@gmail.com; **setia.rahmawan@uin-suka.ac.id

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Abstract: Thermochemistry is considered difficult because students are required to be able to apply mathematical equations in a calculation. Coupled with the use of the lecture method, this makes students less active and bored with learning, so the learning outcomes are low. Therefore, appropriate teaching strategies are needed so that learning becomes effective, namely using a buzz group based on blended learning where there is collaboration and discussion between students with the integration of digital technology. This study aimed to determine the effect of buzz groups based on blended learning to improve students' cognitive learning outcomes in thermochemical material. This research is experimental research, with a quasi-experimental design in the form of a pretest-posttest control group. The research was conducted at MA Minhajut Tholabah, Purbalingga. The sampling technique chosen was saturation sampling, with a sample of class XI MIA 1 as the experimental class and class XI MIA 2 as the control class. The research instrument uses test questions and questionnaires. The function of this instrument is to compare the result of learning between the experimental and control classes. The data analysis technique used for testing the hypothesis is the Mann-Whitney test, and the questionnaire uses percentages. Based on the results of the Mann-Whitney test, the significance value was $0.03 < 0.05$, which means that H_0 is rejected. The average of the student response questionnaire was 77%. This result can be categorized as interesting. It was concluded that there was an influence of the blended learning-based buzz group method to improve students' cognitive learning outcomes in thermochemical material, and the results of the response questionnaire indicated that students were interested in using this method.

Keywords: Buzz group; blended learning; learning outcomes; thermochemistry

Abstrak: Termokimia dianggap sulit, karena siswa dituntut mampu menerapkan persamaan matematika dalam suatu perhitungan. Ditambah lagi dengan penggunaan metode ceramah yang membuat siswa kurang aktif dan bosan dalam belajar, sehingga hasil belajarnya rendah. Oleh karena itu, diperlukan strategi pengajaran yang tepat agar pembelajaran menjadi efektif yaitu dengan menggunakan buzz group berbasis blended learning dimana terjadi kolaborasi

dan diskusi antar siswa dengan integrasi teknologi digital. Tujuan penelitian ini adalah untuk mengetahui pengaruh buzz group berbasis blended learning terhadap peningkatan hasil belajar kognitif siswa pada materi termokimia. Penelitian ini merupakan penelitian eksperimen, dengan desain quasi eksperimen berupa kelompok kontrol pretest-posttest. Penelitian dilakukan di MA Minhajut Tholabah Purbalingga. Teknik pengambilan sampel yang dipilih adalah sampling jenuh, dengan sampel kelas XI MIA 1 sebagai kelas eksperimen, dan kelas XI MIA 2 sebagai kelas kontrol. Instrumen penelitian menggunakan soal tes dan angket. Fungsi instrumen ini adalah untuk membandingkan hasil belajar antara kelas eksperimen dan kelas kontrol. Teknik analisis data yang digunakan untuk menguji hipotesis adalah uji Mann-Whitney, dan untuk angket menggunakan persentase. Berdasarkan hasil uji Mann-Whitney nilai signifikansi sebesar $0,03 < 0,05$ yang berarti H_0 ditolak. Rata-rata angket respon siswa sebesar 77%. Hasil ini bisa dikategorikan menarik. Disimpulkan bahwa terdapat pengaruh metode buzz group berbasis blended learning terhadap peningkatan hasil belajar kognitif siswa pada materi termokimia, dan hasil angket respon menunjukkan bahwa siswa tertarik menggunakan metode tersebut.

Kata kunci: Buzz group; blended learning; hasil belajar; termokimia

INTRODUCTION

Education is a benchmark to determine the success and development of a country (Sukma, 2016). One of the determining factors for the success of education is the teacher (Sanglah, 2020). According to Daryanto (2012), teachers have a planning role in increasing learning opportunities for students in improving the quality of their teaching. So the problem is that professional teachers do not only think about what is being taught but about the meaning of learning and the abilities that exist in students participating in learning so that there is an increase in learning outcomes (Febriyani, 2016).

Rohwati (2012) defines learning outcomes as necessary in measuring students' success. Arikunto (2010) adds

her definition as a result that someone has achieved after experiencing the learning process. According to Mukhtar (2017), to find out how much the ability of students to understand specific material, a final test activity is carried out, as is the case with chemistry.

Chemistry is a branch of natural science that studies structure, composition, properties, changes in matter, and energy (Faizi, 2013). However, Utari, Rohiat, & Nurhamidah (2020) revealed that chemistry material in high school is considered difficult because it contains abstract and unreal concepts, which results in low learning outcomes. The results of Merdekawati's research (2013) show that the low academic achievement of students is caused by difficulties in solving problems related to chemical calculations, so

students are less interested in understanding chemical material.

Thermochemistry is one of the most complex and abstract materials in chemistry learning (Ayyikliz & Tarhan, 2012). This material studies energy changes in a chemical reaction (Woldeamanuel, Atagana, & Engida, 2014). In thermochemical material, students must apply mathematical concepts and equations in specific calculations, such as calculating the enthalpy change for reactions (Alfirahmi, 2018).

In this context, the buzzgroup method based on blended learning can provide advantages in several aspects. Mathematical concepts in thermochemistry may require in depth understanding. Through the buzzgroup method, students can discuss and help each other in understanding and completing mathematical calculations related to thermochemical concepts. Discussions between students can improve understanding of concepts.

Buzzgroup allows students to provide feedback to each other, including regarding the application of math concepts. Students who are more advanced in math can provide assistance to peers who need additional help. This process can enrich understanding of

mathematical concepts and improve problem solving skills.

Surjadi (2012) explained that in applying the buzz group method, there are steps that must be considered. Previously, the teacher divided four large groups and several small groups, then chose one significant group leader, then introduced the students to this method. Larasanti & Marlina (2019) added that in the buzz group method, students are divided into small groups for 15-20 minutes, then group members choose group leaders, note-takers, and timekeepers. It aims to give a sense of responsibility and increase cooperation between students.

In the blended learning method, digital technology can be used to provide additional resources, such as learning videos, simulations, or online materials that support mathematical concepts in thermochemistry. Buzzgroup allows students to work together to explore and use these resources.

Blended learning is collaborative learning between face-to-face and online. Thus this learning aims to combine the properties of the two methods. That is the nature of face-to-face learning that helps learn learning materials and interacts with students or teachers in one room as well as the nature of online learning that is time-efficient, and the ease of

accessing learning materials (Hidayat & Andira, 2019).

According to Sandi (2012), this model can be applied effectively with conditions agreed upon by the teacher and students. Learning can take place more meaningfully because the learning material is designed in such a way that it is easier for students to understand it. In addition, blended learning can also increase interest in learning (Budhi, 2013), as well as student learning outcomes (Afdhila, Nazar, & Hanum, 2012).

Based on the background and analysis of the problems above, this study will combine the buzz group method with the blended learning method, with the title "The Effect of Buzz Group Based Blended Learning to Improve Students' Cognitive Learning Outcomes on Thermochemical Materials." It is hoped that applying the blended learning-based buzz group method to thermochemical material can help students understand the material so that meaningful learning is created and will affect cognitive learning outcomes

METHOD

This study uses quantitative research methods with the type of experiment. Namely, research is used to determine the

effect of specific treatments on other treatments under controlled conditions. This study uses numerical data processed using statistical methods (Sugiyono, 2013).

The researcher used a quasi-experimental design in the form of a nonequivalent control group. Namely, the sample group was not chosen at random. This quasi-experimental research uses an experimental class and a control class. Two classes were pretested to understand the basic abilities of students. After that, the experimental class was treated with the *buzz group* based on *blended learning* and the control class with the conventional method. After the learning process is complete, a posttest is carried out. The research design can be seen in table 1.

Table 1. Research design pretest-posttest control group design

Group	Pretest	Treatment	Post-test
Experiment	T ₁	X ₁	T ₂
Control	T ₁	X ₂	T ₂

Information:

- T₁ : Pretest (test conducted before being given treatment)
- T₂ : Posttest (tests carried out after being given treatment)
- X₁ : The treatment given to the experimental class using the *buzz group* based on blended learning
- X₂ : The treatment given to the control class using the conventional method. Conventional teaching methods refer to teaching methods where instructors initiate discussion and focus on knowing content in textbooks (Ekeanyanwu, 2021).

The location of the research was in MA Minhajut Tholabah, Kembangan Village, Bukateja District, Purbalingga Regency. This research was conducted on January 11-21, 2022. The population is class XI MIA MA Minhajut Tholabah students consisting of 51 children. The sample of students in class XI MIA 1 as the experimental class totaled 29 children, and class XI MIA 2 as the control class amounted to 22 children. The sampling technique used is non-probability sampling, namely saturated sampling.

To obtain the necessary data, the researcher used a test instrument to analyze the students' ability to thermochemical material by conducting a pretest and posttest. The instrument used was tested for validity by expert lecturers, then empirically tested by testing the validity and reliability. The questions amounted to 11 multiple-choice questions. The student response instrument used a questionnaire containing 10 statement items to collect information about student responses to the *buzz group based on blended learning* on thermochemical material.

The technique of analyzing test questions uses hypothesis testing. Before testing the hypothesis, prerequisite tests were carried out that must be met, including the normality test using the

Kolmogorov-Smirnov test and the homogeneity test using the *Levene statistic*. If the prerequisites are met, then the statistical test is continued, namely, the T-test. If one of the prerequisites is not met, a non-statistical test is used, namely the *Mann-Whitney*.

The analysis technique for the student response questionnaire was carried out using the Percentage of responses as follows (Sudijono, 2010):

$$P = \frac{f}{N} \times 100\% \dots\dots\dots(1)$$

Description:

- P = Percentage of student responses
- f = Proportion of respondents who chose
- N = Number of respondents

Table 2. Distribution of student response assessments

Percentage of Achievement (%)	Information
81-100	Very Attractive
61-80	Attractive
41-60	Fairly Attractive
21-40	Less Attractive
1- 20	Not Attractive

RESULTS AND DISCUSSION

The research was conducted at MA Minhajut Tholabah, which is located in Kembangan Village, Bukateja District, Purbalingga Regency. The research was carried out from January 11, 2022, to January 21, 2022. The type of research used was quasi-experimental. Namely, a method with a control class that cannot

function fully to control external variables that affect the implementation of the experiment (Sugiyono, 2013). The design used is a *nonequivalent control group*. Because the research site only has two MIA classes, a saturated sampling technique is used, namely the use of all population members as a sample (Sugiyono, 2017).

Based on the sampling, class XI MIA 1 was chosen as the experimental class, with 29 children, and XI MIA 2 as the control class, with a total of 27 children. There were five children from class XI MIA 2 who never attended the study, so the researcher only took 22 children as samples in the control class.

This study aimed to determine the effect of *buzz group*-based *blended learning* on thermochemical material to improve students' cognitive learning outcomes. *The buzz group* is a method of small group discussion to carry out a brief discussion about a problem (Hisyam, 2008). Collaborated with *blended learning*, which is a combination of direct learning with internet-based learning with the help of technology (Fahrurrozi & Majid, 2018).

Implementation of Learning in the Experimental Class

implementation of chemistry learning in the experimental class was carried out

four times, with 10 lesson hours. The first meeting started with a pretest. Students work on 11 multiple choice questions for 1-hour lesson. Furthermore, learning is carried out using the *buzz group* based on *blended learning*, following the following steps:

Learning begins with an introduction. The researcher opened with greetings and checking attendance. Next, the researcher conveyed the topic and learning objectives. In the apperception and motivation section, the researcher relates the material to its application in everyday life. In the core activity, students choose a leader from a large group. Then the researcher divides six small groups of 4-5 children. In small groups, there is a division of tasks according to the group structure according to Nasih & Khalidah (2009), group leader, note-taker, and spokesperson.

Each group representative took a lottery division of matter, the material discussed was systems and the environment, exothermic and endothermic reactions, types of enthalpy, Hess's law, bond energy, and calorimeter. The results of group distribution and discussion materials can be seen in table 4.

Table 4. Small group division and discussion material

Group	Materials	Order of presentation
A	Exothermic reactions and endothermic reactions	2
B	Bond energies	5
C	Systems and environment	1
D	Types of enthalpy	3
E	Hess's law	4
F	Calorimetry	6

Each group then discussed according to the distribution of material. As a form of *blended learning*, the experimental class is provided with laptop facilities that can access the internet. The type of *blended learning* is described by Broke (2015), namely *station rotation*, where students learn in traditional classes in one or more class periods, with at least one of them involving technology. Laptops are used as reference material for students in discussions. After the small group discussion is finished, they return to the large group (class), and each small group will present the results of their discussion.

Group C's first presentation was made with material on systems and the environment. After the presentation was over, the other groups had the right to ask questions, and group C answered them. When group C found it challenging to answer, they tried to find other references on the internet and put them in their sentences. Before learning ends,

researchers and students conclude the material that has been presented. The researcher also informed the following lesson plan to continue the presentation for groups A, B, D, E, and F. The researcher ended the meeting with a prayer and greeting.

The application of *the buzz group* is in line with Fitriani's research (2019). In her research, Fitriana divides large groups into small groups consisting of 2-3 children, then asks students to discuss well, then do a short question and answer to other groups. The application of *blended learning* in this study is in line with the research of Alfafa, et al. (2018), who use a *blended learning type station rotation model*. In learning, the teacher uses the lecture method by explaining the material to students, and the use of information technology is also added through the application of online learning.

The second meeting to the fourth meeting still uses the same learning steps. Students take turns presenting and conducting a question-and-answer session according to the order of the discussion material. One lesson hour before the posttest, researcher and student reviews all the material that has been discussed. Researchers also provide opportunities for students to ask questions about material that is not yet

clear. After that, the posttest was carried out at the last hour. Individual students work on 11 multiple choice posttest questions. The researcher asked for an additional 1-hour lesson for the chemistry teacher to fill out the student response questionnaire.

Overall, the learning process in the experimental class went well, as seen from the activeness of students in discussing and the courage to ask questions. As well as the enthusiasm of small groups in using laptops to look for material references that were discussed in depth.

Implementation of Learning in the Control Class

Implementation of chemistry learning in the control class was carried out six times, with 10 lesson hours. The first meeting begins with a pretest activity for a 1-hour lesson. Students work on 11 multiple choice pretest questions. From the 2nd to fifth meeting, the researcher used the lecture learning method, following the steps as follows:

The learning begins with the same introduction in the experimental class. The researcher opened greetings and checked attendance. The researcher conveys the topic and learning objectives. In the apperception and motivation section, the researcher relates the material

to everyday life applications. The difference in learning begins in the core activity. The researcher provides an introduction to the material. Students are asked to listen carefully to the explanation given by the researcher. In each material, the researcher provides examples of questions and their discussion. Then, students work on practice questions on the student worksheets.

After completing the practice questions, the researcher invites students to correct the answers jointly. If there are students who do not understand, the researcher will re-explain the questions/materials asked. At each meeting before closing, researchers and students conclude the material that has been explained. The researcher informs the lesson plan and ends the meeting with a prayer and greeting.

The last meeting was used to review all the material that had been explained, followed by doing the posttest in the last hour. Individual students work on 11 multiple choice posttest questions. The learning process in the control class went relatively smoothly. Seen when the researcher explained the material, the students listened well. However, there are obstacles to this lecture method. Students are less active in interacting with researchers during question-and-answer

sessions at each meeting. So that learning looks monotonous. The learning

atmosphere of the experimental class and control class can be seen in Figure 1.



(a)



(b)

Figure 1. (a) The learning atmosphere of the experimental class and (b) control class

Cognitive Learning Outcomes of the Experimental Class and Control Class

Learning outcomes are seen as a tool to measure the ability of students to receive learning, according to Benjamin Bloom, learning outcomes are divided into three domains, namely cognitive, affective and psychomotor. one of the abilities tested is from a cognitive point of view, namely the ability of students' knowledge, cognitive learning outcomes in this study using a multiple-choice test technique, consisting of pretest and posttest.

The pretest is given before receiving treatment to measure the level of understanding of students, and the posttest is given after receiving treatment, namely the *buzz group* based on *blended learning* in the experimental class and the lecture method in the control class,

aiming to determine whether the material being taught has been mastered properly. Well by students. The pretest and posttest questions consist of 11 items related to thermochemical material. To answer the hypothesis, it can be seen from the increase in cognitive learning outcomes in each class's pretest and posttest scores.

Before testing the hypothesis, a prerequisite test was conducted, namely, the homogeneity test to analyze whether the sample came from a homogeneous population and the normality test to analyze whether the data were normally distributed. Based on the analysis of the homogeneity test obtained a significant value of 0.234. The value is > 0.05 . According to the decision-making criteria, H_0 is accepted, meaning that the data group has a homogeneous variant (Nurgiyantoro, 2009). Based on the

results of the normality test, the experimental class pretest significance value was $0.01 < 0.05$, the experimental class posttest significance value was $0.02 < 0.05$, the control class pretest significance value was $0.013 < 0.05$ and the control class posttest significance value was $0.048 < 0.05$. According to the decision-making criteria, H_0 is rejected (Stanislaus & Uyanto, 2009). In conclusion, the data are not normally distributed.

Because the data is not normally distributed, then the *Mann-Whitney* answers the hypothesis. The *Mann-Whitney* test is an alternative to the non-parametric test of the t-test. The significance value obtained is 0.03, and the value is <0.05 . According to the decision-making criteria, H_0 is rejected (Sugiyono, 2017). It is concluded that there is an effect of the *buzz group* based on *blended learning* on the cognitive learning outcomes of students on thermochemical material.

Based on the results of the study, the average pretest value of the experimental class was 34.80, and the average pretest of the control class was 30.14. After being given treatment, the average posttest result for the experimental class was 70.80, and the posttest score for the control class was 61.98 out of a maximum value of 100. This study

showed differences in students' cognitive learning outcomes, where the experimental class learning outcomes were improved than the control class, with the difference in the average value of the experimental class of 36.00 and the difference in the average value of the control class 31.84.

This is by the research of Muhammad Rivaldi (2019), using the *buzz group*, obtaining a value of 37.797 greater than the t table of 1.697, with a Sig.2-tailed $0.000 < 0.05$. So that there is a significant influence on the type of *buzz group* on student learning outcomes. According to the research of Euis Siti Maemunah (2021), who applied *blended learning* with classroom action research, the mastery learning outcomes were 61% in the first cycle, 79% in the second cycle, and 94% in the third cycle. These results indicate that *blended learning* can improve student chemistry learning outcomes.

Learning outcomes are not things that can stand alone. In theory, Nasution et al. (2001) proposed that learning outcomes result from various underlying factors. Such as factors from students themselves (internal) and factors from the environment (external). Internal factors include motivation, interest, and the psychic of students. However, it is undeniable that external factors,

including teachers, teaching and learning methods, and strategies, significantly affect the learning process. Therefore, educators must be able to manage to learn with the correct method. To achieve optimal results.

From the results of the above discussion, it can be said that this method gives a solid impetus to students' cognitive learning outcomes. Because in the application of the *buzz group*-based *blended learning*, students are directly involved in problem-solving. For students who are usually less active and tend to be shy when expressing opinions, in this method, each student is given tasks and responsibilities that must be

met. Resolved. Plus the use of the internet which really helps them in finding references. So that it has a positive impact on learning outcomes.

5. Student Responses

response questionnaires have been analyzed based on the answers of each student. Interested or not can be seen from the average number of students who answered strongly agree, agree, moderately, disagree, or strongly disagree. The questionnaire consists of 10 statement items, with five items assessing the *buzz group* and five other items assessing the *blended learning*. The distribution of student response assessment data is given in Table 5.

Table 5. Distribution of student response assessments on the buzz group method based on blended learning on thermochemical material

No	Statement	Percentage	Information
<i>Buzz group</i>			
1.	The application of this learning method can increase my motivation to learning	77%	Interesting
2.	Method this makes it easier for me to interact with group friends	78%	Interesting
3.	The use of this learning method can improve my learning outcomes	74%	Interesting
4.	This learning method makes me enthusiastic about learning	74%	Interesting
5.	This method makes me more daring in expressing opinions	81%	Very Interesting
<i>Blended learning</i>			
6.	learning <i>Blended</i> helps me understand thermochemical material more deeply	73%	Interesting
7.	learning <i>Blended</i> helps me discover new knowledge that I haven't learned from classroom learning	80%	Interesting
8.	learning <i>Blended</i> allows me to learn thermochemistry anywhere and anytime without being limited by time	79%	Interesting
9.	learning <i>Blended</i> helps me interact well with friends and teachers	79%	Interesting
10.	learning <i>Blended</i> makes me motivated to seek more information about thermochemical material.	77%	Attractive
% Average		77%	Attractive

Based on table 4, the average student response to the *buzz group* based on *blended learning* is 77%. This Percentage falls into the range of 61-80%, with an attractive category. The interest of students shows that they like learning with this method.

In statement number 1, some aspects are observed. Namely, the *buzz group* creates an enjoyable learning atmosphere. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement is 77%. This shows that learning using *buzz groups* can create an exciting atmosphere.

Statement number 2, some aspects are observed, namely the *buzz group* facilitates group learning. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement is 78%. This shows that *buzz groups* can make it easier for them to study in groups.

Statement number 3, observed aspects, namely, the *buzz group* is an effective learning method. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement is 74%. This shows that *the buzz group* considered an effective method.

Statement number 4, there is a practical aspect. Namely, the *buzz group* creates fun learning. Based on the results

of the questionnaire analysis, the average score of students agreeing with the statement is 74%. This shows that *buzz group* learning can create fun learning.

In statement number 5, some aspects are observed. Namely, the *buzz group* trains the courage to speak in public. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement is 81%. This shows that *buzz group* can really train the courage to speak in public.

The following assessment refers to *blended learning*. Statement number 6, some aspects are observed. Namely, *blended learning* creates more meaningful learning. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement is 73%. This shows that *blended learning* can create more meaningful learning.

Statement number 7, there is a practical aspect. Namely, *blended learning* helps students gain new knowledge outside the classroom. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement is 80%. This shows that *blended learning* can help students gain new knowledge outside the classroom.

Statement number 8, there are observed aspects: *blended learning*

provides flexibility in accessing teaching materials. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement was 79%. This shows that *blended learning* can provide flexibility in accessing teaching materials.

Statement number 9, there is a practical aspect. Namely, *blended learning* increases interaction. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement was 79%. This means that *blended learning* can increase interaction.

Statement number 10, there is a practical aspect. Namely, *blended learning* provides the opportunity to access a different level of learning. Based on the results of the questionnaire analysis, the average score of students agreeing with the statement was 77%. This shows that *blended learning* can provide opportunities to access different levels of learning.

It was explained in previous research regarding the success and enjoyment of students in learning, which can be seen from the responses of students, such as the Dasliar research (2019), which uses the *buzz group* to get a student response questionnaire of 94%, this indicates that students are very interested in the *buzz*

groups. In line with Nuraini (2021) research using *blended learning* to improve student learning outcomes, the results of student responses obtained were 93% in cycles I and II.

Based on the student response questionnaire analysis results, it can be concluded that the *buzz group*-based *blended learning* was effectively applied to class XI MIA 1 MA Minhajut Tholabah as an experimental class. This is evidenced by the average response assessment of students choosing to agree with the ten statements proposed by the researcher and by increasing thermochemistry learning outcomes.

CONCLUSION

After carrying out the research, it was concluded that, based on the results of the Mann Whitney test, the significance value was 0.03, the value was <0.05 , then H_0 was rejected. This shows an effect of the *buzz group* based on *blended learning* on the cognitive learning outcomes of students on thermochemical material. The response of students to the *buzz group*-based *blended learning* on thermochemical material at MA Minhajut Tholabah is interested in the learning that takes place. This is in accordance with the average student response result of 77%.

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