RESEARCH ARTICLE

Students' Perceptions of Electronic Content in Virtual Classrooms: A Field Study of a Sample of Students from the Department of Educational Sciences at the University of Biskra

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Abstract

The present study aimed to investigate the perceptions of students in educational sciences regarding electronic content within the environment of virtual classrooms. The research focused on three principal themes: the quality of the content, the level of student interaction, and the difficulties encountered by students in using educational platforms. The researcher employed a descriptive–analytical approach, which was deemed appropriate for the nature and objectives of the study. The sample comprised 100 male and female students from the Department of Educational Sciences, Faculty of Social Sciences, Mohamed Khider University of Biskra, who were selected via a simple random sampling method.

To collect data, a questionnaire consisting of three axes was developed:

- The first axis addressed the quality of electronic content in terms of clarity, organisation, and currency of information.
- The second axis examined the extent of students' interaction with the content through virtual participation and communication tools.
- The third axis explored the difficulties faced by students in utilising educational platforms, whether technical, organisational, or psychological.

The results indicated that students' perceptions concerning content quality and interaction were generally moderate, whereas their awareness of the obstacles impeding full benefit from e-learning was relatively high. The study concluded with the need to develop electronic content that meets students' needs and to provide ongoing technical and educational support to increase the effectiveness of virtual classrooms and ensure the quality of distance learning.

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Introduction

Educational institutions in the late twentieth century underwent profound transformations in their methods, modes, and fields of instruction in response to various challenges arising from the rapid advancement of information

technology, globalisation, and the emergence of new industries. These shifts prompted nations worldwide to compete in leveraging such developments to enhance prospects in employment, economic, social, and educational policies. Nevertheless, recent crises have brought about significant changes in educational concepts, resulting in the widespread adoption of distance learning models. The blended learning model subsequently emerged, raising questions concerning the quality of education, as well as its impact on students' motivation, acceptance, and integration with this educational approach, which was implemented abruptly.

With the proliferation of the internet and the development of e-learning platforms, virtual classrooms have become a flexible alternative to traditional education, offering students extensive opportunities to acquire knowledge in diverse and adaptable learning environments. However, the success of this experience largely depends on the quality of electronic educational content, the extent of students' interaction with it, and their ability to overcome the challenges associated with virtual learning.

Virtual classrooms represent one of the most significant components of e-learning, contributing to a radical transformation in university education. They provide an innovative, technology-based educational environment, enabling students to participate in lectures and interact with instructors and peers from various locations. These classrooms are characterised by a high degree of flexibility, as students can attend lectures in real time or revisit their recordings later, thus allowing them to learn in ways that suit their needs and schedules. Furthermore, interactive tools such as discussion rooms, instant messaging, and real-time surveys offer a more dynamic educational experience, enriching academic discourse and deepening understanding.

Moreover, virtual classrooms constitute an effective solution for delivering education in exceptional circumstances that hinder physical attendance, such as natural disasters or health crises. They also reduce financial burdens on universities by minimising their reliance on traditional infrastructure. In addition, virtual classrooms assist students in acquiring advanced technical skills that prepare them for the modern labour market, which increasingly demands digital competencies. For these reasons, virtual classrooms have become pivotal tools for universities striving to provide high-quality education that meets the needs of the digital age.

1. Research Problem

E-learning plays a pivotal role in enhancing both the personal and academic skills of learners. It enables students to develop critical thinking and problem-solving abilities through engagement with multimedia educational materials. Furthermore, this type of education helps improve technological proficiency, which has become essential in the modern labour market. Through virtual classrooms, students learn effective time management and collaboration with peers via digital tools. In addition, e-learning encourages innovation and creativity by providing diverse educational resources and innovative interactive tools. Thus, this system constitutes an effective means of preparing students to meet the demands of the twenty-first century.

Numerous studies have addressed and examined the subject of e-learning, each exploring different aspects of this educational environment. For example, the study by Hendal and Al-Khuzai (2022) aimed to explore Kuwait University students' assessment of their e-learning experience during the COVID-19 pandemic, revealing moderately positive attitudes towards e-learning alongside various challenges, such as technical problems and communication with instructors. Khawaldeh's study (2020) sought to identify the perceptions of University of Jordan students regarding the effectiveness of e-learning platforms in fostering self-learning skills, and the results revealed positive perceptions of the benefits of these platforms, albeit with limited obstacles. Al-Anzi's study (2021) aimed to explore the perceptions of secondary school female students regarding the educational use of the Edmodo social learning network, with results generally showing positive perceptions, despite some difficulties related to internet connectivity. Finally, the study by Rabhi (2021) aimed to investigate the perceptions of Al-Aqsa University students regarding e-learning during the COVID-19 pandemic and concluded that there is a need to improve the e-learning environment by enhancing access to and interaction between students and lecturers.

Electronic educational content constitutes a vital foundation within the digital education system, contributing to the delivery of knowledge through innovative and diverse means. This type of content is distinguished by its flexibility, as it can be designed to accommodate various learning styles—whether visual, auditory, or interactive. Electronic content encompasses multiple forms, such as educational videos, presentations, interactive simulations, and e-books, rendering it more engaging and effective for learners. It also enables the continuous updating of information, thereby ensuring the provision of content that is current and aligned with scientific advancements.

Moreover, electronic educational content enhances the quality of education by offering self-assessment and interactive tools that enable students to gauge their progress and understanding of course materials. This form of

content also allows access to global educational resources, thereby enriching the learning experience and promoting cultural and intellectual diversity. Moreover, electronic content serves as an effective means of supporting self-directed learning, as learners can access educational materials at any time and from any location. Owing to these advantages, electronic educational content has become an essential component in achieving the objectives of modern education.

Within this context, students in educational sciences emerge as a cohort that is particularly aware of the intricacies and components of the educational process, rendering their perceptions of electronic educational content especially significant. Their evaluation of the quality of this content, the degree of interaction facilitated by virtual classrooms, and the challenges they encounter can provide valuable insights for the improvement of e-learning.

This study aims to explore these perceptions in depth and analyse the impact of content quality and design on the achievement of educational objectives. It also seeks to identify the challenges faced by students during virtual learning and to offer practical recommendations that contribute to enhancing the educational experience. Through this research, it is possible to support the development of innovative educational strategies that advance e-learning and keep pace with the rapid transformations occurring in the field of digital education.

2. Main Research Question:

What are the perceptions of students in educational sciences regarding the quality of the electronic educational content used in virtual classrooms?

1.2. Subquestions:

- To what extent is the quality of the electronic educational content provided to students?
- To what extent do students interact with electronic educational content?
- What difficulties are encountered by students when using e-learning platforms?

3. Objectives of the Study:

1. To evaluate the quality of the electronic educational content used in virtual classrooms from the perspective of students in the educational sciences.
2. To explore the level of interaction achieved by students within virtual classrooms.
3. To identify the difficulties and challenges faced by students when using virtual learning platforms.

4. Significance of the Study:

1. This research may contribute to understanding the role of electronic educational content in enhancing virtual education in line with technological advancements and the digital transformation of the educational process.
2. This highlights the strengths and weaknesses of electronic educational content, thereby assisting educational institutions in improving the quality of e-learning to meet students' needs better.
3. Understanding students' perceptions may facilitate the improvement of virtual classroom environments and increase their effectiveness in achieving educational objectives, thereby enhancing the virtual learning experience.
4. This research contributes to identifying the problems that hinder students from fully benefiting from virtual education.

5. Definition of Concepts:

1.5. Perceptions:

Jaensh defines perception as the ability possessed by specific individuals to determine their view of things they have previously seen (Chico, 2018, p. 54). In this study, perceptions refer to the opinions and impressions formed by students regarding various aspects of their experience with e-learning through virtual classrooms and their evaluation of the quality of electronic educational content. Perceptions are measured via a questionnaire comprising a set of questions designed to gather data on students' opinions and to assess their perceptions concerning the following: the quality of electronic educational content, interaction within virtual classrooms, and the difficulties they encounter.

2.5. E-learning:

Al-Owaid and others define e-learning as "education aimed at creating an interactive environment rich in applications based on computer and internet technologies, enabling access to learning resources at any time and from any place" (Boujenah, 2020, p. 88).

In this study, e-learning refers to the educational process that takes place through the use of internet technologies, whereby lessons and learning activities are delivered via dedicated electronic platforms. E-learning involves the use of

multimedia tools such as videos, texts, and interactive assessments, enabling students to access educational content digitally within a virtual learning environment.

3.5. Virtual Classrooms:

Virtual classrooms are a collection of programmes comprising activities analogous to those in traditional classrooms, conducted by both teachers and students, despite geographical barriers between them. Nevertheless, both parties work together either synchronously or asynchronously, interacting via online dialogue and posting messages visible to all network participants (Sharif & Taqabahi, 2022, p. 50).

In this study, virtual classrooms refer to educational environments conducted via the internet, where students interact with instructors and peers through digital learning platforms. Lectures and interactive activities are delivered at scheduled times, utilising communication tools such as audio, video, text chat, and online assessments. Virtual classrooms enable students to engage directly with both the educational content and the instructor within a virtual setting.

4.5. Electronic Educational Content:

Electronic content comprises educational materials delivered through digital media, such as text, images, videos, diagrams, and interactive simulations. This content is utilised in e-learning environments to provide information flexibly and interactively, thereby enhancing educational quality and facilitating access to knowledge (Bouthaljah, 2021, p. 120).

Procedurally, the electronic educational content in this study refers to educational materials provided online via digital learning platforms. This content includes texts, videos, presentations, assessments, interactive activities, and supplementary resources designed to enhance the student learning experience. The content is designed to be accessible online and must be current, organised, and clear to meet the educational needs of students.

Each of these concepts is measured in this study through a questionnaire comprising questions about students' experiences with e-learning and virtual classrooms, as well as their evaluation of the quality of electronic educational content and their engagement with these tools.

6. Previous studies:

1.6. Study by Hendal and Al-Khuzai (2022):

This study aimed to explore the e-learning experiences of Kuwait University students during the COVID-19 pandemic following the closure of schools and universities in Kuwait.

Methodology: This study was conducted during the summer semester of the 2019/2020 academic year and used a questionnaire comprising three sections: (1) an evaluation of the course, (2) an evaluation of the instructor, and (3) difficulties encountered by the students. The questionnaire was administered to a sample of 851 male and female students.

Results: The findings revealed moderately positive attitudes towards the e-learning experience, with no statistically significant differences based on gender or academic year. However, differences were observed between students from humanities faculties and those from scientific faculties in favour of humanities faculties. The results also indicated that students faced numerous challenges and problems, categorised as technical issues, curriculum-related problems, instructor competence, health and psychological problems, and communication difficulties.

2.6. Study by Khawaldeh (2020):

This study sought to identify the perceptions of University of Jordan students regarding the effectiveness of using e-learning platforms (Edraak) in developing self-learning skills within the National Culture course. The study sample consisted of 745 students who took the National Culture course during the second semester of the 2017/2018 academic year. The descriptive-statistical method was employed. The results revealed that students' perceptions of the benefits of using e-learning platforms (Edraak) in teaching the National Culture course were high, and the obstacles to using Edraak were limited. The respondents indicated that e-learning platforms are effective in developing self-learning skills, with no statistically significant differences in their perceptions according to gender, academic year, college, or family income variables. The study recommended the use of e-learning platforms such as Edraak in teaching other general university courses to capitalise on their role in fostering students' self-learning skills.

3.6. Study by Al-Anzi (2021):

This study aimed to explore the perceptions of secondary school female students regarding their educational use of the social learning network Edmodo in light of the variables of academic year and frequency of use. The research adopted the descriptive survey method, with a sample consisting of 355 students from the city of Al-Rass in the

Kingdom of Saudi Arabia. Data were collected via a questionnaire developed according to a five-point Likert scale comprising 30 items distributed across two principal axes: the advantages and disadvantages associated with the educational use of Edmodo. The results indicated the following:

- The students' perceptions were generally positive, except for a negative observation concerning poor internet connectivity.
- The study also revealed no statistically significant differences in perceptions according to the academic year variable, whereas there were differences related to frequency of use, as students who rarely used the network exhibited less positive perceptions regarding its benefits in education.
- The study highlighted the need to enhance the integration of Edmodo and other social networks into general education because of their positive impact on supporting the educational process.

4.6. Study by Rabhi (2021):

This study aimed to explore the perceptions of Al-Aqsa University students regarding e-learning during the COVID-19 pandemic and to propose a framework for the development of e-learning in higher education institutions. The qualitative approach was utilised, involving the development of an electronic interview tool, which was administered to a sample of 94 students. The researcher relied on the PEEL method for analysing the responses, leading to the following findings:

- The study revealed that the eight criteria analysed were important for improving e-learning, with some being achieved while others were not.
- The study presented 32 proposed indicators that could be added to students' perceptions of the development of e-learning.
- The design of the e-learning environment requires improvements to ensure flexible access and interaction between students and lecturers.

7. Field study procedures:

1.7. Exploratory Study:

An exploratory study was conducted at the beginning of the research to identify students' initial perceptions of the subject and to achieve a preliminary understanding of the concepts related to the study. This study aimed to gather preliminary information to aid in the formulation of the main research instruments and to determine the areas of focus for the questionnaire.

1.1.7. Objectives of the Exploratory Study:

1. To identify the key concepts related to electronic content, virtual classrooms, and interaction with educational platforms.
2. To examine students' understanding of the subject and the extent of their knowledge regarding the educational technology used in distance learning.
3. To identify prevalent patterns in the use of educational platforms and anticipate the difficulties students may encounter in interacting with electronic content.

2.7. Research Methodology:

The researcher employed the descriptive–analytical approach in this study, as it was deemed most suitable for the nature and objectives of the research. This methodology is among the most commonly used methods in educational and social studies, as it serves to describe phenomena as they exist in reality and to analyse them to reach accurate scientific conclusions. This approach was applied to the study of educational sciences students' perceptions of electronic content in virtual classrooms by collecting data through a questionnaire and analysing them statistically to derive indicators that facilitate a deeper understanding of the phenomenon under investigation.

3.7. Study Sample:

The study sample consisted of 100 male and female students from the Department of Educational Sciences, Faculty of Social Sciences, Mohamed Khider University of Biskra. They were selected via the simple random sampling method to ensure the representation of different academic levels within the department and to achieve a degree of diversity in perspectives regarding electronic content in the virtual classroom environment. The sample selection also took into account the need to represent students in the virtual education system who have experience with electronic learning platforms, thereby enhancing the reliability of the study's findings.

4.7. Study limitations:

- **Thematic delimitations:** This study focuses on the perceptions of educational sciences students regarding electronic content in virtual classrooms, specifically addressing three axes: content quality, interaction with content, and challenges related to the use of educational platforms.
- **Temporal delimitations:** The study was conducted during the second academic semester of the 2024–2025 academic year.
- **Spatial delimitations:** This research was carried out at the Faculty of Social Sciences, Mohamed Khider University of Biskra, Algeria.
- **Human delimitations:** This study involved a sample of 100 male and female students from the Department of Educational Sciences who were selected via a simple random sampling method at various academic levels.

5.7. Research instrument:

5.7.1. Description of the instrument:

The study relied on a questionnaire designed to reveal the perceptions of educational sciences students regarding electronic content in the virtual classroom environment. The instrument was constructed following descriptive-analytical methodology and was based on previous literature and scientific studies addressing the subject of e-learning. The instrument comprises three principal dimensions, each containing nine items formulated clearly and straightforwardly to measure students' opinions accurately. A five-point Likert scale was employed to determine the degree of respondents' agreement with each item according to the following scale: strongly agree, agree, neutral, disagree, and strongly disagree.

The following table presents the dimensions of the research instrument and the distribution of items for each dimension:

Table 1

Dimensions of the Research Instrument

Dimension Number	Dimension Name	Number of Items	Description of Dimension
01	Quality of Electronic Content	09	Measures the clarity, organisation, recency, and accuracy of information provided electronically.
02	Interaction with Electronic Content	09	Focuses on students' interaction with the content through participation and communication tools.
03	Difficulties in Using Educational Platforms	09	Addresses the technical, psychological, and organisational challenges impeding the effective use of platforms.

2.5.7. Validity and Reliability of the Instrument

First: Questionnaire validity: The validity of the questionnaire was verified via the following methods:

1. Expert Validity:

The questionnaire was submitted to five experts and specialists in the fields of educational sciences and e-learning. The experts reviewed the items in terms of their formulation, relevance, clarity, and extent to which they were aligned with the dimensions and objectives of the study. On the basis of their feedback, certain items were revised to ensure the instrument's face validity.

2. Internal consistency validity (Pearson correlation coefficient):

The correlation coefficients between each questionnaire item and its corresponding dimension were calculated to verify the consistency of the items with their respective dimensions. Additionally, the correlation coefficient for each dimension with the overall questionnaire was determined.

The results of the Pearson correlation coefficient indicated that all the items were statistically significant at the 0.05 and 0.01 levels, indicating the validity of the items and their associations with their dimensions. The following table presents the correlation coefficients of the dimensions with the overall scale:

Table 2

Correlation Coefficients of the Dimensions with the Overall Scale

Pearson Correlation	Dimension
0.88	Quality of Electronic Educational Content
0.84	Interaction in Virtual Classrooms
0.79	Difficulties in Virtual Learning

Table 2 clearly shows that all the correlation coefficients between the dimensions and the overall scale indicate a strong relationship. Therefore, the questionnaire is considered reliable for measuring students' perceptions of e-learning and virtual classrooms, with the dimensions demonstrating good integration in capturing these perceptions.

Second: Reliability of the instrument

The reliability of the questionnaire was assessed via Cronbach's alpha coefficient to ensure the internal consistency of the instrument. The alpha coefficient was calculated for each dimension of the questionnaire individually, as well as for the entire instrument. The following table presents the Cronbach's alpha values.

Table 3

Cronbach's alpha coefficients for the dimensions and the overall instrument

Cronbach's Alpha	Dimension
0.85	Quality of Electronic Educational Content
0.80	Interaction in Virtual Classrooms
0.82	Difficulties in Virtual Learning
0.87	Overall Instrument

It is evident from Table 3 that all the dimensions exhibited high reliability, reflecting that the questionnaire, as a research instrument, is dependent on obtaining accurate and reliable data.

3.6.7. Statistical methods

The researcher employed SPSS statistical software and relied on the following indicators:

- Standard deviation and arithmetic mean
- Cronbach's alpha coefficient
- Pearson correlation coefficient

8. Presentation and Discussion of the Study Results:

Upon completion of data collection and analysis via appropriate statistical methods, this section presents the study findings related to the perceptions of students in educational sciences regarding electronic content in the virtual classroom environment, according to the three main dimensions adopted in the research instrument: quality of electronic content, interaction with the content, and challenges associated with the use of educational platforms. The presentation of the results is followed by a scientific interpretation aimed at clarifying their significance in light of the theoretical framework and previous studies, highlighting the main trends reflected in the responses of the sample, and assessing their alignment with the study's objectives and research questions.

8.1. Presentation and Discussion of the First Research Question:

The first research question states, "To what extent is the quality of electronic educational content provided to students from their perspective?" To address this question, several steps must be undertaken, beginning with the calculation of the class interval, identification of response levels and estimation, followed by the computation of arithmetic means and standard deviations for the sample's responses.

Level of Agreement | Standard Deviation | Arithmetic Mean | Item Statement | Item Number

1. Calculation of the Class Interval:

Class interval = (Upper limit – Lower limit)/Number of categories = (5 – 1)/3 = 4/3 = 1.33

2. Determination of Study Categories:

- [1.00 to 2.33]: Low level of agreement
- [2.34 to 3.67]: Medium level of agreement
- [3.68 to 5.00]: High level of agreement

The following table illustrates the levels and estimation of response scores:

Table 4

Levels and Estimation of Response Scores

Level	Score Estimation
Low	1.00–2.33
Medium	2.34–3.67
High	3.68–5.00

Table 5

Arithmetic Means and Standard Deviations of Sample Responses Regarding the Quality of Electronic Educational Content

Level of Agreement	Standard Deviation	Arithmetic Mean	Item Statement	Item Number
Medium	1.05	3.30	The electronic educational content is straightforward to understand.	1
Medium	0.96	3.15	The educational content is presented in an engaging and stimulating manner.	2
Medium	1.12	3.27	The educational materials are supported by multimedia (images, videos, diagrams).	3
Medium	1.07	3.35	The educational content is up to date and reflects the latest information in the field.	4
Medium	1.00	3.48	The educational content is organised in a way that facilitates access to information.	5
High	0.66	3.83	The language used in the educational content is appropriate and clear.	6
Medium	0.86	3.55	The educational content helps achieve the intended learning objectives.	7
Medium	1.05	3.52	Additional resources are available for further enrichment.	8
Medium	1.22	3.24	The electronic educational content supports critical thinking and problem-solving.	9

Table 5 shows that the participants' overall evaluation of the quality of electronic educational content predominantly falls within the middle level, with arithmetic means ranging between 3.15 and 3.83. The statement regarding the appropriateness and clarity of the language used (Item 6) recorded the highest mean (3.83) with a low standard deviation (0.66), indicating a high level of agreement among participants regarding language clarity, an encouraging indicator of linguistic quality. The statement concerning the organisation of content and ease of access to information (Item 5) also recorded a good mean (3.48), reflecting an acceptable level of satisfaction with content organisation. In contrast, the lowest evaluation pertained to the statement about the attractiveness and stimulation of content presentation (3.15), indicating a relative weakness in the visual or interactive aspects of the content. Furthermore, the statement related to the support of critical thinking and problem solving (Item 9) received a relatively low mean (3.24) and a high standard deviation (1.22), reflecting considerable variation in participants' views and potentially indicating a shortcoming in this aspect of the content. Overall, the results reflect an acceptable level of satisfaction with the electronic content, with a clear need for improvement in areas such as attractiveness and deeper cognitive support, including the development of critical thinking and more effective utilisation of interactive media.

The data analysis indicates that the electronic educational content satisfactorily achieves certain pedagogical fundamentals in its design, particularly with respect to language clarity and the organisation of instructional material. This reflects the presence of a sound linguistic structure and ease of navigation and information access, suggesting an awareness among content developers of the importance of linguistic and organisational aspects in supporting learners' acquisition.

Conversely, the results highlight several areas requiring improvement, most notably the elements of attractiveness and engagement in presentation. This suggests that the content does not sufficiently employ interactive media or engaging features that capture the learner's interest and motivate continued learning. There is also a relative weakness in fostering critical thinking and problem-solving skills, which are higher-order abilities necessitating content that incorporates complex educational scenarios, open-ended questions, and cognitive tasks extending beyond rote memorisation and recall.

Furthermore, the variation in participants' responses to certain statements indicates differences in user experiences, which may be attributed to disparities in prior knowledge, previous exposure to electronic content, or inconsistencies in content quality across different units. This variability calls for a comprehensive review to increase the level of integration and consistency throughout all parts of the instructional material.

Overall, the findings reflect an acceptable foundation for the quality of electronic educational content; however, it remains necessary to address specific pedagogical aspects related to motivation, interaction, and cognitive development to achieve a more comprehensive and practical e-learning experience.

8.2. Presentation and Discussion of the Second Research Question:

The second research question states, "To what extent do students interact with electronic educational content?"

Table 6

Arithmetic Means and Standard Deviations of Sample Responses Regarding Their Interaction with Electronic Educational Content

Level of Agreement	Standard Deviation	Arithmetic Mean	Item Statement	Item Number
Medium	1.33	3.06	Interaction with the instructor in virtual classrooms is easy and effective.	1
Medium	1.05	2.99	My inquiries are answered promptly during virtual lessons.	2
Medium	1.08	3.30	Interactive tools (chat, polling, participation) are available and easy to use.	3
Medium	1.01	3.34	I feel comfortable expressing my opinions in virtual classrooms.	4
Medium	1.20	2.87	Group discussions are encouraged in virtual classrooms.	5
Medium	1.13	2.71	The virtual environment allows collaboration with peers in projects and activities.	6
Medium	1.04	2.83	The interaction time in virtual classrooms is sufficient to clarify ideas.	7
Medium	1.00	2.82	I feel well connected with my peers and instructors in virtual classrooms.	8
Medium	1.09	3.09	Virtual classrooms enhance engagement in the learning process.	9

Table 6 shows that the results related to the evaluation of interaction levels in virtual classrooms indicate that all nine statements fall within the medium level of agreement, with arithmetic means ranging from 2.71--3.34. The highest number of responses was recorded for the statement "I feel comfortable expressing my opinions in virtual classrooms," with a mean of 3.34 and a standard deviation of 1.01, indicating a reasonable degree of freedom of expression and psychological comfort within the online educational environment. This is followed by the statement concerning the availability and ease of use of interactive tools, with a mean of 3.30 and a standard deviation of 1.08, reflecting that technological tools are accessible and play a functional role in facilitating interaction.

Conversely, the lowest-rated items pertain to "the opportunity for collaboration with peers in projects and activities," with a mean of 2.71 and a standard deviation of 1.13, reflecting a shortcoming in fostering collaborative dimensions among students within the virtual environment. Similarly, the statement concerning the encouragement of group discussions received a mean of 2.87 and a standard deviation of 1.20, indicating the limited utilisation of virtual classrooms as spaces for discussion and idea exchange among learners. The item "I feel well connected with my peers and instructors" was also rated low, with a mean of 2.82 and a standard deviation of 1.00, which may reflect a weakness in social cohesion and a sense of belonging within the e-learning environment.

Overall, the standard deviations ranged from 1.00 to 1.33, indicating considerable variability in students' experiences, which further underscores the need to standardise the quality of interaction in virtual classrooms and to adopt educational practices that ensure a more balanced and inclusive learning experience for all students.

The results suggest that the level of interaction in virtual classrooms, as expressed by the students, was generally moderate, reflecting an acceptable degree of satisfaction with the nature of electronic interaction, although it did not reach the desired level for digital learning environments. The findings indicate that the most effective aspects of

interaction were learners' comfort in expressing their opinions and the availability of technical tools such as chat and participation features, which demonstrate partial success in establishing an interactive environment that allows for freedom of expression and provides accessible means of communication.

In contrast, notable shortcomings emerged in terms of collaborative and social communication, as participants reported an apparent lack of opportunities for peer collaboration within virtual classrooms and limited encouragement for group discussions. This suggests that the e-learning environment still lacks systematic mechanisms to enhance participatory learning and group interaction, which may reduce the effectiveness of learning and impact the sense of belonging and integration within the academic community.

Furthermore, the variation in students' responses to several items reflects the presence of individual differences in the extent to which learners benefit from the virtual learning environment. This may be attributed to differences in their digital backgrounds, the level of teacher engagement, or the nature of the instructional content delivered. This indicates a pressing need to improve educational practices in virtual classrooms by enhancing the human and social dimensions of learning and implementing pedagogical approaches that foster active participation and teamwork. Such improvements would contribute to creating a more dynamic and inclusive learning environment.

8.3. Presentation and Discussion of the Third Research Question:

The third research question states, "What are the difficulties encountered by students when using e-learning platforms?"

Table 7

Arithmetic Means and Standard Deviations of Sample Responses Regarding the Main Difficulties Faced by Students when using Educational Platforms

Level of Agreement	Standard Deviation	Arithmetic Mean	Item Statement	Item Number
Medium	1.15	3.46	I have difficulty using virtual learning platforms.	1
High	0.63	4.42	Internet connectivity is unstable and affects the learning experience.	2
Medium	1.14	3.51	I feel isolated and do not have sufficient communication with my peers.	3
High	1.03	3.83	I find it challenging to organise my time during virtual learning.	4
High	0.93	3.72	The educational content does not cover all the aspects I need.	5
High	1.03	4.18	I find it difficult to follow lectures due to distractions in the home environment.	6
High	0.81	4.31	I find that virtual classrooms do not provide the same level of interaction as traditional learning.	7
Medium	0.94	3.41	I face technical challenges when using e-learning tools.	8
Medium	0.84	3.51	I suffer from a lack of technical support when facing technical problems.	9

From Table 7, it is evident that students participating in virtual classrooms face a range of challenges spanning technical, organisational, and psychological issues. The most prominent difficulty is the instability of internet connectivity, which received the highest level of agreement, with a mean of 4.42 and a standard deviation of 0.63. This finding indicates that weak digital infrastructure constitutes a significant obstacle to the learning experience.

Additionally, the findings show that distractions in the home environment and difficulties in following lectures are among the main challenges affecting learners' ability to engage with educational content, as reflected by a mean of 4.18 and a standard deviation of 1.03 for the corresponding item. The study also revealed that learners perceive virtual classrooms as not providing the same level of interaction as traditional classrooms do, with this statement achieving a mean of 4.31 and a standard deviation of 0.81, reflecting a sense of lack of direct communication and active participation.

Despite the existence of specific technical difficulties, such as challenges in using educational platforms and insufficient technical support, these issues were less influential than other problems were, with means ranging between 3.41 and 3.51 and standard deviations ranging from 0.84 to 1.14. These results suggest that improving digital infrastructure, providing better technical support, and organising time in ways that foster social interaction are crucial factors for enhancing the virtual learning experience.

The analysis of the study's results reveals several important indicators concerning the nature of the difficulties faced by learners in virtual learning environments. The findings show a general sense among participants of multiple challenges affecting the quality of their educational experience, varying from technical issues to those related to self-organisation, in addition to problems related to social interaction and motivation.

From a technical perspective, difficulties stem from unstable internet connections and limited technical support, both of which hinder effective engagement in the educational process, particularly in environments heavily reliant on direct connection and real-time interaction. Furthermore, problems with handling digital tools and educational platforms emerged, indicating the need for training users—both instructors and learners—in the efficient use of these technologies.

From an educational and organisational perspective, the results indicate that many learners face challenges in time management and overcoming distractions, particularly in the absence of direct supervision and a structured classroom environment. This highlights the importance of developing self-directed learning skills and enhancing students' capacity to take responsibility for their learning.

At the same time, there is evident weakness in social interaction and a sense of isolation, which negatively affects emotional and communal engagement in the learning process. This deficiency in communication between students and their instructors represents one of the most significant shortcomings of virtual learning and calls for the adoption of interactive strategies that strengthen human relationships, even within digital environments.

Overall, the results demonstrate that the virtual learning experience continues to face challenges that require comprehensive solutions, combining infrastructure development, enhanced technical and pedagogical support, and the design of more interactive and contextually relevant educational content, alongside fostering learners' skills in self-organisation and effective communication.

Conclusion:

This study provides a deeper understanding of educational science students' perceptions of electronic content in virtual classroom environments. The findings revealed that students encounter specific challenges when dealing with electronic learning platforms, particularly concerning content interaction and quality. The study also underscores the importance of improving the quality of electronic content and providing adequate technical support to ensure a productive learning experience. Although virtual classrooms offer considerable opportunities, they still require enhancements across various technical and organisational aspects to ensure greater student engagement and to maximise the benefits of distance learning environments.

On the basis of the findings presented, this study proposes a set of recommendations as follows:

1. **Enhancing the Quality of Electronic Content:**
2. Periodically update and develop electronic content to reflect the latest information in the field, ensuring that the content is organised, clear, and easily comprehensible for all students.
3. **Continuous Technical Support:**
4. Provide effective technical support services for students to assist them in overcoming the technical issues encountered while using educational platforms.
5. **Promoting Student Interaction:**
6. Develop interactive tools to increase student engagement with the content, such as adding interactive activities, discussion forums, and innovative means of communication.
7. **Training Students in the Use of Educational Platforms:**

8. Organise workshops and training sessions to enable students to use educational platforms more effectively and efficiently, with a focus on improving self-directed learning skills.
9. **Enhancing Psychological and Social Support**
10. The virtual classroom environment should incorporate strategies to create a collaborative social atmosphere among students, which helps reduce feelings of isolation and fosters positive interaction.
11. **Improving Interaction between Students and Instructors:**
12. Instructors should allocate regular periods for interaction with students in virtual classrooms, thereby enhancing their understanding of the content and increasing their participation in the learning process.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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