The Emotional Impact of Virtual Learning Environments: A Psycho-Educational Perspective among Upper Secondary Students

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***Abstract*—This study explored how virtual learning environments affect the emotions of upper secondary students from a psycho-educational viewpoint. The researcher used a descriptive-analytical approach and gathered data with the Positive and Negative Affect Schedule (PANAS) and other scales that assessed learning experiences and psycho-educational effects. The participants were upper secondary students who took part in virtual learning during the school year. The results showed that most students reported positive emotions such as enthusiasm, happiness, and self-confidence, with 65% to 79% reporting them. Negative emotions such as stress, frustration, and anxiety were much less common. Students also gave high ratings to the educational, psychological, and social aspects of virtual learning, noting that it helped them better understand the material, improve technical skills, and feel more connected to their school community. Statistical analysis found a significant difference in Subscale 1 by course load, but no significant differences by gender, grade, or in other subscales. This suggests that virtual learning environments are inclusive and emotionally supportive for all students. The study concludes that well-designed virtual learning can boost both academic success and emotional health, and recommends further research on integrating emotional support into digital learning.**

***Keywords*—emotional impact, virtual learning environments, psycho-educational perspective, secondary students**

I. Introduction

Digital technology has transformed education, leading educational systems worldwide to adopt strategies that integrate information and communication technologies into teaching and learning. This transition has raised concerns about educational quality, particularly regarding comprehension, adaptability, and alignment with current technological advancements [1, 2].

Amid the ongoing digital transformation, Virtual Learning Environments (VLEs) have become prominent tools for facilitating e-learning and blended learning [3]. VLEs are implemented worldwide in higher education institutions, primary and secondary schools, and other educational organizations to deliver interactive, collaborative learning experiences centered on the learner. Since the early 2000s, numerous universities have integrated VLEs to enhance teacher preparation programs and distance education [4].

Virtual learning environments help students interact, collaborate, and express their feelings, which build strong communication skills and peer relationships. Emotional factors play a big role in how effective these environments are. When learning activities are designed with these factors in mind, students tend to be more motivated and engaged, and to achieve better academic outcomes. This approach also supports a well-rounded learning experience that addresses both thinking and emotional needs [5].

Digital platforms within VLEs provide students with access to diverse educational resources, instructional tools, and structured activities. Addressing students' emotional responses is critical for creating a supportive and inclusive educational environment [6, 7].

Social-Emotional Learning (SEL) theory focuses on developing the social and emotional skills necessary for success in school and life. Students who develop these skills can manage their emotions, build healthy relationships, and make good decisions. SEL also fosters positive interactions in online learning and supports learners in working together effectively. Today, SEL is seen as important for both children and adults because it supports lifelong learning, well-being, and a better learning experience [8].

Huerta-Pacheco *et al*. [9, 10] highlight the importance of modeling cognitive-affective factors in Intelligent Tutoring System (ITS), focusing on intrinsic and extrinsic influences on student learning. Their research shows that understanding students' traits and preferences can make tutoring systems more effective by enabling the prediction of students' emotional responses and learning outcomes.

Virtual learning environments may be designed to promote social interaction, collaboration, and emotional expression, which are essential for both cognitive and emotional development *Virtual learning environments may be designed to promote social interaction, collaboration, and emotional expression, which are essential for both cognitive and emotional development* [11]. These settings also provide students with more opportunities to communicate meaningfully by collaborating and using digital spaces to share their feelings. By integrating social and emotional dimensions, students can have richer learning experiences and develop skills for interacting and adapting to different learning contexts [12, 13].

Positive emotional engagement increases motivation, improves information retention, and supports a constructive learning environment. In contrast, negative emotional states hinder learning. Emodiversity—the balance and variety of emotional experiences is also a significant factor influencing the quality of the educational experience [12].

Emotions are integral to the learning process, particularly in virtual learning environments that employ virtual reality technology. Emotional states affect motivation, decision-making, and academic performance [14]. These findings indicate the importance of integrating emotional strategies into virtual learning environments to promote

emotional awareness [12]. Emotions also influence learners' experiences, skill acquisition, and cognitive processes. Therefore, developing self-awareness and emotional regulation through methods such as reflective journaling and emotion logging is valuable [5].

Xiong *et al*. [15] show that student satisfaction in virtual learning depends on the interaction of technology acceptance, cognitive presence, and emotional engagement. Jamebozorg [16] further identifies students' emotional perception and teachers' emotional responses as key aspects of emotional presence. The strong correlation between teachers' emotional responses and students' perceptions highlights the need to incorporate emotional strategies into virtual learning design to enhance interaction and motivation.

A study found that 85% of upper-level students consider emotions essential to virtual learning, underscoring the importance of emotional support in distance education [17]. Another study reported that emotional discomfort, including anxiety and frustration, was widespread among students during the pandemic and contributed to resistance to online learning [18].

While addressing emotional aspects in virtual learning is important, some researchers argue that education should primarily focus on developing students' cognitive skills [19]. Striking a balance between emotional and academic needs is challenging but essential for creating an inclusive environment that supports holistic learner development.

Given the above, the importance of conducting a descriptive study to explore the emotional impact of virtual learning environments on upper secondary students is evident, particularly in light of the experiences imposed by the COVID-19 pandemic. Such studies uncover students' perceptions and feelings toward learning in virtual settings and examine their satisfaction with this educational experience. This ultimately contributes to developing pedagogical practices and improving educational quality in modern digital contexts.

While many studies have examined how students felt about online learning during the COVID-19 pandemic, few have examined how students adapt emotionally to virtual learning after the pandemic. There is also little research on how upper secondary students (Grades 10–12) experience these changes, especially in the Middle East. Most existing work focuses on university students, so we know less about adolescents' unique emotional and educational experiences. This study helps address this gap by examining the emotional impact of virtual learning on upper secondary students in Jordan, using a modified PANAS scale that includes extra psycho-pedagogical factors.

II. Theoretical Framework

It is important to conduct a descriptive study to understand how virtual learning environments affect the emotions of upper secondary students, particularly in the wake of the challenges posed by the COVID-19 pandemic. These studies help reveal how students feel about learning online and how satisfied they are with this experience [14]. The findings can guide more effective teaching methods and improve the quality of education in today's digital world.

VLEs now include features that support administrative tasks, course delivery, and student interaction. The incorporation of digital tools such as forums, wikis, and video conferencing further enriches the learning experience, especially within blended learning models that integrate online and in-person instruction [20].

Virtual Learning Environments (VLEs) have become essential in academia, with their significance increasing during the COVID-19 pandemic. These platforms support communication and interaction between educators and students, expanding learning opportunities beyond conventional classroom settings and scheduled hours [21]. VLEs allow learners to collaborate, access educational resources, submit assignments, complete online assessments, and obtain instructor support without requiring in-person interaction in online or blended learning contexts [22].

Virtual Learning Environments (VLEs) are changing how education works today by encouraging both collaboration and personalized learning. They use Information and Communication Technologies (ICTs) to help students and teachers interact, build knowledge, and become more independent learners [14]. Studies show that VLEs help teachers and students work together, communicate, and engage more effectively.

A. Types of Virtual Learning Environments

Virtual Learning Environments (VLEs) enable people to learn outside regular classrooms. They use technology to create interactive experiences for learners of all kinds. Below are some main types of VLEs that researchers have identified.

- Collaborative Virtual Learning Environments are distributed platforms that facilitate interaction among learners, peers, and instructors, often incorporating graphical representations ranging from two-dimensional to three-dimensional [23].
- Learning Management Systems (LMS): Platforms such as Moodle and Edmodo facilitate course management, content delivery, and student assessment, providing a structured approach to online learning [14].
- Immersive environments and simulations, such as educational games and augmented reality apps, encourage students to participate more and learn through hands-on activities. These tools allow students to explore complex ideas in a virtual setting.
- Asynchronous and Synchronous Learning: VLEs are often grouped by how people interact. Asynchronous environments let students learn at their own pace, while synchronous platforms support real-time collaboration and communication [24].

1) The emotional impact of virtual learning environments

Virtual Learning Environments (VLEs) significantly influence the emotions of students and teachers. Changes in teachers' emotional states may reduce instructional effectiveness. Pedagogical approaches within VLEs can also affect students' psychological well-being [14]. This relationship highlights the need for evidence-based interventions and support systems to promote emotional stability and well-being for everyone involved in education.

The emotional effects of VLEs are complex and strongly influence learners and educators. While VLEs offer effective educational opportunities, they also introduce challenges that affect emotional engagement [25]. Understanding these

factors is essential for developing virtual learning strategies that optimize educational and emotional outcomes.

B. Emotional Responses among Students

Students in Virtual Learning Environments (VLEs) experience diverse emotions that reflect the challenges of digital learning. Satisfaction and engagement often result from achieving goals or positive interactions, while technical issues or unclear instructions can lead to stress and anxiety [26]. These emotional responses underscore the importance of psychological and affective factors in motivation and persistence.

User experience also shapes emotional responses Collaborative tasks can promote belonging and enthusiasm, while complex individual tasks may cause stress or frustration. Effective design is essential to enhance learning and support student well-being [27].

C. Teachers' Perspectives

Virtual Learning Environments (VLEs) affect teachers emotionally as well as students. Teachers may feel tired or frustrated due to remote monitoring, technical issues, and less interaction. On the other hand, seeing students make progress and engage positively can make teachers feel enthusiastic and accomplished [26–28].

How teachers use VLE tools can shape students' emotions. When teachers encourage interaction, give helpful feedback, and let students express their feelings, students' well-being improves [14]. Relying too much on technical or impersonal methods can reduce emotional engagement. This shows the importance of teaching strategies that support both the emotional and psychological sides of learning in virtual settings [29, 30].

D. PANAS (Positive and Negative Affect Schedule)

The PANAS scale is a standard tool in psychology and education for measuring emotions. Created by Watson, Clark, and Tellegen in 1988 [31]. It assesses two main types of feelings: Positive Affect, which includes emotions such as pride, enthusiasm, alertness, and joy, and Negative Affect, which encompasses feelings such as anger, fear, frustration, and sadness.

The PANAS scale has 20 items: 10 for positive emotions and 10 for negative ones. People rate each item from 1 (never) to 5 (always or very often). Researchers can use PANAS to measure either short-term feelings or general mood, depending on their needs. Studies from around the world, including Arabic research, show that PANAS is reliable and valid. This makes it helpful in studying emotions in virtual learning and metaverse education, and for looking at how these emotions affect satisfaction, motivation, and well-being [31].

Research shows that VLEs significantly affect students' emotional responses, which in turn influence learning outcomes. Studies also show that adding Virtual Reality (VR) to education causes unique emotional reactions. Natural virtual environments in VR boost positive feelings and decrease negative ones [32]. VR design elements can be customized to trigger particular emotions, increasing engagement and participation in learning and enriching the overall experience [33].

1) Emotional responses in virtual learning environments

Interactive and engaging Virtual Learning Environments (VLEs) promote positive emotions in students, increasing motivation and improving learning outcomes. Conversely, negative emotions like confusion and frustration can impede progress, with their effects depending on the context and duration [34].

2) The role of PANAS in assessing affect

The Positive and Negative Affect Schedule (PANAS) reliably measures positive and negative emotions across diverse populations. In virtual learning environments, using PANAS to assess students' emotions supports the creation of learning settings that address emotional needs and enhance teaching strategies [35, 36].

While PANAS offers valuable insights into emotional states, the link between affect and learning is complex and influenced by various contextual factors affecting both outcomes and experiences.

III. Previous Studies

Kooptiwoot *et al*. [37] examined students' online learning preferences during the COVID-19 pandemic disrupted education and prompted a shift to online learning, underscoring the importance of understanding students' preferences in this context. A recent study used decision trees and machine learning methods to look at students' online learning preferences during the pandemic. The study found that students' feelings, like anxiety and stress, have a direct effect on their willingness and performance in digital learning. The results also showed that providing students with basic computer and internet training can help them participate more effectively

Al-Eisawi [38] indicates that the present study shows that higher education institutions struggled to quickly shift to online learning during and after the COVID-19 pandemic, especially in maintaining high educational quality. These studies emphasize the need for educational systems to adapt to students' diverse needs in digital environments. There is also a lack of understanding about what affects student satisfaction with online learning, particularly in Jordanian institutions. Some researchers have addressed this by developing predictive models that use data mining and machine learning to analyze various factors to improve digital learning and increase student satisfaction.

Hamzah *et al*. [39] highlight that the study aims to create a design framework that integrates virtual reality and social-emotional learning to help Malaysian adolescents better manage their emotions. The framework uses immersive virtual reality to build interactive scenarios, with attention to user interface, display features, and brain activity. The findings suggest strong potential for educational use, but technical issues, content creation, and teacher training must be addressed to fully realize these benefits).

Yang *et al*. [40] demonstrate that he present study investigates the influence of Interactive Virtual Reality (IVR) features and emotional learning experiences on learning outcomes among university students. Results indicate that a sense of presence and enjoyment within the virtual environment serve as significant mediators, enhancing both learning outcomes and student satisfaction. The research

provides theoretical and practical recommendations for the design of virtual learning environments, supports the integration of virtual reality into experiential and collaborative learning, and contributes to the ongoing digital transformation in higher education.

Zhang *et al*. [41] reveal that this study examines the application of virtual reality to enhance social-emotional learning in children and adolescents over the past decade, focusing on technological characteristics and instructional design. The findings indicate that virtual reality interventions produce a moderate positive impact on social-emotional learning outcomes, with effectiveness varying by specific disorder and the characteristics of the learning tasks. The study concludes with practical recommendations and outlines future research directions for the development of virtual reality applications in social-emotional learning.

Nogueira and Neto [27] report that this study examines the emotional impact of students' interactions with a virtual learning environment using the Affect Grid tool for emotion classification. Twelve students participated, providing sixty responses while completing tasks. The findings show that user experience methods help identify students' emotions during learning and improve our understanding of educational experiences in virtual environments.

Flores-González [42] observes that this study examined the emotional responses of high school students engaged in virtual learning after the COVID-19 pandemic. Researchers administered a Likert-scale questionnaire to students at Enrique Cabrera Barroso School. The results demonstrate that students experience diverse emotional states during online learning and interaction, which substantially affect their adaptability and academic performance in digital settings.

Studies show that decision-support frameworks help guide users' interactions with digital interfaces. For example, Kooptiwoot [43] shows that interactive digital systems can support decision-making by using user preferences and real-time feedback. This idea also applies to virtual learning environments, where emotional engagement and interface design affect students' choices and learning, underscoring the need to incorporate emotional factors into digital education design.

IV. Methodology

A. Design, Participants, and Procedure

A quantitative descriptive research method was used to explore the emotional effects of virtual learning environments from a psycho-educational perspective among Upper secondary school students. This method supports the study's goal of systematically describing and analyzing emotions related to digital learning using measurable data.

The study population consisted of all upper secondary school students (grades 10, 11, and 12) in independent international schools, totaling 150 students, who regularly use virtual learning environments as part of the educational process.

To achieve the study objectives and accurately analyze the emotional impact, Purposive convenience sampling was chosen because the study focused on students who often use virtual learning environments. This ensured that participants could share relevant insights about their emotional experiences. A total of 106 students took part, covering grades 10, 11, and 12, with a balanced mix of genders and different numbers of subjects studied. To reduce sampling bias, all 150 upper secondary students in independent international schools were invited to participate. While the findings mainly reflect the experiences of these 106 students, the results may be cautiously applied to similar upper secondary groups who regularly use virtual learning platforms.

The Positive and Negative Affect Schedule (PANAS) was used to measure emotions. The scale was adjusted to fit the virtual learning environment and the needs of upper secondary school students in Jordan. Changes included updating item wording to match online learning experiences, such as changing "I feel excited today" to "I feel excited while using the virtual learning environment." Items about digital interaction, such as anxiety or frustration due to connectivity problems, were added. The translation was also checked for clarity and understanding. Experts reviewed the scale, and a pilot test with a small group confirmed its validity and reliability before the main data collection.

The scale was distributed via Microsoft Teams, Moodle, and email, and data collection lasted 3 weeks. Participants cooperated well during the scale administration, resulting in reliable data for statistical analysis. In this study, the virtual learning environment was set up using the school's Learning Management System (LMS). The LMS offered interactive features like video lessons, discussion boards, and real-time feedback. While it is not a complete Metaverse platform, it includes immersive, interactive elements that mimic aspects of virtual learning.

Before the study, the researcher received official approvals from the school administration. Participants were informed about the study's goals, with assurances that their responses would be kept confidential and that their participation was voluntary. The institutional review board granted ethical approval for the study, Informed consent was obtained from students' guardians, and verbal assent was obtained from the students before data collection began.

Based on the sample size and participation rate, the number of participants in this study is considered adequate and sufficient to meet the research objectives and perform the necessary statistical analyses with accuracy and reliability. Table 1 shows the demographic characteristics of the study participants.

Table 1. The demographic characteristics of the participants

NO	characteristics		*F*	*P*
1	Gender	Male	55	%51
		Female	51	48.%
2	Class	10	29	27%
		11	42	39.6%
		12	35	33%
3	No of subject	<5	57	53.8%
		5-10	27	25.5%
		>10	22	20.8%

B. Study Instrument

The PANAS scale was used to measure students' psychological and emotional impact in Virtual learning

environments and to collect data on students' psychological and emotional responses.

The developed scale consisted of 24 items divided into two parts:

Part 1: includes demographic information (3 items) that collect data about the respondent's gender, grade level, and the number of courses studied through virtual learning environments.

Part 2: addresses the psychological and emotional impact of these environments on students and comprises 22 items designed to measure their influence. This part includes three sub-dimensions:

- The Positive and Negative Emotional Impact Section, consisting of 10 items adapted from the PANAS scale.
- The Evaluation of the Learning Experience Section, consisting of 5 items.
- The Psych pedagogical Impact of the Virtual Learning Environment Section, consisting of 7 items.

The questionnaire took approximately 30 min to complete, and a five-point Likert scale was used, ranging from (1 = Strongly Disagree) to (5 = Strongly Agree).

Table 2. Pearson correlation coefficients between subscales and the overall questionnaire

Subscales	Subscale 1	Subscale 2	Subscale 3	Total
Subscale 1	1	0.189	0.211*	0.725**
Subscale 2	0.189	1	0.290**	0.740**
Subscale 3	0.211*	0.290**	1	0.555**
Total				1

*$p < 0.05$; ** $p < 0.01$

Eight experts in curriculum and instruction, educational psychology, counseling, and educational technology verified the scale's content validity. Correlation analyses between the subscales and the total scale (see Table 2) confirmed the scale's internal and construct validity. All subscales showed positive, statistically significant correlations with the total score (r = 0.725, 0.740, 0.555; $p < 0.01$), indicating that the subscales effectively measure the primary construct and support the instrument's construct validity.

Table 3. Cronbach's alphas for the PANAS questionnaire

Scale	Subscale	Cronbach's Alphas
The Psychological and Emotional Impact of Virtual Learning Environments on Students (22 Items).	Emotional Impact Section: (Positive and Negative (10 Items)	0.72
	Evaluation of the Learning Experience in the Virtual Learning Environment (5 Items)	0.66
	The Psychological Impact of the Virtual Learning Environment (7 Items)	0.84
	Total	0.88

Cronbach's alpha coefficients were also calculated, as shown in Table 3, indicating that the research instrument is valid and reliable (i.e., it possesses both validity and reliability).

C. Data Analysis

The research questions were addressed by using descriptive statistics to explore the psychological and emotional impact of virtual learning environments on students. The analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 25.

V. Results and Discussion

To answer the research questions, the means, standard deviations, frequencies, and percentages of the participants' responses were calculated for the subscales of the PANAS measure

RQ1: What is the level of emotional impact generated by virtual learning environments among upper secondary school students?

A. Emotional Impact: Positive and Negative Dimensions

1) Positive emotional responses (items 1–5)

The findings show that most students experienced enthusiasm, happiness, and confidence during participation in virtual learning environments, with favorable response rates between 65% and 79%. These results demonstrate that virtual learning environments enhance intrinsic motivation and increase student engagement in academic activities. Self-report measures may be affected by social desirability bias or by the novelty of VLEs. Cultural and contextual factors may also shape students' emotional responses, as shown in other studies [32–40].

Several factors contribute to these outcomes. Virtual learning environments provide diverse and interactive activities that foster excitement and stimulate self-motivation through active engagement. These platforms support the use of effective teaching strategies [41]. The immersive qualities of virtual platforms increase student satisfaction and enjoyment with educational content. Additionally, these environments promote positive communication and collaboration among peers and instructors, facilitating the exchange of experiences and the development of collaborative learning skills [33].

Active participation in virtual learning environments fosters self-confidence and enables students to complete academic tasks more effectively and independently. Intrinsic motivation and engagement in both individual and group educational activities further reinforce self-confidence in these settings. This result aligns with previous studies [27] which have confirmed that positive digital interactions increase students' feelings of enjoyment and engagement in learning. The elevated sense of self-confidence observed among students can also be attributed to their perceived autonomy and control over the pace of learning, which is consistent with the principles of self-directed learning and learner-centered education.

It is important to view these positive outcomes with caution. Some studies have found challenges such as frustration, technological anxiety, and difficulty adapting to VLEs [4]. The newness of VLEs might boost positive emotions for a short time, and cultural or local factors in Jordan could lead students to respond differently than those in other places.

2) Negative items (items 6–10)

The results show an apparent reduction in negative emotions related to virtual learning, with mean scores below 2.5. This suggests students did not experience significant

stress or anxiety in these environments.

As shown in Table 4, positive emotions such as enthusiasm ($M = 3.8$), happiness ($M = 4.1$), enjoyment ($M = 3.8–3.9$), and confidence ($M = 3.97$) were generally high, while negative emotions such as stress ($M = 2.05$), frustration ($M = 2.14$), anxiety ($M = 2.27$), pressure ($M = 2.08$), and exhaustion ($M = 2.13$) were low, indicating an overall positive perception of the virtual learning environment.

learning activities and user-friendly platforms, which reduce frustration from technical issues or interaction difficulties [40]. Additionally, the decrease in negative emotions may reflect students' adaptation to technology in education after the COVID-19 pandemic, as virtual environments are now part of their daily experience.

While the results show low levels of negative emotional affect, it is important to interpret these findings carefully. The low scores might not only reflect how effective virtual learning environments are. They could also be shaped by social desirability bias, the specific traits of the study group (e.g., motivated, high-achieving students in international schools), or the limited sensitivity of the measurement scale used. In addition, earlier studies have found higher levels of stress and anxiety in online learning, which suggests that differences in context and research methods may explain the gap between these results and previous research. These findings are consistent with [33] study, which found that frequent use of virtual learning reduces technological anxiety and increases psychological acceptance of these environments.

Table 4. Descriptive statistics of students' responses for subscale 1 (positive and negative affective impact in virtual learning environments)

Statement	*SD*	*D*	*N*	*A*	*SA*	*M±Std*
I experienced enthusiasm while engaging in virtual learning environments.	12.3%	6.6%	9.4%	26.4%	45.3%	± 1.38
I felt happy while engaging with educational content in the virtual learning environment.	3.8%	9.4%	7.5%	30.2%	49.1%	4.1. ± 1.13
I found participation in educational activities within the virtual learning environment enjoyable	0.9%	3.8%	30.2%	37.7%	27.4%	3.8 ± 0.89
I found participation in educational activities within the virtual learning environment enjoyable.	0.9%	6.6%	23.6%	39.6%	29.2%	3.8 ± 0.93
I was confident in my ability to complete learning activities in the virtual learning environment.	0%	7.5%	18.9%	42.5%	31.1%	3.97 ± 0.98
I experienced stress due to the difficulty of engaging with content in the virtual learning environment.	17.9%	58.5%	23.68%	0%	0%	2.05 ± 0.644
I experienced frustration due to a technical problem encountered while using the virtual learning environment.	16.0%	57.5%	23.6%	1.9%	0.9%	2.14 ± 0.736
I experienced anxiety regarding my ability to keep up with learning in the virtual learning environment.	12.3%	52.8%	31.1%	2.8%	0.9%	2.27 ± 0.750
I experienced pressure due to the workload in the virtual learning environment.	21.7%	50.9%	24.5%	2.8%	0%	2.08 ± 0.757
I experienced exhaustion from prolonged use of the virtual learning environment.	17.9%	54.7%	23.6%	3.8%	0%	2.13 ± 0.744

B. Students' Evaluation of Virtual Learning Environments

The study found that students rated virtual learning environments highly, with average scores ranging from 4.10 to 4.29. Most participants agreed that these environments support learning and encourage interaction Over 80% of students responded positively to most statements, showing strong satisfaction and acceptance Perceptions might not show the full picture of long-term learning outcomes or challenges found in other settings. For example, technical problems or differences in how people adapt across cultures could alter these effects [33].

One reason for these positive results is that virtual learning environments offer many ways for students to interact with content, teachers, and classmates. They also give students flexible access to materials and tools that help them better understand academic concepts. For instance, 76.4% of students said virtual learning helped them understand subjects more deeply than traditional methods, highlighting the value of simulations, interactive presentations, and digital activities.

Similarly, item 15 showed that 85.9% of students believed that the virtual learning environment contributed to the development of their technical skills, which aligns with previous studies such as [29–33] indicating that virtual learning enhances learners' digital competence and equips them with new skills for handling educational software and interactive platforms.

Table 5. Descriptive statistics of students' responses for subscale 2 (evaluation of virtual learning environment

Statement	*SD*	*D*	*N*	*A*	*SA*	*M±Std*
I found that the virtual learning environment offered adequate support for engaging with the course materials.	0.9%	5.7%	12.3%	25.5%	55.7%	±0.95
The virtual learning environment enabled me to develop a deeper understanding of the subjects than traditional learning methods.	0.9%	10.4%	12.3%	30.2%	46.2%	± 1.04
The virtual learning environment facilitated meaningful interaction with both teachers and classmates.	0%	4.7%	13.2%	39.6%	42.5%	±.0.84
I was comfortable using the technological tools available in the virtual learning environment.	0%	4.7%	6.6%	44.3%	44.3%	±0.78
The virtual learning environment contributed to the development of my technical skills, including proficiency with applications and digital devices.	0%	3.8%	10.4%	38.7%	47.2%	4.29 ± 0.80

The results also showed that students felt comfortable using technical tools, with an average score of 4.20. This suggests that virtual learning environments helped reduce students' initial anxiety about technology. These findings

align with those of [14], who found that easy-to-use, well-designed digital platforms make students more willing to use them and improve their learning experience.

As shown in Table 5, students reported high levels of positive engagement and satisfaction in the virtual learning environment, including adequate support ($M = 4.29$), deeper understanding of subjects ($M = 4.10$), meaningful interaction with teachers and classmates ($M = 4.19$), comfort with technological tools ($M = 4.20$), and development of technical skills ($M = 4.29$).

C. Psychological Impact of Virtual Learning Environments

The study found that students rated the psychological and social impacts of virtual learning environments highly, with average scores ranging from 4.1 to 4.3. Most participants agreed that these environments improved their educational experience.

Specifically, 85.9% of students reported that the virtual learning environment positively influenced their overall attitude toward education (item 16), while 87.7% indicated that it enhanced the overall quality of their academic life (item 22). These high percentages highlight the effectiveness of virtual learning environments in promoting academic satisfaction and a sense of achievement [33].

However, these findings should be viewed with caution, as positive reports may be influenced by novelty effects or self-report bias. Experiences can also differ depending on cultural or contextual factors. Some studies have found that students in online learning experience stress, anxiety, or resistance, which shows the importance of a balanced interpretation [18, 19].

The results show in Table 6 that virtual learning environments have a positive effect on students' mental well-being and motivation. Many students said they felt more positive about education and were more open to digital learning. About 79% said virtual learning improved their mood during classes, and 84% felt it helped them manage the challenges of distance learning. This highlights the importance of support and interaction with instructors and classmates [32].

Regarding social aspects, about 86% of students said that interacting in virtual learning environments helped them build good relationships with instructors and classmates. Around 84% felt a sense of belonging to the school community, even while learning remotely. This shows that virtual environments can support social connection and boost motivation. These results are similar to findings from [33–40], who found that social interaction in digital settings helps reduce anxiety and isolation. That virtual learning environments extend beyond their academic role, serving also a therapeutic and preventive function in supporting students' mental health. In summary, these results show that virtual learning environments do more than support academics. They also help students' mental health by offering a flexible, engaging, and safe space to learn [26]. These environments can improve mood, social connection, and participation. The study suggests adding more emotional and social support to virtual learning to create a healthier and more balanced experience for Students [32]. Overall, these findings are promising, but it is important to consider possible methodological limitations, self-report biases, novelty effects, and cultural or contextual factors to maintain a balanced perspective.

Table 6. Descriptive statistics of students' responses for subscale 3 (psychological impact of virtual learning environments)

Statement	*SD*	*D*	*N*	*A*	*SA*	*M±Std*
The virtual learning environment positively influenced my overall perception of education.	0%	1.9%	12.3%	38.7%	47.2%	4.3 ± 0.76
The virtual learning environment supported the development of my personal skills, including time and task management.	9%	3.8%	13.2%	46.2%	35.8%	4.1 ± 0.84
The virtual learning environment influenced my overall mood throughout the learning process.	0%	3.8%	17%	44.3%	34.9%	4.1 ± 0.81
Interaction within the virtual learning environment enabled me to build positive emotional relationships with both teachers and classmates.	0.9%	1.9%	11.3%	42.5%	43.4%	4.2 ± 0.80
I felt that the virtual learning environment fostered a sense of belonging to the educational community, even while learning remotely.	0%	3.8%	12.3%	43.4%	40.6%	4.1 ± 0.80
The learning environment helped me overcome psychological challenges related to distance learning.	0.9%	6.6%	8.5%	39.6%	44.3%	4.1 ± 0.91
.The virtual learning environment contributed to the overall improvement of my academic life.	0%	1.9%	10.4%	35.8%	51.9%	4.3 ± 0.74

RQ 2: Are there statistically significant differences in the levels of emotional impact among high school students?

First, for gender, the independent-samples t-test, as presented in Table 7 showed that male students had a mean emotional impact of ($M = 3.8515$, $SD = 0.28627$), while female students had ($M = 3.8128$, $SD = 0.34476$), with no statistically significant difference ($t(104) = 0.631$, $p = 0.529$).

This suggests that gender does not influence emotional impact among students. One possible reason is that virtual learning environments offer equal chances for interaction and emotional engagement, focusing more on activities and content than on personal characteristics.

Several studies have similarly reported that online and virtual settings minimize gender-based differences in participation, motivation, and emotional experience, as the learning process depends primarily on digital content and social presence rather than face-to-face dynamics [26, 33, 32].

Table 7. Results of the independent samples t-test for gender on the overall emotional impact level

SEX	*M*	*SD*	*t*	*df*	*Sig*
Male	3.85	0.28	0.63	104	0.52
Female	3.81	0.34			

Second, for grade level, the one-way ANOVA, as shown in Table 8 showed no significant differences among 10th, 11th, and 12th-grade students ($F(2,103) = 1.980$, $p = 0.143$). The mean scores were similar: 3.86 for 10th grade, 3.76 for 11th grade, and 3.90 for 12th grade. This suggests that grade level does not affect emotional impact. This may be because virtual learning environments and their content provide students across different grades with similar learning

experiences, leading to similar emotional engagement [32].

Table 8. One-way ANOVA results for emotional impact by grade level

grade level	*M*	# of students	*F* value	*Sig*
10th	3.85	29	1.98	0.143
11th	3.76	42		
12th	3.89	35		

When looking at the number of courses students were taking, the one-way ANOVA as shown in Table 9 showed that overall emotional impact did not differ by course load ($F(2,103) = 1.56$, $p = 0.213$). However, one part of the emotional impact (SUB1) showed significant differences among groups ($F = 4.051$, $p = 0.020$), whereas the other two parts did not. This means that the number of courses does not affect the overall emotional impact. However, some specific aspects of students' emotional experience may be influenced by their workload or the number of tasks [14].

Table 9. One-way ANOVA results for emotional impact by number of courses

number of courses	*F* value	*Sig*	Statistical Significance
Overall Emotional Impact	1.56	0.213	Not Significant
SUB1	4.05	0.020	Significant
SUB 2	1.84*	0.162*	Not Significant
SUB 3	0.95*	0.389*	Not Significant

*$p < 0.05$

In summary, these results show that gender, grade level, and number of courses do not lead to significant differences in students' emotional impact in virtual learning environments. This suggests that the emotional experience is stable and inclusive for all groups, with no apparent signs of discrimination. However, one specific subscale related to emotional impact (Subscale 1) did show a statistically significant difference. This suggests that some emotional factors may be influenced by the number of courses students take rather than by their demographic characteristics.

In summary, the results show that gender and grade level did not cause any statistically significant differences in students' emotional impact in virtual learning environments. There were also no significant differences in overall emotional impact based on the number of courses taken. However, one specific subscale related to emotional impact (Subscale 1) did show a statistically significant difference. This suggests that some emotional factors may be influenced by the number of courses students take rather than by their demographic characteristics.

VI. Conclusion

This study found that virtual learning environments help create engaging educational settings that boost positive emotions in upper secondary students. Students often felt enthusiastic, happy, and confident during virtual learning, showing that these environments can support motivation and increase engagement with lessons. The results showed no significant differences based on gender, grade, or course load, suggesting that virtual learning is inclusive for all students.

The findings show that it is important to design virtual learning environments that address students' psychological and emotional needs to support effective, lasting learning. The study also suggests adding emotional and psychological support to virtual activities and creating teacher training programs to help teachers understand how emotions affect learning.

The study also recommends adding emotion-sensitive features to virtual learning environments, such as adaptive feedback, on-screen supportive messages, and prompts to help reduce stress. These features can help teachers respond quickly to students' emotions. The findings highlight the importance of teacher training programs that build skills in emotion-aware digital teaching, recognizing early signs of students' emotions, and using tools to track emotional engagement. The study also suggests that future research should use machine learning for emotional analytics, such as automated facial expression recognition, sentiment analysis of student interactions, and tracking emotions in different ways. These methods could help make virtual learning more responsive and effective.

A. Recommendations

The study suggests that teachers should create interactive virtual learning activities that help students stay emotionally engaged. They can use encouraging strategies, send stress-reducing reminders, and regularly check how students are feeling to adjust their teaching. School leaders are advised to offer teacher training and ensure virtual platforms support social interaction and quick feedback, while also considering the different needs of students across schools with varying resources. For those who design virtual learning platforms, it is helpful to add features that boost emotional engagement, let students check in on their own feelings, and use a mix of visual and audio elements to create positive experiences. Future researchers should consider conducting long-term studies to examine how students' emotions change over time, including more public and under-resourced schools in their samples, and use advanced methods to examine how design features affect students' emotions.

B. Study Limitations

The sample was drawn from upper secondary students in a single school (International Independent School), which may limit the generalizability of the findings to students in other educational institutions or different regions. The participants also share similar cultural and social backgrounds, which might affect the diversity of emotional responses and experiences. Additionally, the internal consistency of Subscale 2 (Evaluation of Learning Experience) was slightly below the conventional threshold ($\alpha = 0.66$), and the inter-subscale correlations were relatively low. These factors may limit the confidence in findings related to this specific dimension and suggest the need for further refinement of the instrument in future studies.

Time Frame

The study was conducted over a limited period, which may not fully capture long-term emotional adaptation or sustained impacts of virtual learning environments. Therefore, the findings may not reflect long-term effects on students' emotional development.

Virtual Learning Platforms

The study focused on students' perceptions and emotional experiences within Learning Management System

(LMS)-based virtual learning environments, specifically Moodle and Microsoft Teams, as implemented at the selected school/university. Given the descriptive nature of the study, the findings reflect contextualized experiences within these platforms and should not be generalized to other forms of virtual learning environments, particularly immersive technologies such as Virtual Reality (VR) or Metaverse-based platforms, which involve different levels of interaction and learner engagement.

SELF-REPORT MEASURES

Emotional responses were assessed using self-report instruments, which may be subject to biases such as social desirability, novelty effects, or subjective interpretation of items.

ETHICAL APPROVAL

This study was conducted in accordance with ethical guidelines, and approval was obtained from the relevant institutional review board prior to data collection.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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