Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES
P-ISSN 2581-1657
E-ISSN 2581-2203

A Comparison of Students' Perceptions of Chemistry Learning via Google Classroom, E-Learning Madrasah, and Discord

Egi Syahrah Anggraeni, Muhamad Rindoi, Deveronica Karning Saputri, Dinar Prasiwi, Sri Lestari, Sukemi*
Chemistry Education, Universitas Mulawarman, Samarinda, 75123, Indonesia

ARTICLE INFO

Article history:

Received: 03 Oct 2025
Revised: 13 Oct 2025
Accepted: 27 Oct 2025
Published online: 15 Nov 2025

Keywords:

Chemistry Learning,
Discord,
E-learning Madrasah,
Google Classroom,
Perception

* *Corresponding author:*

E-mail: kekem.basri@gmail.com

Article Doi:

https://doi.org/10.31258/jes.9.6.p.5833-5850

A B S T R A C T

Online learning non face-to-face interaction can be effectively supported by learning management systems (LMS) such as Google Classroom, E-learning Madrasah, and Discord. This study aims to determine the differences in students' perceptions about chemistry learning via Google Classroom, E-learning Madrasah, and Discord. The perceptions measured include aspects of ease of access, benefits, communication and interaction, instruction delivery, and student satisfaction. This research is a retrospective comparative quantitative study, involving 68 students from SMAN 2 Samarinda (Google Classroom), 73 students from MAN 1 Samarinda (E-Learning Madrasah), and 74 students from SMAN 13 Samarinda (Discord) as sample. Data were collected via documentation and analyzed used the Kruskal-Wallis and Dunn's Post-hoc tests. The Kruskal-Wallis test revealed a significant difference in perceptions (0.003<0.05). Dunn's post-hoc analysis indicated significant differences between Google Classroom and E-Learning Madrasah (sig. <0.001) and between Google Classroom and Discord (sig. 0.041), but there was no significant difference between E-learning Madrasah and Discord. Overall, students' perceptions of chemistry learning using Google Classroom were better than using E-learning Madrasah and Discord.

1. Introduction

Online learning, also known as e-learning, is an educational method that utilizes the internet to support students without the need for face-to-face interaction. Online learning can be done with internet access and sophisticated digital-based technology (Budianti & Lubis, 2022). E-learning covers various types of education conducted individually or in groups through electronic devices, such as computers or networks (Sasmal & Roy, 2021). According to Clark and Mayer (2016), optimally designed e-learning enhances learning outcomes through the use of interactivity, visual elements, and audio that support deeper conceptual understanding. Compared to conventional learning methods, e-learning is also more cost-effective and reaches a larger number of students.

With e-learning, students can access lessons more easily and without being limited by distance or time. This makes the e-learning platform a strategic solution to meet comprehensive learning needs (Huda, 2023). Online learning in chemistry education faces many challenges due to the nature of the subject, which requires an understanding of concepts and experimental practices (Taruklimbong & Muniarti, 2024). Online learning is divided into synchronous and asynchronous learning. According to Ahmad et al. (2023), synchronous learning enables real-time interaction between teachers and students through platforms such as video conferencing, chat, or webinars. This supports spontaneous communication and enhances a sense of community in the classroom. Conservely, asynchronous learning does not require teachers and students to be together at the same time. Materials such as modules, videos, and forums can be accessed at any time, allowing learning to be flexible and tailored to individual rhythms. Synchronous learning generally utilizes applications such as Zoom, Google Meet, Microsoft Teams, and Cisco Webex, while asynchronous learning often uses Learning Management Systems (LMS) such as Moodle, Google Classroom, Canvas, Edmodo, E-learning Madrasah, and Schoology, as well as video platforms such as YouTube or Khan Academy for independent delivery of material (Singh & Thurman, 2019; Kementerian Agama RI, 2020b).

Google Classroom is an online learning tool designed to make it easier for teachers to exchange assignments, run lessons, and interact with students (Iftakhar, 2016). Additionally, Google Classroom gives students access to educational materials, turn in assignments, gives them instant feedback, and integrates with other Google apps like Meet, Docs, Slides, and Drive to manage student evaluations (Abuzant et al., 2021). However, E-learning Madrasah, developed by the Directorate of KSKK Madrasah, Ministry of Religious Affairs of the Republic of Indonesia, is a distance learning for the madrasah environment (Kementerian Agama RI, 2020a). This portal offers both teachers and students access to services including open material posting, assignment submission, courage evaluation, discussion forum, and learning outcome report (Kementerian Agama RI, 2020a). Teachers can also manage classes, submit materials in the form of texts, videos, or other files, and deliver assignments (Kementerian Agama RI, 2020b).

Students can access resources, complete assignments, and engage in conversations asynchronously, based on their own schedules and learning preferences (Ahmad et al., 2023). Discord is a platform for instant chat that allows users to transmit audio, video, and picture files. By fostering an interactive online communication environment that supports digital-based learning, it has been utilized as an effective instrument to assist learning (Huda, 2022). Additionally, Discord can facilitate teacher student cooperation and communication, offer real-time feedback, and assess students' understanding (Dewantara et al., 2020). You may also use Discord to send documents, images, and videos in PDF and PowerPoint formats (Wijayanto et al., 2021). This can all be done without face-to-face interaction. Discord's features make it possible to offer a dynamic approach to raising involvement and engagement in online learning.

A key factor in influencing the effectiveness of the online learning process is how students perception the Learning Management System (LMS). This perception reflects the extent to which students perceive the effectiveness of the learning platform, which affects the quality of knowledge transfer and learning achievement (Hijah et al., 2023; Az-zahra et al., 2019). Students' perception of chemistry lessons can be understood as the process of interpreting stimuli that appear in the chemistry learning environment, which includes subjects, materials, and all aspects related to the learning process itself. This perception can be positive or negative, depending on how students interpret their learning experiences in the context of chemistry. The assessment is influenced by students' interactions with subject matter, teaching methods, learning environment, cultural background, ability to grasp a problem, and learning experiences that students have (Irmayanti et al., 2023).

Different e-learning platform tools, such Google Classroom, E-learning Madrasah, or Discord, change the way students learn and cause them to interpret and view the process in different ways (Huda, 2023). As chemistry requires both conceptual knowledge and experimental practice, differences in philosophy, interface design, features, delivery methods, and accessibility can significantly affect how students perceive and how effective their learning is, even though they are designed to support distance learning (Muliadi & Elmunsyah, 2024).

LMS has emerged as the popular online learning choice, particularly for chemistry instruction, as technology has grown increasingly interwoven into education. Google Classroom, E-learning Madrasah, and Discord are platforms used in educational settings, but studies comparing students' perceptions of chemistry learning on these three platforms are limited. Previous research has shown that students generally have a more positive impression of Google Classroom than Zoom Meetings in online learning contexts, including a study by Putri et al. (2023). Irmayanti et al. (2023) found that both instructors' and students' perceptions on the use of Google Classroom apps in chemistry teaching fell into the favorable (positive) category findings. Based on previous research findings, there are currently relatively few studies examining students' attitudes toward learning management systems (LMS), especially in chemistry classrooms. This is especially true in comparison to sites such as Discord, E-learning Madrasah, and Google Classroom. Students' perceptions of the three platforms are compared in this study by focusing on aspects such as accessibility, benefits, communication and engagement, instruction delivery, and student satisfaction. This study is expected to provide new insights into the dynamics of student perceptions and a basis for educators to select and optimize learning management systems (LMS) that align with chemistry education goals, resulting in a more effective and meaningful learning experience.

2. Methodology

This study is a retrospective comparative quantitative research to explore a comparison in student perceptions of the use of Google Classroom, E-learning Madrasah and Discord in learning chemistry. The retrospective model is a method

of data analysis that looks at past occurrences. Measurements are performed utilizing data that has previously occurred or passed, and research is carried out after the event being studied has occurred (Sembiring et al., 2023). The research population consists of the students who have used the three e-learning systems. The samples included 68 students from SMAN 2 Samarinda instruction via Google Classroom, 73 students from MAN 1 Samarinda instruction via E-learning Madrasah, and 74 students from MIPA SMA Negeri 13 Samarinda instruction via Discord. Aspects of perception such as ease of access, benefits, communication and interaction, instruction delivery, and student satisfaction were measured. Data on student perceptions were gathered using documentation techniques from data collected from prior studies (Prasiwi, 2022; Rindoi, 2021; Saputri, 2022). IBM SPSS Statistics Version 27 was used to do statistical testing on the data, including the normality test, the difference test and the ranking test using the Kruskall-Wallis, and an additional test using Dunn's Post-hoc test.

3. Results and Discussion

Chemistry learning using Goole Classroom involves class X as many as 6 classes with scientific method material, the nature of science, laboratory safety, and the role of chemistry in life. Of the total population of 216 students, the respondents of this study were 68 people consisting of 20 male and 48 female students. Meanwhile, chemistry learning using E-learning Madrasah was implemented in the MIPA department, with details of classes X-XII IPA each as many as 3 classes. The total population was 216 students and the respondents in this study were 73 students who were students and female students. As for the implementation of chemistry learning using Discord involves class X IPA as many as 3 classes, class XI IPA as many as 3 classes, and XII IPA as many as 2 classes, where chemistry learning in class X (atomic structure) class XI (stoichiometry and thermochemical material) and class XII (salt hydrolysis and buffer solution). Of the total population of 279 students, the respondents of this study were 74 MIPA majors consisting of 30 male and 44 female student.

The school used direct learning and flipped classroom models for chemistry learning. The direct learning model is a pedagogical framework expressly crafted to enhance student comprehension, particularly in procedural and declarative knowledge, through systematically provided stages by the teacher. It uses interactive media to highlight conceptual understanding, which helps students understand instructions and content (Lase & Tangkin, 2022). It is very important in modern education because it lets students move at their own pace and in the way that works best for them (Majid & Arifin, 2025). Chemistry learning takes place in a virtual or online classroom environment by providing material first in Google Classroom/E-learning Madrasah/Discord related to the chemistry topic to be studied, then direct learning (virtual face-to-face) is carried out.

Quantitative data were collected used a questionnaire with statements to obtain student perceptions of chemistry learning using Google Classroom, E-learning Madrasah, and Discord. The list of statements is closed by providing four answer

options (strongly agree, agree, disagree, and strongly disagree) with a linkert scale. The results of quantitative data were then followed up with interviews to see the reasons students chose the answer choices in the questionnaire. Respondents in the interviews chosen were students who were considered to understand the data needed. This interview process will provide knowledge related to feelings, perceptions, and knowledge of the object. The interview data and documentation obtained will be qualitative data analyzed to determine student perceptions of chemistry learning using Google Classroom, E-learning Madrasah, and Discord. Questionnaire Students' perceptions of chemistry learning using Google Classroom, E-learning Madrasah, and Discord is displayed in Table 1.

Table 1. Questionnaire Students' perceptions of chemistry learning using Google Classroom, E-learning Madrasah, and Discord

No.	Statements
Ease of Access	
1	Login to Google Classroom/E-learning Madrasah/Discord easily
2	Accessing materials through Google Classroom/E-learning Madrasah/Discord is easy
3	Sending and receiving assignments in Google Classroom/E-learning Madrasah/Discord is easy
4	Navigating the Google Classroom/E-learning Madrasah/Discord system is easy
Benefit	
5	Learning activities in Google Classroom/E-learning Madrasah/Discord are good
6	Google Classroom/E-learning Madrasah/Discord is a good medium for social interaction (teacher-student and student-student)
7	Google Classroom/E-learning Madrasah/Discord really helps me to submit my assignments on time
8	Feedback from teachers on Google Classroom/E-learning Madrasah/Discord is very useful
9	The scoring on Google Classroom/E-learning Madrasah/Discord helps me monitor my progress and understanding of the material being taught
Communication and Interaction	
10	The delivery of learning objectives, assessments, and subject matter is done appropriately with the help of Google Classroom/E-learning Madrasah/Discord
11	I feel comfortable talking (communicating) in learning using Google Classroom/E-learning Madrasah/Discord
12	The teacher helps students stay engaged and participate in productive discussions
13	I feel comfortable interacting with other participants in learning activities
14	My views/responses/answers in learning are recognized by other students during learning activities
15	Teachers enthusiastically teach and explain learning materials through Google Classroom/E-learning Madrasah/Discord
Delivery Instructions	
16	Teachers are friendly, welcoming and approachable
17	The teacher gives clear instructions on how to participate in learning activities
18	The teacher clearly communicates important deadlines/due dates/timeframes for learning activities
19	The teacher communicates clearly about important materials
20	The teacher helps students to stay on task
Student Satisfaction	
21	The teacher provides feedback that enables me to understand the material
22	Learning using Google Classroom/E-learning Madrasah/Discord helps me understand the material
23	I would recommend learning using Google Classroom/E-learning Madrasah/Discord to be applied to other subjects as appropriate

24	I like Google Classroom/E-learning Madrasah/Discord because it brings out my initiative and boosts my motivation to learn

The results of statistical tests and the average scores of students' opinions regarding learning chemistry using Google Classroom, E-learning Madrasah, and Discord are displayed in Tables 2–5.

Table 2. Average score for each aspect of students' perceptions

No.	Aspect	Google Classroom		E - Learning Madrasah		Discord	
		Average Score	Category	Average Score	Category	Average Score	Category
1	Ease of Access	3.29	Strongly agree	3.12	Agree	3.06	Agree
2	Benefit	3.20	Agree	2.95	Agree	3.02	Agree
3	Communication and Interaction	3.11	Agree	2.86	Agree	3.20	Agree
4	Delivery Instructions	3.27	Strongly agree	3.03	Agree	3.25	Strongly agree
5	Student Satisfaction	3.16	Agree	2.89	Agree	2.72	Agree
	Total	3.20	Agree	2.97	Agree	3.05	Agree

Students had positive opinions about Google Classroom for studying chemistry, as seen in table 2, where they overwhelmingly concur that it is user friendly. Students concur that Google Classroom enhances their educational experience. In terms of communication and interaction, students concur that this platform fosters positive teacher-student relationships. Students also strongly agreed with the ease of sending instructions. Overall, the student satisfaction level shows that students agree that this platform can fulfill their chemistry learning needs. With E-learning Madrasah, students get a positive impression. Students agreed that E-learning Madrasah is easily accessible, provides benefits, as well as ease of communication and interaction on chemistry learning, and provides ease of instruction delivery. Overall, the level of student satisfaction shows that students agree that this platform can meet the needs of chemistry learning. Also Discord showed positive student perceptions. Students agree that Discord is easy to access, provides benefits, as well as ease of communication and interaction in chemistry learning. In addition, students strongly agreed that Discord makes it easy to send instructions. Overall, the level of student satisfaction shows that students agree that this platform met their chemistry learning needs.

Table 3. Data normality test

	Media	Kolmogorov-Smirnov [a]		
		Statistics	df	Sig .
Student Perception	Google Classroom	0.146	68	0.001
	E - Learning Madrasah	0.134	73	0.003
	Discord	0.070	74	0.200

Students' perceptions of Google Classroom, E-learning Madrasah, and Discord have a Sig. value of 0.001, 0.003, and 0.200, respectively. According to table 3. non-parametric statistical technique (Kruskal-Wallis) is used to test the differences

between the three groups and the Sig value (Google Classroom and E-learning madrasah) is less than 0.05, indicating that the data is not considered to be normally distributed.

Table 4. Kruskal-Wallis difference test

	Student Perception
Kruskal-Wallis H	11.866
df	2
Asymp. Sig.	0.003

According to table 4, the difference test of students' perception through Google Classroom, E-learning Madrasah, and Discord reveals an acquisition of 0.003 (less than 0.05) (asymp. Sig. <0.05), indicating a significant difference between the three groups.

Table 5. Dunns post-hoc test

Sample 1-Sample 2	Test Statistics	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. [a]
E-Learning Madrasah - Discord	-14.607	10.255	-1.424	0.154	0.463
E-Learning Madrasah - Google Classroom	35.949	10.478	3.431	0.001	0.002
Discord- Google Classroom	21.342	10.443	2.044	0.041	0.123

Based on table 5. Dunn's Post-hoc test showed that there were significant differences in students' perceptions of chemistry learning between students taught with Google Classroom and E-learning Madrasah (sig. <0.001), and between students taught with Google Classroom and Discord (sig. 0.041), but no significant differences between students taught with E-learning Madrasah and Discord. These findings indicate that Google Classroom has a greater influence on students' positive perceptions in learning chemistry than the other two platforms, while E-learning Madrasah and Discord show similarities in terms of impact on students' perceptions.

Table 6. Ranks test

	Media	N	Mean Rank
Student Perception	Google Classroom	68	127.55
	E-Learning Madrasah	73	91.60
	Discord	74	106.21
	Total	215	

Table 6. shows the acquisition of mean rank through Google Classroom is higher than E-learning Madrasah and Discord. These results students' perceptions of chemistry learning using Google Classroom are more positive than students' perceptions of chemistry learning using E-learning Madrasah and Discord. These outcomes are directly correlated with the perceptions of the students, as seen in Table 2. The average score of Google Classroom is higher (3.11-3.29) with a total average score of 3.20 than the average score of E-learning Madrasah (2.86-3.12) with a total average score of 2.97 and the average score of Discord (2.72-3.25) with

a total average score of 3.05, according to the average score of each of the following aspect such as ease of access, benefits, communication and interaction, instruction delivery, and student satisfaction.

Students strongly agree that learning chemistry using Google Classroom is easier than learning it through E-learning Madrasah and Discord. This is influenced by the simple and practical login process in Google Classroom, where students simply use their Google e-mail address and enter the class code provided by the teacher to access the class (Ramadhani, 2019; Google, 2023). E-learning Madrasah requires login through the official website https://elearning.kemenag.go.id or a madrasah specific domain, with an account managed by the madrasah admin using a special username and password (Kementerian Agama RI, 2020a; Saputri, 2022). Discord has a more complicated process, requiring registration with name, email, and password, and then joining the server through an invitation code from the admin (Prasiwi, 2022; Lauricella et al., 2024). Benefit of Google Classroom is how simple it is to use on a variety of devices, including smartphones with Android and iOS apps and slow internet connections. (Al-Maroof & Al-Emran, 2018; Nursyahrina et al., 2021). In addition, Google Classroom has a simpler design in instructional interface compared to E-learning Madrasah which requires a stable internet network due to the large storage (Heryanto et al., 2023).

Although available in mobile web version, E-learning Madrasah is not always optimal and harder to access if the connection is slow. Internet access limitations mainly occur when used simultaneously by several classes (Ahmad et al., 2023). Similarly, Discord also requires a stable internet network due to its large storage. Discord also requires stable internet and tends to be difficult to access on low-end devices or poor connections, even though it is available on desktop, browser, and mobile applications (Jamaly et al., 2025). On Google Classroom, students can directly view the materials on the "Classwork" tab (Iftakhar, 2016), the materials are organized by topic, date or theme displayed neatly and chronologically (Google, 2023). In contrast, E-learning Madrasah and Discord display materials by module, but the consistency depends on the admin, and the download file format varies, which can make access difficult (Kementerian Agama RI, 2020a; Prasiwi, 2022).

Google Classroom is superior in the ease of managing assignments for chemistry learning compared to E-learning Madrasah and Discord. Students receive automatic notifications via email or app when a new assignment is posted, can work on assignments directly in Google Docs, Slides, or Forms without downloading files, and submit them with the "Submit" button for teachers to see instantly (Iftakhar, 2016; Google, 2023). The deadline for submitting assignments is clearly displayed on the Classroom calendar, task list, or email notifications, with the status of the assignment (submitted, returned, graded) easy to track. Students can also view teacher comments or revisions directly on the document (Google, 2023). While E-learning Madrasah displays assignments on the dashboard or assignment menu, but email notifications are often inactive. Students usually have to download the file, work on it offline, and then upload it back, which is sometimes constrained by the file format or internet connection (Kementerian Agama RI, 2020a). Submission deadline notifications are not always available, and teacher comments appear only

in the comments field, not directly on the student's document (Kementerian Agama RI, 2020a). On Discord, tasks are uploaded through dedicated channels or direct messages without an automated tracking system.

Monitoring deadlines and task status requires an additional bot or external system, with grading and feedback done through server features or PDF documents shared in the chat forum (Prasiwi, 2022; Jamaly et al., 2025). Despite supporting a variety of file formats, task management in Discord is less structured than Google Classroom. In terms of navigation, Google Classroom offers a simple and intuitive interface, allows quick access to assignments, materials, and announcements with integration of other Google services, and is new user-friendly (Iftakhar, 2016; Google, 2023). E-learning Madrasah has more complex navigation due to variations in development between madrasahs, so new students need more time to adapt (Kementerian Agama RI, 2020). While flexible for local customization, the system lacks consistency. Discord, originally designed for a community of gamers, also has a complex navigation that requires longer adaptation for new students to access assignments and materials (Lauricella et al., 2023). However, Discord excels in supporting interactive learning through high-quality text, voice and video communication (Jamaly et al., 2025).

On the benefits aspect, Google Classroom, E-learning Madrasah, and Discord have positive benefits, but each has different features. Google Classroom provides an integrated platform that makes it easy to manage assignments, assessments, discussions and materials. Its integration with Google Docs, Sheets, and Slides supports interactive and collaborative learning (Dewi et al., 2021). On the other hand, E-learning Madrasah is used to facilitate learning. Nonetheless, it has a more formal learning structure, with a module system organized based on the school curriculum. Although the chat and discussion forum features of this platform are not integrated with other platforms, they still allow students and teachers to interact with each other (Heryanto et al., 2023; Saputri, 2022). However, the Discord feature allows for quick and easy connections between friends and teachers (Lauricella et al., 2023).

Every post in Google Classroom contains a comment section that facilitates structured dialogues. Additionally, the notification system makes sure that everyone is aware of the most recent developments regarding educational activities. Because document sharing and real-time collaboration are so simple with other Google tools, students may engage in virtual conversations and connect effectively with their teacher (Iskandar et al., 2023). However, E-learning Madrasah also has features such as discussion forums, chat rooms, and video conferencing for two-way communication. These features allow teachers to form discussion groups based on specific topics or classes (Ahmad et al., 2023). E-learning Madrasah has a lower level of student interaction than Google Classroom, due to the interface arena and notification system that does not always work well, the expected response is slower. However, educators have greater control over school discussions and subject matter (Heryanto et al., 2023). While, with Discord teachers and students can communicate via text, voice, or video in the server conversation (Jamaly et al., 2025).

The automatic reminder system and Google Calendar integration help students manage their assignment collection schedule and remind them of their assignment deadline in Google Classroom (Abuzant et al., 2021). In contrast to E-learning Madrasah, the assignment submission system is still less effective. Connection or file format issues may hinder the assignment submission process. Students often have to work on their assignments offline after downloading the files and re-uploading. This increases the possibility of technical failures or delays. However, the reminder system can be improved by using WhatsApp and other communication platforms (Kementerian Agama RI, 2020a). Google Classroom has an assignment submission feature that allows teachers to quickly provide feedback on their students' assignments (Madaling et al., 2023). However, E-learning Madrasah feedback systems have some limitations.

According to Saputri (2022), teachers' comments are usually provided through the comments column rather than being directly integrated with students' work. With Google Classroom's scoring feature, teachers can keep track of students' grades and their work. E-learning Madrasah also has an assignment scoring and grading system that is created by teachers and accessible to students online. It also tracks students' progress and understanding, allowing low-scoring students to re-learn material they have not understood (Abuzant et al., 2021). Google Classroom allows students to easily access previous grades (Ahmad et al., 2023). According to Abuzant et al. (2021), using its features, teachers can communicate in a structured manner with their students, assign tasks, and upload open materials. On the other hand, E-learning Madrasah allows teachers to upload course materials to a teaching material menu that is easily accessible to students.

When submitting assignments, the platform automatically sets a deadline. However, since the notification system is often problematic, students usually contact teachers via WhatsApp if they miss an assignment submission. According to Prasiwi (2022), Discord provides reminders through built in notifications that pop up when there is a new message or notification. This feature helps student complete assignments on time and collect current information more effectively. Discord's communication features enable a fast and seamless feedback system, which facilitates user interaction (Rizal & Aesthetika, 2022). As a tool for completing tasks and activities, this platform can help teachers deliver learning objectives, assessments, and subject matter in a way that is appropriate and easily accepted by students (Prasiwi, 2022; Jannah et al., 2024).

In terms of communication and interaction, Google Classroom supports communication through a chat feature that allows students and teachers to discuss publicly, visible to the whole class. In addition, private comments provide a comfortable space for students to interact in learning (Abuzant et al., 2021). As Heryanto et al. (2023) that this platform enriches the learning process through its various features. Discord, as a communication platform, offers complete features such as text chat, voice and video channels, emoticons, and photo and document sharing, which support online learning (Putra, 2021). As a Voice over Internet Protocol (VoIP) based pedagogical tool, Discord has a simple interface and interactive interactions that enhance students' comfort in expressing understanding

of the material (Soeiro et al., 2024; Ardiansyah et al., 2021; Yulannugroho, 2023). Teachers can maximize active contributions through voice features to minimize passive students, such as calling randomly to answer questions, thus creating dynamic discussions (Prasiwi, 2022). Interaction between students in Discord often occurs via room chat without the need for a camera or microphone, allowing for a comfortable response between participants. The role of the teacher is required to actively provide an enjoyable learning experience during the learning process. With Discord, interaction between students is mostly done via chat rooms with chatting because there is no need to turn on the camera and mic. Google Classroom's class comment feature is the main discussion platform, where teachers encourage participation through question and answer sessions (Rindoi, 2021). Its interactive features also allow immediate feedback from classmates and teachers, supporting seamless communication (Nursyahrina et al., 2021).

Research by Wulandari & Panduwinata (2021) confirmed that students feel comfortable interacting with teachers and peers through this platform. In E-learning Madrasah, teachers guide participation via timeline, but students tend to only comment or like without in-depth discussion, preferring WhatsApp for active engagement (Saputri, 2022). E-learning Madrasah still allows safe and convenient remote interaction (Saputri, 2022). According to Huda (2022), Discord offers text and voice channel features that allow users to have live conversations with text and voice. This allows them to create an interactive and convenient online communication environment for their members. Sometimes Discord requires a stable network to use its video calling feature, so students may experience difficulties (Jannah et al., 2024). However, there are paid boosters that can be used to upgrade a better server in case of signal or Discord app interruption (Putra et al., 2021).

The class forum feature in Google Classroom allows students to see classmates' answers directly, which greatly supports discussion and Q&A. Rindoi (2021) research showed that during the discussion, no expression of opposition or negative tone was found, reflecting mutual respect between students. In contrast, in E-learning Madrasah, students can respond through the comment column, but this participation is rare, so appreciation is mostly given by the teacher alone (Saputri, 2021). Teachers on-time attendance in Google Classroom shows enthusiasm in teaching, supported by platform features that make it easy to deliver materials, explanations, and assignments without obstacles. Similarly, in E-learning Madrasah, teachers can organize materials, set schedules, provide immediate feedback, and create more interactive learning that is tailored to student needs even though it is limited by internet connections that are not always stable (Ahmad et al., 2023). In terms of communication, teachers in Google Classroom are friendly and approachable, with features that allow quick responses to students' personal comments (Rindoi, 2021). The same can be seen in E-learning Madrasah, where teachers communicate in a friendly manner and provide access to questions via WhatsApp for students who need clarification (Saputri, 2022). On Discord, students' views and answers are acknowledged during learning, if mistakes are made, the teacher encourages group discussion for correction. The teacher also gives appreciation directly through the chat forum. The Discord server feature

facilitates communication and information sharing in the chat room, even though learning takes place online without face-to-face. According to Prasiwi (2022), teachers consistently remind the chemistry learning schedule, share teaching materials and readings, and confirm attendance if they cannot attend. During the session, the teacher explains the material through the voice feature, while students listen and pay attention.

On the aspect of instruction delivery, students' perceptions of using Google Classroom and Discord are better than using E-learning Madrasah to features that allow teachers to structure learning directions in an organized and structured manner. Google Classroom has offers students clear instructions with time limitations for tasks and discussion sessions to make sure they understand how to engage in each activity (Nursyahrina et al., 2021). An FAQ (Frequently Asked Questions) feature available in Google Classroom to anticipate students' common questions (Google, 2023). This platform makes it easy to distinguish between materials, assignments, attendance lists, and clear deadlines (Hikmatiar et al., 2020). On the other hand, E-learning Madrasah provides structured instructions through the Timeline feature, where teachers provide participation directions and students easily access materials, assignments, and attendance (Saputri, 2022). However, instruction updates often require administrative approval, which limits flexibility compared to Google Classroom. On Discord, instructions are delivered in a structured manner through topic specific channels, making it easier for students to follow activities and customize interactions (Jamaly et al., 2025; Setyawan et al., 2024). Teachers send pre-learning information for student preparation, accompanying assignment deadlines tailored to the level of difficulty, and utilize notifications for important date reminders. Chemistry materials become more effective with the support of text, image, video, and screen-sharing formats for formulas, reactions, and complex calculations (Huda, 2022; Putra et al., 2021). Teachers can also monitor student progress in real-time through direct messaging or small discussion groups, providing timely assistance (Huda, 2022).

In terms of communication with Google Classroom, teachers can use the class forum when posting materials to directly communicate important lessons. Private comments can help students understand what is being conveyed if they have not understood it. In addition, teachers have the ability to integrate the performance of their students and offer help through private comments in case of problems, as well as track students who have not completed assignments. In addition, the comment feature allows teachers to provide feedback to students through private comments and Q&A sessions in the class forum (Rindoi, 2021). Teachers will mark the writings or formulas in the sent files with colors, different from E-learning Madrasah. In addition, through class discussion forums, teachers can help students who need feedback by asking questions and explanations. However, the response is sometimes still late (Ismawarni, 2022). For Discord communication is done within the server. In addition, teachers help convey important material by emphasizing important elements, such as using different colors or highlighting the conclusions presented. In addition, teachers help students complete tasks by creating a list of outstanding tasks, which are delivered during the lesson through chat rooms and voice features. According to Prasiwi (2022), teachers continue to

ensure students learn by studying hard even though they are online. By using Discord's reply and discussion system, teachers can provide feedback to their students which helps them understand more complex chemistry concepts. This makes the learning process more interactive and responsive to students' needs. It also gives students the opportunity to ask questions about material they haven't understood.

In the context of student satisfaction, students enjoy using Google Classroom during the learning process, as the system provides easy access to teaching materials and helps them collaborate with other students in various ways (Diantari et al., 2023). The platform can also be integrated with various learning models or methods, thus supporting the success of the teaching-learning process (Wulandari & Panduwinata, 2021). In addition, Google Classroom is known as one of the most popular online learning platforms due to its diverse and attractive features, which increase user satisfaction, including among teachers who consider it an optimal learning platform (Muliadi & Elmunsyah, 2024). The ease of use of Google Classroom also motivates students to complete assignments, as they can access materials, view assignments to be completed, and submit them only through mobile devices (Nursyahrina et al., 2021). The platform's features allow students to easily access teaching materials, ask questions, and provide responses, thus creating a collaborative learning environment. They also play an important role in helping students understand the material, develop new ideas, and retain information more effectively (Abuzant et al., 2021). Meanwhile, E-learning Madrasah showed similar results in terms of student satisfaction. The use of this platform in online learning, especially for chemistry subjects, creates a more interesting and comfortable learning experience, while improving student understanding of the material (Mu'minah et al., 2021).

Features such as timeline, teaching materials, and assignment collection on this platform facilitate communication between students and teachers (Saputri, 2022). However, compared to Google Classroom, E-learning Madrasah still faces challenges such as network instability and users lack of understanding of the platform's features that require further customization (Ahmad et al., 2023). In addition, Discord also offers a satisfying online learning experience. Student satisfaction with online learning through Discord can be seen from their understanding of the material, their recommendations for learning methods, preferences in the learning process, and interest in the learning process itself (Shaharanee et al., 2020). In the context of online chemistry learning, Discord provides a more interesting, comfortable experience, and is able to improve understanding of the material. This finding is in line with the research of Jannah et al. (2024), which showed that Discord can support online learning and increase student motivation. The platform has a number of beneficial features, such as a simple interface, engaging interaction process, constructive feedback, as well as an interactive learning experience, all of which contribute to learning effectiveness.

The results showed that students overall preferred Google Classroom compared to E-learning Madrasah and Discord, although the variance between the three was different. This is due to the difference between the respondents and the place of

their school origin. Students have different perspectives on online learning, largely influenced by their learning environment, as well as school characteristics. Online learning can be implemented in different ways if there are differences in technology access and institutional support (Rachmat & Krisnadi 2020; Irmayanti et al., 2023). Schools with better facilities and adequate technological support tend to provide better learning experiences to their students. Conversely, students who do not have access to the necessary educational resources and technologies may face problems, which may affect how they perceive their school's e-learning platform. Students' use of e-learning platforms also can be hindered by limitations in technological infrastructure, teachers' readiness to use them, problem solving power, and learning experience (Ahmad et al., 2023). In addition, the quality of a person's thinking will also affect how they see an event (Irmayanti et al., 2023). Students' learning experience will improve if these factors are minimized.

4. Conclusion

Students' perceptions of chemistry learning using Google Classroom, E-learning Madrasah, and Discord showed significant differences. On average, students showed an agree category from each aspect of perception collected in the form of ease of access, benefits, communication and interaction, instruction delivery, and student satisfaction. During online learning, students' perceptions of Google Classroom gave more positive results than E-learning Madrasah and Discord. Therefore, teachers especially those teaching chemistry can use the three platforms as a solution for adopting online learning by adapting the features needed.

References

Abuzant, M., Ghanem, M., Abd-Rabo, A., & Daher, W. (2021). Quality of Using Google Classroom to Support Learning Processes. *International Journal of Emerging Technologies in Learning*, 16(6), 72-87. https://doi.org/10.3991/ijet.v16i06.18847

Ahmad, A. K., Sumarni., Rahayu, K, M., & Lisnawati, S. (2023). Pembelajaran berbasis e-learning di madrasah dalam peningkatan kualitas pendidikan: kasus MTsN Al Azhar. Edukasi: *Jurnal Penelitian Pendidikan Agama dan Keagamaan*, 21(3), 275-289. https://doi.org/10.32729/edukasi.v21i3.1572

Al-Maroof, R. S., & Al-Emran, M. (2018). Students' Acceptance of Google Classroom: An Exploratory Study using PLS-SEM Approach. *Education and Information Technologies*, 23(6), 2703–2717. https://doi.org/10.1007/s10639-018-9786-3

Ardiansyah, T. Y., Batubara, R. W., Auliya, P. K. (2021). Using Discord to Facilitate Students in Teaching Learning Processduring COVID-19 Outbreak. *Journal of English Teaching, Literature, and Applied Linguistics*, 5(1), 76-78. http://dx.doi.org/10.30587/jetlal.v5i1.2528

Az-zahra, F. F., Murwaningsih, T., & Susantiningrum. (2019). Pengaruh persepsi siswa tentang metode mengajar guru dan penggunaan media pembelajaran

terhadap prestasi belajar siswa kelas XI AP SMK Negeri 1 Sukoharjo. *Jurnal Informasi dan Komunikasi Administrasi Perkantoran*, 3(2), 58-66.

Budianti, Y. & Lubis, R. R (2022). Electronic Learning (Studi Tentang Model, Kebijakan dan Problematika di Indonesia), *Edu-Riligia*, 6(1), 69-93.

Clark, R. C., & Mayer, R. E. (2016). *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning (4th ed.)*. Hoboken, NJ: John Wiley & Sons.

Dewantara, J. A., Efriani., & Afandi. (2020). Pemanfaatan aplikasi discord sebagai media pembelajaran online. *Jurnal Teknologi Informasi dan Pendidikan*, 13(1), 61-65. https://doi.org/10.24036/tip.v13i1.283

Dewi, R., Mulyati, Y., Rahmat, J., Sari, E. N., & Dalima, P. (2021), Manajemen Daring/Online dengan menggunakan google classroom di SDIT Fajar, Depok. *Jurnal Ilmiah Mahasiswa Mengabdi*, 1(1), 47-52. http://dx.doi.org/10.32493/jmwab.v1i1.10373

Diantari, A. M., Artini, L. P., & Dewi, K. S. (2023). Students' perception on the use of google classroom in the online and onsite learning mode. *Journal of Educational Study*, 3(2), 108-125. http://dx.doi.org/10.36663/joes.v3i2.471

Google. (2023). *Get started with Classroom*. Google for Education Help.https://support.google.com/edu/classroom/answer/6020279?hl=en

Heryanto, S. H., Aprianti, S., Pelani, R. R., & Irvani, A. I. (2023). Penggunaan e-learning madrasah dalam proses pembelajaran fisika di MAN 2 Garut. *Jurnal Pendidikan dan Ilmu Fisika*, 3(1), 172-178.

Hijah, S., Agung, S., & Bahriah, E. S. (2023). Persepsi Siswa Terhadap Kualitas E-Learning Madrasah dan Pembelajaran Daring Kimia Menggunakan E-Learning Madrasah. *SPIN Jurnal Kimia & Pendidikan Kimia*, 5(1), 127-145. https://doi.org/10.20414/spin.v5i1.7114

Hikmatiar, H., Sulisworo, D., & Wahyuni, M. E. (2020). Utilization of google classroom-based learning management system in learning. *Jurnal pendidikan Fisika*, 8(1), 78-86.

Huda, A. (2023). Pembelajaran online: solusi pendidikan masa depan dengan yang terjangkau dan efisien. *Journal of Learning, Teaching, and Instruction*, 3(2), 96-107.

Huda, M. B. (2022). Pemanfaatan discord sebagai alternatif media pembelajaran secara daring. *Jurnal Ilmu-ilmu Sosial*, 19(2), 659-667. https://doi.org/10.29100/insp.v19i2.2697

Iftakhar, S. (2016). Google Classroom: What Works and How?. *Journal of Education and Social Sciences*, 3, 12–18.

Irmayanti, M., Andayani, Y., Sofia, B. F. D., & Haris, M. (2023). Persepsi Siswa dan Guru Terhadap Penggunaan Aplikasi Google Classroom dalam Pembelajaran Kimia di SMAN 1 Praya dan SMAN 2 Praya. *Jurnal Ilmiah Profesi Pendidikan, 8(1b)*, 814-820.

Iskandar, A., Parnawi, A., Sagena, U., Kurdi, M. S., Fitra, D., Nursofah., Haryati, S., Rizka, F. M., Arianto, T., Kurdi, M. S., Hartatik., Fitrianan., Rofi'i, A., Putra, P., Baun., N., & Rahmi, H. (2023). *Transformasi Digital dalam Pembelajaran*. Malang: Penerbit Lisnus.

Ismawarni, N. Q. (2022). Penerapan e-learning madrasah dan whatsapp terhadap aktivitas dan hasil belajar bahasa inggris siswa di masa pandemi. *Jurnal Inovasi Pendidikan Menengah*, 2(4), 419-429.

Jamaly, A. Muhammad, H. M., Cahyani, I. D., & Anbiya, B. F. (2025). Potensi discord sebagai media pembelajaran interaktid dalam pendidikan. *Jurnal Teknologi Pendidikan,* 5(1), 1-9.

Jannah, E. I., Wahyuni, S., Aini, N., & Jokhio, A. A. (2024). A literature review on the use of discord application in education: contributions and the developments. *JEELS*, 11(2), 877-896. https://doi.org/10.30762/jeels.v11i2.2530

Kementerian Agama RI. (2020a). *Panduan Penggunaan E-Learning Madrasah Versi 2.0*. Direktorat Jenderal Pendidikan Islam. https://elearning.kemenag.go.id

Kementerian Agama RI. (2020b). *Sosialisasi dan Implementasi E-Learning Madrasah dalam Pembelajaran Daring*. Direktorat KSKK Madrasah.

Lase, R. K. & Tangkin, W. P. (2022). Model pembelajaran langsung untuk meningkatkan kemampuan memahami instruksi pada siswa SD dalam pembelajaran daring. *Jurnal Cakrawala Pendas*, 8(3), 564-572. http://dx.doi.org/10.31949/jcp.v8i2.2426

Lauricella, S., Kay, R. H., & Craig, C. D. (2024). Examining the benefits and challenges of using discord in online higher education classrooms. *Journal of Educational Informatics*, 4(2),20-31. http://dx.doi.org/10.51357/jei.v4i2.225

Madaling., Lasino., Munir., Nainggolan, H., Ulimaz, A., & Weraman, P. (2023). Efektivitas penggunaan google classroom terhadap hasil belajar. *Jurnal Pendidikan dan Kewirausahaan*, 11(2), 672-684. https://doi.org/10.47668/pkwu.v11i2.837

Majid, A. & Arifin, M. (2025). Flipped classroom efektivitas model pembelejaran terbalik dalam meningkatkan pemahaman siswa. *JIM: Jurnal Ilmu Multidisiplin,* 1(3), 210-221.

Muliadi, M. & Elmunsyah, H. (2024). Pengaruh feature e learning dan ketertarikan user terhadap peningkatan penguasaan teknologi pembelajaran pasca pandemic covid 19. *Jurnal Ilmiah Profesi Pendidikan*, 9(2), 847-864. https://doi.org/10.29303/jipp.v9i2.2226

Mu'minah, L. H., Sugandi, M. K., & Gaffar, A. A. (2021). Penggunaan ''e-learning madrasah'' terhadap motivasi belajar siswa di masa pandemi covid-19 pada pembelajaran IPA. *Jurnal Pendidikan Biologi*, 6(2), 277-290.

Nursyahrina, H., Retami, L. H., Pratama, R., Salsabil, S. P., & Ihsan, M. T. (2021). The use of google classroom in enghlish teaching dan learning process senior high school level. *JRIP: Jurnal Riset dan Inovasi Pembelajaran*, 1(2), 123-133. https://doi.org/10.51574/jrip.v1i2.41

Prasiwi, D. (2022). Persepsi siswa tentang pembelajaran daring kimia menggunakan aplikasi discord di SMA Negeri 13 Samarinda. *Skripsi*, Universitas Mulawarman

Putra, M. A. P., Salim, A. & Utama, A. H. (2021). Pemanfaatan aplikasi discord sebagai alternatif media pembelajaran online di masa pandemi covid-19. *Journal of Instructional Technology*, 2(2), 75-85. https://doi.org/10.20527/j-instech.v2i2.9453

Putri, I. C. V., Alti, R. M., Asri, Y. N., & Wulandari, I. Y. (2023). Studi komparatif penggunaan platform zoom dan google classroom sebagai media

perkuliahan daring. *Scholaria*, 13(1), 20-27. https://doi.org/10.24246/j.js.2023.v13.i1.p20-27

Rachmat, A., & Krisnadi, I. (2020). Analisis efektifitas pembelajaran daring (online) untuk siswa SMK Negeri 8 Kota Tangerang pada saat pandemi covid 19. *Jurnal Pendidikan*, 1(1), 1-7. Retrieved from https://www.academia.edu/download/64275703/Analisis_Efektifitas_Pembelajaran_Daring.pdf

Ramadhani, D. A. (2019). Evaluasi pengajaran bahasa arab dengan media online di perguruan tinggi. *Jurnal Al-Mi'yar*, 2(1), 85-104.

Rindoi, M. (2021). Persepsi siswa tentang pembelajaran kimia menggunakan google classroom di SMA Negeri 2 Samarinda. *Skripsi*, Universitas Mulawarman.

Rizal, S. M. & Aesthetika, N. M. (2022). Efektifitas penggunaan aplikasi discord dalam meningkatkan komunikasi interpersonal di kalangan pecinta film. Jurnal Ilmiah Fakultas Ilmu Komunikasi, 10(1), 19-27. https://doi.org/10.25299/medium.2022.vol10(1).8882

Saputri, D. K. (2022). Persepsi siswa terhadap pembelajaran kimia menggunakan secara daring menggunakan e-learning madrasah. *Skripsi*, Universitas Mulawarman.

Sasmal, S. & Roy, M. (2021). Perception of undergraduate nursing student regarding e-learning during COVID-19 pandemic in West Bengal. *International Journal of Communicaty Medicine and Public Health*, 8(4), 1892-1898. http://dx.doi.org/10.18203/2394-6040.ijcmph20211251

Sembiring, T. B., Irmawati., Sabir, M., & Tjahyadi, I. (2023). *Buku Ajar Metodologi Penelitian (Teori dan Praktik)*. Karawang: CV Saba Jaya Publisher.

Shaharanee, I. N. M., Jamil, M. J., & Rodzi, S. S. M. (2016). The application of google classroom as a tool for teaching and learning. *Journal of Telecommunication, Electronic and Computer Engineering (JTEC)*, 8(10), 5–8. Retrieved from https://jtec.utem.edu.my/jtec/article/view/1357

Singh, V., & Thurman, A. (2019). How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018). *American Journal of Distance Education*, 33(4), 289–306. https://doi.org/10.1080/08923647.2019.1663082

Soeiro, R., David, G., & Neves, A. M. A. (2024). Discord in a university STEM learningenvironment: collective learning. *Journal on Teaching Engineering*, 3(1), 2-14. http://dx.doi.org/10.24840/2795-4005_003-001_1884

Taruklimbong, E. S. W. & Muniarti, E. (2024). Analisis peluang dan tantangan pembelajaran kimia pada kurikulum merdeka pada satuan pendidikan sekolah menengah atas. *Edukatif: Jurnal Ilmu Pendidikan*, 6(4), 3013-3021. https://doi.org/10.31004/educatif.v6i4.7177

Wijayanto, P. A., Nafi'ah, K., & Pratomo, V. A. (2021). Persepsi Penggunaan Media Pembelajaran Berbasis Online Mahasiswa Pendidikan Geografi Universitas Negeri Semarang Menjelang Pandemi Covid-19. *JPIPS*, 7(2), 117-132. https://doi.org/10.15548/jpips.v7i2.12084

Wulandari, R. N. & Panduwinara, L. F. (2021). Keefektifan penggunaan google classroom dalam pembelajaran daring selama pandemi covid-19 pada

program studi S1 pendidikan administrasi perkantoran universitas negeri surabaya. *Jurnal Ilmiah Ekonomi dan Pembelajarannya*, 9(1), 1-7.

Yulannugroho, S. H (2023). Kepuasan remaja menggunakan aplikasi discord (studi deskriptif kuantitatif kepuasan remaja menggunakan aplikasi discord di surabaya). *Commercium*, 6(2), 20-28. Retrieved from https://ejournal.unesa.ac.id/index.php/Commercium/article/download/50742/41603/99315

How to cite this article:

Anggraeni, E. S., Rindoi, M., Saputri, D. K., Prasiwi, D., Lestari, S., & Sukemi. (2025). A Comparison of Students' Perceptions of Chemistry Learning via Google Classroom, E-Learning Madrasah, and Discord. *Journal of Educational Sciences*, *9(6)*, 5833-5850.