How do students' personality traits affect their academic performance and stickiness towards e-learning?: The moderating effect of students' engagement

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How do students’ personality traits affect their academic performance and stickiness towards e-learning?: The moderating effect of students’ engagement

Abstract

Previous studies have been conducted on the importance of students' personality traits in their acceptance of e-learning services. However, there is a lack of research on the effects of students' personality traits on their academic performance and long-term stickiness in e-learning usage, and how these effects are moderated by their students' engagement. This study presents a conceptual framework for investigating how students' personality traits affect their learning engagement, academic performance and stickiness in e-learning. From a theoretical perspective, this study will provide a validated research model for exploring the effects of students' personality traits on their academic performance and long-term stickiness in e-learning usage for achieving better student learning outcomes and commitment to life-long learning. From a practical perspective, this study will provide insightful research findings to aid in the creation of tailored strategies for the development of e-learning platforms for promoting the delivery of high-quality education.

Keywords: E-learning, higher education, stickiness, student personalities, learner engagement, academic performance
Introduction

The applications of e-learning have been promoted significantly in the higher education sector during the past few years (Spring et al. 2016; Neuwirth et al. 2021; Cowell 2022). E-learning is able to provide learning opportunities that are free from the constraints of place and time, and support new learning and teaching approaches. Neuwirth et al. (2021), for example, state that e-learning does not require extensive computer skill, which helps to reduce the acceptance barriers. It also promotes self-paced independent study where students can determine their own schedule and study at their own pace. Robinson and Cook (2018) point out that e-learning offers synchronous learning where students attend live lectures via computer and ask questions by e-mail or in real-time live chat. Kamal and Radhakrishna (2019) highlight that e-learning promotes asynchronous interactive where students can attend classes whenever they need or until the course material is completed. Thus, a large number of higher education institutions have adopted e-learning as the major mode of teaching due to its flexibility that reduces barriers of space and time, facilitates collaborations, provides students with access to a broader range of information, and allows them to study at their own pace (Coman et al. 2020; Ebardo and Wibowo 2021). To understand students’ learning preferences and performance, it is important to explore the effects of students’ personality traits on the perceptions and adoption of e-learning (Kamal and Radhakrishna 2019).

Existing studies have discussed the significant effects of personality traits on e-learning students including their acceptance (Coman et al. 2020; Siddiquei and Khalid 2018; Watjatrukul 2016), engagement (Kamal and Radhakrishna 2019), satisfaction (Robinson and Cook 2018), and academic performance (Siddiquei and Khalid 2018). These studies, however, have not considered the influence of stickiness on students’ learning and their engagement on e-learning platforms. Stickiness refers to the use of online systems to attract and hold the attention of users, and to create a compelling and magnetic reason for them to return repeatedly (Yang et al. 2021). Given that some higher education institutions will rely on online teaching in the long term after COVID-19 pandemic, it is necessary to further explore the role of students’ personality traits in their academic performance and long-term adoption of e-learning services (Neuwirth et al. 2021). Accordingly, a few researchers have highlighted the importance of more ‘sticky’ content to attract students’ attention and encourage them to return and spend longer time on e-learning platforms (Robinson and Cook 2018). Li et al. (2021) assert that a better understanding of students’ stickiness can help to improve educators’ instruction and students’ learning activities. However, Yang et al. (2021) find that the effects of students’ perceived qualities on e-learning stickiness, the roles of students’ personality traits and academic performance remain under-researched. Therefore, the motivation of this study is to better understand the impact of students’ personality traits on their academic performance and stickiness towards e-learning. This is significant as it helps in identifying and developing effective strategies to further increase students’ learning outcomes and commitment to life-long learning.

Furthermore, the diffusion of e-learning has significantly changed teaching practices in higher education by refining the concept of student’s engagement (Mubarak et al. 2021b; Cowell 2022). Thus, higher education institutions should not merely focus on students’ attendance. It is important for them to understand the various types of students’ engagement in e-learning for promoting active participation in education programs (Cowell 2022; Neuwirth et al. 2021). Previous studies have investigated the moderating effect of student’s engagement on teaching effectiveness and academic performance (Gerber et al. 2013; Kanta et al. 2019). However, these studies did not investigate the various types of student’s engagement and their moderating effects on e-learning stickiness.

Therefore, this research aims to investigate how students’ personality traits affect their learning engagement, academic performance and stickiness in e-learning. This study, therefore, addresses this issue with the research questions formulated as follow: What are the roles of personality traits in determining the level of students’ academic performance and their stickiness towards e-learning? How do various types of students’ engagement moderate their academic performance and stickiness towards e-learning?

The findings of this research are expected to offer insights into user behaviour in information technologies and educational systems. This will also help the higher education institutions and academics in actively pursuing better designs and the development of e-learning systems that promote the delivery of high-quality education.
Related Work

Personality Traits

The trait theory of personality studies what traits constitute various personalities and how they relate to actual behaviours (Schiffman and Kanuk 2004; McCrae and Costa 2008). Goldberg (1992) classifies the big five personality traits into (a) neuroticism, (b) extraversion, (c) openness, (d) agreeableness, and (e) conscientiousness. Neuroticism refers to the tendency to be emotionally unstable and experience negative emotions such as anger, anxiety, and depression (Kalshoven et al. 2011). For example, individuals with high neuroticism usually experience more anxiety which can impair their performance (Sutin et al. 2011). Extraversion reflects on the tendency to be assertive and social, and experience positive effects and excitement (Kalshoven et al. 2011). Individuals with high extraversion respond faster and show higher assertiveness (Giluk and Postlethwaite 2015). Individuals who belong to this trait are open to experience, and they are actively seeking out new ideas and methods. On the other hand, openness to experience is positively associated with sensation-seeking and negatively associated with conforming to values. Agreeableness refers to a person’s trait such as being kind, gentle, trusting, honest, and altruistic (Kalshoven et al. 2011). These individuals tend to be agreeable, likeable, trusting, and concerned about others’ welfare (Giluk and Postlethwaite 2015). Agreeable individuals are also inclined towards avoiding or causing less conflict with others (Kalshoven et al. 2011). The conscientiousness trait considers an individual’s characteristics who is organised, and goal-directed (Giluk and Postlethwaite 2015). People with these traits are found to be thorough, diligent, and responsible (Kalshoven et al. 2011).

Students’ Personalities in the Context of E-learning

In the context of e-learning, Kamal and Radhakrishna (2019) believe that personality traits have a significant influence on the individual preference of learning. Even though new technological innovations in e-learning are crucial for improving the quality of student learning, it is equally important to understand how different personalities might approach these educational innovations. Devaraj et al. (2008) believe that people with the trait of neuroticism experience more negative emotions such as depression and anxiety. These negative emotional states might obstruct their learning performance, and they will have to learn to adapt to new e-learning methods. Siddiquei and Khalid (2018) state that the student's performance is positively correlated with three personality traits and negatively correlated with neuroticism. A study by Kamal and Radhakrishna (2019) revealed that personality traits, particularly in the case of e-learning, have a significant influence on the individual preference of learning. Meanwhile, Coman et al. (2020) emphasise that personality traits could be indicative of the preferred learning styles and could influence learning activities in an e-learning environment. However, their study does not consider the role of various types of student’s engagement, which makes its findings inconclusive.

Students’ Learning Engagement

Students’ learning engagement can be defined as the input of cognitive, emotional and behavioural effort that students require to complete their learning tasks (Kamal and Radhakrishnan 2019; Mubarak et al. 2021b). The cognitive aspect focuses on students’ interest and positive attention to acquiring new knowledge and skills through learning; In other words, it emphasises on the interaction between learning motivation and cognitive engagement (Bowden et al. 2021; Sutin et al. 2011). By comparison, emotional engagement concerns students’ emotions and feelings in the learning environment (Watjatrakul 2016). Behavioural engagement refers to the behaviour evident in students’ efforts for learning, such as participating in assigned tasks and seeking help from the instructor for learning activities (Siddiquei and Khalid 2018). As the cognitive, emotional, and behavioural engagement focus on students’ academic aspects, these concepts are sometimes integrated as students’ academic-related engagement (Wang and Hofkens 2020). Some researchers have introduced the term social engagement as another pillar of student engagement, which highlights the bonds of identification and belongingness formed between students and their peers, academic staff, and administrative staff in their tertiary education experience (Bowden et al. 2021). The importance of social engagement in the context of e-learning is supported by the fact that students may feel isolated due to the lack of physical interaction and the presence of physical peers and instructors (Di Malta et al. 2022). A lower level of social engagement indicates more likelihood of students’ experience of loneliness and isolation, which affects their mental health (Bowden et al. 2021; Di Malta et al. 2022). It is crucial to study students’ social engagement as an individual factor in the context of e-learning. This is because Bowden et al. (2021) report that students’ well-being is related to their social engagement.
Rather than cognitive engagement. When compared to students' behavioural engagement, social engagement plays a more significant role in transformative learning. Therefore, the current study compares students' engagement based on cognitive, emotional, behavioural, and social aspects.

Unlike personality traits, engagement is not a type of students' nature because it depends on an e-learning platform's education and service quality (Yang et al. 2021). Spring et al. (2016) point out that increasing student engagement is an important goal for the development of curriculum design in e-learning. Meanwhile, Arribathi et al. (2021) and Mubarak et al. (2021a) believe that understanding student engagement and satisfaction in e-learning is critical for the effective designing of e-learning courses. Coman et al. (2020) argue that the lack of students' engagement in the learning process leads to poor learning outcomes. The authors believe that one of the main challenges that teachers face is to create a positive learning environment for increasing student engagement and reducing absenteeism. Meanwhile, Bowden et al. (2021) claim that students' engagement plays a significant role in the success of their performance.

**Students' Stickiness**

In the context of e-learning, students' stickiness is reflected by students' readiness to continue using and prolong the duration of their learning on the platforms (Yang et al. 2021). Robinson and Cook (2018) describe user stickiness as the use of online systems to attract and hold the attention of users, and to create a compelling and magnetic reason for them to return repeatedly. Xu et al. (2017) state that the users of websites with high user stickiness will spend a long time or frequently visit the website. Meanwhile, Robinson and Cook (2018) believe that the concept of stickiness should comprise both users' duration of visit on an online platform and the platform's ability to retain visitors. Thus, stickiness is widely accepted as one of the success criteria for online platforms as it reflects the capability to motivate their users to view relevant content or consume more services provided by the websites after staying for a longer time (Yang et al. 2021). Furthermore, Li et al. (2021) suggest that the concept of students' stickiness should be applied to assess students' online learning activities for the success of online education.

The discussion above has demonstrated the positive relationship between students' personality traits on e-learning. However, these studies have not considered the influence of personality on students' learning stickiness and their engagement on e-learning platforms. To address this issue, this study investigates how students' personality traits affect their learning engagement, academic performance and stickiness in e-learning.

**Research Framework and Hypotheses Development**

This study applies the traits theory of personality and engagement model for investigating the impact of students' personality traits on their academic performance and stickiness towards e-learning. The traits theory of personality has been applied for a better understanding of how different personalities influence an individual's learning activities (Coman et al. 2020, Kamal and Radhakrishna 2019). It provides a suitable lens for exploring the effect of personality on students' learning activities in an e-learning environment. Meanwhile, the engagement model has been applied to understand the interaction between learning motivation and cognitive engagement (Fredricks et al. 2005). This model can be used to provide a better understanding of the effect of students' engagement on their academic performance in an e-learning environment. Drawing upon the traits theory of personality and engagement model, this study develops a conceptual framework for investigating the interactions among students' personality traits, engagement, academic performance, and stickiness toward e-learning. Figure 1 presents this proposed theoretical framework based on the literature review and hypotheses development.

Students' academic performance is affected by their personality traits (Hazrati-Viari et al. 2012; Cuartero and Tur 2021; Mateus et al. 2021; Verbree et al. 2021). Payne et al. (2007) argue that students with high conscientiousness, extraversion, and openness have greater motivation to learn and perform well. This argument is supported by Hazrati-Viari et al. (2012) and Serrano et al. (2021), who claim that conscientiousness and openness to experience as predictors of academic performance in higher education. Bergold and Steinmayr (2018) report that students with higher conscientiousness and neuroticism showed a significant association between intelligence and academic achievement. Similarly, Dumfart and Neubauer (2016) argue that intelligence and conscientiousness are the most important predictors of academic accomplishments. Yen (2016) suggests that students' extraversion, openness, and agreeableness are positively correlated to their academic achievement. On the other hand, students with low levels of
extraversion and high levels of neuroticism have low motivation in their studies and do not perform well (McCrae and Costa 2008). Along this line, the following hypothesis is proposed to test the effects of personality traits on academic performance in the e-learning context:

**Hypothesis 1: Students’ academic performance is positively affected by their personality traits**

The level of students’ stickiness towards e-learning can also be influenced by their personality traits. For instance, Caci et al. (2019) argue that extroversion and conscientiousness can affect the time that users spend on online platforms. Meanwhile, several studies have been conducted on the effects of personality traits based on knowledge sharing behaviours as they have a direct influence on the users’ commitment and stickiness intention toward online platforms (Yen 2016). For instance, conscientiousness and agreeableness have been found to be relevant to employees’ knowledge sharing in the context of organisational learning (Matzler et al. 2011). In the context of live-streaming platforms, it can increase users’ visit duration when they perceive their personality traits are similar to streamers (Li et al. 2021). Despite the growing attention paid to social media platforms, the existing research has not discussed the relationship between e-learning students’ personality traits and stickiness. This leads to the development of the following hypothesis:

**Hypothesis 2: Students’ stickiness toward e-learning is positively affected by their personality traits**

Students’ stickiness is positively influenced by their academic performance in higher education. In other words, students usually have stickiness toward an e-learning platform when they have achieved a reasonable level of academic performance (Li et al. 2021; Robinson and Cook 2018; Xu et al. 2017). Thus, the higher the level of stickiness, the higher the academic performance is. For instance, Xu et al. (2017) state that there is a significant positive correlation between academic performance and e-learning stickiness of students. Robinson and Cook (2018) find that the learning stickiness of students’ e-learning can lead to higher academic performance. This is because when students become sticky to the e-learning platform, they will be more deeply involved in the use of the platform. For example, they may earnestly support and watch the course, submit and correct their homework, and conduct in-depth topic discussions with teachers and students (Li et al. 2021). Given the effects of students’ personality traits on their stickiness toward e-learning platforms as discussed in the previous section, this may imply the mediating role of stickiness between these factors. Stated differently, when students’ personality traits increase their stickiness toward e-learning, this may contribute to their academic performance. Thus, the following hypothesis is developed:

**Hypothesis 3: Students’ stickiness toward the e-learning platform is a mediator between their personality traits and academic performance.**

Student engagement is an important variable that can moderate the relationships between students' academic performance and its influencing factors (Gerber et al. 2013; Kanta and Srivalli 2019; Ebardo and Wibowo 2021). Although students’ learning outcomes can be supported by their advantageous personal backgrounds and traits, this learning outcome should be based on students’ effective learning through a high level of engagement (Gerber et al. 2013). Further, people's personality traits are their inner psychological characteristics which are unlikely to be changed within a short timeframe (Roberts et al. 2017). Mubarak et al. (2021b) assert that even though students’ academic performance can be influenced by their diverse backgrounds, higher education institutions can promote students' engagement by improving course design, learning support and communication methods. This suggests that higher education institutions should consistently enhance learning experiences to promote students’ engagement even though students’ personality traits can significantly affect their academic performance. The study by Kanta and Srivalli (2019) presented that students’ engagement has a marginal moderating effect on the relationship between teachers' commitment and academic performance. However, the research explored the dependent and independent variables from the teachers' perspective, and applied the concept of student engagement as a one-dimensional construct. Gerber et al. (2013) highlight the significant moderating effects of students' cognitive, affective and behavioural engagement on their academic performance. Nevertheless, this study was conducted in the context of face-to-face learning. Rodríguez-Muñoz et al. (2021) argue that conscientious students are more likely to achieve a better academic performance when they have positive emotional engagement. Furthermore, the role of students’ social engagement should not be ignored because it contributes to students’ academic performance when educational institutions promote social connectedness (Di Malta et al. 2022). Therefore, we proposed the following hypotheses:

**Hypothesis 4: Students’ cognitive engagement moderates the relationship between their academic performance and personality traits**
Hypothesis 5: Students’ affective engagement moderates the relationship between their academic performance and personality traits

Hypothesis 6: Students’ behavioural engagement moderates the relationship between their academic performance and personality traits

Hypothesis 7: Students’ social engagement moderates the relationship between their academic performance and personality traits

The effect of users’ personal factors on their stickiness toward an online platform is also influenced by how the service provider engages users via continually motivating them to participate in “sticky” behaviours such as knowledge and information sharing (Li et al. 2021). Thus, student’s engagement can contribute to the stickiness of e-learning platforms (Yang et al. 2021). A high level of student engagement suggests an interesting and pleasant learning experience (Gerber et al. 2013), which could encourage students to prolong their duration of learning on e-learning platforms (Yang et al. 2021). A study by Friedrich et al. (2019) suggests that online platforms should enhance the cognitive and affective factors to improve the stickiness. Ren et al. (2021) relate the stickiness of online platforms to how they facilitate users' participation behaviours. While these studies have implied that online platforms' stickiness can be promoted by enhancing users’ cognitive, affective and behavioural engagement, they were conducted in the e-business context and did not consider the role of social engagement. Therefore, this research will further explore how cognitive, affective, behavioural, and social engagement can moderate the effects of personality traits on students' stickiness toward e-learning platforms, which leads to the following hypotheses:

Hypothesis 8: Students’ cognitive engagement moderates the relationship between their personality traits and stickiness

Hypothesis 9: Students’ affective engagement moderates the relationship between their personality traits and stickiness

Hypothesis 10: Students’ behavioural engagement moderates the relationship between their personality traits and stickiness

Hypothesis 11: Students’ social engagement moderates the relationship between their personality traits and stickiness

Figure 1. The Proposed Conceptual Framework
Proposed Methodology and Future Work

The goal of this paper is to investigate how students' personality traits affect their academic performance and stickiness in the e-learning process, and how the effects are moderated by students' engagement. Accordingly, the research model shown in Figure 1 is presented to empirically test the hypotheses. In line with the positivist approach, a sample of items measuring the students' understanding of the e-learning platform will be generated. In particular, their opinions on personality traits, academic performance, stickiness and learning engagement will be studied using the items generated earlier.

A mixed-method study involving an online survey via Qualtrics and semi-structured interviews of students will be conducted. Emails will be sent to Australian universities requesting them to invite their students who are currently enrolled to participate in the survey and the interview. We aim to collect data from about 250 participants for the survey and out of these participants, a total of 15 participants will be invited for the interview.

The online survey questionnaire comprises three parts. The first part includes questions seeking responses on essential demographic characteristics such as participant's age, gender, employment and previous study mode. The second part seeks responses on their e-learning experiences, and general evaluation. The final part requires participants to specify the extent to which they agree or disagree with the developed hypotheses. Construct items will be tested using a 5-point Likert scale ranging from (1) Strongly Disagree to (5) Strongly Agree. A statistical analysis using IBM SPSS will be utilised for reliability tests and exploratory construct analysis to ensure data validity using the collected data. This is followed by the use of the SmartPLS software tool to check the proposed research model with the gathered data. Structural Equation Modeling will be used to analyse the survey data, while Nvivo will be used to analyse interview transcripts.

Expected Contribution and Conclusion

There is a limited study investigating the effects of students' personality traits, academic performance and long-term stickiness towards e-learning platforms, and how the effects are moderated by student engagement. Thus, this research study will fill an important research gap in this aspect. This study is expected to have both theoretical and practical implications. From a theoretical perspective, this study will provide a validated research model for exploring the effects of students' personality traits on their academic performance and long-term stickiness in e-learning usage for achieving better student learning outcomes and commitment to life-long learning. From a practical perspective, this study will provide insightful research findings to aid in the creation of tailored strategies for the development of e-learning platforms for promoting the delivery of high-quality education.

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