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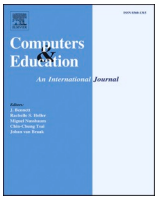

The influences of lecturer charismatic leadership and technology use on student online engagement, learning performance, and satisfaction

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ABSTRACT

Previous research has indicated that the quantity and quality of lecturer-student interaction may enhance student engagement in online lessons, and that student engagement may promote student learning and satisfaction. However, the effectiveness of such interaction may depend upon the lecturer's leadership characteristics and technology use. Thus, the purpose of this study is to identify lecturers' charismatic leadership and technological use that enable student engagement, and ultimately, student learning and satisfaction. An online survey was used to obtain data from 659 higher education students in the United States, which were analyzed using covariance-based structural equation modeling. Lecturer charismatic leadership and technology use are each significantly related to student engagement, which predicts students' learning performance and satisfaction. Further, it was found that in the lower self-efficacy student group, lecturer charismatic leadership and technology use significantly improves students' behavioral engagement. The findings of this research emphasize the importance of lecturer and learner characteristics for effective interaction and outcomes in online lessons.

1. Introduction

The COVID-19 pandemic forced many higher education institutions to suspend face-to-face classes, which were replaced with online delivery to minimize the impact on student progression (Tang et al., 2021). In response to this disruptive situation, universities revisited their digital infrastructure, including hardware, software, and internet access, to facilitate effective learning and encourage student engagement in online lessons (Law, Geng, & Li, 2019). However, lecturer and student readiness, as well as individual attributes, may influence the successful adoption and effective usage of these digital systems and resources. For example, Lai and Jin (2021) explain that a lecturer's self-efficacy beliefs about their technological literacy and their pedagogical use of technology impact their use of educational technology. Lecturers that function as leaders and facilitators can model behaviors, guide discussions, and engage students in online course activities supporting their attainment of positive learning experiences (Farmer & Ramsdale, 2016). On the other hand, learner characteristics such as self-efficacy, technology readiness, and interest in the course play a key role in determining student engagement in online classes (Manwaring, Larsen, Graham, Henrie, & Halverson, 2017).

Previous studies have highlighted the salience of the student engagement concept as an indicator of student success and the

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attainment of academic outcomes (Henrie, Halverson, & Graham, 2015; Kahu, 2013). Dixson (2015) explains that engagement refers to an individual's attitudes, thoughts, behaviors, and interactions with others. According to Sun and Rueda (2012), student online engagement has three dimensions. First, cognitive engagement refers to students' effort and investment in their learning, such as reading extra materials to learn more about a topic discussed in the online class. Second, emotional engagement explains the feelings of students about their online learning experience, such as excitement and happiness when taking online classes. Finally, behavioral engagement highlights the students' observable behavior, such as completing an online task or following the rules of the online classrooms (Sun & Rueda, 2012). Student and faculty interactions may stimulate and enhance student engagement (Kim & Lundberg, 2015). Face-to-face delivery provides opportunities for students to engage with their lecturers before and after a class, which the online setting does not so easily provide (Paulsen & McCormick, 2020). Online teaching and learning are complex and require new strategies to enhance outcomes and foster students' connections and relationships. According to Henrie et al. (2015), keeping students engaged in online learning requires adaptable practices and approaches that are unique to the challenges of technology-mediated learning. Thus, in the online environment, keeping students engaged remains a challenge for higher education institutions, since lecturers and students may lack the opportunities to interact and collaborate effectively as compared to the traditional educational settings (Sun & Rueda, 2012).

Previous studies have investigated strategies that may overcome these challenges and enhance students' online engagement (Shah & Barkas, 2018). Blasco-Arcas, Buil, Hernández-Ortega, and Sese (2013) argue that technological advancements have facilitated more interactive learning environments, where students and lecturers have modified the ways in which they interact, while Bolliger and Martin (2018) suggest that lecturers may enhance learners' sense of community and support students' participation and interaction by guiding online discussions. Such interactions may support student engagement and feelings of satisfaction. In other words, the interactive environment that encourages rapport and collaboration between learners and lecturers increases student engagement (Martin & Bolliger, 2018). These learning environments promote student engagement by fostering direct interactions and relationships with faculty members, including spontaneity and immediate feedback (Clayton, Blumberg, & Auld, 2010). Few studies have highlighted the importance of lecturer charismatic leadership or technology use on interactive online classes. For example, Queen (2022) explained that charismatic lecturers influence online interactions by improving students' participation in learning activities. On the other hand, lecturer technology use impacts these interactions by creating interactive and collaborative learning environments (Lai & Jin, 2021). However, the question of how the combination of these two lecturer characteristics enhances student-lecturer interactions and engagement remains underexplored. Specifically, there is a gap in the literature on how lecturer leadership complement technology use and interact with learners' characteristics to facilitate student engagement and improve learning performance. This study fills the gap by identifying lecturer charismatic leadership and technology use as enablers of online student engagement, and consequently, students' learning performance and satisfaction.

Charismatic leadership may be as valuable to a higher education lecturer in an online classroom setting as to a manager in a business organization. According to Conger and Kanungo (1994), charismatic leadership is defined as an attribution made by followers observing their leader's behaviors, and this process includes three stages. First, the charismatic leader shows sensitivity to followers' needs and the organizational opportunity. Second, the charismatic leader formulates and articulates an inspirational vision. Finally, charismatic leader acts as a role model and takes risks for the benefit of the organization (Conger & Kanungo, 1987). Further, charismatic leadership differs from other types of leadership by the ability to develop and communicate an inspirational vision and by the behaviors that foster an impression that they and their role are extraordinary (Conger, Kanungo, & Menon, 2000). Charismatic leadership demonstrates conviction and passion for the mission and communicates in a symbolic way to make the message clear and vivid (Banks et al., 2017). Thus, charismatic leadership may support the lecturer in online classrooms requiring more social and facilitating roles due to the lack of physical interactions (Richardson, Besser, Koehler, Lim, & Strait, 2016). Even though previous research in education settings has established that lecturer charisma may promote student engagement (Queen, 2022), help overcome student resistance behaviors, such as straying off-task and disobeying lecturer instructions (Goodboy & Bolkan, 2011), and boost students' ratings of teaching effectiveness (Shevlin, Banyard, Davies, & Griffiths, 2000; Yin, 2021), charismatic leadership is more often researched in the context of managing staff (Banks et al., 2017; Conger, 1999; Groves, 2005).

Although charismatic leadership may inspire and influence students in on-site classrooms, this personal characteristic may not be successful or enough as an engagement strategy without considering the lecturer's technology use, and the impact of learning activities design and students' characteristics in online classrooms. For example, the design of collaborative online activities such as forums and webinars influence students' engagement, and lecturer technological use is required for successful implementation (Lai & Jin, 2021; Toro-Troconis, Alexander, & Frutos-Perez, 2019). Besides, lecturer use of educational technologies is critical to engage learners in self-directed study such us video presentations, podcasts and other interactive self-learning activities (Kent, Laslo, & Rafaeli, 2016; Lai & Jin, 2021; Redmond, Heffernan, Abawi, Brown, & Henderson, 2018). Students' belief of receiving excellent grades and their confidence in doing excellent work in online classrooms may impact their levels engagement (Manwaring et al., 2017). For example, students with lower self-efficacy may benefit from the interactive, well-designed and collaborative online activities which improve their levels of engagement (Martin, Budhrani, Kumar, & Ritzhaupt, 2019). However, students with higher level of self-efficacy enjoy their learning experience and show more cognitive engagement with online classrooms (Manwaring et al., 2017).

Thus, the purpose of this study is to investigate the impact of lecturers' charismatic leadership and technology use on online student engagement. Further, the study aims to investigate the moderation effects of students' self-efficacy on the relationships between lecturer charismatic leadership and technological use, and student online engagement. The study contributes to improving our understanding of the role of lecturers' leadership and technological use in online student engagement, and it answers six main research questions:

RQ1. How does lecturer charismatic leadership influence student online engagement?

RQ2. How does lecturer use of educational technologies influence student online engagement?

RQ3. Does student online engagement influence student learning performance and satisfaction?

RQ4. Does student online engagement mediate the relationships between lecturer charismatic leadership, lecturer technology use and student learning performance and satisfaction?

RQ5. Does student self-efficacy moderate the relationship between lecturer charismatic leadership and student online engagement?

RQ6. Does student self-efficacy moderate the relationship between lecturer technology use and student online engagement?

The remainder of this paper is organized as follows. First, we discuss the theoretical background, lecturer charismatic leadership, lecturer technology use, and online student engagement. Then, we present a concise literature review and develop the hypotheses that specify the proposed relationships between lecturer charismatic and technology use and student engagement, and we consider how learner characteristics may influence these relationships. After explaining our method, we present and discuss the results, including the contributions and implications of this research.

2. Literature review and research hypotheses

2.1. Theoretical frame and lecturer charismatic leadership

Student engagement is critical for online learning and refers to the time, thought, effort, and energy that students put into their learning (Dixson, 2015). Many studies explain that student engagement is a concept that includes several dimensions such as cognitive, emotional, and behavioral engagement (Henrie et al., 2015; Sun & Rueda, 2012). According to Fredricks, Blumenfeld, and Paris (2004), cognitive engagement highlights the focused efforts that students invest in their learning, including self-regulation and metacognitive behaviors. For example, students that are cognitively engaged read extra materials, study even when they do not have tests, look for course-related information using other resources, ask themselves questions to make sure that they understand the online materials and do something to better understand the concepts that they do not know when they are in online classrooms (Sun & Rueda, 2012). Emotional engagement explains students' feelings about their learning experience and the social connection with others. An emotionally engaged student may be highly interested in the online course and feel excited about the online work (Shah & Barkas, 2018). Finally, behavioral engagement refers to the observable behaviors leading to student success such as attendance, active participation in the online classroom and following the online class rules (Fredricks et al., 2004; Sun & Rueda, 2012).

Previous studies highlighted the contributions of student engagement to academic performance and student satisfaction (Kucuk & Richardson, 2019; Owston, York, & Murtha, 2013; Shah & Barkas, 2018). Research using on-site settings has highlighted a relationship between lecturer leadership behaviors and student engagement (Balwant, 2016; Bolkan & Goodboy, 2009). However, online delivery increases the physical distance between the student and lecturer, presenting a challenge for student engagement. Thus, the lecturer in online classrooms may need charismatic leadership and technology use to design engaging learning activities, decrease the psychological distance and stimulate higher levels of interaction and engagement (Kent et al., 2016; Lai & Jin, 2021; Sun & Rueda, 2012).

House's (1977) theory of charismatic leadership explains the behavioral aspect of a charismatic leader and highlights the relationship between the leader and the follower. A charismatic leader creates an impression of competence, acts as a role model, sets elevated expectations, communicates a strong vision, and arouses followers' motivation to be productive (Miner, 2015). Charismatic leadership is multi-dimensional and includes five sub-scales that measure strategic vision and articulation, sensitivity to the environment, sensitivity to member needs, personal risk, and unconventional behavior (Conger et al., 2000). In this research, we define lecturer charismatic leadership as, the 'ability and behaviors of the lecturer that inspire the students to engage in learning activities and achieve high performance by effectively communicating the benefits of what the students are doing, and by showing sensitivity to student needs and the class environment'.

Charismatic leadership differs from other types of leadership by highlighting greater levels of sensitivity to the online environments, including student needs and communicating attractive and achievable learning objectives (Conger & Kanungo, 1987; Goodboy & Bolkan, 2011). For example, charismatic leadership lecturers recognize the constraints in the online classrooms such as technological limitations or lack of resources. These lecturers might take personal risks such as using humor or giving examples from their own experience to pursue learning goals and for the benefit of the students (Queen, 2022). Charismatic lecturers are inspirational and exciting public speakers that may use nonverbal skills, such as changing their tone of voice, using facial expressions and hand movements which may be more important in online classrooms to emphasize social presence and enhance student engagement in teaching and learning (Richardson et al., 2016). Further, charismatic lecturers differ from others in the sense that their students perceive their greater desire to change the status quo and by their heightened sensitivity to online classrooms opportunities, constraints and students' needs (Conger et al., 2000).

Lecturer technology use is defined as the ability of the lecturer to use technology to deliver, enrich, and transform teaching and learning (Lai & Jin, 2021). Lecturers may use technology to deliver instructional content more effectively, supporting students' dissemination of information and understanding of complex materials (Ertmer et al., 2012; Shah & Barkas, 2018). Lecturers may benefit from educational technologies to enrich students' learning through novel resources and collaborative learning (Redmond et al., 2018). Further, the lecturer may use the technology to implement new ways of teaching and learning helping the students to use different technological resources/tools to enhance their work (Ertmer et al., 2012; Lai & Jin, 2021). Thus, lecturer technology use

represents the integration of three dimensions and this concept is measured using the three sub-scales of technology use for delivery, technology use for enrichment, and technology use for transformation (Lai & Jin, 2021).

Moore (1989) argues that the interaction between lecturer and student is a predictor of students' learning performance and satisfaction. These interactions are influenced by individual qualities such as the self-efficacy that a student brings to the learning situation (Manwaring et al., 2017). For example, lecturer charismatic leadership may influence students with lower self-efficacy in online classrooms by recognizing their abilities and communicating clear learning objectives (Goodboy & Bolkan, 2011; Queen, 2022). On the other hand, lecturer technology use may support lower self-efficacy students by creating additional content and designing engaging online learning activities (Manwaring et al., 2017; Martin et al., 2019). Self-efficacy reflects the amount of effort exerted and the individual's judgment of their abilities to achieve designated types of outcomes (Bandura, Pastorelli, Barbaranelli, & Caprara, 1999). Students' self-efficacy is important in online learning and critical to improve online students' engagement (Shen, Cho, Tsai, & Marra, 2013). According to Manwaring et al. (2017), students' self-efficacy, such as considering themselves doing excellent work in online classes and having the confidence that they can understand the most complex material in online classrooms, may influence their levels of engagement. Thus, this study proposes that students' self-efficacy may interact with lecturer charismatic and technology use and influence students' level of engagement, and their learning performance and satisfaction in online classrooms.

2.2. Lecturer charismatic leadership and student online engagement

Charismatic leaders exert strong influence on their followers' trust, satisfaction, and performance by being sensitive to member needs and the surrounding environment of work (Conger et al., 2000). These leaders reflect a caring concern and respect for their followers leading to the development of self-esteem, admiration, and relationships, allowing them to exceed performance expectations (Kath, Salter, Bachiochi, Brown, & Hebl, 2020). Leader charismatic attributes may be beneficial in higher education classroom environments, as lecturer charisma has shown to influence students' perceptions of the lecturer's teaching effectiveness (Shevlin et al., 2000). Thus, we argue that lecturer charismatic leadership might influence student engagement with learning activities in online lessons.

First, a charismatic lecturer articulates and communicates inspiring learning goals to the students, including the use of suitable learning materials and sharing of experiences, which stimulates students' cognitive engagement and improves their understanding (Goodboy & Bolkan, 2011; Queen, 2022). Second, a charismatic lecturer influences students by developing mutual liking and by showing sensitivity to student feelings, which appeals to their emotions and fosters a higher level of emotional engagement (Balwant, Birdi, Stephan, & Topakas, 2018; Conger et al., 2000). Finally, a charismatic lecturer can motivate students to complete tasks and follow the online class rules by effectively articulating the importance of what students are doing, developing mutual respect, and recognizing the abilities and skills of students in the online classroom (Conger et al., 2000; Sun & Rueda, 2012).

Previous studies highlighted the importance of lecturer leadership in motivating and stimulating student engagement in online learning activities (Queen, 2022; Yin, 2021). Charismatic lecturers may enhance the online learning experience and contribute to student engagement by producing emotions and effort necessary for engagement (Manwaring et al., 2017). These lecturers provide inspiring learning goals and generate innovative ideas driving students to invest in their learning and to find relevance in new information (Redmond et al., 2018). They communicate in symbolic ways, delivering clear and vivid messages, and facilitating cognitive engagement and students' effort toward their learning in online classrooms (Banks et al., 2017). Charismatic lecturers determine how best to harness emotion for effective learning, which stimulates students' emotional engagement (Balwant et al., 2018; Tualaulelei, Burke, Fanshawe, & Cameron, 2021). Charismatic lecturers engage in emotional and inspiring displays, demonstrating passion for teaching and learning which may generate emotional engagement and interest for students in online classrooms (Sun & Rueda, 2012). Further, a charismatic lecturer fosters an active learning environment by recognizing student abilities and seizing opportunities to motivate participation and achievement of online tasks (Kath et al., 2020; Queen, 2022; Redmond et al., 2018; Shevlin et al., 2000).

H1a. Lecturer charismatic leadership is positively related to student online cognitive engagement.

H1b. Lecturer charismatic leadership is positively related to student online emotional engagement.

H1c. Lecturer charismatic leadership is positively related to student online behavioral engagement.

2.3. Lecturer technology use and student online engagement

The impact of web-based learning technology on student engagement is established in the literature (Chen, Lambert, & Guidry, 2010; Shah & Barkas, 2018). These learning management systems provide lecturers with several tools to design courses and learning experiences that enhance and facilitate student engagement (Redmond et al., 2018). However, the availability of technology is not alone sufficient to stimulate student engagement, but the lecturer knowledge about technology is a crucial factor influencing the design of learning activities that engage students (Tualaulelei et al., 2021). Lecturer integration and usage of technology varies according to the individual's interpretation and conception of their teaching and classroom practice (Lai & Jin, 2021).

According to Ertmer et al. (2012), lecturers have three types of technological practice that may impact upon learner engagement and experience. First, lecturers may use technology to deliver content and reinforce skills that improve students' knowledge of complex material while stimulating their cognitive engagement (Shah & Barkas, 2018). Second, lecturers may use technology to enrich students' learning experiences, by engaging the students in collaborative and interactive learning that fosters excitement and fun (Lai & Jin, 2021; Shah & Barkas, 2018). Finally, lecturers may use technology to transform teaching and learning, by implementing new

methods that enhance students' strategies and skills, making better use of technologies to complete tasks effectively and efficiently (Ertmer et al., 2012).

Advances in technology and the availability of interactive learning management tools support lecturers in improving learning productivity and fostering a collaborative environment (Chen et al., 2010; Owston et al., 2013). Lecturers use technology in diverse ways to stimulate student engagement. This usage may be informative, including learning materials that stimulate cognitive engagement. For example, lecturers may use the technology to present instructional content in a more appealing way or help the students to access resources more easily, supporting them to learn more about the concepts discussed in the online class (Lai & Jin, 2021; Sun & Rueda, 2012). On the other hand, lecturers use technology to create interactive and collaborative learning environments that improve students' emotional engagement. For example, lecturers may use technology to bring authentic resources and experiences to the online classroom, generating students' interest and enhancing their emotional engagement (Lai & Jin, 2021; Sun & Rueda, 2012). The lecturer may also use technology to provide personalized content, while integrating self-study to support students' completion of tasks and improve their behavioral engagement (Ertmer et al., 2012; Lai & Jin, 2021; Trentin, 2008).

H2a. Lecturer technology use is positively related to student online cognitive engagement.

H2b. Lecturer technology use is positively related to student online emotional engagement.

H2c. Lecturer technology use is positively related to student online behavioral engagement.

2.4. Student online engagement and learning performance

Previous studies have investigated the relationship between student engagement and learning performance using several modes of deliveries, which have explained the contribution of distinct types of engagement on student performance (Bond, Buntins, Bedenlier, Zawacki-Richter, & Kerres, 2020; Dixon, 2015; Henrie et al., 2015). For example, Junco, Heiberger, and Loken (2010) explain that student engagement with Twitter in on-site classrooms for educational purpose is a powerful force for student development and academic success. Balwant et al. (2018) confirmed that cognitive, emotional, and behavioral engagement contribute positively to learning performance in face-to-face classrooms. Further, Shah and Barkas (2018) found that student use of resources and behavioral engagement such as attendance significantly and positively relate to their grade levels. On the other hand, a study by Law et al. (2019) concluded that students in blended learning who seek more information related to their course and acquire knowledge quickly achieve superior skills and grades. Students' focused efforts toward their learning, interest and enjoyment in blended learning environments improves their learning experience and knowledge (Hosen et al., 2021). Student engagement has been significantly and consistently related to students' learning performance and positive outcomes, such as improving their understanding and reducing learning time in blended and online learning classrooms (Owston et al., 2013; Redmond et al., 2018).

H3a. Student online cognitive engagement is positively related to student learning performance.

H3b. Student online emotional engagement is positively related to student learning performance.

H3c. Student online behavioral engagement is positively related to student learning performance.

2.5. Student online engagement and satisfaction

Student engagement is one of multiple factors that may predict student satisfaction with online lessons (Kucuk & Richardson, 2019; Swan, 2001). According to Pye, Holt, Salzman, Bellucci, and Lombardi (2015), student engagement is a critical predictor of student satisfaction in higher education, and more specifically in undergraduate courses. Alqurashi (2019) found that students involved in processing information, self-thinking, and learning from content are more satisfied, while Martin, Wang, and Sadaf (2018) conluded that student engagement enhances student motivation, reduces the sense of isolation, and increases student satisfaction. The relationship between student online engagement and satisfaction was further explored by Gray and DiLoreto (2016), who found that student engagement relates significantly and positively to student satisfaction. This finding was further confirmed by Bangert (2006), who identified student engagement as one of the principal factors that contribute to student satisfaction with online lessons. Recently, Kim and Kim (2021) found that student engagement affects positively student satisfaction in asynchronous online courses. Finally, in a study conducted during the COVID-19 pandemic, Baloran, Hernan, and Taoy (2021) concluded that students with positive emotions and higher participation in online classrooms tend to be highly satisfied with their online courses.

H4a. Student online cognitive engagement is positively related to student satisfaction.

H4b. Student online emotional engagement is positively related to student satisfaction.

H4c. Student online behavioral engagement is positively related to student satisfaction.

2.6. Student self-efficacy, lecturer charismatic leadership and online engagement

Self-efficacy refers to a person's belief in their ability to organize and act to achieve a desired outcome (Bandura et al., 1999). In higher education, self-efficacy is a key component in student learning, which supports individuals to perceive obstacles as opportunities to engage, develop their skills, and complete online classrooms successfully (Alqurashi, 2019). Self-efficacy might affect

students' overall learning process, including their interactions with course content, lecturers, and their engagement in online classrooms (Kumar, Kumar, & Ting, 2021; Sun & Rueda, 2012). The self-efficacy construct is multidimensional, complex, and context specific. In this research, the focus is on the learning aspect of self-efficacy that showed the highest contribution to online self-efficacy and learning satisfaction in comparison with other efficacies such as computer self-efficacy (Shen et al., 2013).

Manwaring et al. (2017) investigated student characteristics that may impact their engagement in blended learning environments and found that students' learning self-efficacy influences only the cognitive and not the emotional level of engagement. On the other hand, Alqurashi (2019) found that learner-instructor interactions and students' self-efficacy influence students' perceived learning. Previous studies have explained that lecturer and student characteristics influence the communication in online lessons, which is one of the major factors for student engagement (Bolliger & Martin, 2018; Kim & Lundberg, 2015). Charismatic leaders are more sensitive to students' needs and they recognize students' abilities in online classrooms, and these lecturers may improve lower self-efficacy students' understanding of complex materials by communicating clear and vivid messages (Banks et al., 2017; Conger et al., 2000; Manwaring et al., 2017). Charismatic lecturers can enhance engagement by monitoring student participation or assignment submission and provide support to lower learning self-efficacy students, to search for information and complete a task, or actively participate in an online discussion (Redmond et al., 2018; Yin, 2021). Further, a charismatic lecturer can stimulate learner emotions, who may experience anxiety, feel less supported by others, and show lower level of self-efficacy in online classrooms (Balwant et al., 2018; Shen et al., 2013; Tualaulelei et al., 2021).

H5a. Student self-efficacy moderates the relationship between lecturer charismatic leadership and cognitive online engagement. This effect is stronger for students in the lower self-efficacy group.

H5b. Student self-efficacy moderates the relationship between lecturer charismatic leadership and emotional online engagement. This effect is stronger for students in the lower self-efficacy group.

H5c. Student self-efficacy moderates the relationship between lecturer charismatic leadership and behavioral online engagement. This effect is stronger for students in the lower self-efficacy group.

2.7. Student self-efficacy, lecturer technology use and online engagement

According to Manwaring et al. (2017), engagement is the outcome of interaction between students' characteristics, such as self-efficacy, and the lecturers' ability to design a meaningful learning experience. These interactions are influenced by the lecturer's diverse use of technology to engage students in online learning activities (Redmond et al., 2018). Although a lecturer may use technology to deliver content, and enrich and transform teaching and learning, online student engagement may vary depending on the learner's attributes and self-efficacy (Hoey, 2017; Lai & Jin, 2021; Tang et al., 2021). Martin et al. (2019) argue that lower learning self-efficacy students facing difficulties in online lessons may benefit from the lecturer's affordance of technology and their abilities to create additional materials. This finding was confirmed by McConville and Lane (2006) who found that lecturers' use of video improves student engagement and understanding of course information among lower self-efficacy learners. Further, the engagement of these students may be enhanced depending on the lecturer's understanding of how students learn and their usage of technology to

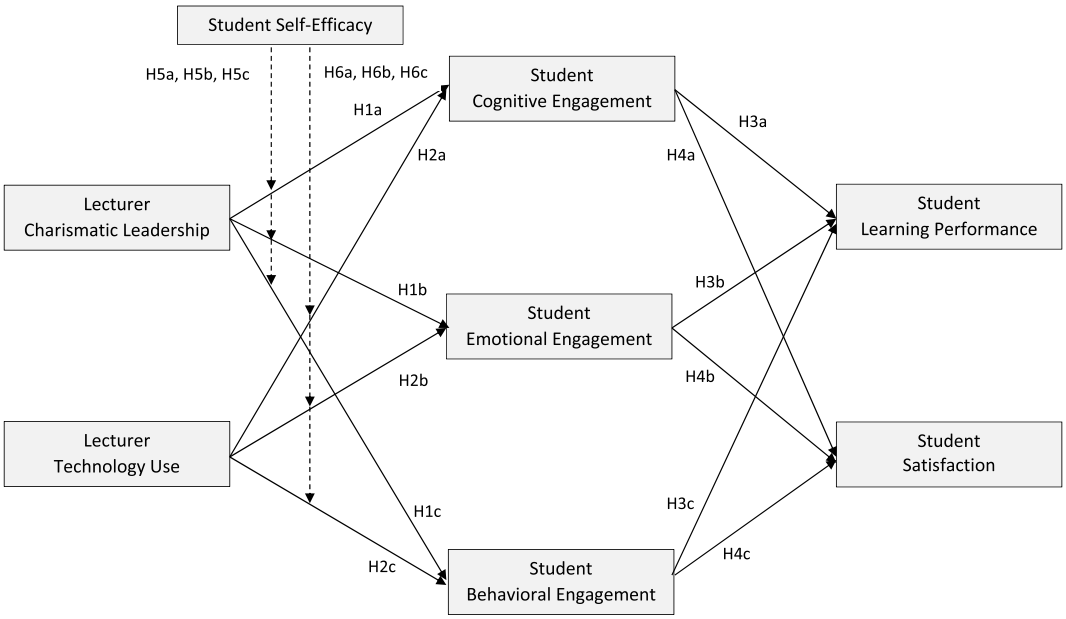

Fig. 1. Proposed conceptual model.

design learning activities that address several learner styles (Martin et al., 2019; Shen et al., 2013).

Students with higher self-efficacy exert more cognitive engagement and enjoyment with their learning experience Manwaring et al. (2017). However, students with lower self-efficacy may benefit from the lecturers' technology use and design of engaging online learning activities that provide autonomy and choice for learners in online classrooms (Martin et al., 2019). Lecturer use of technology may facilitate the effective delivery of content including the easy access to instructional materials, which may improve student learning and understanding of complex materials in online classrooms (Sun & Rueda, 2012). Further, lecturer use of technology to foster collaboration in online classroom giving students more choices in learning may improve student interest and support those with lower self-efficacy to do better in online classes and complete their tasks effectively (Manwaring et al., 2017).

H6a. Student self-efficacy moderates the relationship between lecturer technology use and cognitive online engagement. This effect is stronger for students in the lower self-efficacy group.

H6b. Student self-efficacy moderates the relationship between lecturer technology use and emotional online engagement. This effect is stronger for students in the lower self-efficacy group.

H6c. Student self-efficacy moderates the relationship between lecturer technology use and behavioral online engagement. This effect is stronger for students in the lower self-efficacy group.

Previous studies have highlighted the role of student engagement linking the interactions between students and lecturers to learning performance and satisfaction (Bolliger & Martin, 2018; Kahu, 2013). It was found that the learning experiences created by lecturers influence student engagement and these interactions contribute to successful outcomes (Manwaring et al., 2017). Balwant et al. (2018) investigated the relationship between lecturer leadership and student performance, and the results indicated that student engagement is a key mechanism through which lecturer leadership relate to performance. Thus, post-hoc analysis in this study investigates the potential mediating role of student engagement between lecturer charismatic leadership and technological use and student learning performance and satisfaction.

Fig. 1 presents the proposed conceptual model and the associated hypotheses.

3. Method

3.1. Sample and data collection

The study population is undergraduate students in the United States who have participated in online lessons in the last 12 months. The level of analysis is the individual student, and the participants were asked to think about one specific course, i.e., module in a program, that they took that had been, or was currently, delivered online, and answer all the questions in the survey regarding only this one course and the main lecturer who delivered it. This process ensured that the participants answered the questionnaire effectively, as they had sufficient experience of their chosen lecturer's teaching style and it avoided the complexity of answering questions that relate to program level, which would likely include multiple lecturers and modes of delivery. Data were collected using an online survey questionnaire, which was available in Mechanical Turk (MTurk) for one month. This online crowdsource platform facilitates the access to a large and diverse participant pool, having the added advantages of ease of use and speed of data collection at a reasonable cost (Aguinis, Villamor, & Ramani, 2020). We followed the best practice recommendations to address validity threats and we employed participant quality control measures through Turkprime (Aguinis et al., 2020; Litman et al., 2017).

The number of responses received was 738, and a total of 659 useable responses without missing data were obtained. 53.1% of the respondents classified themselves as male and 46.9% as female. 34.1% of the participants have attended up to five courses that included online lessons, 53.4% have attended between 6 and 10 courses that included online lessons, and 12.4% have attended more than 10 courses that included online lessons. Further, we have conducted power analysis using G*Power 3.1, which determines the sample adequacy for this research (Faul, Erdfelder, Lang, & Buchner, 2007). According to the G*Power test, we needed 158 participants to achieve 0.95 statistical power at 0.05 significance. This study achieved 659 responses, exceeding the mimimum required sample size.

3.2. Measures

All latent constructs in the model were measured using pre-existing validated scales adopted from the literature. All these scales had previously demonstrated satisfactory internal reliability. Lecturer charismatic leadership was measured using Conger, Kanungo, and Menon's (2000) five dimensions that include strategic vision and articulation (seven-item scale), personal risk (three-item scale), sensitivity to the classroom environment (four-item scale), sensitivity to student needs (three-item scale), and unconventional behaviors (three-item scale). Lecturer technology use was measured using Lai and Jin's (2021) three dimensions reflecting technology use for delivery (three-item scale), technology use for enrichment (three-item scale) and technology use for transformation (five-item scale).

Sun and Rueda's (2012) five-item scale was used to measure student cognitive engagement, six-item scale to measure student emotional engagement, and three-item scale to measure student behavioral engagement. Hosen et al.'s (2021) five-item scale was used to measure students' learning performance. A six-item student satisfaction scale was adopted from Sher (2009). The self-efficacy four-item scale was adopted from Manwaring et al. (2017). The items used in this study are provided in Appendix 1, and all latent constructs in this study were measured using a 7-point Likert scale, where 1 = strongly disagree and 7 = strongly agree. The survey

questionnaire was subjected to pretesting with 40 students, and no issues of concern were identified.

4. Results

4.1. Measurement model

Exploratory factor analysis (EFA) was conducted using SPSS software version 28 to investigate the model's structure and construct dimensions. First, KMO = 0.97 and Bartlett's test was significant ($p < .000$). Second, the examination of the pattern matrix revealed that items SSN1, SSN2, SSN3, TUD1, TUE1, TUT1 and EE1 cross-loaded on two or more components and their loadings were below 0.45. Thus, these items were deleted from further analysis, as recommended by Hair, Black, Babin, and Anderson (2014). Further, factor loadings of ±0.50 and higher are practically significant (Hair et al., 2014). The pattern matrix that followed the re-specification and deletion of the problematic items consists of 11 components including strategic vision and articulation, personal risk, sensitivity to

Table 1
Results of the confirmatory factor analysis, with the corresponding factor loadings and reliabilities.

Construct	Item	Loading	T value	α	CR	AVE
Strategic vision and articulation	SVA1	0.755	–	0.91	0.917	0.613
	SVA2	0.791	21.66			
	SVA3	0.777	21.20			
	SVA4	0.774	21.08			
	SVA5	0.778	21.21			
	SVA6	0.815	22.46			
	SVA7	0.790	21.61			
Personal risk	PRK1	0.810	–	0.86	0.862	0.676
	PRK2	0.804	23.373			
	PRK3	0.852	24.757			
Sensitivity to classroom environment	SCE1	.783	–	0.86	0.869	0.625
	SCE2	.783	21.760			
	SCE3	.795	22.186			
	SCE4	.800	22.374			
Unconventional behaviors	UNB1	0.843	–	0.89	0.896	0.741
	UNB2	0.846	27.675			
	UNB3	0.819	28.693			
Lecturer technology use	TUD2	0.744	–	0.89	0.895	0.560
	TUD3	0.716	18.474			
	TUE2	0.738	19.113			
	TUE3	0.731	18.893			
	TUT2	0.759	19.708			
	TUT3	0.792	20.642			
	TUT4	0.751	19.481			
	TUT5	0.753	19.530			
Student cognitive engagement	CE1	0.702	17.749	0.86	0.866	0.563
	CE2	0.755	19.195			
	CE3	0.775	19.741			
	CE4	0.756	19.218			
	CE5	0.762	–			
Student emotional engagement	EE2	0.806	24.329	0.90	0.902	0.648
	EE3	0.796	23.898			
	EE4	0.777	23.098			
	EE5	0.810	24.533			
	EE6	0.834	–			
Student behavioral engagement	BE1	0.792	19.799	0.82	0.821	0.605
	BE2	0.753	18.900			
	BE3	0.788	–			
Student learning performance	LP1	0.808	23.382	0.91	0.913	0.677
	LP2	0.819	23.808			
	LP3	0.841	24.684			
	LP4	0.835	24.468			
	LP5	0.809	–			
Student satisfaction	SAT1	0.822	27.849	0.90	0.902	0.721
	SAT2	0.853	29.842			
	SAT3	0.855	29.996			
	SAT4	0.846	29.347			
	SAT5	0.843	29.167			
	SAT6	0.875	–			
Student self-efficacy	SEF1	0.722	19.330	0.84	0.851	0.588
	SEF2	0.743	20.023			
	SEF3	0.780	21.215			
	SEF4	0.818	–			

classroom environment, unconventional behaviors, lecturer technology use, student cognitive engagement, student emotional engagement, student behavioral engagement, student learning performance, student satisfaction and student self-efficacy, and every item loaded at a value of more than 0.60. The results of reliability tests indicate that Cronbach's alpha exceeds the minimum threshold of 0.7 for all the measurement scales (Hair et al., 2014). (See Table 1).

Common method bias was assessed using several procedures. First, the highest variance accounted for a single factor was 39.54% using Harman's single factor method. Second, the correlations between constructs are below 0.90 (Table 2), and the highest value of variance inflation factor is below the threshold of 3.3, which provides additional support that common method bias is unlikely a problem in this study (Kock, 2015; Pavlou, Liang, & Xue, 2007). Third, the common latent factor method was used by introducing an unmeasured latent factor reflected by all the measured indicators of the original measurement model. Then, the standardized loadings were compared when no common latent factor is present in the measurement model. The difference between the two sets of standardized loadings were lower than the cut criterion of < 0.20 (Nystrand & Olsen, 2020; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Covariance-based structural equation modelling integrates several multivariate techniques and can perform a simultaneous analysis of observed variables and latent structures (Zhang, Dawson, & Kline, 2021). Structural equation modelling (SEM) is a powerful statistical technique that models several relationships among independent and dependent variables simultaneously. This method is more flexible than other multivariate techniques and consists of a two-step approach: (1) the measurement model or confirmatory factor analysis (CFA), and (2) the structural model (Hair et al., 2014). Confirmatory factor analysis (CFA) followed the EFA, which indicates how well the measured variables represent the research constructs (Anderson & Gerbing, 1988; Gallagher, Ting, & Palmer, 2008). The measurement model was estimated (see Table 1) using maximum likelihood estimation and covariance matrix in AMOS software version 26. The results indicate that the data has a good fit with the model: $\chi^2 = 2785.06$ ($df = 1263$, $p < .01$); $\chi^2/df = 2.20$; RMSEA = 0.04; CFI = 0.93, and TLI = 0.93, and the values of the standardized factors' loading estimates are higher than 0.7 with statistical significance of $p < .05$, and without any loadings above 1 or below −1 (see Table 1). Results of the measurement model (Table 1) indicate that all the constructs achieved values above the minimum cut criteria of > 0.70 for composite reliability (CR) and >0.50 for average variance extracted (AVE), thus establishing convergent validity (Anderson & Gerbing, 1988).

Discriminant validity is achieved if the value of the square root of AVE of each construct is higher than its highest correlation with any other construct in the model. Table 2 shows that the square root of AVE of the study constructs, in the diagonal, is greater than their correlations below the diagonal line (Fornell & Larcker, 1981). The research constructs achieved discriminant validity.

4.2. Hypothesis testing

We ran the full structural model to test the hypothesized paths, and lecturer charismatic leadership was treated as a second-order latent factor construct linking to its four first-order latent factors. The results of the structural model indicate that the data has a good fit with the proposed model: χ^2 (1108) = 2981.35, $p < .001$; $\chi^2/df = 2.69$; RMSEA = 0.051; CFI = 0.92, and TLI = 0.91. The estimates of squared multiple correlations (R^2) explain 41% of the variance in student learning performance and 63.5% of the variance in student satisfaction. Table 3 presents the results of the coefficient, standard error, and critical ratio related to each hypothesis tested.

As shown in Table 3, the empirical tests of the key relationships predicted in our theoretical model are significant at $p < .01$, supporting all the hypotheses. The findings of path analysis indicate that lecturer charismatic leadership relate positively and significantly to student's cognitive ($\beta = 0.42$, $p < .001$), emotional ($\beta = 0.46$, $p < .001$) and behavioral engagement ($\beta = 0.25$, $p < .01$), supporting H1a, H1b and H1c. The results show that lecturer technology use relates positively and significantly to student's cognitive ($\beta = 0.26$, $p < .001$), emotional ($\beta = 0.36$, $p < .001$), and behavioral engagement ($\beta = 0.37$, $p < .001$), supporting H2a, H2b and H2c. The relationships between student cognitive engagement and learning performance ($\beta = 0.17$, $p < .01$) and student satisfaction ($\beta = 0.12$, $p < .001$) indicate significant and positive loading paths, supporting H3a and H4a. The relationships between student emotional engagement and learning performance ($\beta = 0.36$, $p < .001$) and student satisfaction ($\beta = 0.52$, $p < .001$) indicate significant and positive loading paths, supporting H3b and H4b. Finally, the relationships between student behavioral engagement and learning

Table 2
Convergent and discriminant validity.

	CR	AVE	SVA	PRK	SCE	UNB	TU	CE	EE	BE	LP	SAT	SEF
Strategic vision and articulation	.91	.61	*.78*										
Personal risk	.86	.67	.62	*.82*									
Sensitivity to classroom environment	.87	.62	.73	.56	*.79*								
Unconventional behaviors	.89	.74	.56	.73	.51	*.86*							
Lecturer technology use	.89	.56	.75	.51	.75	.52	*.75*						
Student cognitive engagement	.86	.56	.58	.50	.47	.38	.60	*.75*					
Student emotional engagement	.90	.65	.68	.43	.65	.50	.73	.57	*.80*				
Student behavioral engagement	.82	.60	.52	.25	.53	.15	.56	.49	.53	*.78*			
Student learning performance	.91	.67	.48	.31	.49	.33	.53	.45	.57	.52	*.82*		
Student satisfaction	.90	.72	.64	.43	.65	.38	.68	.54	.73	.61	.48	*.85*	
Student self-efficacy	.85	.59	.52	.34	.58	.33	.60	.58	.58	.65	.47	.57	*.76*

Notes: CR = composite reliability; AVE = average variance extracted; figures in italics on the diagonal are the square roots of the average variance extracted.

Table 3
Hypothesis test results.

	Association	Standardized estimate	Standard error	Critical ratio	Result
H1a	Lecturer charismatic to cognitive engagement	.420	.080	5.021	Supported
H1b	Lecturer charismatic to emotional engagement	.465	.084	6.463	Supported
H1c	Lecturer charismatic to behavioral engagement	.250	.079	2.913	Supported
H2a	Lecturer technology use to cognitive engagement	.264	.076	3.355	Supported
H2b	Lecturer technology use to emotional engagement	.359	.079	5.371	Supported
H2c	Lecturer technology use to behavioral engagement	.372	.079	4.402	Supported
H3a	Cognitive engagement to learning performance	.126	.044	2.734	Supported
H4a	Cognitive engagement to student satisfaction	.124	.044	3.302	Supported
H3b	Emotional engagement to learning performance	.357	.041	6.952	Supported
H4b	Emotional engagement to student satisfaction	.523	.042	11.929	Supported
H3c	Behavioral engagement to learning performance	.285	.047	6.082	Supported
H4c	Behavioral engagement to student satisfaction	.291	.047	7.560	Supported

performance ($\beta = 0.28$, $p < .001$) and student satisfaction ($\beta = 0.29$, $p < .001$) indicate significant and positive loading paths, supporting H3c and H4c.

4.3. Moderation analysis

Our conceptual model proposed that student-self efficacy may moderate the relationships between lecturer charismatic leadership and the three levels of student engagement and between lecturer technology use and the three levels of student engagement. To test for moderation, we used Hayes' Process macro 3.5 model 1, with 5000 bias corrected bootstrap samples and a 95% confidence interval (Hayes, 2017). First, the interaction effects between student self-efficacy and lecturer charismatic leadership on cognitive engagement ($\beta = 0.04$, $t = 1.63$, $p = .10$) and on emotional engagement ($\beta = -0.01$, $t = -0.68$, $p = .49$) are not significant. Thus, hypotheses H5a and H5b are not supported, and student self-efficacy is not considered as a moderator between lecturer charismatic leadership and cognitive and emotional engagement. This explains that students' efforts and perceived capabilities in their online learning are not affecting the influences of their lecturers' charismatic leadership on their cognitive or emotional engagement.

However, student self-efficacy moderates the relationship between lecturer charismatic leadership and student behavioral engagement, supporting hypothesis H5c. The overall model was significant ($F = 105.14$, $p < .001$), and the main effect of self-efficacy ($\beta = 0.39$, $t = 10.78$, $p < .001$), and interaction effect of student self-efficacy with lecturer charismatic leadership were also significant ($\beta = -0.08$, $t = -2.90$, $p < .01$, $\Delta R^2 = 0.008$). The conditional effects are reported in Table 4. The results suggest that for −1 standard deviation from the mean on self-efficacy the effect ($\beta = 0.20$, $t = 4.81$, $p < .001$) is higher than the effect on the mean level of self-efficacy ($\beta = 0.13$, $t = 4.01$, $p < .001$). This effect ($\beta = 0.06$, $t = 1.55$, $p = .11$) becomes non-significant for +1 standard deviation from the mean on student self-efficacy (see Table 4).

Second, the interaction effects between student self-efficacy and lecturer technology use on cognitive engagement ($\beta = 0.01$, $t = 0.37$, $p = .70$) and on emotional engagement ($\beta = -0.01$, $t = -0.23$, $p = .81$) are not significant. Thus, hypotheses H6a and H6b are not supported, and student self-efficacy is not considered as a moderator between lecturer technology use and cognitive and emotional engagement. This explains that students' efforts and perceived capabilities in their online learning are not affecting the influences of their lecturers' technology on their cognitive or emotional engagement. However, student self-efficacy moderates the relationship between lecturer technology use and student behavioral engagement, supporting hypothesis H6c. The overall model was significant ($F = 128.47$, $p < .001$), and the main effect of self-efficacy ($\beta = 0.32$, $t = 9.16$, $p < .001$), and interaction effect of student self-efficacy with lecturer technology use are also significant ($\beta = -0.09$, $t = -3.89$, $p < .001$, $\Delta R^2 = 0.014$). The conditional effects are reported in Table 4. The results suggest that for −1 standard deviation from the mean on self-efficacy the effect ($\beta = 0.33$, $t = 8.48$, $p < .001$) is higher than the effect on the mean level of self-efficacy ($\beta = 0.24$, $t = 7.26$, $p < .001$) and the effect of +1 standard deviation ($\beta = 0.16$, $t = 3.84$, $p < .001$) from the mean on student self-efficacy (see Table 4).

Figs. 2 and 3 present the moderating effects of student self-efficacy on behavioral engagement. When self-efficacy is low, increasing lecturer charismatic leadership positively influences student behavioral engagement. The moderation effect in the lower self-efficacy group is stronger than the higher self-efficacy group. In other words, lecturer charismatic leadership has more impact on students to follow the rules of the online classes and complete their tasks on time when these students consider that the online courses are difficult

Table 4
Moderation analysis results.

Moderator	Predictor	Condition	Effect	SE	*t*	*p*	95% CI	
Student self-efficacy	Lecturer charismatic leadership	−1 SD	.20	.04	4.81	.0000	.1193	.2837
		At the mean	.13	.03	4.01	.0001	.0672	.1957
		+1 SD	.06	.03	1.55	.1193	−.0159	.1388
	Lecturer technology use	−1 SD	.33	.03	8.48	.0000	.2590	.4150
		At the mean	.24	.03	7.26	.0000	.1823	.3173
		+1 SD	.16	.04	3.84	.0001	.0796	.2455

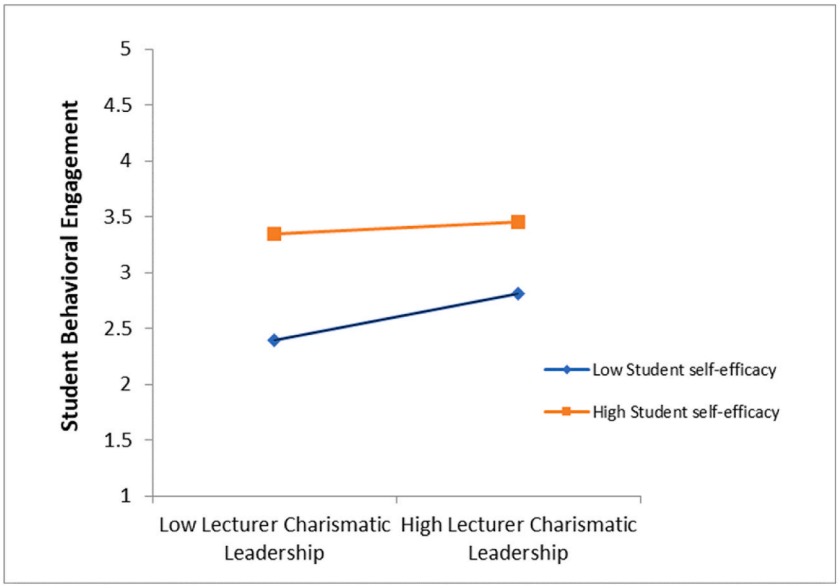

Fig. 2. The effects of lecturer charismatic leadership on student behavioral engagement at different levels of student self-efficacy.

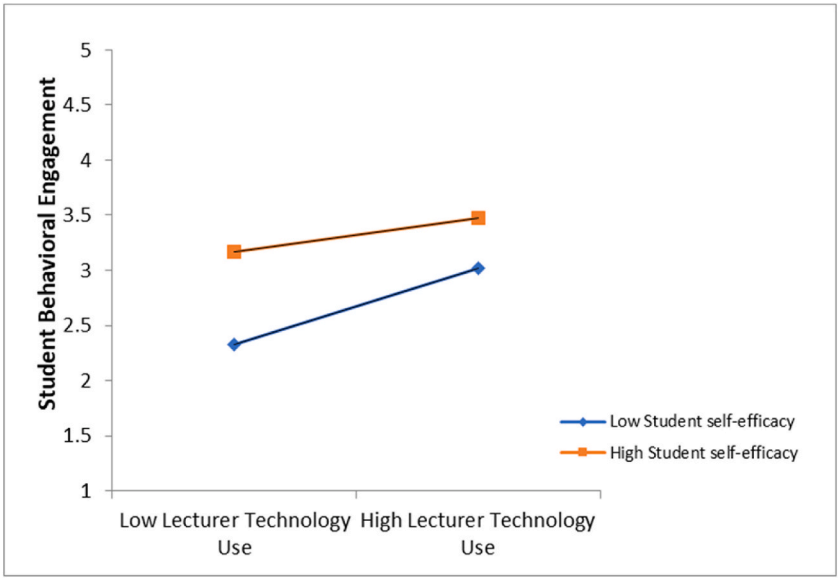

Fig. 3. The effects of lecturer technology use on student behavioral engagement at different levels of student self-efficacy.

Table 5
Mediation analysis results.

	Standardized direct path coefficient (*p*-value)	Standardized indirect path coefficient (*p*-value)
Lecturer charismatic leadership → Student learning performance	.12 (.060)	.11 (.004)
Lecturer charismatic leadership → Student satisfaction	.10 (.023)	.13 (.004)
Lecturer technology use → Student learning performance	.09 (.120)	.25 (.004)
Lecturer technology use → Student satisfaction	.17 (.013)	.29 (.003)

and may not understand the most complex material in these classrooms. The same analysis applies for self-efficacy's moderation effect on the relationship between lecturer technology use and students' behavioral engagement. When self-efficacy is low, increasing lecturer technology use positively influences students' behavioral engagement and this effect is stronger in the low self-efficacy group compared to the higher self-efficacy group. In other words, lecturers who use technology to 1) present instructional content in a more appealing way; 2) engage students in collaborative learning and sharing, and 3) introduce new technological resources or tools to student to use on their own has more influence on student behavioral engagement such as completing their tasks on time or checking their work for mistakes.

Further to the moderation tests, this study attempts to clarify the possible mediation effects of student engagement. We used the SEM bootstrap method in AMOS to test for mediation effects (Cheung & Lau, 2007). Table 5 indicates that the direct relationships between lecturer charismatic leadership, lecturer technology use and student learning performance are not significant. However, the indirect relationships are significant. Thus, student engagement fully mediates the relationships between lecturer charismatic leadership and learning performance and lecturer technology use and learning performance. This result explains that student engagement is the mechanism to translate lecturer charismatic leadership and technology use into learning performance. This finding implies that lecturer charismatic leadership and technology use are not enough for students to achieve learning performance in online classrooms. However, students' engagement in their learning, such as reading extra materials, being excited and following the rules of online classrooms may transform the influence of their lecturer charismatic leadership and technology use into learning performance. On the other hand, the direct relationships between lecturer charismatic leadership, lecturer technology use and student satisfaction are significant. Also, the indirect relationships are significant. Thus, student engagement partially mediates the relationships between lecturer charismatic leadership and student satisfaction and lecturer technology use and student satisfaction.

5. Discussion

The objective of this study is to identify lecturers' charismatic leadership and technology use that are associated with student engagement in online classrooms, and to examine the contribution of student online engagement to learning performance and satisfaction. Further, the purpose of this research is to investigate the influence of student self-efficacy on the relationships between lecturer charismatic leadership and technology use and student online engagement. This research contributes to the student online engagement literature by identifying lecturer attributes, namely charismatic leadership and technology use, which stimulate student engagement, and ultimately, learning performance and satisfaction. Further, the study contributes to the body of knowledge by highlighting the interactions between lecturer and student attributes that are essential for student engagement. The findings of the moderation analysis explain that the effects of high lecturer charisma and technology use are stronger on the behavioral engagement of lower self-efficacy students.

To answer our first research question explaining the influence of lecturer charismatic leadership on student online engagement, the findings from the tests of hypotheses 1a, 1 b and 1c highlight that lecturer charismatic leadership relates significantly to cognitive, emotional, and behavioral engagement. Although previous studies highlighted that lecturer knowledge, experience, and competence are important for effective teaching (e.g., Martin et al., 2019), this research implies that lecturers need charismatic leadership to facilitate students' engagement in online classrooms and achievement of learning outcomes (Redmond et al., 2018; Shevlin et al., 2000). These lecturers stimulate student engagement by linking learning outcomes and assessments to their future success in the real world. Further, charismatic leadership supports lecturers' story telling abilities including metaphors and examples that connect with student needs and development (Banks et al., 2017).

Higher education institutions may consider specific training for lecturers who teach online, on how to develop inspiring learning objectives and how to be sensitive to student needs and experiences in the online classroom. For example, training in public speaking may help individuals manage their tone of voice, facial expressions and movement of hands, which may add more excitement to online lessons. The greater influence of lecturer charismatic leadership on emotional engagement implies that these lecturers can foster positive emotions and mutual respect engaging students in meaningful interactions and enjoyable learning activities. These findings advance previous studies (e.g., Balwant et al., 2018) that incorporate leadership theories in classroom environments, and explain that lecturer charismatic leadership influences the three levels of engagement, and student satisfaction directly, and learning performance through its impact on student engagement.

For our second research question, regarding the association between lecturer educational technology use and student online engagement, the results explain that lecturer technology use significantly affects cognitive, emotional, and behavioral student engagement (H2a, H2b and H2c). These findings highlight the importance of technology adoption by lecturers for different pedagogical purposes, as an integral part of their professional identity (Lai & Jin, 2021). The results imply that lecturers need to possess diverse technology use to stimulate student engagement in online classrooms, and these skillsets should include the use of technology not only for content delivery, but for enrichment and transformation of teaching and learning (Ertmer et al., 2012). For example, lecturers may use breakout rooms or audience polling solutions to foster collaborative and active learning. Discussion boards, gaming software and the integration of social media tools are potential options supporting lecturers in transforming teaching and learning.

Higher education institutions may encourage their lecturers to experiment with new technological tools by providing a safe environment for both successes and failures. Students' participation with these tools can be recorded in real time, which may support the lecturer's continuous use or adaptation to specific tasks. Training on how to create interactive multimedia resources or the use of simulations may improve lecturer's skillsets to support more sophisticated student-centered learning that engages students in collaborative learning (Lai & Jin, 2021; Shah & Barkas, 2018).

To answer our third research questions investigating the influence of student online engagement on student learning performance

and satisfaction, the results indicate that students' cognitive, emotional, and behavioral engagement relate significantly to learning performance and satisfaction. These results are consistent with previous studies' findings (e.g., Balwant et al., 2018; Blasco-Arcas et al., 2013; Kucuk & Richardson, 2019; Manwaring et al., 2017), highlighting the importance of the student engagement construct in traditional and online teaching and learning environments. The effect sizes for the relationships between emotional engagement and learning performance and student satisfaction are the largest, informing lecturers to develop learning activities that stimulate excitement and enjoyment in online lessons. Further, the contribution of cognitive and behavioral engagement on performance and satisfaction implies that lecturers in online classrooms may develop a mix of activities for various learning styles, and map student's touchpoints against the dimensions of engagement (Martin et al., 2019; Tualaulelei et al., 2021).

To answer our fourth research question explaining the role of online student engagement as a mediator, the results indicate that online student engagement fully mediates the relationships between lecturer charismatic leadership and technology use and learning performance. However, the mediation effect is partial between lecturer charismatic leadership and technology use and student satisfaction. The findings highlight the critical role of online student engagement as a mechanism to transform the lecturer charismatic leadership and technology use into learning performance (Balwant et al., 2018). The result implies that lecturers as inspirational public speakers using technology to deliver appealing content and to transform learning and teaching need student engagement for achieving learning performance outcomes (Manwaring et al., 2017).

Our final research questions that investigate the moderation effects of student self-efficacy on the relationships between 1) lecturer charismatic leadership and student online engagement; and 2) lecturer technology use and student online engagement. First, it was found that student self-efficacy is associated significantly with all the dimensions of student engagement. However, student self-efficacy moderates only the relationship between lecturer charismatic leadership, lecturer technology use, and student behavioral engagement. Second, the effect of this moderation is larger for students in the lower self-efficacy group. These findings highlight the importance of learner characteristics, and learners' interactions with their lecturers as enablers of student engagement (Manwaring et al., 2017). The result implies that enhancing lecturer charismatic leadership significantly improves behavioral engagement for students with lower self-efficacy. This effect was not significant for students with higher self-efficacy. Further, lecturers that use more technology to 1) present instructional materials in a more appealing way, 2) give students more choices in learning and 3) implement new ways of teaching and learning improve behavioral engagement for lower and higher self-efficacy students, and this effect is stronger for students with lower self-efficacy. To foster inclusive education, motivate participation, and task completion in online courses, higher education institutions may enhance lecturers' charismatic leadership and train them to use technology to design content and learning activities that appeal and support students to build self-confidence in their learning (Shen et al., 2013). Our findings support Manwaring et al. (2017), who argue that students with high self-efficacy experience enjoyment and exert more cognitive efforts toward their learning. On the other hand, this study extends this previous result and found that behavioral engagement of lower self-efficacy students may be improved depending on their lecturer's charismatic leadership and technology use in online classrooms (Balwant et al., 2018; Lai & Jin, 2021; Manwaring et al., 2017).

6. Conclusion

This study sheds light on the positive and significant contributions of lecturer charismatic leadership and educational technology use on student engagement in online classrooms, which in turn relates to learning performance and student satisfaction. Further, the outcome of this research deepens our understanding on the student self-efficacy levels that may influence the associations between lecturer charismatic leadership, educational technology use and student engagement. To our knowledge, this is the first study that identifies lecturer charismatic leadership together with technology use as enablers of student engagement in online classrooms. We provide evidence that lecturers who develop and articulate inspiring learning objectives, show sensitivity to the online classroom environments and student needs, and use educational technologies for instructional design influence the three dimensions of online engagement, namely cognitive, emotional, and behavioral engagement, which in turn contribute to student learning performance and satisfaction. While previous studies explain that on-site student engagement is malleable and may be influenced by learning experiences created by the lecturer and learner characteristics, this research verifies and extends this previous view to the online environment. The results reveal lecturer charismatic leadership and technology use, including the design of learning activities, as enablers of online student engagement, and they provide evidence that this concept is an important mechanism transforming lecturer charismatic leadership and technology use into academic and satisfaction outcomes (Lai & Jin, 2021; Manwaring et al., 2017; Queen, 2022). Not surprisingly, our study confirms the links between student engagement and learning performance and student satisfaction. However, the study explains that emotional engagement has the greater influence on student learning performance and satisfaction. Further, a unique contribution of this research is the significant and positive influences of lecturer charismatic leadership and technology use on the online behavioral engagement of students with lower self-efficacy, which represents a primary objective of higher education institutions worldwide.

7. Limitations and future research

This study presents several limitations and recommendations for future research. First, the cross-sectional research design limits our ability to generalize the findings and does not capture the changes in student engagement during online courses. Besides, the data were collected in one country and only from undergraduate students. Future studies may employ a longitudinal research design using pre and post data to measure learning outcomes, and collect data in different countries, including other cultures and student attributes. Also, future studies may consider the differences in online engagement for students enrolled in several subjects. Researchers may also

assess the influence of other types of student self-efficacy such as computer self-efficacy to interact with lecturers and classmates in online classrooms. Second, the data in our study were collected using the crowdsourcing platform MTurk, which may represent a concern for the quality of responses even though we employed participant quality control measures and best practice recommendations to address validity threats. Thus, future research may confirm our findings in different educational settings such as blended or face-to-face learning environments including the collection of objective measures of student performance. This may reduce the limitation of self-report responses and the presence of common method bias. Finally, recent studies have confirmed the influence of students' personality traits such as conscientiousness influencing all levels of online engagement (Quigley, Bradley, Playfoot, & Harrad, 2022). Thus, future research may consider the impact of lecturer charismatic leadership on the online engagement of students with different personality traits.

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Credit author statement

Joe Hazzam: Conceptualisation, Methodology, data Formal analysis & writing. Stephen Wilkins: Conceptualisation, writing, Writing – review & editing.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.compedu.2023.104809.

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