



## Effectiveness of DL (Discovery Learning) Learning Model Integrated IDA (Identify, Explore, Actualize)

### Assisted by CET Media (Chemo Edutainment) on The Material of The Mole Concept

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#### Keywords

*Discovery Learning, IDA, Chemo Edutainment, Mole Concepts*

#### Abstract

This study aims to analyze the effectiveness of the IDA integrated DL learning model assisted by Nearpod application CET media on the material of the mole concept in increasing interest and learning outcomes of the mole concept. This research is an R and D (Research and Development) research. The design used is ADDIE including (1) analysis (needs analysis, infrastructure analysis, determining scope, determining boundaries and sources); (2) design (determining innovative ideas, making the syntax of the IDA-integrated DL learning model assisted by Nearpod CET media, making learning devices (Teaching Modules, LKPD and evaluation instruments, making Nearpod CET media prototypes on mole concept material); (3) development (validation of the syntax of the IDA-integrated DL learning model assisted by Nearpod application CET media, small-scale trials); (4) implementation (large-scale trials, tests) and (5) evaluation. Data collection techniques are learning outcomes test, observation, interview, and Likert scale of interest. Data analysis techniques are instrument validation, interest data analysis and learning outcomes. The data obtained are the results of validation of media experts and material experts, responses of students and teachers on small-scale trials, pretest and posttest results of students on large-scale trials. The results showed the effectiveness of the IDA-integrated DL learning model assisted by Nearpod CET on the mole concept material in the experimental class for learning outcomes N-gain value of 0.8148 has a high category. For learning interest, the N-gain value of 0.7725 has a high category.

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## INTRODUCTION

Chemistry subjects emphasize in-depth understanding of concepts, especially in the material of the mole concept, which is the basis for chemical calculations. This material is usually taught in grade X SMA/MA semester 2 and is considered challenging because it combines concept understanding, mathematical calculation skills, and the use of various related formulas. The mole concept belongs to the submicroscopic level of understanding, which means that it cannot be observed directly by the human eye (Pica et al., 2023). This material involves an understanding of atoms, molecules, and ions that have very small particle sizes, so that for ease in calculating the number of molecules, the number of ions is very small. particles, the unit mole is used. The formula used to calculate one mole can vary depending on certain conditions, so this material has submicroscopic properties (Pica et al., 2023).

The problem that occurs during learning is the lack of enthusiasm from students. The condition of students who are bored in participating in learning can be caused by lack of interest in learning (Pakuna, 2021). Interest can be expressed through a statement that shows that students prefer one thing over another, it can also be seen from students' participation in learning. Learners who have an interest in certain subjects tend to pay attention when educators explain material in class. Such as the interest of students to follow chemistry subjects (Aleandro et al., 2023).

Based on observations during his time as a chemistry teacher at SMA Negeri 1 Batang, data were obtained that there were still many students who were less motivated to study chemistry, students were still less interested and felt lazy and had difficulty when dealing with problems solving calculations such as the concept of moles so that their learning outcomes were not as expected. This is because as many as 65% of students' learning outcomes are below the Minimum Completeness Criteria (KKM). This happens because students feel that chemistry is a difficult and unpleasant lesson, students are still less active in practicing doing problems, this is due to the use of an inappropriate learning model, namely the lecture model in delivering material / concepts to students, even though they have used media with computer technology in the form of power points and videos. However, the media used has not been able to attract the attention of students. This results in the interest and activeness of students, and the average chemistry score has not met the expected target.

In various other schools, similar problems are also experienced. Through interviews with chemistry teachers from several high schools in Batang Regency, Kendal Regency, and Pekalongan City during the Chemistry MGMP event, it was revealed that student learning outcomes, especially in understanding the concept of moles, did not reach the expected expectations. As many as 100% of chemistry teachers admitted to facing difficulties in teaching the material. They find it difficult to explain the mole concept calculation material to make students better understand the calculation of the mole concept. In addition, students' interest in learning chemistry also shows a low level, where more than 50% are not too eager to take chemistry lessons, especially on the material of the concept of mole, because it is considered too complicated with many calculations that must be done.

Based on the observations of chemistry teachers, the main obstacle faced in learning the concept of mole is the level of difficulty felt by students. This is reflected in the responses of students who are less enthusiastic, as well as the lack of satisfactory learning outcomes. Although there have been efforts In order to teach the material with various methods, such as those carried out in Chemistry MGMP activities, the challenge of capturing the mole concept remains the main focus that needs to be addressed in improving the effectiveness of chemistry learning at the high school level.

Based on the learning that has been done at SMA Negeri 1 Batang, this research tries to implement the DL (Discovery Learning) learning model integrated with IDA (Identify, Deepen, and Actualize) assisted by Chemo Edutainment media with Nearpod application to increase interest and learning outcomes in the competency of the mole concept.

In Discovery Learning, the teacher plays an important role as a guide to provide opportunities for students to be more actively involved in teaching and learning activities (Kartika, 2017). In preparing this learning model, teachers must know the syntax of Discovery Learning as follows: Stimulation, Problem Statement (Statement or Problem Identification), Data Collection, Data Processing, Verification, Generalization (drawing conclusions or generalizations) (Anitah 2009).

The IDA approach, which stands for Identify, Explore, and Actualize, is a new idea from the author which is a new approach in teaching chemistry that aims to improve learning effectiveness. This approach is specifically designed to help students in understanding and mastering chemistry materials, especially in terms of the concept of mole which is often considered difficult. With IDA, the learning process does not only focus on delivering information, but also on identifying learners' ability to understand concepts, delve deeper into

the material, and apply the knowledge in a relevant and actual context. In addition, this approach is expected to increase students' interest in learning chemistry in a more interesting and interactive way.

Based on observations made at SMA Negeri 1 Batang, information was also obtained that learning has used media with computer technology in the form of power points and videos. However, the media used has not been able to attract the attention of students. Therefore, fun learning is needed in order to foster students' interest in learning. The creation of a fun learning can use the Chemo Edutainment (CET) method which can motivate students to learn independently and in class (Roziyah & Kamaludin, 2019).

The CET method is an alternative to the chemistry learning process that is varied and able to improve student learning outcomes that can be realized through learning media. Learning media emphasized through CET is media that combines elements of education (education) and entertainment (entertainment) (Roziyah & Kamaludin, 2019). This CET-based learning media does not have to mimic reality, but has challenges that can be overcome. It is fun for learners so that they can achieve the desired competencies and create a pleasant atmosphere. Thus, in learning, students are not only required to have the ability to observe, but indirectly involve aspects of language (observing, listening, and speaking) have been covered in it (Chairiah, 2016).

In this study, the CET used is the Nearpod application. Nearpod application is an application for learning media that can be used offline or online using android and iOS-based devices that are directly connected to the internet network. This application can interact directly or indirectly between teachers and students (Minalti & Erita, 2021). In addition, teachers can create interactive, effective, and interesting learning media. The use of the Nearpod application can make it easier for students to understand the material independently and can follow the simulation videos presented.

However, to ensure the effectiveness of this learning model, it is necessary to conduct a comprehensive effectiveness test. The effectiveness test can include an evaluation of the improvement of students' understanding of the mole concept before and after the application of this learning model. In addition, it can also assess the level of learner participation, interest in learning, and the ability of learners to apply the concepts learned in different contexts. Thus, the data collected from the effectiveness test can provide valuable information to evaluate the success and improve the DL learning model integrated with IDA assisted by CET media through Nearpod application to make it more effective and useful for students.

## METHODS

This research uses the Research and Development (R&D) method. The research method aims to produce certain products, and test the effectiveness of the products produced (Sugiyono, 2011, p. 407). This research development model is the ADDIE development model which consists of five stages consisting of analyze, design, development, implementation, and evaluation.

The research on the development of Discovery Learning learning model integrated with IDA (Identify, Explore, Actualize) assisted by Nearpod application on the material of mole concept was conducted at SMAN 1 Batang which is located at Jl Ki Mangun Sarkoro no 8 Batang, Central Java.

Samples are parts taken from the population to be studied (Sudjana, 2005: 6). Normality test and homogeneity test in each class X at SMA Negeri 1 Batang were conducted before sampling the research. The test was conducted using the students' test scores on the previous material. The test results showed that the data in the nine classes had a normal and homogeneous data distribution. The results of the homogeneity test in nine X classes show the analysis of data values Sig = 0.456 then the data distribution is homogeneous. The results of the normality test and homogeneity test were carried out as a basis for taking research samples by random sampling. The samples in this study were taken as many as two X classes in SMA N 1 Batang, namely X A and X G. Class X A as the experimental class is a class that conducts chemistry learning using the IDA integrated DL learning model assisted by Nearpod CET learning media. The X G class as the control class is a class that conducts chemistry learning using the DL learning model assisted by power point media.

Data collection techniques used learning outcome tests, observations, interviews, and interest Likert scales. The learning outcomes test method was used to measure the achievement of learning outcomes of the mole concept competency through pretest and posttest questions. The test questions were designed in accordance with the learning objectives, namely students can determine the concept of mole at least the relationship of mole with the number of particles, mass, and volume. The test results were analyzed to determine the achievement of learning outcomes of the mole concept competency. The observation method is used to observe students' interest in learning. Observation is carried out by researchers by observing during the learning process. Then give an assessment based on the rubric in the observation sheet that has been

designed. The Likert scale method of interest is used to determine the response of students to the learning that is applied. The results of this method are analyzed by means of descriptions and then drawn conclusions. Interviews were conducted with students after learning. Interview activities are guided by interview guidelines which are used to collect students' learning independence after learning. The purpose of this interview is to find problems more openly where the interviewee is asked for his opinions and ideas.

Data Analysis Techniques using Instrument Validation, instrument analysis. The instruments used in this study are learning models, learning media, posttest questions, observation sheets, interview sheets and interest Likert scales. The instrument was validated first by an expert. Content validation is intended to test whether the instrument is good for use in research. Validators are experts who have taken higher education who are Chemistry Lecturers FMIPA UNNES.

To analyze the effectiveness of the IDA-integrated DL learning model assisted by Nearpod CET developed by using the N-gain score. N-gain score aims to determine the effectiveness of using a particular method or treatment in the learning process research. The N-gain score test is done by calculating the difference between the pretest score and the posttest score. By calculating the difference between the pretest and posttest scores or the gain score, we will be able to find out whether the use or application of a particular method can be said to be effective or not. We can calculate the N-gain Score formula by referring to the following formula:

$$\text{N-gain} = \frac{\text{posttest score} - \text{pretest score}}{\text{ideal score} - \text{pretest score}}$$

The category of the N-gain score can be determined based on the N-gain value or the N-gain value in the form of percent (%). The division of the N-gain score category can be seen in Table 1.

Table 1 Categories of N-gain Value Acquisition

N-gain Value	Category
$g > 0,7$	High
$0,3 \leq g \leq 0,7$	Medium
$g < 0,3$	Low

Source: Archambault et al in Situmorang, 2015

## RESULTS AND DISCUSSION

The effectiveness of the DL (Discovery Learing) learning model integrated with IDA (Identify Dalami Aktualisasi) assisted by CET (Chemo Edutainment) Nearpod application media on the material of the mole concept on learning outcomes and student interest can be seen from the evaluation results and student interest questionnaire scores. The research instrument used is a cognitive learning outcome question in the form of multiple choice questions on the material of the mole concept to measure the cognitive learning outcomes of students and an interest questionnaire to determine the interest possessed by students. The results of the product trial produced evaluation scores and interest scores in the experimental and control classes. Evaluation data on cognitive learning outcomes and students' interest were then analyzed using N-gain with the help of SPSS software version 25 on 72 students.

The results of the analysis of cognitive learning outcomes show on average that the value of the results of the mole concept tested in the experimental class has high criteria, this is evidenced by the N-gain value of 0.8148 which has a high category. There was an increase for each indicator of learning outcomes of the mole concept between the experimental class and the control class. In the experimental class for the indicator of determining the relative molecular mass (Mr) has an N-Gain value of 0.67 with a medium category, for the indicator of the mole relationship with the number of particles has an N-Gain value of 0.55 with a medium category, for the indicator of the mole relationship with mass, the mole relationship with volume and the mole relationship with molarity all three have an N-Gain value of 1.00 with a high category. This means that the

product of the Discovery Learning learning model integrated with IDA (Identify Dalami Aktualisasi) assisted by Chemo Edutainment Nearpod which was developed effectively can increase the competence of the mole concept in the experimental class (XA). In the learning process of the experimental class (XA) using the Discovery Learning integrated IDA (Identify Ini Actualize) learning model assisted by Chemo Edutainment Nearpod on the mole concept material that has been developed.

While the N-gain value of learning outcomes in the control class, the value of the mole concept tested has moderate criteria, this is evidenced by the N-gain value of 0.3371 which has a moderate category. The control class has moderate mole concept competence. So that the Discovery Learning learning model integrated with IDA (Identify Dalami Aktualisasi) assisted by Chemo Edutainment Nearpod developed can effectively increase the competence of the mole concept compared to the Discovery Learning learning model with the help of power point media. With an increase in N-gain value of 0.4777.

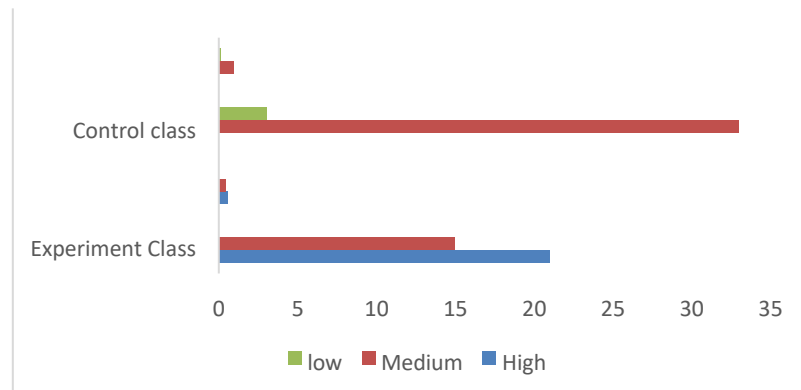


Figure 1. The relationship between the increase in criteria for the N-gain test results of experimental and control class learning outcomes.

The results of the analysis of learning interest show on average that the value of learning interest tested in the experimental class has high criteria, this is evidenced by the N-gain value of 0.7725 which has a high category. This means that the Discovery Learning learning model product integrated with IDA (Identify Dalami Aktualisasi) assisted by Chemo Edutainment Nearpod which was developed effectively can increase learning interest in the experimental class (XA). In the learning process of the experimental class (XA) using the Discovery Learning integrated IDA (Identify Ini Actualize) learning model assisted by Chemo Edutainment Nearpod on the mole concept material that has been developed, this is in accordance with what Kasmiana et al., 2020 said when applying the Discovery Learning learning model the teacher can provide opportunities for students to independently construct their knowledge and understanding based on the learning experience they get. One of the studies conducted by (Falaha Zauma & Priyono Budi Prasetyo, 2021) states that the Discovery Learning learning model can improve students' learning outcomes so that the learning model has a great opportunity to increase students' interest in learning. This is in accordance with the statement of Hasian Harahap in the book a collection of teacher innovation articles, namely Prasetya et al., (2021) which states that "the way to increase student interest in learning is to use interactive and interesting learning approaches, many approaches that can be designed and practiced in schools, for example: Nearpod, Kahoot, Mentimeter, Smart Application Creator and so on". This is in line with research conducted by Thompson (2023) which states that Nearpod is an educational technology that helps teachers teach interactive learning on all students' devices, assess students within a certain period of time, and get immediate feedback. This is supported by Ami (2021) who states that Nearpod can maximize learning.

While the N-gain value of learning interest in the control class, the interest value tested has moderate criteria, this is evidenced by the N-gain value of 0.3370 which has a moderate category. The control class has moderate mole concept competence. So that the Discovery Learning learning model integrated with IDA (Identify Dalami Aktualisasi) with the help of Chemo Edutainment Nearpod developed can effectively increase learning interest compared to the Discovery Learning learning model with the help of power point media. With an increase in N-gain value of 0.435

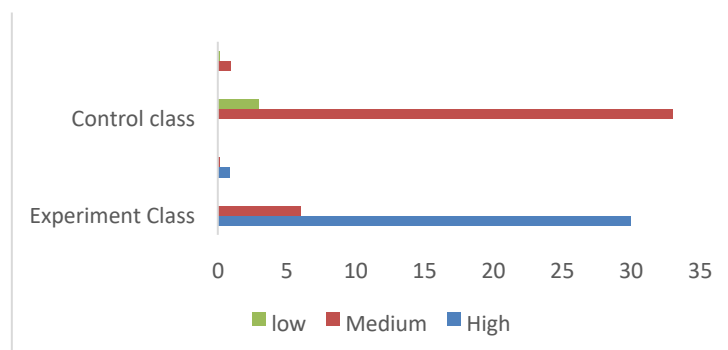


Figure 2 Relationship between the increase in criteria for the N-gain test results of learning interest in experimental and control classes

The effectiveness of the Discovery Learning learning model integrated with IDA (Identify Dalam Aktualisasi) assisted by Chemo Edutainment Nearpod is also analyzed based on the learning completeness value. The interval value of learning completeness is: 0-64% of the category is not complete (remidi entirely), 65-70% of the category is complete (remidi partially) and 71-100% of the category is complete (Wahyudin et al., 2024). In the experimental class based on pretest scores, 13 students or 36% obtained incomplete criteria while 64% or 23 students obtained complete criteria. While in the posttest session 100% of all students obtained the criteria were complete. The percentage of learning completeness has increased from 64% to 100%, this shows that the Discovery Learning model integrated with IDA (Identify Dalam Aktualisasi) assisted by Chemo Edutainment Nearpod on the mole concept material developed is effectively used in the learning process.

While in the control class, the pretest scores were 21 students or 58% obtained unfinished criteria while 42% or 15 students obtained the criteria were completed. While in the posttest session as many as 13 students or 36% obtained unfinished criteria while 64% or 23 students obtained completed criteria. The percentage of learning completeness has increased from 42% to 64%.

## CONCLUSION

The development of an IDA-integrated DL learning model assisted by Nearpod CET on the material of the mole concept can effectively improve learning outcomes and interest in learning based on the results of the N-gain test with a high category.

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