



Differences in Students' Perceptions of Chemistry Learning Using Google Classroom and Discord

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Abstract: Learning management system (LMS) applications such as Google Classroom and Discord help an online learning. The objectives of research are to knowing the differences on students' perceptions toward chemistry learning using Google Classroom and Discord. The type of research used is retrospective comparative quantitative that utilizes documentation of student perception data that has been collected previously. Samples of this study were 68 respondents from tenth grade students of SMAN 2 Samarinda in the academic year of 2020/2021 who were taught using Google Classroom and 74 respondent majoring in Mathematics and Natural Sciences at SMAN 13 Samarinda in the academic year of 2020/2021 who were taught using Discord. The method of data collecting by documentation technique and the data analyzed by using independent t-test and mann withney u. The results showed that the t-test obtained $0.032 < 0.05$, there is a significant difference between students' perceptions toward chemistry learning using Google Classroom and Discord, but there is no difference in perception results when viewed from the gender of each platform (Sig. (2-tailed) value of 0.821 (for Google Classroom) and 0.314 (for Discord)). Students' perceptions toward chemistry learning using Google Classroom are better than that of using Discord.

Keywords: Chemistry learning; Discord; E-learning; Google; Students perception

Introduction

Online learning (e-learning) is a teaching approach that enables students to learn without face to face contact with the help of the internet (Maulana & Hamidi, 2020). E-learning is defined as instruction delivered on digital devices (computers, tablets, smartphones) to support learning, with key features including electronic storage and transmission of lessons via drives, cloud, or servers, content relevant to learning objectives, media elements such as words and pictures, instructional methods including examples, practice, and feedback, synchronous or asynchronous format, and development of knowledge and skills linked to learning goals (Clark & Mayer, 2016). E-learning, as "e" implies "electronic," includes all forms of educational activities conducted by individuals or groups, one of which is online, through standalone or networked computers and other electronic devices (Sasmal & Roy, 2021). According to Clark et al.

(2016), well-designed e-learning can increase by visual media, audio, and interactivity that support in depth understanding of concepts. In addition, e-learning is also able to reach learners on a wider scale with relatively more efficient costs than conventional learning.

E-learning platforms become a strategic solution to overcome the difference between the need for comprehensive learning and the limitations of direct interaction (Huda, 2023). Students can interact easily with materials or lessons through e-learning, and distance and time are no longer a problem with e-learning (Ahmad et al., 2023). In the context of chemistry education, the challenges in online learning are very complex due to the nature of the subject that requires conceptual understanding and experimental practice (Taruklimbong & Murniarti, 2024). Therefore, it is necessary to choose the right platform so that e-learning in chemistry education can overcome existing challenges. Online learning is divided into two

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categories, namely synchronous and asynchronous. According to Ahmad et al. (2023), Synchronous learning facilitates real-time online instruction, enabling immediate engagement between educators and students through digital platforms such as video conferences and live chats. This approach is particularly effective in fostering spontaneous dialogue and cultivating a cohesive classroom community. In contrast, asynchronous learning offers a more flexible framework that does not necessitate simultaneous attendance. By providing unrestricted access to resources like instructional videos, discussion forums, and modules, this method empowers learners to engage with the material reflectively and progress according to their individual pace.

Google has devised an online learning platform known as Google Classroom to facilitate teachers in managing classes, distributing assignments, and communicating with students efficiently (Iftakhar, 2016). With Google Classroom, teachers can create and share learning materials, give assignments and quizzes, provide immediate feedback, and manage student grades in an integrated way with other Google applications such as Google Drive, Docs, Slides, and Meet (Abuzant et al., 2021). The platform also allows students to access learning materials, do and submit assignments, and discuss through commenting and class forum features (Mwalumbwe & Mtebe, 2017).

Discord is an instant messaging service that allows users to transmit additional material, including sound, video, and photos. As e-learning, Discord can help create a more dynamic online communication environment (Huda, 2023). In this instance, Discord can also evaluate students' knowledge, offer comments, and even create a communication and cooperation platform amongst all students and teachers without in-person interactions (Dewantara, 2020).

One thing to consider when choosing the right platform is student perception. Student' perception is the student's point of view of the stimulus given, after the stimulus is received by the senses, forming an experience called perception (Sari et al., 2023). Students' perception of the LMS is very important. by knowing students' perceptions of learning, we can determine whether or not the learning is carried out (Hijah et al., 2023). Not only that, it is also an important factor that affects the success rate of knowledge transfer to achieve learning achievement (Az-zahra et al., 2019).

However, each e-learning platform has unique characteristics that can provide different learning experiences, resulting in various interpretations and meanings of the learning experience (Huda, 2023). This also can make differences in perception among individuals. Google Classroom and Discord, although both aim to support teaching and learning, have

different philosophies and architectures that can shape students' perceptions. Perception construction in online learning is not just a technical issue of the platform, but includes psychological, pedagogical, and social aspects. How students perceive and interact with their learning experience with chemistry materials, as well as proximity to the learning process becomes an important focus in understanding the dynamics of perception to determine which one is better to provide more positive perceptions. Differences in features, interface design, material delivery methods, and ease of access can significantly affect the effectiveness and quality of learning (Muliadi & Elmunsyah, 2024).

Online chemistry learning evokes diverse perceptions among students based on their experiences and observations during the learning process. For example, online learning can increase interest and motivation to learn in some students, but evoke different or even opposite perceptions in other students (Jannah et al., 2023). Therefore, this study aims to examine whether there are differences in students' perceptions of platforms such as Learning Management Systems (LMS). LMS, such as Google Classroom and Discord have become an option in managing online learning. Although these two platforms have been used in online learning, including in chemistry learning, there are still limited studies that compare the two based on student perceptions. One of the differences in student perceptions found was from the research of Putri et al. (2023), which found differences in student perceptions, namely that the perception of students using Google Classroom is better than Zoom Meeting. This research will provide a new perspective by analyzing the comparison of the use of Google Classroom and Discord in learning chemistry based on student perceptions of the aspects studied on both platforms. The results of this study are expected to not only provide a theoretical contribution to the development of LMS based chemistry learning but also provide a practical basis for educators in choosing and optimizing learning platforms that suit the needs and characteristics so that they are more effectively applied to chemistry learning needs.

Method

This study used a comparative quantitative research method with a retrospective design, which is an approach used to analyze data by looking at events that have already occurred. The research was conducted after the events under study had occurred by taking measurements based on data that had already occurred or had passed in the previous period (Sembiring et al., 2023). So this research consist of collecting data,

analyzing data and interpreting data that had been done at Samarinda city from May to September 2025.

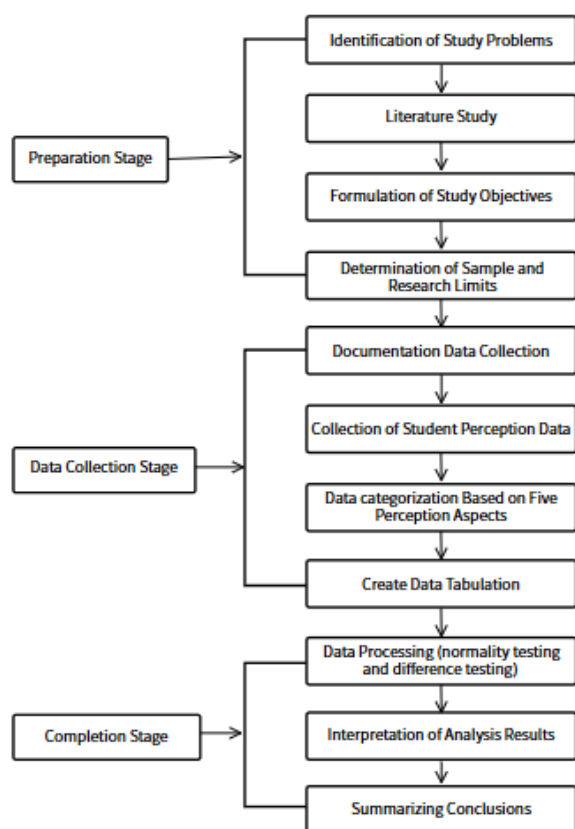


Figure 1. Flow chart of the research

The study population includes students who have used e-learning platforms and sent their responses that collected by the previous researchers and/or pre-service

teacher. All data (responses) that had been collected by the previous researchers and/or pre-service teacher are used in this research. They were collected from 68 students of SMAN 2 Samarinda (Google Classroom users) and 74 students of SMAN 13 Samarinda (Discord users). All the students were chosen by their willingness on giving responses and randomized sampling technique (Mardhiyah et al., 2025). The variables included students' perception on teaching and learning of chemistry by using e-learning platform (Google classroom and Discord) that covering five aspects include ease of access, benefits, communication and interaction, instruction delivery, and student satisfaction, and students' gender. Data were collected using documentation techniques from previous studies in the form of validated perception questionnaires (Prasiwi, 2022; Rindoi, 2021). The research was conducted in three stages: preparation, data collection, and completion. The details can be seen in Figure 1. The research data would be analyzed by statistical testing using IBM SPSS Statistics Version 27, including a normality test (Kolmogorov-Smirnov and Shapiro-Wilk) and difference (Independent t-test and Man Withney U) and ranking tests.

Result and Discussion

Students' Perception for LMS

The average scores of students' perceptions of online chemistry learning using Google Classroom and Discord along with the results of statistical tests (normality test, difference test, and ranking test) are presented in tables 1-4.

Table 1. The Average Score of Students' Perceptions of Online Chemistry Learning Using Google Classroom and Discord

Aspects	Google Classroom		Discord	
	Score	Criteria	Score	Criteria
Ease of Access	3.29	Strongly Agree	3.06	Agree
Benefits	3.20	Agree	3.02	Agree
Communication and Interaction	3.11	Agree	3.20	Agree
Instruction Delivery	3.27	Strongly Agree	3.25	Strongly Agree
Student's Satisfaction	3.16	Agree	2.72	Agree
Total Average Score	3.20	Agree	3.05	Agree

Based on Table 1, the students' perception of Google Classroom in chemistry learning is classified as good, where students strongly agree that Google Classroom is easy to access. Students agree that Google Classroom provides benefits in their learning process. In the aspect of communication and interaction, students agree that this platform supports a good relationship between teachers and students. In addition, students strongly agreed with the ease of sending instructions. Overall, the level of student satisfaction shows students

agree that this platform can fulfill their chemistry learning needs. Similarly, Discord showed favorable student perceptions. Students agree that Discord is easy to access and agree that this platform provides benefits as well as ease of communication and interaction in chemistry learning. In addition, students also agree that Discord provides ease of sending instructions. Overall, the level of student satisfaction shows that students agree that this platform can fulfill the needs of chemistry learning.

Table 2. Results of Data Normality Testing

Students' Perception	Learning Management Systems	Kolmogorov-Smirnov Statistic		
		Statistic	df	Sig.
	Google Classroom	0.146	68	0.001
	Discord	0.070	74	0.200

Based on Table 2, the Sig. value of the data on student perceptions of Google Classroom is 0.001, and student perceptions of Discord is 0.200. The Sig. value on Google Classroom is below 0.05, meaning that the data is concluded not to be normally distributed, so to see the difference between the two groups, a non parametric statistical method (Mann Whitney U) is used.

Table 3. Mann Whitney U Test Results

	Perception Result
Z	-2.144
Asymp. Sig. (2-tailed)	0.032

Based on Table 3, the difference test of student perceptions using Google Classroom and Discord shows an acquisition of 0.032 (smaller than 0.05) (asyp. Sig. < 0.05), which means that there is a significant difference between students' perceptions on the chemistry learning using Google Classroom and Discord.

Table 4. Results of the Mann Whitney Rank Test

Students' Perception	Learning Management Systems	N	Mean Rank	Ranks
				Sum of Ranks
	Google Classroom	68	79.22	5387.00
	Discord	74	64.41	4766.00
	Total	142		

Based on Table 4, the mean rank of students' perceptions of chemistry learning using Google Classroom is greater than using Discord. These results indicate that students' perceptions of chemistry learning using Google Classroom are more positive (better) than students' perceptions of chemistry learning using Discord. This result is directly proportional to students' perceptions as presented in Table 1. Based on the average score of each aspect, students' perceptions of chemistry learning using Google Classroom are higher (3.11-3.29) with a total average score of 3.20. Compared to the average score of student perceptions of chemistry learning using Discord (2.72-3.25) with a total average score of 3.05.

The Ease of Access

Students' perceptions of the ease of access to chemistry learning using Google Classroom showed better results compared to Discord. Google Classroom offers a simple and practical login process, 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). Easy integration with the Google workspace ecosystem, which most students are familiar with, supports this convenience. Different from Google Classroom, which allows users to log in using a Google account, Discord users need to create an account if they don't already have one. Discord has a more complex access system. The login process requires registration by filling in the name, email, and password (Prasiwi, 2022). After signing in successfully, students then join the server (there were welcome/introductory, topic specific, and off topic channels on each server) created by the educational institution through an invitation code provided by the server administrator (Lauricella et al., 2024). It's ease of access using various devices such as mobile applications (Android/iOS) and limited internet connections (Al-Marroof & Al-Emran, 2018; Nursyahrina et al., 2021). In addition, Google Classroom has a simpler interface compared to Discord, which requires a stable internet network due to its large storage. Although Discord can be accessed via desktop, browser, or mobile app which makes it easy for users to connect at any time, but discord's performance can be significantly hindered by its high resource demands, making it less accessible for students facing connectivity issues or those using low-specification hardware (Kurniasari 2024; Jamaly et al. 2025). Using Google Classroom, students can directly view the materials on the classwork tab (Iftakhar, 2016), the materials are organized by topic, date or theme which are displayed neatly and chronologically (Google, 2023). While on Discord, materials can be displayed according to the module, but sometimes it is not consistent because it depends on the server admin. In terms of ease of downloading, materials in Google Classroom can be directly downloaded through Drive or Google Docs without requiring format conversion, while materials on Discord can be downloaded but the file format and access can be different (Prasiwi, 2022).

Still on the aspect of ease of access, the ease of receiving and sending assignments in chemistry learning using Google Classroom is better than Discord. With Google Classroom, students receive automatic notifications via e-mail and applications if there is a new assignment from the teacher (Google, 2023), students can work on assignments directly in Google Docs, Slides, or Forms without the need to download files (Iftakhar, 2016), students can just click the turn in button, when they want to send an assignment and the teacher can immediately see the results automatically, students can find out the notification of the deadline for submitting assignments by looking at the assignment deadline on the classroom calendar, in the assignment list, or through e-mail notifications sent by the system, students can directly see, comments or revisions from teachers on

the documents they work on, all assignment statuses are recorded and can be seen by students (Google, 2023). Meanwhile, Discord, as a communication platform, does not have an integrated task management system like Google Classroom. Submission of assignments through Discord is generally done through file uploads in direct messages, which has no automatic tracking system (Prasiwi, 2022). To monitor the deadline and status of assignment collection in Discord, teachers as server managers need to use additional bots or external systems. Bots can be used to monitor activities, enforce sanctions, award points to active members, play educational games, or customize needs (Jamaly et al. 2025). Although Discord supports various file formats, organizing and grading assignments is more difficult than Google Classroom. The reminder and deadline management systems also show significant differences between the two platforms. Google Classroom integrates with Google Calendar to provide automatic reminders about assignment submission deadlines (Abuzant et al., 2021). While Discord requires bot operations or manual reminders for similar functions (Jamaly et al. 2025). This difficulty could be a barrier to the implementation of Discord in formal learning contexts that require a strict administrative structure. In terms of navigation systems, Google Classroom has a simple and intuitive navigation system, allowing students to easily access various features such as assignments, materials, and announcements in just a few clicks. The interface is designed to be minimalistic and integrated with other Google services, supporting ease of use even for new users (Google, 2023; Iftakhar, 2016). In contrast, Discord tends to have a more complex navigation system, as it was developed for a community of gamers. Users, especially students who have never used Discord, need a lot more adaptation time to understand the flow of menu navigation, task collection, accessing learning materials, and communicating (Lauricella et al., 2024). Nonetheless, Discord supports interactive and collaborative learning with easy communication with good quality text, voice, and video (Jamaly et al. 2025).

Benefit

Regarding the benefits, Google Classroom shows equal student perception with Discord. In terms of the feature benefits, Google has integrated features that allow assignments, assessments, discussions, evaluations, and provision of materials to be done easily. The platform can be integrated with other Google products such as docs, sheets, and slides to create an interactive and collaborative learning experience (Dewi et al., 2021). As for Discord, it has a variety of features that facilitate connections between friends and teachers easily and quickly (Lauricella et al., 2024). Each post in

Google Classroom has a comment feature, which allows for organized discussions. In addition, the notification system ensures that each individual has access to the latest information about their learning activities. Due to the ease of document sharing and real time collaboration through other Google products, students can interact well and participate in virtual discussions between students and teachers (Iskandar et al., 2023). Meanwhile, Discord has a chat room. In the server, interaction between teachers and students can be conducted through text, voice, or video, with flexibility and variety of features (Jamaly et al., 2025; Soeiro et al., 2024). Also, Google Classroom has an automatic reminder system and Google Calendar integration that helps students better manage their assignment submission schedules and reminds students of assignment deadlines (Abuzant et al., 2021). Different from Discord, reminders are available through built in notifications that will be visible if there is a message or notification (Prasiwi, 2022). So that students can submit assignments on time and monitor the information available. In terms of the assignment submission feature with Google Classroom, teachers can provide quick feedback on their students' assignments (Madaling et al., 2023). Meanwhile, the feedback system in Discord also takes place quickly and seamlessly due to the communication features, facilitating easier interaction between users (Rizal & Aesthetika, 2022). The use of Google Classroom for learning makes it easier for teachers to keep track of students' grades and work throughout the semester with the scoring feature. It is useful for tracking student progress and understanding and allows low scoring students to relearn material that has not been understood (Abuzant et al., 2021). Such a feedback system that is directly integrated with students' work documents allows for contextual comments and detailed revision tracking. In contrast to Discord, grading system runs by relying on the server feature in the chat room, where teachers can give points with the help of bots to students, and teachers do feedback on assignments written in PDFs, then distributed to the chat room (Jamaly et al. 2025; Prasiwi 2022). Although unstructured like Google Classroom, implementing an assessment system through Discord still provides a perspective for students quite well. According to Abuzant et al. (2021), teachers can communicate structurally with their students, give assignments, and upload teaching materials through Google Classroom features. Teachers can also deliver information, assessments, and provide teaching materials. Similar to Google Classroom, Discord, with its features, allows teachers to conduct interactive learning activities. This platform can be a tool to carry out tasks and activities smoothly so that teachers can deliver learning objectives,

assessments, and subject matter appropriately and easily accepted by students (Jannah et al., 2024; Prasiwi, 2022).

Communication and Interaction

Based on communication and interaction aspects, Google Classroom and Discord both received positive perceptions from students in the agree category. Students agree that online learning provides a positive experience during the learning process from the aspects of communication and interaction. Google Classroom provides a chat feature that allows students and teachers to talk and discuss, which can be witnessed by all students. In addition, private comments allow students to feel comfortable interacting in learning activities (Abuzant et al., 2021). The availability of these features facilitates direct communication, both between students and teachers and between students and students, easily. On the other side, Discord as a platform that facilitates communication has text chat features, voice & video channels, emoticons, photos, document files, and others that can be used in the online learning process (Putra et al., 2021). As a pedagogical tool, Discord is classified as a virtual forum or online discussion platform application with the concept of Voice over Internet Protocol (VoIP), which has a simple interface and interactive interaction process that increases students' comfort in expressing their understanding of learning materials (Ardiyansah et al., 2021; Soeiro et al. 2024; Yulannugroho, 2023). In terms of communication support features, Google Classroom has a class comment feature that becomes a forum for discussion between students and teachers. Teachers can actively invite students to participate through interactive question and answer sessions (Rindoi, 2021). The learning process, which is supported by the teacher's active contribution in class processing, will have an impact on creating active discussions from students as well. Meanwhile, with Discord, teachers will conduct learning by ensuring active student involvement that utilizes the voice feature. The teacher will call on students randomly to answer questions. Through the use of Discord, teachers can minimize passive students by encouraging them to be active during the learning process (Prasiwi, 2022). The teacher's role is required to be active to provide an enjoyable learning experience during the learning process. Regarding interaction with other students, Google Classroom offers various interactive features that allow for active discussions. Teachers can also give students the option to immediately send feedback to their classmates so they can get immediate feedback from the teacher and other students if they need help. The use of Google Classroom provides an opportunity for students to communicate without limits (Nursyahrina et al., 2021). The study results of Wulandari et al. (2021) support this finding, showing

that students feel comfortable interacting with other participants and teachers in learning activities through Google Classroom. As with Discord, interaction between students is mostly done through the chat room by chatting because there is no need to be on camera and on mic. Students can also respond to other students more comfortably. In a study by Huda (2022), explained that the text and voice channel features support users to have conversations in the form of both text and voice live in order to form an interactive and comfortable online communication environment for its members. Sometimes students have difficulty in maximizing the use of the video call feature in Discord because it requires a stable network (Jannah et al., 2024). However, in the event of signal interference, the Discord application has a paid booster to improve a better server (Putra et al., 2021). Google Classroom's class forum feature allows students to directly view other students' answers. This is highly beneficial for discussion and question and answer in the forum, especially between students. According to Rindoi's research (2021), findings indicate that the class forums successfully fostered active and respectful student discussions, with no evidence of negative or opposing interactions. Within the Discord environment, students felt their contributions were valued; when errors occurred, the instructor facilitated collaborative peer discussions rather than mere correction. Furthermore, the platform enabled the teacher to provide immediate feedback and appreciation within the chat. By utilizing Discord's server features, students were able to prioritize seamless communication and information sharing, successfully maintaining a sense of community despite the lack of face-to-face interaction (Prasiwi, 2022). The use of Google Classroom for teachers provides an enthusiastic experience in conducting the learning process. With the timely presence of teachers during learning using Google Classroom, it shows that teachers are enthusiastic about teaching and explaining lessons. Teachers can proactively deliver and explain lessons and give assignments without being hindered. In terms of communication, teachers communicate in a friendly manner and are easy to contact in Google Classroom. With the platform's features, teachers can easily respond to students' personal comments quickly and kindly (Rindoi, 2021). Similar to Discord, teachers also show enthusiasm in teaching and explaining learning materials through Discord. This was conveyed by students in Prasiwi's study (2022) that when learning using Discord. The teacher always improves the chemistry learning schedule and provides teaching materials and reading materials. Teachers will also confirm attendance if they cannot attend the lesson. When learning, the teacher explains through the voice feature, and students can listen and pay attention.

Instruction Delivery

Students' perceptions on Google Classroom and Discord use in the context of instruction delivery are positive, with a strongly agree category. The implementation of these two platforms allows teachers to deliver learning directions in a more organized and structured manner. Clear instructions contribute to effective communication, thus encouraging students to be active during the learning process (Shaharane et al., 2016). With Google Classroom, teachers can structurally differentiate materials, assignments, and attendance lists and deadlines clearly (Hikmatiar et al., 2020). Another advantage is that assignment deadlines and discussion sessions are clearly stated to ensure students understand how to participate in each activity (Nursyahrina et al., 2021). The FAQ (Frequently Asked Questions) feature is also available in Google Classroom to anticipate students' common questions (Google, 2023). In contrast, chemistry learning is taught using Discord by setting up a dedicated channel for each topic, which ensures that students understand the tasks involved in each learning exercise. Members can also more easily modify the space and manner of interaction when channels are divided by topic (Jamaly et al. 2025; Setyawan et al., 2024). Before the class begins, teachers might give out information to get pupils more prepared. When teachers give homework, they also include information on the due date, which is tailored to the task's level of complexity. Teachers can directly notify students about assignment due dates and other significant dates by using Discord's notification and reminder tools. Discord's support for multiple forms, including text, images, videos, and screen sharing, makes it easier to teach chemistry classes and helps students understand chemical formulas, reactions, and intricate calculations (Huda, 2023; Putra et al., 2021). Regarding communication with Google Classroom, while posting resources, teachers can use the class forum to directly transmit critical information. Students can review the material by using private comments if they haven't comprehended it. In addition, teachers can keep an eye on their students' progress, track those who have not finished tasks, and offer support through private comments in the event that issues arise. Also, this comment feature enables teachers to give students feedback via private comments and Q&A sessions in class forums (Rindoi, 2021). Discord also enables teachers to keep checks on their students' assignment progress and offer support as required via small discussion groups or direct messaging options (Huda, 2023). As a way to convey important details, the teacher highlights key points, such as formulas or the use of various colors. Teachers also assist students in continuing to complete tasks by compiling a list of pupils who have not completed their work. This list is communicated during the learning process via audio

features or chat rooms. Even in online learning, the teacher continues to monitor students closely to ensure they continue to put in a lot of effort in their studies (Prasiwi, 2022). Discord's conversation and reply system enables teachers to provide students targeted, individualized feedback, which helps them grasp challenging chemistry ideas. This allows students to raise questions about the information they haven't grasped and makes the learning process more dynamic and responsive to their needs.

Student Satisfaction

In the aspect of student satisfaction, both platforms obtained an agree category, indicating that learning chemistry using Google Classroom and Discord provides a satisfying experience. Students' satisfaction with online learning can be seen from their understanding of the material, recommendations for learning methods, choices in learning, and preferences for the learning process (Shaharane et al., 2016). Students responded positively to Google Classroom because it makes it easier to obtain instructional resources and encourages group projects (Diantari et al., 2023). Google Classroom can be utilized for other disciplines that are significant since it can be integrated with different models or approaches and offers teaching and learning success (Wulandari & Panduwina, 2021). Google Classroom is the most widely used learning tool due to its many intriguing features. Teachers consider it the best choice for learning, especially because of its high level of user satisfaction (Muliadi & Elmunsyah, 2024). Google Classroom also helps students become more motivated to complete activities because they only need to open their phones, see what needs to be completed, and submit it (Nursyahrina et al., 2021). Students have easy access to instructional resources, as well as the opportunity to ask questions and provide answers, which fosters a collaborative learning environment. These characteristics are crucial because they improve students' comprehension of the subject matter, their capacity to come up with fresh thoughts, and their ability to remember knowledge (Abuzant et al., 2021). Using Discord for online chemistry instruction can make the learning process more engaging and comfortable, as well as help students comprehend the subject matter. This finding is consistent with the research conducted by Jannah et al. (2024), which demonstrated that Discord can facilitate online learning environments and enhance student motivation. The platform offers several advantageous features that support the learning process, including an intuitive user interface, engaging interactive mechanisms, constructive communication channels, and a collaborative learning environment that promotes active student participation. However, compared to Google Classroom, Discord still has

problems like unreliable network connectivity and lack of adequate devices. But students still advise using Discord in chemistry education, because it may be more enjoyable, practical, and engaging.

Differences Student' Perception Based on Gender

Data of students' perceptions of online chemistry learning using Google Classroom and Discord based on gender along with the results of statistical tests (normality test, homogeneity test, difference test, and ranking test) are presented in tables 5-9.

Table 5. The average score of students' Perceptions of Online Chemistry Learning Using Google Classroom Based on Gender

Aspects	Score	Male		Female	
		Criteria	Score	Criteria	Score
Ease of Access	3.40	Strongly Agree	3.25	Strongly Agree	
Benefits	3.22	Agree	3.19	Agree	
Communication and Interaction	3.13	Agree	3.09	Agree	
Instruction Delivery	3.25	Strongly Agree	3.30	Strongly Agree	
Student's Satisfaction	3.18	Agree	3.13	Agree	
Total Average Score	3.24	Agree	3.19	Agree	

When categorized by gender, according to Table 5 the average students' perception scores based on gender for online chemistry learning through Google Classroom were 3.01 for males and 3.08 for females, indicating an overall positive response across both groups.

Table 6. The Average Score of Students' Perceptions of Online Chemistry Learning Using Discord Based on Gender

Aspects	Score	Male		Female	
		Criteria	Score	Criteria	Score
Ease of Access	3.09	Agree	3.03	Agree	
Benefits	2.96	Agree	3.07	Agree	
Communication and Interaction	3.14	Agree	3.24	Agree	
Instruction Delivery	3.19	Agree	3.28	Strongly Agree	
Student's Satisfaction	2.68	Agree	2.77	Agree	
Total Average Score	3.01	Agree	3.08	Agree	

The data in Table 6 reveals a slight difference in mean students' perception scores based on gender between male students (3.01) and female students (3.08). Despite this, the overall perception across the five analyzed aspects remains consistently in the agree range.

Table 7. Results of Normality Tests of Students' Perceptions Based on Gender

	Gender	Statistic	Shapiro-Wilk	
			df	Sig.
Google Classroom	Male	0.883	20	0.200
	Female	0.925	48	0.050
Discord	Male	0.981	30	0.849
	Female	0.959	40	0.160

Table 7 shows that the data on students' perceptions of online chemistry learning using Google Classroom and Discord based on gender (male and female) is normally distributed (Sig. \geq 0.05).

Table 8. Results of the Homogeneity Test of Students' Perceptions Using Fisher's Test Based on Gender

Perception Results		Levene			
		statistic	df1	df2	Sig.
Google Classroom	Based on Mean	0.609	1	66	0.438
Discord	Based on Mean	2.172	1	72	0.145

Table 8 shows the results of the homogeneity based on gender of variance test using Fisher's test, which found that both are homogeneous (Sig. \geq 0.05).

Table 9. Results of the Difference Test Based on Gender

Perception Results	T	Df	Sig. (2-tailed)
Google Classroom	0.227	66	0.821
Discord	-1.015	72	0.314

Based on Table 9, the results of the difference test show an independent t-test, producing a Sig. (2-tailed) value of 0.821 (for Google Classroom) and 0.314 (for Discord). Thus, there is no difference in perception results when viewed from the gender of each platform.

This study, researchers wanted to examine differences in students' perceptions by looking at gender differences. Gender is one factor that influences students' perceptions of online learning. Gender differences are characteristics that distinguish how students learn and process information into productive variables for understanding information, so that the perceptions, attitudes, and behaviors of male and female students can lead to differences in how they perceive information (Muliadi, 2020).

Therefore, differences can be related to perception. Gender differences affect several aspects of perception of the module, the ability to search for and find information, the implementation of practical work, and the assessment process (Zamista et al., 2021). From a female perspective, women tend to use applications that make their work easier, which means that the perception of ease of access will tend to be high if the experience provided to women does indeed offer convenience. However, in terms of the perceived benefits of using

internet websites, male show better results than female (Sari, 2016).

The results show that gender does not affect students' perceptions of chemistry learning using Google Classroom or Discord. This is possible because the respondents are tech savvy and easily adapt to technological innovations, such as the platforms used in learning, and these platforms are commonly used by many people. Therefore, gender differences are not relevant in influencing the ease of access and benefits of technology (Sakitri, 2021). Similar findings were also found in previous studies, which found that there was not always a difference in students' perceptions of the benefits with the moderating effect of gender (Utami & Indriayu, 2025). In the context of this study, no significant differences were found in terms of student perceptions, presumably because technological developments have become a common phenomenon that is accepted by all genders relatively equally. Based on this, it can be explained that the experiences gained by all students are relatively equal, whether female or male.

Research Limitations

Although research showed that students' opinions about using Google Classroom were usually more positive than those of Discord, the two groups exhibited an uneven variation. This is a result of variations in the respondents' background and where they attended school. Differences in student perceptions of online learning are mostly caused by school characteristics and learning environment variables.

According to Rachmat et al. (2020) the implementation of online learning might differ depending on variations in institutional support and technological access. The learning environment is often better in schools with better facilities and adequate technical support for the students. Students in schools with inadequate technology and learning resources, on the other hand, may experience difficulties, which might affect their perspective of the e-learning at their school. Technical infrastructure limitations, teachers' readiness to use e-learning platforms, and difficulties in managing online interactions between instructors and students may all be barriers to students' use of these platforms (Ahmad et al., 2023). The learning experience of the student will have positive perceptual outcomes if these factors can be minimized. Additionally, retrospective (historical) studies have limitations in terms of generalizability because they rely on available data and cannot control for external variables since they pertain to the past.

Conclusion

This research reveals significant differences in students' perceptions of chemistry learning between Google Classroom and Discord platforms. Overall, average students' perceptions showed an agree category in five aspect, include the ease of access, benefits, communication and interaction, instruction delivery, and student satisfaction. The findings indicate that students held more positive (better) perceptions toward Google Classroom compared to Discord during online chemistry learning, but when compared based on gender, students' perceptions showed no significant differences. These findings show that Google Classroom and Discord can be used by teachers as learning management systems (LMS) to conduct online learning.

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Author Contributions

All authors contributed to this research. Formal analysis, methodology, visualization, writing-original draft, E. S. A.; writing-original draft, L.; Supervision, methodology, writing-review & editing, S; Supervision, writing-review, S. L.

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Conflicts of Interest

The authors declare no conflict of interest.

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