Investigating student’s motivation and online learning engagement through the lens of self-determination theory

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Abstract
Purpose – The lack of physical contact and the absence of nonverbal clues could make some learners uncomfortable interacting with others via online learning platforms. Hence, understanding the determinants of students’ motivation and engagement in online learning platforms is crucial in harnessing digital technology as an enabler of unrestricted and quality learning experiences.
Design/methodology/approach – Drawing on the self-determination theory (SDT), this study investigates the factors associated with student’s motivation to learn (MOL) and their influence on online learning engagement (OLE). Data were collected from 228 university students from the Klang Valley region of Malaysia using the online survey method.
Findings – The results of data analysis using the partial least squares structural equation modeling indicate that self-directed learning, computer and Internet self-efficacy and online communication self-efficacy significantly influence MOL. Besides, these factors indirectly influence OLE through MOL.
Originality/value – This study adds to the SDT framework by demonstrating how students’ perceptions of autonomy, competence and relatedness through online interaction relate to MOL and OLE.
Keywords Digital technology, Self-determination theory, Motivation to learn, Online learning engagement, University students, Higher education
Paper type Research paper

1. Introduction
Students’ learning and engagement activities have been altered due to the mandated movement restrictions to curtail physical interaction and the spread of the COVID-19 virus, accelerating the adoption of online and digital learning platforms. Although the flexibility and universal reach of digital technologies have ensured the adoption of online learning, the urgent transition necessitated by the outbreak of the COVID-19 pandemic poses significant challenges to both students and instructors (Chiu, 2022; Luo et al., 2021). Student learning engagement captures the willingness, desire, and compulsion to participate in education, which reflects behavioral,

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emotional, and cognitive dispositions (Reschly and Christenson, 2022). The absence of in-person meetings may limit quality interactions and engagement with materials online (Al-Maskari et al., 2022; Shah et al., 2021), making non-self-directed learners struggle due to their inability to take the initiative and responsibility for learning (UNESCO, 2022).

Previous studies, primarily from developed economies, link online learning to flexibility and improved access to quality materials (Shah et al., 2021; Rodriguez et al., 2008). Rodriguez et al. (2008) emphasize students’ comfort with technology in enhancing online learning. However, in developing economies, insufficient technological and educational resources leave many students struggling and contemplating abandoning education (Al-Maskari et al., 2022). Also, lecturers must recognize potential interruptions in students’ Internet access (UNESCO, 2022). Despite digital learning becoming more accessible in Malaysia, some challenges persist (The Star, 2020), such as unreliable Internet access and computer self-efficacy, with students in some rural areas climbing trees when writing online exams (Choong, 2020).

Practitioners and policymakers must acknowledge the challenges in transitioning from traditional to computer-based learning (Sanchez-Gordon and Luján-Mora, 2018). Limited interaction in online classes makes some students uncomfortable, neglecting online communication and feeling timid in seeking support. Unlike physical classrooms, online environments hinder spontaneous communication, impacting engagement (Choong, 2020). Assessing online learning effectiveness emphasizes engaged learners, but compromised interaction quality and spontaneity are concerns (Choong, 2020).

Many studies have adopted self-determination theory (SDT) in conceptualizing face-to-face learning. Still, its relevance in an online context is underexplored, particularly in higher education settings (Deci and Ryan, 2020). Drawing on SDT, this study explores shifts in students’ interest and engagement by investigating the significance of self-directed learning (SDL), computer and Internet self-efficacy (CIS), and online communication self-efficacy (OCS) in motivating online learning (OLE). Also, it examines whether SDL, CIS, and OCS influence online learning engagement (OLE) through the mediation of MOL. The study contributes evidence on factors influencing students’ motivation, enhancing understanding of OLE motivators.

The remaining sections of the paper are arranged as follows. The theoretical background and development of the study’s hypotheses are first presented. Then, the study’s methodology is described. The results of our analysis are presented, followed by discussions and implications of the findings, and lastly, the conclusions.

2. Theoretical background and hypotheses development
2.1 Online learning engagement (OLE)
OLE reflects active participation and cooperation in the learning process through technological resources (Kearsley and Shneiderman, 1998). Access to technology is crucial for effective online learning (Rodriguez et al., 2008), and using technology in education has positive outcomes (Chen et al., 2010). Students’ online learning motivation is impacted by information delivery, online medium, and interaction, affecting engagement (Gallagher et al., 2017). Creating an online community enhances students’ success and quality of learning (Liu et al., 2007). Students’ participation in online learning, a key determinant of outcomes, is linked to recent engagement with technology (Duffy, 2012). Despite available studies on OLE, understanding the impact of students’ motivation remains a growing area. Research indicates varied and mixed engagement levels in online learning (Kahn et al., 2017).

2.2 Self-determination theory (SDT)
SDT, an influential theoretical model (Deci and Ryan, 1985), suggests that meeting fundamental needs fosters maturity and satisfaction. Core needs include competence,
autonomy, and relatedness, which underline motivation (Ryan and Deci, 2011). Intrinsic motivation stems from internal values, while extrinsic motivation relies on external factors (Deci and Ryan, 2012). SDT views individuals as proactive, motivated beings in physical and social contexts. It posits that core psychological needs interact with social influences, shaping positive and negative behaviors (Deci and Ryan, 2012). SDT’s theoretical pillars—motivation, choice, and attributions—have applications in various domains, such as sustainable behaviors (Ojo, 2022), health behaviors (Behzadnia et al., 2022), psychotherapy (Moore et al., 2021), sports (Guo and Liem, 2023), and academic change (Howard et al., 2021).

In education, SDT examines the impact of self-talk on students’ emotions and perception of new material (Oliver et al., 2010). According to Oliver et al. (2010), students interpreting inner conversation as informative express positive effects, highlighting the importance of fostering autonomy and competence. SDT identifies a continuum from intrinsic to extrinsic motivation (Deci and Ryan, 2012). Intrinsic motivation, driven by self-interests, involves students acting autonomously without external influence (Ryan and Deci, 2011). Intrinsic curiosity and interests increase engagement and satisfaction, fostering autonomy and competence. Educators should leverage students’ innate learning propensity to enhance motivation in online learning.

2.3 Hypotheses development
This study proposed a theoretical model (Figure 1) to understand students’ motivation and engagement in online learning through the SDT perspective. Autonomy is seen in self-directed learners who take initiative and ownership, competence in their belief in using online technologies, and relatedness in their confidence to communicate with peers. The research model’s constructs and hypotheses justification are detailed in the following sections (see Figure 1).

2.3.1 Self-directed learning (SDL). Learners initiate SDL by assessing needs, setting goals, and strategizing on the most efficient way of learning (Knowles, 1975). Boyer et al. (2014) define it as guided by necessary knowledge, abilities, and attitudes. Garrison (2016) adds time management, progress tracking, and self-motivation as integral components in adult learning. SDL offers a theoretical framework for measuring online student development (Lynch and Dembo, 2004). Autonomy and self-direction are crucial in online learning, enabling students to control and monitor academic achievement (Moore et al., 2021). Self-directed learners understand learning processes and resource requirements and possess motivation, self-control, curiosity, and self-assurance (Tlili et al., 2022). Motivation is critical to SDL; without it, students lack the ‘will to learn’ (Tlili et al., 2022), impacting responsibility and engagement in online activities.

![Figure 1. Theoretical model](image-url)
Studies show SDL significantly impacts online learning involvement (Demir and Horzum, 2013) and enhances success (Song et al., 2022). SDL also influences learners’ perception of online learning (Wei and Chou, 2020). This study aims to validate the link between SDL, Motivation, and engagement in online learning. Consequently, it is hypothesized that:

**H1a.** SDL positively influences student’s MOL.

**H1b.** MOL positively mediates the influence of SDL on student’s OLE.

### 2.3.2 Computer and internet self-efficacy (CIS)

CIS pertains to a student’s confidence and ability to use technology effectively for learning (Adigun and Ndwanwe, 2022). It focuses on learners’ confidence in performing computer tasks online (Hsiao et al., 2012). CIS is crucial for technological competence (Ojo et al., 2019), and students’ comfort with technology is linked to motivation (Rodriguez et al., 2008). University students need to be knowledgeable about and prepared to use computers and the Internet in their learning pursuits (Chung et al., 2020).

Self-efficacy, a critical factor in learner success, is particularly influential in learning new technologies (Özüdoğru, 2021). Hatlevik et al. (2018) found that CIS impacts a learner’s performance in online learning, converting motivation into learning action. Wang et al. (2013) observed that learners with better CIS control are more content and motivated, leading to improved scores. This research assesses CIS to explore university students’ MOL and OLE. Thus, the following hypothesis emphasizes the above analysis:

**H2a.** CIS positively influences students’ MOL.

**H2b.** MOL positively mediates the influence of CIS on student’s OLE.

### 2.3.3 Online communication self-efficacy (OCS)

OCS is crucial for online learners, helping them overcome communication constraints (Hung et al., 2010). It reflects students’ ability to predict online learning performance, influenced by their willingness to engage with others through online technology (Punjani and Mahadevan, 2022). Students often hesitate to ask questions in traditional classrooms due to social fears, emphasizing the need for higher self-efficacy in online communication, directly impacting engagement (Chung et al., 2020).

In this study, OCS measures a learner’s comfort in using technology for interaction. High self-efficacy in online communication, evident in contributing to discussion and posting questions, correlates with increased engagement (Li et al., 2014). With online learning lacking human contact, communication becomes vital for questions and discussions (Chung et al., 2020). Initiating online discussions enhances engagement, comprehension, and interest (Hung et al., 2010).

OCS significantly correlates with students’ motivation in online courses (Kirmizi, 2015). Schellens et al. (2007) noted a positive link between online participation and successful learning engagement. This study views OCS as a crucial determinant of online students’ motivation and engagement, proposing the following propositions.

**H3a.** OCS positively influences students’ MOL.

**H3b.** MOL positively mediates the influence of OCS on student’s OLE.

### 2.3.4 Motivation to learn (MOL)

Motivation drives goal-directed action to pursue academic success and rewards (Schunk, 2008). Student motivation is crucial in online learning for effective absorption, recall, and analysis of information and knowledge. Schunk (2008) noted that motivated students adapt to their learning environment, engage in challenging tasks, and demonstrate improved outcomes and persistence. Intrinsic and extrinsic motivation are crucial for online learning success, where the former involves emotional and physical development influencing life choices, and the latter relies on external rewards (Deci and
Despite technology integration, positive effects on students’ motivation may not be guaranteed. Educators must consider students’ motivation when transitioning from traditional to online classes (Nurshahidah et al., 2021). Cognitive variables like motivation significantly influence online learners’ performance and success (Alhadabi and Karpinski, 2020). Chen et al. (2019) state that university students perceive online learning as beneficial for improving motivation.

Chung et al. (2020) establish a strong correlation between motivation and online students’ engagement in learning. University students’ motivation increases through frequent online interaction with lecturers, tracking attendance, and creating learning resources (Doculan, 2016). Hence, students’ MOL and engagement are closely linked. Therefore, the following is proposed:

\[ H4. \] MOL positively influences student’s OLE.

3. Methods
3.1 Sample and data collection
Data were gathered from undergraduate and postgraduate students in the Klang Valley region of Malaysia, encompassing Kuala Lumpur and Selangor State, Malaysia’s most populous and diverse (Ojo et al., 2022). Respondents were conveniently sampled from the researchers’ networks, and a Google form questionnaire was emailed to the respondents, encouraging them to also share within their networks. A cover letter clarified study objectives solicited voluntary participation, and assured anonymity. After two months, 228 usable responses were collected from students at four private and three public universities in the Klang Valley, surpassing the minimum sample size of 146 from G*Power analysis. Demographic profiles are summarized in Table 1.

3.2 Measurement
Four items from Hung et al. (2010) gauged SDL, capturing students’ attitudes, abilities, personality traits, and affective responses fostering autonomy in online learning. For CIS, three items from Hung et al. (2010) reflected students’ perception of competence in using technology for learning. OCS was measured with three items adapted from Hung et al. (2010), indicating students’ confidence in online interaction. MOL used eight items from the motivated strategies for learning questionnaire (Pintrich et al., 1991), while 12 items from the online student engagement scale (Dixson, 2015) assessed OLE. Measurement indicators for variables are in the Appendix.
3.3 Data analysis procedure

The partial least squares (PLS) path method was used in evaluating the measurement and structural models. PLS, a variance-based structural equation modeling (SEM) approach, was chosen due to its robustness and resilience to model misspecification, unlike covariance-based SEM (Hair et al., 2017). PLS employs a composite modeling approach, combining indicators to represent specific constructs (Peng and Lai, 2012). Hair et al. (2017) advocate PLS for modified models that predict target constructs, making it suitable for this study’s objectives and hypotheses validation.

4. Results

4.1 Measurement model

In evaluating convergent validity, factors loadings, average variance extracted (AVE), and composite reliability (CR) were examined against recommended benchmarks. As depicted in Figure 2, all item factor loadings, ranging from 0.694 to 0.914, surpassed the 0.5 threshold. Additionally, AVE values (0.590–0.788) exceeded the minimum 0.50, and composite reliability values (0.885–0.947) surpassed the 0.70 cut-off (refer to Table 2). Hence, the criteria for convergent validity were met.

This study assessed discriminant validity for latent variables using Fornell-Larcker’s criterion, and the findings are outlined in Table 2. As shown in Table 2, the results met the requirements for discriminant validity, with off-diagonal elements (correlations between latent variables) being smaller than the square root of the respective AVEs (diagonal elements) (Fornell and Larcker, 1981; Henseler et al., 2009).

4.2 Structural model

The validated structural model (see Figure 3) was used to assess hypothesized relationships based on the coefficient of determination ($R^2$), path coefficient, and level of significance for

![Figure 2. Measurement model](generated from SmartPLS 3)
each hypothesis (Hair et al. (2017). The $R^2$ value of 0.652 indicates that SDL, CIS, and OCS account for 65.2% of the variance in MOL. Also, the overall model explains 61.9% of the variance in OLE ($R^2 = 0.619$). The statistical significances of path coefficients were determined using bootstrap analysis (resampling size = 1000). The hypothesized paths from SDL, CIS, and OCS to MOL were all significant ($\beta = 0.319, p < 0.001$; $\beta = 0.315, p < 0.001$; $\beta = 0.292, p < 0.001$, respectively). MOL significantly predicted learning engagement ($\beta = 0.787, p < 0.001$). Therefore, H1a, H2a, H3a, and H4 were supported.

4.3 Mediating model

The mediation model, tested with the bootstrapping method (1,000 samples, 95% confidence interval), confirmed significant indirect effects. The paths from SDL ($\beta = 0.251, p < 0.001$, 95% CI: 0.150–0.353), CIS ($\beta = 0.248, p < 0.001$, 95% CI: 0.140–0.359), and OCS ($\beta = 0.230,$

<table>
<thead>
<tr>
<th>Variables</th>
<th>AVE</th>
<th>CR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CIS</td>
<td>0.788</td>
<td>0.918</td>
<td>0.888</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. OCS</td>
<td>0.720</td>
<td>0.885</td>
<td>0.648</td>
<td>0.848</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. SDL</td>
<td>0.674</td>
<td>0.891</td>
<td>0.580</td>
<td>0.699</td>
<td>0.821</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. MOL</td>
<td>0.690</td>
<td>0.947</td>
<td>0.689</td>
<td>0.719</td>
<td>0.706</td>
<td>0.831</td>
<td></td>
</tr>
<tr>
<td>5. EOL</td>
<td>0.590</td>
<td>0.945</td>
<td>0.669</td>
<td>0.696</td>
<td>0.756</td>
<td>0.787</td>
<td>0.768</td>
</tr>
</tbody>
</table>

Note(s): CIS – computer and internet self-efficacy; OCS – online communication self-efficacy; SDL – self-determined learning; MOL – motivation to learn; online learning engagement; AVE – average variance extracted; CR – composite reliability; The italic diagonal items are the square root of the AVEs

Source(s): Authors’ own creation

Figure 3.

Structural model

Table 2. Results of convergent and discriminant validity

Source(s): Generated from SmartPLS 3
to OLE through MOL were significant. Thus, H1b, H2b, and H3b were supported (Preacher and Hayes, 2008).

4.4 Predictive relevance (Q²)
Following Henseler et al. (2009), the model’s predictive capability was evaluated using the predictive sample reuse technique (i.e. Stone-Geisser’s Q²). This analysis was computed with the aid of the blindfolding procedure. According to Hair et al. (2017), the predictive relevance of the exogenous construct on the endogenous construct becomes acceptable when the Q² value is greater than zero. The Q² of MOL and OLE were 0.415 and 0.338, respectively, indicating that the research model has satisfactory predictive relevance.

5. Discussion and implication
5.1 Discussion
Most universities had to swiftly shift to online learning platforms in response to restricted physical interactions during the outbreak of the COVID-19 pandemic. Unlike traditional classrooms, online learning limits two-way interactions, affecting student attitudes and motivation. Non-verbal cues, essential for effective communication, are mostly absent in online platforms, causing discomfort for some students. Drawing from SDT, this study explores factors influencing student motivation and engagement in online learning. Results show that autonomy, competence, and relatedness impact students’ motivation and engagement in online learning.

The study aligns with existing literature (Song et al., 2022; Wei and Chou, 2020), reinforcing the link between SDL and MOL. This supports the idea that students with autonomy, seen in self-directed learners taking initiative and ownership, exhibit a significant association with MOL. Such learners embrace responsibility and pace their learning, aligning with SDT’s premise that high autonomy correlates with increased MOL. Hence, commitment to online learning is tied to one’s willingness to control and own the learning process.

In line with prior research (Ozidoğru, 2021; Wang et al., 2013), CIS and OCS (Chung et al., 2020; Punjani and Mahadevan, 2022) were strongly related to MOL. Self-efficacy reflects students’ confidence in using computers and the Internet, influencing their perceptions of competence. Students who perceive themselves as competent and confident in utilizing online tools are motivated to learn online. The significance of OCS underscores its role in shaping learning motivation; students’ confidence in interacting with instructors and peers are likely to develop strong relationships, stimulating interest in the learning platform.

This study’s data supports the role of MOL in mediating the influences of SDL, CIS, and OCS on OLE. Learning motivation guides the effects of autonomy, competence, and relatedness in shaping students’ engagement on online platforms. Self-directed learners take responsibility for their learning and show high motivation for online engagement. Their confidence level influences motivation to use online tools and communicate. Less proficient students, lacking motivation, perform poorly in using online platforms and tools. Motivation plays a key role in linking competence to behavior. According to Hatlevik et al. (2018), students with low confidence in communication may experience reduced engagement in online platforms, fostering apprehension and low morale. As highlighted by Chung et al. (2020), low engagement in online learning platforms could be reinforced among students who lack the confidence to communicate, i.e. ask questions, creating a sense of apprehension and low morale for online learning.

5.2 Implications of study
This study explored various aspects within the SDT framework (SDL, self-efficacy, Motivation, and engagement), offering a comprehensive view of online learning behavior.
This approach enhances the theory’s applicability in describing intricate educational behaviors. Specifically, the study validates and applies SDT in the online learning context, showcasing how autonomy, competence, and relatedness align with factors influencing engagement. Examination of SDL, CIS and OCS underscores the importance of taking responsibility, technology competencies and online social skills in online learning, shedding light on their impact on motivation and engagement. By analyzing motivation as a mediating variable, the study contributes to understanding how SDT’s proposed motivational elements interact in the online learning environment, emphasizing the theory’s effectiveness in explaining OLE through this mediating variable.

The study’s practical implications suggest actions for educators and institutions to enhance motivation and engagement in online learning. Educators can promote SDL, support students’ technology competence, and enhance online communication skills. Fostering autonomy, building technology competence, and improving online communication positively impact motivation and engagement (Han, 2021; Maddens et al., 2023). Recognizing the influence of SDL may lead to more learner-centered and self-paced elements in online courses, offering choices in content, assignments, and assessments. Institutions should provide technological training to improve students’ CIS, helping them gain confidence and navigate challenges. Recognizing the impact of OCS, educators can encourage collaborative activities for meaningful connections, enhancing students' sense of belonging, motivation, and engagement. Additionally, the study underscores the importance of providing constructive feedback and acknowledging achievements, aligning with SDT’s emphasis on competence and autonomy to boost motivation and engagement.

5.3 Limitations and future research
This research has limitations that future studies could address. The cross-sectional design hinders establishing causal relationships, and reliance on self-report measures may introduce response biases. Future research could use longitudinal designs, and mixed-methods approaches for more reliable data. Generalizability could be enhanced by exploring how cultural differences influence the relationships among variables. Examining peer relationships and social dynamics in online learning settings can deepen understanding of student involvement. Incorporating insights from self-regulated learning strategies like time management and critical thinking can provide a better understanding of how students control their learning processes in digital environments. Considering social presence factors, such as learners’ experiences, in future studies can guide successful educational practices in online learning.

6. Conclusion
In conclusion, exploring students’ MOL and OLE through SDT reveals key connections for compelling digital learning. The study, focused on online education, yields significant findings benefiting theoretical understanding and practical application. The supported hypotheses underscore SDT’s relevance in understanding online education dynamics. These findings illuminate factors driving student engagement in virtual learning settings, aligning with SDT principles. Autonomy, technological competencies, and effective online communication, as per SDT, play crucial roles in fostering deeper motivation and engagement. The study affirms SDT’s applicability in explaining mechanisms influencing students’ motivation and engagement in online learning.

Furthermore, the results have valuable implications for educational practice. Educators and institutions can use insights from this study to design more effective online curricula and
experiences. Focusing on fostering SDL, improving tech self-efficacy, and promoting online communication enhances students’ intrinsic motivation, ultimately boosting engagement. This study is a practical guide for pedagogical strategies to enrich online education and enhance students’ learning experiences.

References


(The Appendix follows overleaf)
Appendix

Self-directed learning (Hung et al., 2010)
I have a personal study plan
I manage my time well
I set up my online learning goals
I have higher expectations for my learning performance

Online communication self-efficacy (Hung et al., 2010)
I feel confident using online tools (Email/discussion) to communicate effectively
I feel confident expressing myself (Emotions and humor) through thoughts, text messages and posting comments
I feel confident in posting questions in online discussions

Computer and Internet self-efficacy (Hung et al., 2010)
I feel confident in performing basic functions of Microsoft Office programs (MSWord, MS Excel, MS PowerPoint)
I feel confident in my knowledge and skills of managing software for online learning
I feel confident using the Internet (Google) to find or gather information for online learning

Motivation to Learn (Pintrich et al., 1991)
I prefer an assessment that is challenging to learn new things
It is important for me to learn what the assessments teach me
I think I can use what I learn in online classes in other classes
I choose topics where I will learn something from, even if they require more effort
Even when I do poorly during an assessment, I try to learn from my mistakes
I think it is useful to know what I am learning in a class
I think that what I learn in class is interesting
Understanding a topic taught in class is important to me

Online Learning Engagement (Dixson, 2015)
I stay up for the readings
I look over class notes in between getting online lessons to ensure I understand the material
I take notes over readings and video lectures
I listen and read carefully during online classes
I find ways to make the course relevant to my life
I participate actively in small-group discussions or forums conducted during online classes
I help fellow students (classmates)
I ensure I get a good grade
I ensure I do well in tests/quizzes conducted in online classes
I engage in online conversations with others (Chat, Discussions and Email)
I keep posting in the discussion forum regularly
I put in effort to get to know other students in the class

Table A1.
Variables measurement indicators

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<th>Variables measurement indicators</th>
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