Jurnal Teknologi Pendidikan, Desember 2025, 27 (3), 963-980
DOI: http://dx.doi.org/10.21009/JTP2001.6
p-ISSN: 1411-2744 e-ISSN: 2620-3081
Accredited by Directorate General of Strengthening for Research and Development
Available online at http://journal.unj.ac.id/unj/index.php/jtp

Learning Styles and Outcomes of Students with Intellectual Disabilities Using E-LAPD on Mole Concept: A Mixed Methods Study

Shinta Dian Pramesty[1], Soekarmiani[2], Moniqsa Purbo Syahrani[3], Ima Kurrotun Aini[4], Dian Novita[5(*)]
[1,3,5]Program Studi Pendidikan Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Surabaya, Surabaya, Indonesia
[2]SMA Negeri 10 Surabaya, Surabaya, Indonesia
[4]Program Studi Pendidikan Luar Biasa, Fakultas Ilmu Pendidikan, Universitas Negeri Surabaya, Surabaya, Indonesia

Received : October 31, 2025
Revised : November 20, 2025
Accepted : December 27, 2025

Abstract

The characteristics of students with intellectual disabilities who have difficulty processing information require innovation and the use of learning media that are specifically designed for students with intellectual disabilities. However, innovation and the use of learning media, especially E-LAPD , are still very limited. This study analyzes the learning styles and outcomes of students with intellectual disabilities in understanding the mole concept material through the use of E-LAPD for individual learning. The study uses mixed method design with a type of concurrent embedded design, which both quantitative and qualitative data are collected simultaneously. Three students with intellectual disabilities in SMAN 10 Surabaya as research subjects. Data collection through interviews and pretest-posttest questions. The results of the interview were analyzed using NVivo 11 software in the form of matrix query coding. Quantitative data analysis uses descriptive statistics by comparing the pretest and posttest scores of each student. The research results indicated that the learning styles frequency of students with intellectual disabilities is a visual learning style. Pretest and posttest results significantly increase, indicating increased learning outcomes. The use of E-LAPD can simplify chemical concepts into visual information, so as to improve the learning outcomes of students with intellectual disabilities.

Keywords: Intellectual disabilities, E-LAPD (electronic worksheets), Learning style, Learning outcomes, Mole Concept, Chemistry education

(*) Corresponding Author: diannovita@unesa.ac.id

How to Cite: Shinta Dian Pramesty, Soekarmiani, Moniqsa Purbo Syahrani, Ima Kurrotun Ainin, & Novita, D. (2025). Learning Styles and Outcomes of Students with Intellectual Disabilities Using E-LAPD on Mole Concept: A Mixed Methods Study. JTP - Jurnal Teknologi Pendidikan, 27(3), 963–980. https://doi.org/10.21009/jtp.v27i3.61639

INTRODUCTION

Education is one of the primary pillars of societal progress and individual development. Education is essential in establishing the foundation of knowledge, skills, and attitudes for students to succeed (Wardani, Kusumaningsih, & Kusniati, 2024). Everyone, including children, teenagers, adults, men and women, normal children, and children with special needs, has the right to an education. Every person is entitled to develop their human potential through education that aligns with the concept of education for all (Nengsi et al, 2021).

Inclusive or inclusion education prioritizes a welcoming and open education for everyone, regardless of the context. Inclusive education aims to provide all students, including children with special needs, an equal chance to study in the same group (Maesaroh et al, 2025). Inclusive education is a special education that has a special place, especially for students with disabilities, and consists of a series of practices that special education teachers specifically design to accommodate each student's needs who has a disability (Wiratrianida & Sujarwanto, 2024).

Disability is a long-term physical, mental, intellectual, or sensory limitation that, when faced with various obstacles, might prevent them from entirely and effectually engaging in society on an equal footing with others (Anidi & Anlianna, 2022). Intellectual disability emphasizes medical criteria while considering the biological criteria inherent in intellectual disability. Intellectual disabilities is indicated by significant limitations in intellectual function and ability to adapt that occur during development, according to the American Association for Intellectual and Developmental Disabilities (AAIDD) (Purwandari et al, 2024). Students with intellectual disabilities tend to lack motivation in classroom learning activities. To support motivation in learning, it is necessary to provide interesting stimuli. The characteristics of intellectual disabilities, namely delays in understanding and specific learning media, because students with intellectual disabilities get bored quickly and are easily distracted (Puspita et al, 2024).

In this study, the terminology of intellectual disability in the research subjects was not based on IQ score qualifications, but based on intellectual barriers to information processing. Although the IQ results of the study subjects 104, 108, and 87 were in the average to low average category, the subjects had quite developed information capture and processing skills. Therefore, the E-LAPD with an individualized education approach was developed to facilitate the subject's specific needs in information processing regardless of their IQ score being in the medium to low average category.

Therefore, the Individual Learning Program is very necessary for students with intellectual barriers that can cause learning barriers (Arriani et al., 2021). The Individual Learning Program (IEP) is designed and developed to evaluate each child's abilities, as reflected in their individual profiles. This program is designed for children with difficulty following the general curriculum or its modifications (Moningka et al, 2024).

Learning outcomes are the capability students achieve following their participation in the learning process, encompassing cognitive, affective, and psychomotor skills. Learning outcomes relate to changes in a person's knowledge, understanding, attitudes and behaviour due to the learning process (Mboa & Ajito, 2024). Learning outcomes can be a benchmark in identifying and evaluating learning objectives and can be a report on what students have achieved in the learning process. According to Bloom, three components of learning outcomes indicators are the cognitive, affective, and psychomotor domains (Lestari & Rasto, 2024). The learning outcomes assessment process provides teachers with information about students' progress in achieving learning objectives through learning activities (Supit et al, 2023).

An approach that describes how individuals learn, how they concentrate and master complex information through different perceptions is called learning style

(Sari et al, 2025). Three categories of learning styles include visual, kinesthetic, and auditory. Students with a visual learning style process information through sight and prefer visual media. Visual media include images, charts, videos, posters, animations, concept maps, colours, symbols, and graphs. Students with an auditory learning style process information through hearing. Auditory learners understand information by listening to lectures, attending tutorials/presentations, and stories. Students with a kinesthetic learning style process information more easily when experiencing it directly or practising (Mayung et al, 2023). In the context of chemistry learning, several previous studies have linked the application of learning styles to improved understanding of abstract concepts through approaches appropriate to student characteristics. Learning styles refer to how students respond to stimuli during the learning process (Sari et al., 2025).

Chemistry studies the properties and composition of matter (composed of compounds) and their changes, how these compounds interact or combine to form other compounds (Susanty, 2022). One of the learning materials studied by high school students is stoichiometry. The characteristics of stoichiometry are related to quantitative aspects, such as the concept of moles, which discusses calculations and the use of chemical concepts in calculations. Stoichometry can be interpreted as a bridge in learning other chemical concepts because it contains a basic understanding in chemistry. Because of this, stoichiometry material is an important material for students to learn (Siahaan et al, 2022). The concept of moles has an important role as a unit of measurement used to describe the number of particles in a substance. By understanding the mole concept, students can quantitatively connect the mass and number of particles in a substance (Hidayat et al, 2024).

Based on the results of observations at SMAN 10 Surabaya, it is stated that chemistry teachers and GPK have never developed learning media that are specifically designed for students with intellectual disabilities. Learning media can encourage students' thoughts, feelings, attention, and interests, enabling learning. Learning media must have a capability to motivate students, encourage them to remember what they have learned, and encourage them to provide feedback (Sukarmin et al, 2020).

The Student Activity Sheet (LAPD) is one type of teaching material that can be used to evaluate learning and achieve good results. It is a sheet containing exercises that students complete as a form of evaluation after the learning process, as instructed by the teacher. The LAPD contains steps and instructions for completing the exercises. Using LAPD in learning can support student learning activities, while educators can facilitate and support the smooth running of teaching and learning activities (Sa'diyah & Arifin, 2025). Electronic Student Activity Sheets (E-LAPD) can be an interesting learning media. Liveworksheet is a website-based application that can be used to create electronic student activity sheets. Liveworksheet is a web-based application in the form of an interactive worksheet containing materials. Liveworksheet also supports images, animations, and videos to strengthen student understanding (Basri et al, 2024).

Previous research related to this research is shown through the following table.

Table 1. Previous research

Previous research	Research Results
Research by Teresa et al (2022) entitled Electronic Development of Student Worksheets (E-LKPD) Based on *Liveworksheets* for Mol Concept Materials in Class X Students of MIPA MAN 3 Pontianak (Teresa et al, 2022)	The development of Liveworksheet-Based E-LKPD shows valid and effective criteria as a learning media for mole concept material.
Research by Arisandi (2022) entitled The Use of Liveworksheets Learning Media in Improving Chemistry Learning Outcomes in Mole Concept Materials (Arisandi, 2022)	The use of Liveworksheet Learning Media shows an increase in learning outcomes in cycles I and II in mole concept material.
Research by Wahyu K, et al (2025) with the title Implementation of learning Cycle 7E Assisted By Digital Worksheet to Improve Students' Learning Outcomes and Motivation (Wahyu K et al, 2025)	The Implementation of Learning Cycle 7E by Liveworksheet shows a significant increase in student learning outcomes in the mole concept material.
Research by Hamidah et al (2018) entitled The Effectiveness of Guided Inquiry-Based Student Worksheets to Improve Student Learning Outcomes (Hamidah et al, 2018)	Learning using the Student Worksheet is effective in improving student learning outcomes in the mole concept material.
Research by Febiola and Azhar (2025) entitled Validity and Practicality of Canva AI-Assisted Interactive E-LKPD and Structured Inquiry-Based Liveworksheet on High School Phase F Module Concept Material (Febiola & Azhar, 2025)	Canva AI-assisted interactive e-LKPD and Liveworksheet have proven to meet the criteria of high validity and practicality as an alternative teaching material to the mole concept material. A high assessment of the practicality of E-LKPD based on aspects of attractiveness, ease of use, time efficiency, and benefits.

The difference between this research and previous research lies in the research subject and learning approach. In this study, students with intellectual disabilities in class XI of high school were used, while in the previous study, it was aimed at regular students. The learning approach used in this study is individualized education that ensures the needs and involvement of students so that they are able to follow chemistry learning easily.

The novelty in this study is that E-LAPD uses an Individualized education learning approach. Where the content of the E-LAPD uses simple language and the difficulty level of practice questions adjusts to the students' abilities. In addition, it is added with visualizations that can help students understand the mole concept material. The calculation questions are accompanied by work steps so that it is easier for students to solve the questions given. E-LAPD uses interactive features on Liveworksheet such as join, drag and drop, text field, and single choice. The features used aim to make it easier for students to work on E-LAPD.

The background description above shows that research is needed to explore several of these problems, including the learning styles of students with intellectual disabilities through the application of E-LAPD for individual education on the mole

concept material and the learning outcomes after using E-LAPD for individual education for students with intellectual disabilities. This research aims to analyze learning styles of students with intellectual disabilities who receive individual education on the concept of mole and their learning outcomes after receiving individual education. This study is supposed to contribute to the development of science, particularly in the context of chemistry learning for students with intellectual disabilities.

METHODS

According to Creswell (2009), Mixed method research is a research approach that combines or relates qualitative and quantitative forms (Creswell, 2009). This mixed-methods research combines qualitative and quantitative strategy to gain a deep understanding of the topics. This study uses mixed methods design with a type of concurrent embedded design, which both quantitative and qualitative data are collected simultaneously. Unlike the traditional triangulation model, a concurrent embedded approach has a primary method that guides the project and a secondary database that provides a supporting role in the procedures (Creswell & Creswell, 2018). This method was chosen because this study prioritizes understanding the learning profile (qualitative) while using quantitative data to complement and anthulate the findings of the learning outcomes. The research procedure is illustrated in the flowchart below.

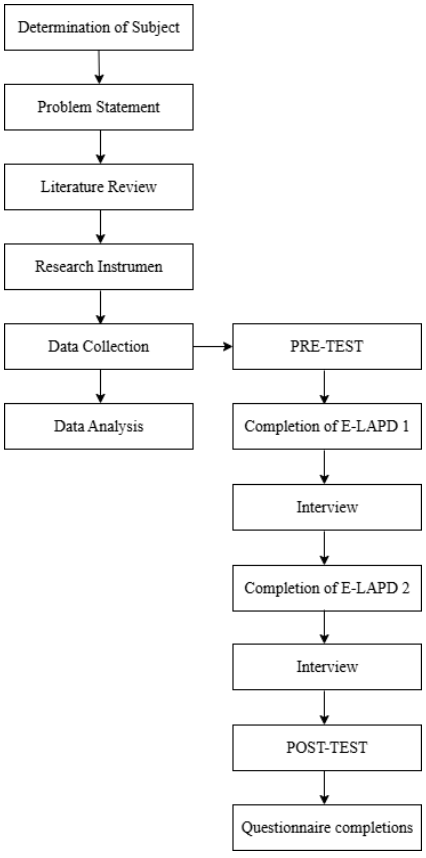


Figure 1. Research Procedure

This research was conduct on August 20, 2025. Three students with intellectual disabilities in grade XI at SMA Negeri 10 Surabaya became the research subjects. The following is presented an information table of the three students with intellectual disabilities.

Table 2. Information for Students with Intellectual Disabilities

Student name	Age	Gender	IQ
AH	18 years	Male	104
DA	17 years	Male	108
E	18 years	Female	87

In this study, the terminology of the research subjects with IQ 104, 108, and 87 were in the average to low average category. The subjects had quite developed information capture and processing skills. Therefore, the Individual Learning Program is very necessary for students with intellectual barriers that can cause learning barriers.

Instrument

1. **E-LAPD (Electronic Student Activity Sheet)**
   The E-LAPD was developed using the Liveworksheet platform and consists of a summary of the material with visual illustrations, examples of work with step-by-step completion, and practice questions (let's practice) with live feedback. The content use easy-to-understand language and shown with visualization that supports sentence explanations. This makes it easier for students to learn and comprehension the content of the material.
2. **Interview**
   The semi-structured interview guide consists of 10 questions. The interview questions aimed to identify learning styles, responses and ease of use of the E-LAPD. Examples of interview questions to identify learning styles include: (1) How are the explanations and pictures of the stimulus? (Can the stimulus provide an illustration of the material on the relationship between moles and number of particles/the relationship between moles and mass?), (2) How is the summary of the material given? (Is the summary of the material easy to understand and helps you in understanding the material of the relationship between moles and number of particles / the relationship between moles and mass?), (3) How the picture is presented? (Are you interested and helped in understanding the material from the image?).
3. **Pretest and Posttest**
   The pretest and posttest consist of 5 multiple-choice questions with a maximum score of 100, both of which are distributed and filled in by respondents through the Google Form platform. The questions developed for two sub-subjects were the relationship between moles and number of particles as many as 3 questions, the relationship between moles and mass as many as 2 questions. Each question measures indicators including analyzing substances whose particle type is in the form of atoms, determining the number of particles contained in 1 mole of substance, determining the relationship of moles to the number of particles, calculating the molecular mass of a compound, and

determining the relationship between moles and the number of particles. The outline of the pretest and posttest is as follows:

1. The following substances whose types of particles are atoms are
   a. Ion bromide (Br-)
   b. Vinegar (CH_3COOH)
   c. Silver (Ag)
   d. Carbon dioxide gas (CO_2)
   e. Table salt (NaCl)
2. 1 mole of substance contains a particle count of 6.02 x 1023 particles. An acid vinegar (CH_3COOH) 1 mole contains as many particles as possible....
   a. 6,02 x 10^{24} molecul
   b. 6,02 x 10^{23} molecul
   c. 6,02 x 10^{20} molecul
   d. 3,01 x 10^{23} molecul
   e. 3,01 x 10^{24} molecul
3. A sample of a gas contains 3,01 x 10^{23} hydrogen molecule (H_2). The number of moles of hydrogen gas (H_2) in a sample is as large as... (Avogadro Number) = 6,02 x 10^{23})
   a. 0,5 mol
   b. 1 mol
   c. 2 mol
   d. 2,5 mol
   e. 3 mol
4. What is the relative molecular mass (Mr) of CO_2, if known Ar C = 12 dan O = 16?
   a. 35
   b. 40
   c. 42
   d. 44
   e. 50
5. The relative atomic mass of oxygen (Ar O) is 16 gram/mol, the mass of 1 mol of Oxygen atoms is ....
   a. 1 gram
   b. 8 gram
   c. 4 gram
   d. 2 gram
   e. 16 gram

Data Collection Techniques

Interviews were used to obtain information about students' learning styles, and tests were used to collect data on student learning outcomes. The procedure for collecting research data is described as follows.

(1) Stage 1 (Pretest): Before using E-LAPD, students work on pretest questions in the form of multiple choice with a total of 5 questions. The duration of the work time is 10-15 minutes and accompanied by an observer. The Pretest aims to measure the initial ability of students to the material to be delivered.

(2) Stage 2 (E-LAPD Completion 1): Students complete the E-LAPD relationship

betwen moles and number of particles using a laptop for 45 minutes and accompanied by an observer.

(3) Stage 3 (Interview): Students conduct an interview with an observer for 5 minutes. This aims to explore deeper information after using the E-LAPD.
(4) Stage 4 (E-LAPD Completion 2): Students complete the E-LAPD of teh relationship between mole and mass using a laptop for 45 minutes and accompanied by an observer.
(5) Stage 5 (E-LAPD Interview 2): Students conduct an interview with an observer for 5 minutes. This aims to explore deeper information after using the E-LAPD.
(6) Stage 6 (Posttest): Students work on posttest questions in the form of multiple choice with a total of 5 questions. The duration of the work time is 10-15 minutes and accompanied by an observer. The posttest aims to measure the final ability of students after using E-LAPD.
(7) Stage 7 (Questionnaire completions): Students are given 5 minutes to fill out a response questionnaire after learning using E-LAPD and be accompanied by an observer.

The results obtained in this study received approval from parents, students, BK teachers and special assistant teachers (GPK). All data is anonymized using a pseudonym (AH, DA, E).

Data Analysis Techniques

Both qualitative and quantitative data analysis methods were applied in this study. The results of the interview were in the form of audio transcribed using Turboscript and analyzed using NVivo 11 software in the form of matrix query coding. Matrix coding queries aim to show the frequency of relationships between elements visualized in matrix form (Sari et al, 2025). The coding approach is based on Fleming's VAK (Visual-Auditory-Kinesthetic) learning style model. The most dominant learning style is determined based on the highest frequency of the added sentence code. Sentences in the interview that indicate a demonstration in the form of visuals will be coded as visual. Sentences that indicate listening to instructions in the code as auditory, and sentences that indicate activities using hand/body movements will be coded as kinesthetic. Although the results of the interviews were not confirmed back to the students, data triangulation was instead applied through synchronization of E-LAPD work result, observation of students' activities during learning, and in-depth interview results. In this study, all research steps were also documented, starting from the results of the E-LAPD work on the liveworksheet to audio recording so that the process could be checked again. These findings were also discussed with colleagues and lecturers.

Quantitative data analysis uses descriptive statistics by comparing the pretest and posttest scores of each student. Because the sample size is 3 students, the percentage increase is calculated for each student using the formula:

$$\frac{(skor\ posttest - skor\ pretest)}{maximum\ score} \times 100\%$$

Data on the improvement of each student's score will be displayed in the form of tables and graphs that aim to provide an overview of changes in learning outcomes.

Data triangulation was carried out by comparing the profile of learning style (based on the results of the interview) with the learning outcomes (based on the test). For example, if a student shows a visual learning style in an interview, this is associated with the results of the E-LAPD work that involves visuals and is supported by improved learning outcomes.

RESULTS & DISCUSSION

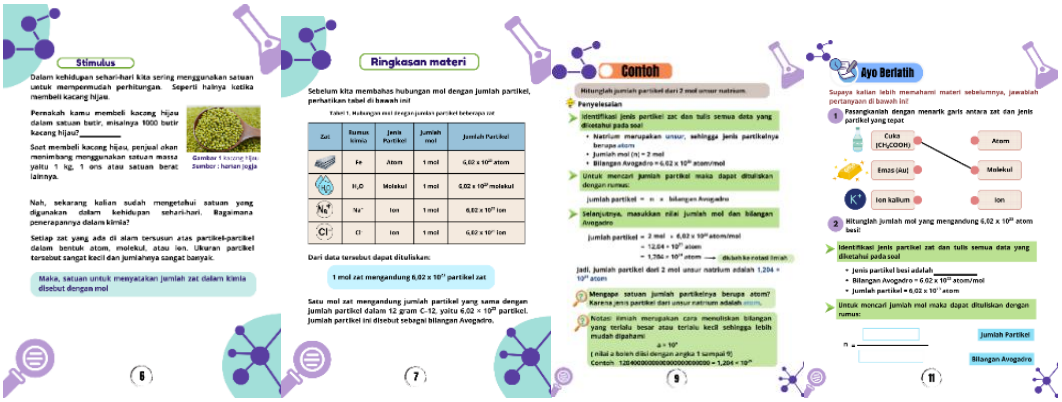
Results

One special education lecturer, one chemistry teacher, and one GPK assessed the validity of the E-LAPD. The E-LAPD validity test uses a Likert scale with a score range of 1 to 4. This assessment includes content suitability, language clarity, visual design. The following is a table of the results of the E-LAPD validation developed.

Table 3. Validation Result

Aspect	Validator 1 (Special Education Lecturer)	Validator 2 (Chemistry Teacher)	Validator 3 (GPK)	Average	Category
Content suitability	3	4	4	3	Valid
Language clarity	3	4	4	3	Valid
Visual design	3	4	4	3	Valid

This study used an electronic student activity sheet (E-LAPD) validated with a score of ≥3. E-LAPD that were declared valid were then subjected to limited trials. The following is a picture of the E-LAPD that has been developed and used in the form of a table.



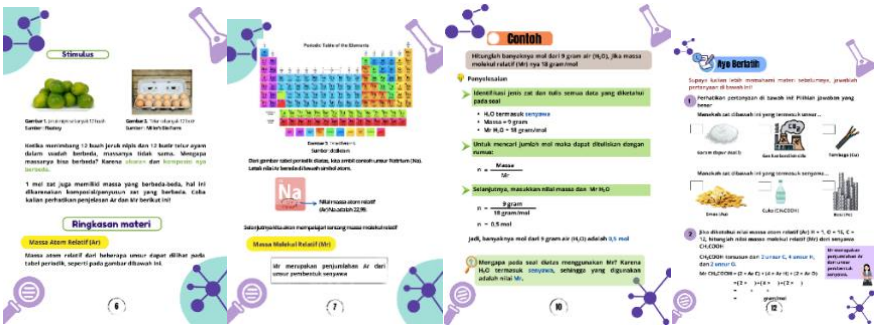


Figure 2. Outline of the E-LAPD display

In order to obtain information about learning styles and learning outcomes for student who have intellectual disabilities, the study's results were collected using interviews and test.

Student Learning Style

This study will analyze the mapping of three student learning styles: visual, auditory, and kinesthetic. The analysis outcome will be presented using NVivo 11 software as a matrix coding query.

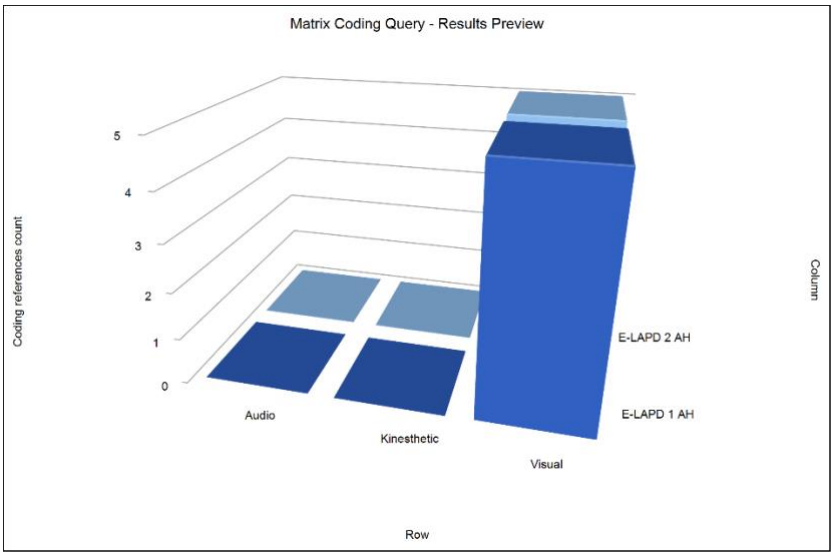


Figure 3. Student AH Learning Syle Frequency

Based on the diagram above, student AH uses a visual learning style. The frequency of auditory and kinesthetic learning is classified as low. The frequency of AH students' learning styles that tend to be visual is reinforced by the results of student interviews that state “Stimulus can give an idea of the relationship of matter between moles and the number of particles. The pictures provided are also helpful and easy to understand the material”, “With this stimulus, it can provide an overview of the material of the relationship between moles and mass. Earlier, there was a picture of 12 oranges and 12 eggs. Actually this is more because it differentiates them in their mass, they are not the same. The pictures given in the summary material and practice questions are very clear”.

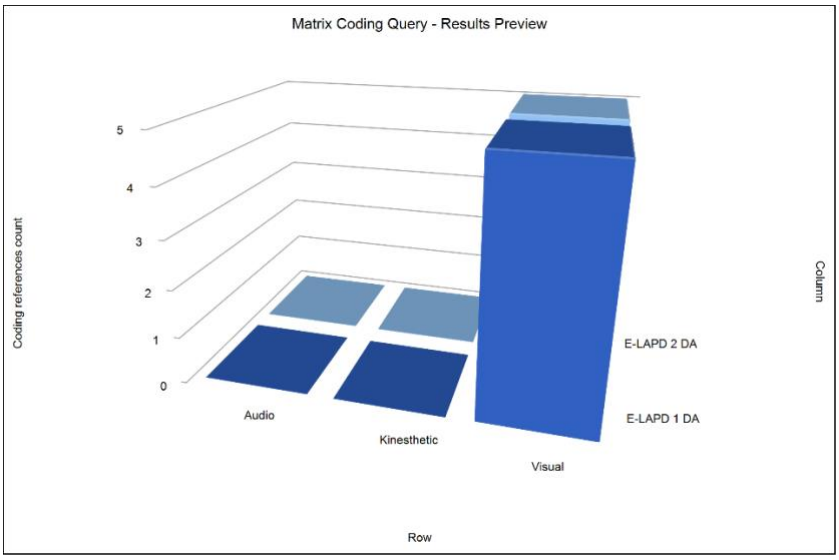


Figure 4. Student DA Learning Style Frequency

The learning style diagram of the second student with the initials DA shows the frequency of learning using a visual learning style. The frequency of auditory and kinesthetic learning of student DA is relatively low. The frequency of DA students' learning styles that tend to be visual is strengthened by the results of student interviews which state "The existence of stimuli can have an overview and relate to the number of particles. The images given such as images of iron, sodium chloride, and water are interesting, because later they understand how the particles are arranged. I like that visualization". “Presented with a picture of 12 limes and eggs which shows that 1 lime is not the same mass as 1 egg, meaning it can explain that 1 mole of the substance has a different period. The picture presented is clear, for the periodic table it is clear but a little small".

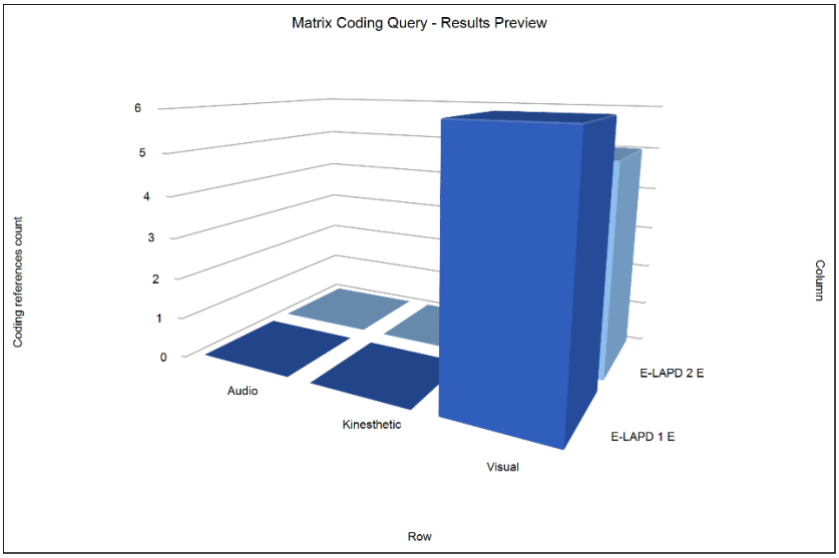


Figure 5. Student E Style Learning Frequency

Based on the learning style diagram of the third student with the initials E, the learning frequency using a visual learning style is seen. For the frequency of

auditory and kinesthetic learning, student E is classified as low. The frequency of the learning style of student E which tends to be visual is strengthened by the results of student interviews which state "Explanations and pictures can already give an idea of the material of the relationship between moles and the number of particles. The pictures presented are helpful and provide insight into daily life to understand them. Like Fe is iron". “The explanation of the picture in the stimulus can give a view of what oranges and eggs look like. Oranges and eggs weigh differently, so when weighed they weigh differently. The images presented are interesting and help in understanding the material".

From the learning style mapping results of students with intellectual disabilities, the highest learning frequency was obtained using a visual learning style. The interview result reinforces that three students were interested and helped by the visualization in images. The image provided helped students to understand and describe the sub-material on the relationship between mole and the number of particles, and the relationship between mole and mass. Using simple language in material summary, the steps in the example questions, and the Let's Practice section made it easier for students.

Student Learning Outcomes

1. Relationship between mole and the number of particles

Table 4. Pretest and posttest results for the sub-material on the relationship between mole and the number of particles

Student name	Pretest	Posttest
AH	0	100
DA	0	100
E	0	100

There are three questions about the relationship between mole and the number of particles. The three students got a score of 0 in the pretest and a score of 100 in the posttest.

2. Relationship between mole and mass

Table 5. Pretest and posttest results for the sub-material on the relationship between mole and mass

Student name	Pretest	Posttest
AH	0	100
DA	0	100
E	0	100

The sub-material has two questions on the relationship between moles and mass. The three students got a score of 0 in the pretest and a score of 100 in the posttest.

In the pretest questions, the three students answered wrong on all indicators about the relationship between moles and the number of particles and the relationship between moles and mass. In the first question, the category of student errors is conceptual errors in identifying the types of particles. The category of student errors in the second question is conceptual errors, where students do not know the number of particles contained in 1 mole of substance. The category of student errors in the third question is calculation errors in

determining the number of moles of a substance. In the fourth category of student errors, namely calculation errors in determining the relative molecular mass of a compound. In the fifth question category of student errors, namely calculation errors in calculating the mass of a substance.

The increase in scores from pretest to posttest shows that E-LAPD serves as an effective medium to strengthen conceptual understanding of mole concept material. In the E-LAPD, a summary of the material and practice questions are given to determine the particle type of a substance accompanied by supporting images associated with examples in everyday life. With pictures, it can simplify the material into visual information that is easy for students to understand. In addition, the calculation practice is presented with simple step-by-step instructions that make it easier for students to understand and solve the problem.

Looking at the two sub-topics as a whole, namely the relationship between moles and the number of particles and the relationship between moles and mass, three students with intellectual disabilities experienced a significant increase in learning outcomes. This significant improvement is shown in the table and diagram below.

Table 6. Pretest results on two sub-materials

Student name	Pretest sub-material on the relationship between mole and the number of particles	Pretest sub-material on the relationship between mole and mass	Average
AH	0	0	0
DA	0	0	0
E	0	0	0

Table 7. Posttest results on sub-materials

Student name	Posttest sub-material on the relationship between mole and the number of particles	Posttest sub-material on the relationship between mole and mass	Average
AH	100	100	100
DA	100	100	100
E	100	100	100

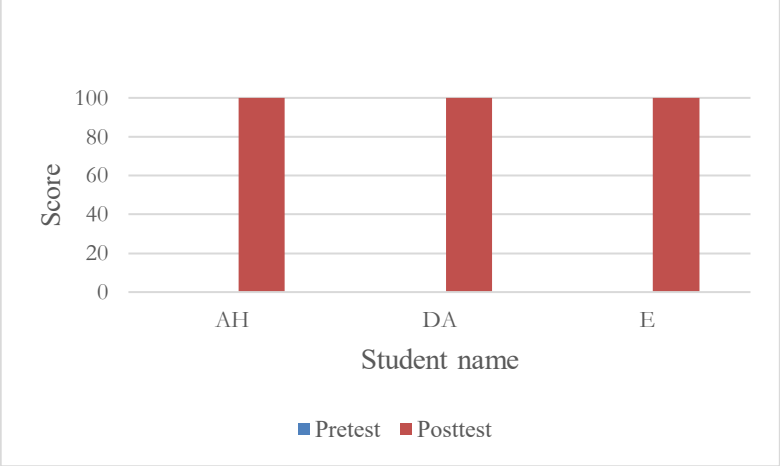


Figure 6. Pretest and posttest graphs on two sub-materials

Quantitative data (pretest and posttest scores) showed a 100% increase in scores, this was reinforced by the results of student interviews which stated that image visualization helped students to understand and describe the sub-material on the relationship between mole and the number of particles, and the relationship between mole and mass. In addition, the use of simple, step-by-step language on calculation questions can also make it easier for students to understand the material.

Discussion

The results of the learning style of the three students with intellectual disabilities tended to be dominant in visual learning style. This is shown in matrix coding queries, the frequency of visual learning styles is higher than the frequency of auditory and kinesthetic learning styles. This is in line with research by AI et al (2023) which found that the characteristics of learning styles of students with disabilities have visual learning styles. The use of learning media in the form of pictures or videos is easier to understand because you can see evidence directly related to the material presented (Al et al, 2023). This is because the student has the inability to think abstractly or imagine learning material. Fleming & Milss (1992) mentioned that visual learning styles are easier to process information more easily through pictures, diagrams, and graphs. Individuals with visual learning styles tend to easily remember information presented in visual form (Nasrul et al, 2025). The characteristics of students with disabilities in general are difficulties in understanding abstract concepts, taking longer to process information and develop memory skills (Sari et al, 2025).

This study found that the learning outcomes of the three students increased by 100%. The improvement in student learning outcomes was also conveyed by Nuzulia and Sudirman, but the percentage increase was not shown in the study. Based on research conducted by Nuzulia and Sudirman (2020), it is stated that the use of student worksheets shows an increase in pretest and posttest. This is shown in the results of the pretest of students who are less than the KKM (< 70) as many as 3 people, then in the posttest there are no students who get a score below the KKM (>70) (Nuzulia & Sudirman, 2020).

The effectiveness of the E-LAPD used is associated with several mechanisms, namely (1) the existence of visualization; The e-LAPD provides a visual representation that is associated with examples in everyday life. For students with intellectual disabilities who have deficiencies in abstract thinking (D. Y. Sari et al., 2025), the use of visualization can help understand concretely, interestingly, and funly. (2) Second, simplified language: the use of simple language aims to make it easier for students to understand the material presented. Research conducted by Nugrahaeni (2020) shows that students with intellectual disabilities need repetition in the delivery of material in order to be able to accept and remember what has been conveyed by the teacher (Nugrahaeni, 2020). This can be a strong reason that the use of simplified language can make it easier for students to understand the material. (3) Third, direct feedback: the interactive nature of Liveworksheet provides feedback allowing learners to minimize misunderstandings in the material. In line

with the theory of Behaviorism which emphasizes learning that presents stimuli with direct feedback (Juraganda et al., 2025)

The findings of this study show that 2 out of 3 students with average IQ scores of 104 and 108 still need individualized education. This may be because students may have sufficiently developed information processing skills and the ability to solve complex calculation problems still require guidance.These findings are in line with Iqbal et al (2021) who stated that academic achievement and intelligence have a complex relationship. The academic achievement of students with average or low IQ is almost the same as the academic achievement of students with higher IQs. This can be due to the hard work of students with low or average IQs. Therefore, IQ cannot be attributed to academic performance (Iqbal et al., 2021).

The findings of the study showed that all three students got a perfect score on the pretest of 100. This can show the effectiveness of the E-LAPD, but there are several factors that are considered, including (1) The scope of assessment is limited, where the pretest and posttest consist of 5 questions for two sub-topics. (2) Potential similarities between practice and assessment. There is similarity between pretest and posttest questions with practice questions in E-LAPD which allows for direct and accurate knowledge transfer to students. Despite the limitations of the study, significant improvements in the three students showed that the E-LAPD used could assist students in understanding and reinforcing concepts in the mole concept material.

CONCLUSION

This research aims to analyze learning styles and outcomes of students with intellectual disabilities who receive individual education on the concept of mole after using E-LAPD. The research results indicated that the three students who have intellectual disabilities' learning style frequency is a visual. This was reinforced by pretest and posttest results, which indicated a significant increase in the three students. These findings imply that the use of the Electronic Student Activity Sheet also considers the addition of visualizations to materials associated with daily life to simplify the material into visual information. The novelty of this study lies in the application of E-LAPD for individualized education, where in previous studies it has not studied the use of E-LAPD for individual education in chemistry. Although this research is limited to a small number of samples, the results obtained can provide an overview for the development of learning media for students with intellectual disabilities. For recommendations to increase the learning results of students with intellectual disabilities, it is recommended to develop and use E-LAPD with an individual learning approach for other chemistry materials and accompanied by visualizations to support explanatory sentences.

REFERENCES

Al, W. I. H., Sukmanasa, E., & Irdiyansyah, I. (2023). Analisis Gaya Belajar Visual pada

Siswa Tunagrahita Kategori Sedang. Jurnal Pendidikan Kebutuhan Khusus, 7(2), 167–172. https://doi.org/https://doi.org/10.24036/jpkk.v7i2.797

Anidi, & Anlianna. (2022). Permasalahan Anak Disabilitas Intelektual dan Disabilitas Mental di Sekolah. Arus Jurnal Pendidikan (AJUP), 2(3), 233–243. https://doi.org/https://doi.org/10.57250/ajup.v2i3.134

Arisandi, S. N. (2022). Penggunaan Media Pembelajaran Liveworksheets Dalam Meningkatkan Hasil Belajar Kimia Pada Materi Konsep Mol. Jurnal Inovasi Pendidikan Menengah, 2(3), 306–316. https://doi.org/https://doi.org/10.51878/secondary.v2i3.1361

Arriani, F., Agustiawati, Rizki, A., Widiyanti, R., Wibowo, S., Tulalessy, C., & Herawati, F. (2021). *Panduan Pelaksanaan Pendidikan Inklusif*. Jakarta: Pusat Kurikulum dan Perbukuan Badan Penenlitian dan pengembangan dan Perbukuan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Basri, Y., Irhasyuarna, Y., & Khairunnisa, Y. (2024). Pengembangan E-Lkpd Berbasis Liveworksheets Untuk Melatihkan Keterampilan Berpikir Kritis Peserta Didik pada Materi Green Chemistry. Journal of Banua Science Education, 4(2), 54–65. https://doi.org/https://doi.org/10.20527/jbse.v4i2.265

Creswell, J. W. (2009). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. (Third Edition). California: SAGE Publications, Inc.

Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative and Quantitative Approaches* (Fifth Edition). California: SAGE Publications, Inc.

Febiola, C. H., & Azhar, M. (2025). Validitas dan Praktikalitas E-LKPD Interaktif Berbantuan Canva AI dan Liveworksheet Berbasis Inkuiri Terstruktur Pada Materi Konsep Mol Fase F SMA. Jurnal Inovasi Pendidikan Matematika Dan IPA, 5(4), 1989–2000. https://doi.org/https://doi.org/10.51878/science.v5i4.7830

Hamidah, N., Haryani, S., & Wardani, S. (2018). Efektivitas Lembar Kerja Peserta Didik Berbasis Inkuiri Terbimbing Untuk Meningkatkan Hasil Belajar Siswa. Jurnal Inovasi Pendidikan Kimia, 12(2), 2212–2223. https://doi.org/https://doi.org/10.15294/jipk.v12i2.7460

Hidayat, A., Rasmawan, R., Oktavianty, E., & Sutamah, S. (2024). Peningkatan Aktivitas Dan Hasil Belajar Melalui Pendekatan Kimia Kontekstual Pada Materi Konsep Mol. Jurnal Kajian Pembelajaran Dan Keilmuan, 8(2), 240–247. https://doi.org/10.26418/jurnalkpk.v8i2.77792

Iqbal, K., Chaudhry, S. R., Lodhi, H. N., Khaliq, S., Taseer, M., & Saeed, M. (2021). Relationship between IQ and academic performance of medical students. The Professional Medical Journal, 28(02), 242–246. https://doi.org/10.29309/tpmj/2021.28.02.4348

Juraganda, C. S., Laowo, N., Butar-butar, N. F., Situmorang, P. R. A., Sitepu, R. Z. M., Manik, E., & Pangaribuan, F. (2025). Memanfaatkan Teori Belajar Behaviorisme Untuk Memperkuat Pembelajaran Deep Learning. NDRUMI: Jurnal Ilmu Pendidikan Dan Humaniora, 8(1), 46–58. https://doi.org/https://doi.org/10.57094/ndrumi.v8i1.3115

Lestari, D. D., & Rasto. (2024). Peran Motivasi Belajar Dalam Memoderasi Pengaruh Whatsapp Group terhadap Hasil Belajar Siswa. Jurnal Pendidikan Manajemen Perkantoran, 9(1), 1–10. Retrieved from https://doi.org/10.17509/jpm.v9i1

Maesaroh, D. L., Sari, N. A., Putri, E. O., & Zulfahmi, M. N. (2025). Strategi Pembelajaran Program Pelayanan Individual Siswa ABK di SD Inklusi. Jurnal Nakula : Pusat Ilmu Pendidikan, Bahasa Dan Ilmu Sosial, 3(2), 21–30. https://doi.org/10.61132/nakula.v3i2.1585

Mayung, R. A., Tandiayu, W. N., Untu, Z., & Widajanti, A. (2023). Analisis Profil Gaya Belajar Peserta Didik Untuk Pembelajaran Berdiferensiasi Pada Pelajaran

Matematika. Prosiding Seminar Nasional PPG Universitas Mulawarman, 4(2020), 224–230. https://doi.org/https://doi.org/10.30872/semnasppg.v4.3101

Mboa, M. N., & Ajito, T. (2024). Meningkatkan Hasil Belajar dengan Menggunakan Model Pembelajaran Problem Based Learning (PBL) pada Materi Peluang Siswa Kelas VIII SMPK St. Theresia Kupang. Journal on Education, 06(02), 12296–12301. https://doi.org/https://doi.org/10.31004/joe.v6i2.5074

Moningka, A. D., Dapa, A. N., Marentek, L. K. ., & Siwi, F. D. (2024). Program Pembelajaran Individual untuk Meningkatkan Konsentrasi Bagi Anak Dengan Attention Deficit Hyperactyvity Disorder (Adhd) di SD GMIM VI Tomohon. Jurnal Ilmiah Wahana Pendidikan, 10(24), 942–947.

Nengsi, R., Malik, A., & A Natsir, A. F. (2021). Analisis Perilaku Peserta Didik Slow Learner (Studi Kasus Di MTsN Makassar). Education and Learning Journal, 2(1), 49. https://doi.org/10.33096/eljour.v2i1.93

Nugrahaeni, A. D. (2020). *Gangguan Berbahasa pada Anak Berkebutuhan Khusus dan Implikasinya Bagi Pembelajaran Bahasa Indonesia di SLB Negeri 1 Pemalang*. Universitas Pancasakti Tegal.

Nuzulia, N., & Sudirman. (2020). Pengembangan Lembar Kerja Siswa Dengan Strategi React Pada Tema " Bermain di Lingkunganku " untuk Siswa Tunagrahita Kelas IV di Home Schooling Primagama Malang. Madrasah Jurnal Pendidikan Dan Pembelajaran Dasar, 12(2), 130–139. https://doi.org/https://doi.org/10.18860/mad.v12i2.7538

Purwandari, E., Suparno, S., & Purwandari, P. (2024). Keterampilan Sosial Siswa Usia Dini dengan Hambatan Intelektual di Sekolah Inklusif. Edukatif : Jurnal Ilmu Pendidikan, 6(4), 2906–2915. https://doi.org/10.31004/edukatif.v6i4.7004

Puspita, D. A. M., Subandowo, S., & Karyono, H. (2024). Pengembangan Media Pembelajaran Pada Mata Pelajaran Program Khusus Pengembangan Diri Untuk Anak Disabilitas Intelektual Berbasis Mobile Learning. JIPI (Jurnal Ilmiah Penelitian Dan Pembelajaran Informatika), 9(1), 320–326. https://doi.org/10.29100/jipi.v9i1.4762

Sa'diyah, H., & Arifin, M. B. U. B. (2025). Learner Worksheets As a Learning Evaluation for Students: an Analysis of a Study of Slow Learner Students in Primary School: Lembar Kerja Peserta Didik Sebagai Evaluasi Pembelajaran Bagi Siswa: Analisis Studi Siswa Slow Learner Di Sekolah Dasar. Educate: Jurnal Teknologi Pendidikan, 10(1), 28–40.

Sari, D. Y., Ulfah, M., Rahayu, D., Khanafiyah, A., Asiyah, S., Baity, L. N., … Munawaroh, H. (2025). Analisis Pengaruh Penggunaan Media Pembelajaran Interaktif pada Anak Tunagrahita. Bhinneka: Jurnal Bintang Pendidikan Dan Bahasa, 3(1), 376–385. https://doi.org/10.59024/bhinneka.v3i1.1221

Sari, R. I., Rasmiwetti, & Wulandari, P. A. (2025). Pengaruh Gaya Belajar Terhadap Hasil Belajar Kimia Kelas XI Sma Negeri 2 Tambang. Journal of Research and Education Chemistry (JREC), 7(1), 185–201. https://doi.org/10.25299/jrec.2025.vol7(1).21875 Pendahuluan

Sari, S. N., Sarwidi, S., Nugraheni, F., Musyafa, A., & Sari, S. N. (2025). Identifikasi Karakteristik Desain Temporary Modular Shelter pada Bencana di Indonesia melalui Nvivo dan Review Literatur. Jurnal Penelitian Inovatif, 5(3), 1929–1938. https://doi.org/10.54082/jupin.1592

Siahaan, M. Y., Sahputra, R., Sartika, R. P., Enawaty, E., & Rasmawan, R. (2022). Pengaruh Penggunaan LKPD Berbasis Discovery Learning terhadap Hasil Belajar Siswa pada Materi Konsep Mol. Edukatif : Jurnal Ilmu Pendidikan, 4(5), 6678–6689. https://doi.org/10.31004/edukatif.v4i5.3390

Sukarmin, Poedjiastoeti, S., Novita, D., Lutfi, A., & Susanti, L. (2020). Implementation of

Interactive Multimedia and Kit with Writing-to-Learn Strategy on the Chemistry in Daily Life Topic for Junior High School with Disabilities. Proceedings of the 7th Mathematics, Science, and Computer Science Education International Seminar, MSCEIS 2019. https://doi.org/10.4108/eai.12-10-2019.2296331

Supit, D., Melianti, M., Lasut, E. M. M., & Tumbel, N. J. (2023). Gaya Belajar Visual, Auditori, Kinestetik terhadap Hasil Belajar Siswa. Journal on Education, 5(3), 6994–7003. https://doi.org/10.31004/joe.v5i3.1487

Susanty, H. (2022). Problematika Pembelajaran Kimia Peserta Didik Pada Pemahaman Konsep Dan Penyelesaian Soal Soal Hitungan. Al Qalam: Jurnal Ilmiah Keagamaan Dan Kemasyarakatan, 16(6), 1929. https://doi.org/10.35931/aq.v16i6.1278

Teresa, T., Kurniati, T., & Fadhilah, R. (2022). Pengembangan Elektronik Lembar Kerja Peserta Didik (E-Lkpd) Berbasis Liveworksheet Materi Konsep Mol Pada Siswa Kelas X Mipa Man 3 Pontianak. Jurnal Ilmiah Ar-Razi, 10(1), 13–19. https://doi.org/10.29406/ar-r.v10i1.3245

Wahyu K, Y. V., Herunata, & Silviani. (2025). Implementation of Learning Cycle 7E Assisted By Digital Worksheet To Improve Students' Learning Outcomes and Motivation. Jurnal Pendidikan Kimia FKIP Universitas Halu Oleo, 10(2), 302–315. https://doi.org/https://doi.org/10.36709/jpkim.v10i2.199

Wardani, N. W., Kusumaningsih, W., & Kusniati, S. (2024). Analisis Penggunaan Media Pembelajaran terhadap Hasil Belajar Siswa Sekolah Dasar. Jurnal Inovasi, Evaluasi, Dan Pengembangan Pembelajaran, 4(1), 134–140. https://doi.org/https://doi.org/10.54371/jiepp.v4i1.389

Wiratrianida, S., & Sujarwanto. (2024). Pengelolaan Pendidikan Inklusif Bagi Peserta Didik Disabilitas (Studi Kasus Di Smkn 3 Probolinggo). Unesa, 19(3), 1–13.