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Online Learning Readiness and Challenges Among Engineering Students at Universiti Teknologi MARA: A Quantitative Analysis

Haslinda Abdul Hamid[1], and Nurhafizah Ahmad[2*]

[1] Department of Applied Sciences, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Penang, Malaysia.
[2] Department of Computer and Mathematical Sciences, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Penang, Malaysia.

*Corresponding author: nurha9129@uitm.edu.my

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Abstract

This study investigates the preparedness and challenges encountered by engineering students at Universiti Teknologi MARA as they transition to online distance learning. It concentrates on three pivotal dimensions: digital competencies, self-directed learning strategies, and engagement with digital technologies. A survey of 212 students revealed substantial enthusiasm and digital proficiency, yet highlighted moderate difficulties concerning self-regulation, autonomy, and communication. Significant barriers included inadequate internet connectivity, psychological stress, and the struggle to maintain self-study routines, particularly within the context of hands-on engineering disciplines. Google Classroom emerged as the preeminent platform owing to its user-friendly interface, while WhatsApp and Telegram facilitated informal peer interactions. As online distance learning becomes integral to higher education in the post-pandemic landscape, the study advocates for institutional initiatives aimed at fostering digital equity and enhancing self-directed learning resources to bolster accessibility, communication, and participation.

Keywords: challenges, digital technology, education, engineering, online distance learning, readiness

1. Introduction

Online distance learning (ODL) has become a core element of higher education delivery, following widespread digital adoption during the COVID-19 pandemic. This shift has continued beyond the initial emergency response, with many institutions retaining hybrid or fully online formats to support flexibility and continuity in academic programmes (Alam et al., 2022; Fantinelli et al., 2024) . In engineering education, online delivery is particularly complex. It requires not only theoretical instruction but also simulation of laboratory work, design software usage, and real-time interaction with instructors and peers (Li et al., 2024; Salinas-Navarro et al., 2024; Sato et al., 2024). Despite significant investment in digital infrastructure and instructional technologies, many challenges remain. The most immediate barrier is access to reliable internet and compatible devices, which continues to affect students in rural or underserved areas. These access problems limit participation and reinforce educational inequality (Afzal et al., 2023; Yeh & Tsai, 2022). Technical skills are another concern. Many online systems assume users have prior experience with digital platforms, but this is not always the case. Students with limited exposure to online learning environments may find it difficult to engage effectively (Novak et al., 2023). Online learning also shifts greater responsibility onto students. Independent learning requires the ability to manage time, maintain motivation, and organise tasks without direct oversight. This is especially difficult in engineering programs, where hands-on practice and instructor feedback are essential for developing applied skills (Novak et al., 2023). Without face-to-face interaction, students may feel disconnected from instructors and classmates, which reduces engagement and affects collaboration (Ingkavara et al., 2022; Kalmar et al., 2022). Concerns about mental health have been heightened by both structural and emotional shortcomings. Many students have found the shift to online learning to be emotionally and cognitively taxing. Feelings of being disconnected from peers, alongside limited chances for timely, interactive feedback, have emerged as common concerns. Over time, these conditions appear to correlate with drops in motivation and academic performance (Brandt et al., 2022; Muawanah et al., 2024). These issues reflect broader, ongoing challenges in engineering education, particularly in adapting to post-pandemic hybrid learning environments. As institutions move toward blended models of teaching and learning, the ability to effectively integrate face-to-face and online components becomes critical. This evolution raises important pedagogical, technological, and psychological considerations, especially for practice-oriented disciplines such as engineering. This research investigates how engineering students at Universiti Teknologi MARA (UiTM), Permatang Pauh, are navigating the transition to digital education. It gives close attention to how well students are building relevant digital skills, whether they feel capable of managing their learning independently, and how familiar they are with using online learning tools. The study also sheds light on practical and emotional hurdles students encounter, with the aim of offering grounded recommendations. These may help institutions reduce common barriers and make remote learning more manageable and responsive to students' actual needs (Hollister et al., 2022; Hossain et al., 2024).

2. Literature Review

2.1. Online Learning Readiness

This review is guided by two key frameworks: Self-Regulated Learning (SRL) theory and the Community of Inquiry (CoI) model. SRL highlights how learners plan, monitor, and evaluate their own learning in online contexts, while CoI explains how teaching presence, social presence, and cognitive presence shape the effectiveness of digital learning environments. These models inform the discussion of online readiness, challenges, and student engagement throughout this section.

A student's capacity to excel in online educational environments is referred to as online learning readiness. This concept encompasses not merely technical competencies but also the ability to autonomously manage one's learning, adapt to novel circumstances, and engage in flexible thinking. Engineering students frequently encounter additional obstacles in this regard, as their curriculum typically incorporates practical components that are not readily translatable to a digital format. Traditional models for assessing readiness have mainly focused on five key areas: the ability to learn on one's own, managing the learning process, personal motivation, digital skills, and confidence in communication. While these remain important, recent research suggests we need to expand these models. Newer studies highlight additional factors, such as how learners interact with AI tools, manage materials that are not live, and consistently use digital learning platforms (Imjai et al., 2024; Ingkavara et al., 2022).

Being comfortable with digital platforms is necessary, but it is not enough on its own. Students also have to make sense of automated feedback, handle a variety of content formats, and stay motivated even without direct, in-person support. This can be tough in engineering education, where hands-on practice and immediate feedback are often critical. Without live demonstrations or the chance to ask questions in real time, students may struggle to keep their performance steady. Access to reliable technology also makes a big difference. Students in areas with poor internet or limited devices face extra hurdles. Even the most dedicated learners can have their studies disrupted by unstable connections, which limit their ability to access materials or participate in group work (Xu et al., 2024). Studies comparing different contexts suggest that readiness models should consider local realities in terms of both the structure of the programme and the technology available to students to better support their needs (Mohebi et al., 2024; Van Tonder et al., 2022).

2.2. Challenges in Online Learning

Online learning presents several distinct advantages, such as enhancing educational accessibility for individuals across diverse geographical locations and enabling students to integrate courses into their personal schedules. However, alongside these benefits, persistent challenges continue to emerge. Technical malfunctions frequently pose significant obstacles, particularly for engineering students who often rely on specialised software and manage substantial files. Complications such as unreliable internet connectivity, outdated or inadequate hardware, and software incompatibilities can severely disrupt their academic endeavours and lead to considerable frustration (Marsh et al., 2022; Morrison-Smith & Ruiz, 2020). It is not solely the technological aspects that pose challenges; social and emotional dimensions hold significant importance as well. In the absence of face-to-face interaction, students forfeit valuable opportunities for spontaneous teamwork, informal collaboration, and the supportive atmosphere that arises from being in proximity to others. This phenomenon disproportionately affects engineering students, as a substantial portion of their education relies on collaborative projects and collective problem-solving. Moreover, the inability to perceive individuals' facial expressions or gestures can render online dialogues less engaging and, at times, somewhat isolating (Dwivedi et al., 2022). New tools like AI-powered discussion boards and virtual labs help fill some of these gaps, but how well they work depends a lot on students' comfort with technology and the support they get from their schools (Meşe et al., 2019). Many students still find it tough to manage their time and stay disciplined when learning on their own schedule. While online courses offer flexibility, that same flexibility can lead to bad study habits, missed deadlines, and dropping motivation unless students learn how to regulate their own learning effectively (Dhawan, 2020). Institutional resources such as study planners, progress trackers, and access to advisors can mitigate these effects and improve learning outcomes (Alyami et al., 2021). The challenges identified in this study are consistent with these broader patterns.

2.3. Online Platforms and Communication Tools

Online platforms play a central role in the delivery and structure of distance education. For engineering students, the effectiveness of online learning depends not only on the content but also on how that content is accessed, shared, and discussed. This requires platforms that support both formal instruction and informal interaction. Google Classroom was the most widely used platform among respondents. Students reported that it was easy to navigate and supported assignment submission, feedback tracking, and integration with other Google services. These features made it a preferred platform for managing course-related tasks in a centralized environment. This aligns with findings from Rawashdeh et al. (2021), who note that the platform improves content access and classroom organisation (Rawashdeh et al., 2021). WhatsApp and Telegram were also frequently utilised, albeit for distinct purposes. These applications facilitated informal communication among students and provided prompt updates from instructors. Their mobile-friendly design and accessibility with minimal data rendered them invaluable tools for peer collaboration and group discussions. The pervasive adoption of these platforms underscores a preference for straightforward, rapid communication beyond the confines of structured learning management systems.

Live lecture platforms such as Zoom and Microsoft Teams were used for real-time sessions. These tools helped simulate traditional classroom experiences through screen sharing, question and answer segments, and visual presence. The usefulness of these sessions often varied depending on the reliability of internet access and the availability of appropriate devices. Those with weaker connections tended to participate less actively in live online classes. Other platforms such as YouTube, UFuture, iLearn, and MOOCs were used to supplement formal learning. These allowed students to revisit content, explore additional materials, or engage in independent review. Although not primary platforms, they contributed to flexible learning when used alongside structured course tools. The combined use of these platforms reflects a hybrid approach. Students relied on a mix of formal and informal tools to manage their academic workload, stay connected with peers, and maintain consistent engagement.

2.4. Student Engagement and Communication in Online Learning

Student engagement constitutes a pivotal element in academic achievement, particularly within online environments where interaction is mediated through digital platforms. In the engineering curriculum, engagement is intricately tied to collaboration, constructive feedback, and problem-based learning methodologies. The transition to online formats has disrupted established learning paradigms, frequently rendering it more challenging for students to maintain involvement and cultivate academic relationships. Communication in virtual settings transcends merely possessing the appropriate tools; it is also contingent upon students' comfort levels in utilising these tools to articulate ideas, seek clarifications, and collaborate with peers. Research indicates that learners may exhibit reluctance to contribute to online discussions, especially when they are unfamiliar with the platform or uncertain about how to engage in a digital context (Xia et al., 2022). When students experience hesitation, a diminished number of participants may engage, thereby impeding the collective benefits of collaborative learning. Tools such as video conferencing facilitate rapid exchanges of dialogue; however, they also present challenges, including screen fatigue from prolonged online exposure and anxiety associated with live participation. Conversely, platforms that do not necessitate immediate responses afford students greater flexibility to contribute at their convenience, yet this can decelerate discourse and engender feelings of disconnection among participants. Achieving an optimal equilibrium between these two modalities appears essential for sustaining student engagement and ensuring the fluidity of discussions (Korpershoek et al., 2020). Students' emotional and mental states are also tied closely to how engaged they feel. Many report feelings of isolation in fully remote settings, often related to a lack of daily contact with classmates or access to informal support networks (Urrila et al., 2025). Engineering students are particularly affected due to the collaborative nature of their coursework. When team-based projects and lab activities are moved online, the loss of peer interaction can result in lower satisfaction and reduced learning outcomes. Some platforms attempt to address this issue through features such as group workspaces, instant messaging, and breakout rooms. However, these tools are only effective when students are confident in their use and when instructors create structured opportunities for interaction (Seo et al., 2021). Overall, online communication is a core component of learning readiness. Institutions must recognise that engagement requires more than access to technology. It also hinges on how comfortable students feel communicating online, their familiarity with digital interaction, and whether the course setup encourages ongoing group work.

3. Research Method

3.1. Respondents

This research gathered responses from 212 engineering students at Universiti Teknologi MARA (UiTM), Permatang Pauh Campus in Pulau Pinang, Malaysia, using a questionnaire format. All respondents were taking mathematics courses, which are part of the core curriculum in engineering education. The data was collected during UiTM's period of fully online instruction, which began in March 2020. To reflect the range of engineering disciplines, cluster sampling was employed, ensuring participation from students in civil, mechanical, electrical, and chemical engineering. The questionnaire included demographic questions such as age, gender, academic standing, and enrolled programme as well as queries about students preferred digital tools for learning. This information gave us a clearer picture of how different learners use online platforms and which technologies they rely on most. The study used a structured questionnaire based on the Online Learning Readiness Scale originally developed by Hung et al. (2010), with some adjustments inspired by Engin's (2017) version. We updated the questionnaire to better reflect today's digital learning tools. The final form included 18 questions grouped into five key areas of readiness:

i. Computer and Internet Self-Efficacy: Evaluates the extent of comfort and confidence that students experience when engaging with digital tools and online resources in the pursuit of their educational endeavors.
ii. Self-Directed Learning: Examines how well students can plan and take charge of their own learning, including setting goals and managing their time effectively.
iii. Learner Control: Examines the degree to which students can adeptly navigate educational resources autonomously and maintain their focus while engaging in online learning.
iv. Motivation for Learning: Delves into the intrinsic motivation that propels students' engagement in online coursework and their determination to achieve advancement.
v. Online Communication Self-Efficacy: Concerns the students' self-assurance in articulating their ideas and engaging with others through digital communication platforms.

Responses were collected using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Additional items were included to assess specific online learning challenges, platform preferences, and enjoyment levels. The survey was distributed via Google Forms and shared with students by their lecturers. It was designed to be completed in five to ten minutes to reduce response fatigue and increase participation. Table 1 provides a structured overview of the questionnaire's dimensions, helping to clarify the specific areas of online readiness being assessed and the number of items devoted to each.

Table 1

Dimensions of the Online Learning Readiness Questionnaire

Dimension	Description
Computer and Internet Self-Efficacy	Confidence in using software and online tools for learning
Self-Directed Learning	Ability to manage study plans, goals, and learning tasks independently
Learner Control	Ability to stay focused and navigate content without distraction
Motivation for Learning	Willingness to learn, improve, and stay engaged
Online Communication Self-Efficacy	Confidence in virtual interaction with peers and instructors

3.2. Data Analysis Procedure

This study adopted a quantitative descriptive methodology to evaluate engineering students' readiness for online learning and the challenges they encountered. Data were collected through a structured survey, and all responses were meticulously coded and analysed using SPSS version 22. By computing descriptive statistics, the study aimed to draw a comprehensive picture of student preparedness. Bar charts were also used to present patterns visually, which facilitated clearer interpretation of findings across diverse readiness dimensions.

To ensure the reliability of the survey instrument, Cronbach's alpha coefficients were calculated for each of the five assessed dimensions. Drawing on the classification system by (Farahiyah Akmal Mat Nawi et al., 2020), these coefficients were interpreted as follows: values 0.90 and above, indicated "Excellent Reliability," 0.70–0.89 as "High Reliability," 0.50–0.69 as "Moderate Reliability," and values below 0.50 as "Low Reliability." This interpretive framework, detailed in Table 2, provided a standardised reference for assessing the internal consistency of the instrument.

Table 2

Interpretation of Cronbach's Alpha Values

Reliability Range	Interpretation
0.90 and above	Excellent Reliability
0.70 – 0.89	High Reliability
0.50 – 0.69	Moderate Reliability
Below 0.50	Low Reliability

In this study, all five constructs achieved alpha values within the high reliability range. This outcome reinforced the robustness of the instrument and confirmed its appropriateness for evaluating students' readiness for ODL. The consistent internal reliability across constructs also bolstered the validity of subsequent statistical interpretations.

To interpret students' Likert-scale responses, the readiness level categories proposed by Ismail et al. (2022) were utilised. These classifications (outlined in Table 3) segmented mean values into "Low," "Moderate," or "High" readiness levels. Applying this framework enabled a more nuanced understanding of student preparedness and made it possible to distinguish between specific strengths and areas requiring improvement.

Table 3

Readiness Level Based on Mean Scores

Mean Range	Interpretation
1.01–2.33	Low
2.34–3.67	Moderate
3.68–5.00	High

What emerged from this analytical process was a detailed landscape of student readiness, where certain dimensions (e.g., technical comfort with online platforms) exhibited consistently high mean scores, suggesting strong adaptation. However, moderate readiness levels were found for other areas such as self-regulation and time management. This discrepancy highlighted the need for targeted support mechanisms, particularly in helping students develop soft skills essential for autonomous learning in digital environments.

By integrating robust statistical tools with contextual interpretation, the analysis not only confirmed the reliability of the survey instrument but also provided actionable insights. These findings can guide educators and policymakers in designing interventions that enhance students' experiences and outcomes in ODL settings.

4. Findings and Discussion

4.1. Demographic Profile of Respondents

A total of 212 engineering students participated in the study. Table 4 presents the demographic breakdown by gender, age, year of study, and academic programme. The sample included students from all four major engineering faculties at UiTM Permatang Pauh. In terms of gender distribution, there were 121 male students (57.1 percent) and 91 female students (42.9 percent). A significant majority of respondents (75.5 percent) fell within the age range of 18 to 20 years, which is indicative of conventional enrollment trends in undergraduate engineering programmes. A smaller cohort (24.1 percent) comprised individuals aged 21 to 23, while merely one participant exceeded the age of 23. In terms of academic level, first-year students made up the largest group with 150 participants (70.8 percent). Second-year students accounted for 54 responses (25.5 percent), while third-year students represented 8 responses (3.8 percent). This distribution indicates that the survey primarily captured early-stage learners, which is relevant given the focus on online learning adaptation. The Faculty of Mechanical Engineering had the highest number of respondents at 42.5 percent. This was followed by Civil Engineering at 33.0 percent, Electrical Engineering at 19.3 percent, and Chemical Engineering at 5.2 percent. This composition offers a broad view of student experiences across practical, design-based, and theoretical disciplines.

Table 4

Demographic Characteristics of Respondents

Characteristic	Category	Frequency (N)	Percentage (%)
Gender	Male	121	57.1
	Female	91	42.9
Age	18–20	160	75.5
	21–23	51	24.1
	Above 23	1	0.5
Year of Study	First year	150	70.8
	Second year	54	25.5
	Third year	8	3.8

Characteristic	Category	Frequency (N)	Percentage (%)
Programme	Civil Engineering	70	33.0
	Mechanical Engineering	90	42.5
	Electrical Engineering	41	19.3
	Chemical Engineering	11	5.2
Total Respondents		212	100.0

This demographic overview confirms that the sample represents a diverse cross-section of engineering students. The mix of disciplines and year levels allows for a balanced analysis of readiness and challenges across different stages of academic progression.

4.2. Reliability Analysis

The reliability of each dimension in the online learning readiness questionnaire was assessed using Cronbach's alpha. As shown in Table 5, all five dimensions had alpha values above 0.70, indicating high internal consistency (Farahiyah Akmal Mat Nawi et al., 2020). The dimension with the highest reliability was Motivation for Learning (α = 0.803), followed by Self-Directed Learning (α = 0.794) and Learner Control (α = 0.790). These values confirm that the items within each construct consistently measured the intended traits. Further, these results confirm that the adapted instrument is suitable for evaluating online learning readiness among engineering students in the context of this study.

Table 5

Cronbach's Alpha Reliability for Readiness Dimensions

Dimension	Cronbach's Alpha	Items	Reliability Level
Computer and Internet Self-Efficacy	0.715	3	High
Self-Directed Learning	0.794	5	High
Learner Control	0.790	3	High
Motivation for Learning	0.803	4	High
Online Communication Self-Efficacy	0.720	3	High

4.3. Readiness Level

The overall readiness scores were calculated by averaging student responses within each of the five dimensions. As shown in Table 6, students demonstrated the highest readiness in Motivation for Learning (mean = 3.80) and Computer and Internet Self-Efficacy (mean = 3.75). These findings suggest strong personal motivation and confidence in digital tools among the respondents. Moderate readiness was observed in the remaining three areas. Self-Directed Learning scored a mean of 3.33, indicating that while students were generally able to manage learning independently, they faced difficulties with time management and setting personal learning goals. Learner Control (mean = 3.36) and Online Communication Self-Efficacy (mean = 3.34) also fell within the moderate range. These dimensions reflect challenges in navigating distractions and participating in virtual interactions.

Table 6

Mean Scores of Readiness Dimensions

Dimension	Mean	Interpretation
Motivation for Learning	3.80	High
Computer and Internet Self-Efficacy	3.75	High
Self-Directed Learning	3.33	Moderate
Learner Control	3.36	Moderate
Online Communication Self-Efficacy	3.34	Moderate

These results highlight a readiness profile characterised by high motivation and digital familiarity but limited self-regulation and communication confidence. Students appear

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capable of engaging with online systems but may benefit from additional support in maintaining discipline and expressing themselves effectively in virtual environments.

4.4. Readiness by Respondents When Learning Online

To gain deeper insight into students' strengths and weaknesses, the mean scores for each item within the five readiness dimensions were examined. These results are presented in Table 7. Within the Computer and Internet Self-Efficacy dimension, students expressed high confidence in using Microsoft Office tools (mean = 3.90). They are interested in exploring new topics and ideas and are motivated by the prospect of gaining new knowledge and skills. These results agreed with those reported by previous studies (Engin, 2017; Yeh & Tsai, 2022), which found that students were similarly prepared for online learning. However, their confidence in managing learning software (mean = 3.25) and conducting online information searches (mean = 3.20) was noticeably lower. This suggests familiarity with general-purpose tools but limited proficiency with educational platforms and content navigation. Self-Directed Learning showed varied responses. Students felt confident about initiating study plans (mean = 3.93) and seeking help when needed (mean = 3.68), but many struggled with time management (mean = 2.69) and setting goals (mean = 3.26). This reflects a reliance on external structure and limited development of autonomous learning habits. For Learner Control, most students were comfortable repeating materials at their own pace (mean = 3.77), but many reported difficulties directing their own progress (mean = 3.09) and resisting distractions (mean = 3.21). These moderate scores point to inconsistent self-regulation in online environments. In Motivation for Learning, students indicated openness to new ideas (mean = 3.66) and a willingness to improve from mistakes (mean = 3.56). The highest scores were for general learning motivation (mean = 3.73). These responses confirm that internal motivation remains a strong asset in adapting to online formats. For Online Communication Self-Efficacy, confidence was most pronounced in text-based expression (mean = 3.71) and in posing inquiries during discussions (mean = 3.66), whereas confidence in general online communication tools was marginally lower (mean = 3.18). These findings imply a foundational level of functional capability; however, they underscore the necessity for structured training in virtual collaboration (Chung et al., 2020).

Table 7

Item-Level Mean Scores Across Readiness Dimensions

Dimension	Item Description	Mean	SD
Computer and Internet Self-Efficacy	Confident using Microsoft Office tools	3.90	0.83
	Confident managing learning software	3.25	0.76
	Confident searching online for information	3.20	0.84
Self-Directed Learning	Carries out own study plan	3.93	0.77
	Seeks help when needed	3.68	0.87
	Manages time effectively	2.69	1.01
	Sets personal learning goals	3.26	0.87
	Has high performance expectations	3.08	0.88
Learner Control	Directs own learning progress	3.09	0.84
	Avoids online distractions	3.21	0.90
	Repeats material as needed	3.77	0.68
Motivation for Learning	Open to new ideas	3.66	0.70
	Motivated to learn	3.73	0.76
	Learns from mistakes	3.56	0.70
	Shares ideas with others	3.47	0.79
Online Communication Self-Efficacy	Communicates well using online tools	3.18	0.76
	Expresses self through written messages	3.71	0.77
	Posts questions in discussions	3.66	0.74

These results highlight that while students are motivated and moderately skilled in digital communication, they require support in time management, advanced digital tool usage, and self-regulation strategies to succeed in fully online programmes. These findings reflect gaps in **digital competencies** beyond basic usage, particularly in relation to managing learning systems and navigating educational platforms. Although most students demonstrated high confidence in using general software like Microsoft Office, their lower mean scores in handling specialised learning software and conducting academic searches (mean = 3.25 and 3.20 respectively) suggest that their engagement with digital technologies was **primarily superficial or task-based** rather than reflective or strategic. Furthermore, the **self-directed learning** scores (especially time management, mean = 2.69) highlight a pressing need to cultivate more structured and autonomous learning strategies. These results align with Garrison's (2003) self-directed learning model, which emphasizes the integration of motivation, self-monitoring, and goal-setting — areas where students in this study exhibited weaknesses.

4.5. Challenges Faced During Online Learning

The survey results revealed several key challenges that engineering students encountered during online learning. These issues reflect a combination of technical, emotional, and behavioural barriers that affected student engagement and academic performance. As shown in Figure 1 and Table 8, the most frequently reported problem was poor internet connectivity, cited by 77.4 percent of respondents. This indicates that many students lacked reliable access to the platforms and content required for consistent participation (Alawamleh et al., 2022). Stress was the second most common issue, affecting 67.9 percent of respondents. This stress appeared to result from academic pressure, limited communication with instructors, and the challenges of adapting to new learning environments (Hasan & Bao, 2020). The third most cited challenge was lack of motivation (63.7 percent), suggesting that many students found it difficult to sustain interest and focus outside of a structured classroom setting. Difficulties with self-study habits were reported by 55.2 percent of students. This aligns with earlier findings related to self-directed learning and learner control (Dhawan, 2020). Limited communication with lecturers was reported by 45.8 percent, highlighting a disconnect between students and academic staff in the online environment. Poor physical learning conditions were noted by 44.3 percent, reflecting that many students did not have dedicated or quiet study spaces at home. Only a small number of respondents (2.4 percent) reported not owning a laptop, indicating that access to devices was less of a problem compared to internet reliability and psychological factors.

Figure 1

Challenges Faced by Students in ODL

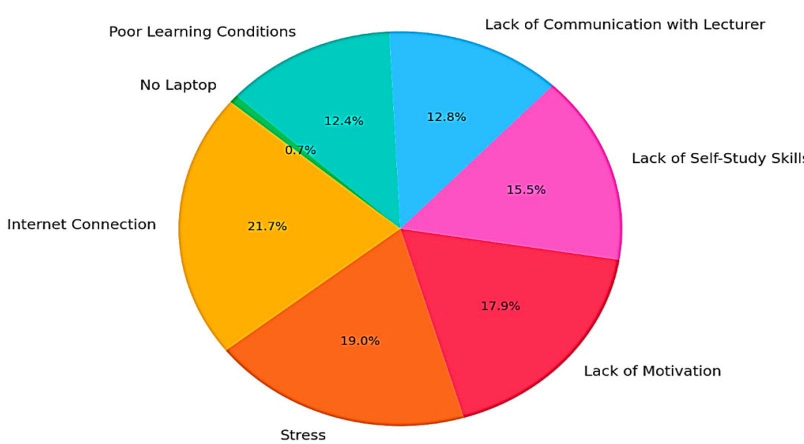


Table 8

Challenges Encountered by Students During Online Learning

Challenge	Frequency (N)	Percentage (%)	Percentage of Cases (%)
Internet connection	164	21.7	77.4
Stress	144	19.0	67.9
Lack of motivation	135	17.9	63.7
Difficulty with self-study skills	117	15.5	55.2
Limited communication with lecturers	97	12.8	45.8
Poor learning environment	94	12.4	44.3
No personal laptop	5	0.7	2.4

These results reinforce the need for institutions to invest in both technical infrastructure and student support services. Improving digital access alone is not sufficient. Strategies must also address motivation, mental health, and the development of independent learning skills.

4.6. Preferred Online Learning Platforms

Students were asked to indicate the platforms they most frequently utilised during their online learning experiences. The feedback revealed a clear inclination toward tools that are user-friendly, familiar, and supportive of both instructional delivery and peer engagement (Smart & Cappel, 2006). As shown in Figure 2 and Table 9, Google Classroom emerged as the most used platform, chosen by 95.8% of participants. Its seamless integration with other Google services such as Drive, Docs, and Calendar, along with its intuitive design, made it an effective option for handling coursework and assignments (Abid Azhar & Iqbal, 2018) . Many students said that certain digital tools made managing their coursework easier especially when it came to keeping track of deadlines, staying in touch with their lecturers, and staying organised overall (Almanie, 2025). WhatsApp was the second most popular platform, with about 67.5% of students using it mainly for casual messaging. It was often the go-to for quick updates, coordinating group projects, and sharing general announcements.

Telegram, used by around 52.8% of students, served a similar purpose and was also a favourite for collaborating on academic work (Suci et al., 2022). Real-time platforms like Zoom and Microsoft Teams were used by 45.3% of respondents. These tools helped with live discussions, scheduled lectures, and group meetings. However, some students mentioned challenges with unreliable internet or conflicting schedules, which sometimes made attending live sessions difficult. Other resources included YouTube and university-supported platforms like UFuture, MOOC, and iLearn. About 27.4% of students turned to YouTube to rewatch lectures or find tutorials, while 23.6% used local platforms mostly for submitting assignments or catching up on recorded lessons. Email was used by a smaller group (7.1%), mainly for formal communication with instructors. Facebook, on the other hand, was hardly used for academic purposes only 0.9% of students mentioned it in that context.

Table 9

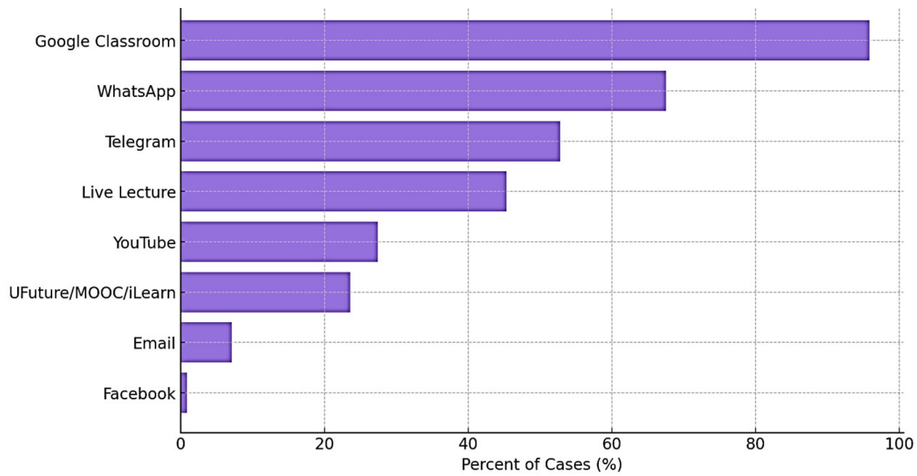
Online Learning Platforms Preferred by Students

Platform	Frequency (N)	Percentage (%)	Percentage of Cases (%)
Google Classroom	203	29.9	95.8
WhatsApp	143	21.1	67.5
Telegram	112	16.5	52.8
Live platforms (Zoom/Teams)	96	14.1	45.3
YouTube	58	8.5	27.4

Platform	Frequency (N)	Percentage (%)	Percentage of Cases (%)
UFuture / MOOC / iLearn	50	7.4	23.6
Email	15	2.2	7.1
Facebook	2	0.3	0.9

Figure 2

Percentage of Respondents Using Various Digital Platforms for Online Learning



Our findings indicate that students tended to rely on a combination of both formal platforms and informal apps, depending on the nature of their academic tasks. While institutional systems helped them keep coursework organised, messaging tools played a larger role in maintaining peer contact and offering mutual support. This pattern points to the importance of flexible platform choices, especially in online learning environments for engineering students. However, student engagement with digital platforms appears to lean more towards convenience than intentional academic interaction. The high use of WhatsApp and Telegram illustrates informal engagement, which supports communication but may lack depth in reflective learning. In contrast, the lower preference for university-supported platforms and real-time engagement tools (UFuture, Zoom, Teams) suggests a potential disengagement from structured digital pedagogy. This signals a need for universities to promote active engagement models such as collaborative online discussions, breakout rooms, or gamified learning to encourage meaningful digital participation and peer-led knowledge building.

4.7. Enjoyment Levels in Online Learning

To understand how students felt about their overall experience with online learning, participants were asked to rate how much they enjoyed it. Their responses varied. Some students appreciated the flexibility and independence that came with learning online, while others found the format isolating, difficult to manage, or lacking in interaction (Giday & Perumal, 2024). These results are shown in Table 10. Almost half of the students (48.6%) said they found online learning "somewhat enjoyable," which shows many were okay with it but did not feel strongly positive. About a quarter (24.5%) described their experience as "very enjoyable," suggesting they adjusted well to the digital format and tools. On the contrary, 18.9% deemed their experience "very unenjoyable," frequently citing issues such as inadequate internet connectivity, a lack of face-to-face interaction, and challenges in maintaining concentration. A smaller fraction (4.2%) even classified their experience as "extremely unenjoyable." Conversely, merely 3.8% asserted that online learning was "extremely enjoyable," indicating that only a scant few felt it truly aligned with their preferred mode of learning. All in all, the data points to the fact that how satisfied students are with online learning depends a lot on their ability to study independently, have reliable tech access, and keep themselves motivated without the in-person support they are used to (Meşe et al., 2019). This reinforces the importance of developing digital learning competencies, including not only technical know-how but also affective and cognitive engagement strategies. Enjoyment levels were clearly higher among students who could navigate digital tools confidently and regulate their own learning, while those lacking these skills experienced greater stress and dissatisfaction. Hence, student success in online learning is intricately linked to their level of digital engagement, digital literacy, and capacity for self-directed learning.

Table 10

Enjoyment Levels in Online Learning

Enjoyment Level	Frequency (N)	Percentage (%)
Extremely unenjoyable	9	4.2
Very unenjoyable	40	18.9
Somewhat enjoyable	103	48.6
Very enjoyable	52	24.5
Extremely enjoyable	8	3.8
Total	212	100.0

The way students experience online learning varies a lot, which shows how important it is to focus on both the technical side and the emotional side of remote education. Having reliable digital tools and user-friendly platforms is important, but students also do better when they have informal support networks - places where they can stay connected, keep their motivation up, and feel like they are part of a community.

5. Conclusion

This study examined the preparedness of engineering students at Universiti Teknologi MARA (UiTM) for online learning and the challenges they encountered throughout the process. The findings indicated that while a significant number of students expressed motivation and a reasonable level of confidence in utilising digital platforms, their capacity for self-directed learning was only moderate. Common obstacles included time management, personal discipline, and effective communication in virtual environments. Several issues came up repeatedly, such as unstable internet connections, heavy academic workloads, and weak habits around studying independently. These problems were especially clear among engineering students, whose courses often require hands-on work and direct support from instructors. Even though most students were pretty good at using online systems, their experiences were limited by both internet infrastructure and how their courses were designed. Google Classroom served as the primary platform for academic endeavours, while applications such as WhatsApp and Telegram gained popularity for facilitating group discussions and maintaining connections with peers. This illustrates that students often blend formal educational tools with more casual applications to enhance collaborative efforts. The study reinforces that motivation alone is insufficient in ensuring online learning success, particularly when self-regulation and access to stable digital infrastructure remain weak points. Overall, the study highlights the need for universities to do more than just provide digital access. They also need to support students' learning habits and foster meaningful interaction in online environments. This includes implementing structured institutional strategies that promote self-directed learning, such as workshops on time management and virtual collaboration, as well as policies that expand digital infrastructure support in underserved areas. Future efforts should focus on giving clear guidance for independent learning, offering specific training in virtual communication, and improving digital infrastructure especially in areas with less reliable internet. Such efforts are aligned with the study's objectives and are crucial for creating a more resilient and inclusive digital learning ecosystem. In addition, more attention must be given to the specific needs of engineering sciences within ODL environments. Students in this field often rely on physical labs, design studios, and collaborative technical workspaces, which are difficult to replicate online. The lack of access to specialised equipment, limitations in software licensing, and the absence of real-time instructor feedback during practical activities can impede the development of core engineering competencies. These constraints highlight the need for more innovative, discipline-specific digital solutions that can simulate authentic engineering experiences and support deeper cognitive engagement with scientific and technical content. Addressing these challenges is essential not only for better results in online courses today but also for helping students develop the digital skills they will need for academic and professional success. As online education becomes a bigger part of higher learning, universities will need to keep evaluating and improving their digital systems. It is important for institutions to pay attention not just to technology but also to the emotional and motivational sides of learning, so they can create a supportive and effective virtual learning environment.

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