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Accounting students' online engagement, choice of course delivery format and their effects on academic performance

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ABSTRACT

This study examines the effects of synchronous and non-synchronous online engagement on the academic performance of accounting students at a New Zealand university based on their choice of course delivery format – either distance learning or face-to-face learning with online components (F2F+). We track accounting students as they complete three financial accounting courses over three consecutive years. Drawing on social constructivism theory, we find that both synchronous and non-synchronous student online engagement are positively related to their academic performance, and this positive effect varies across assessment types. The positive effect of synchronous online engagement on student performance is more pronounced when students choose to learn via F2F+ rather than via distance learning. Further analyses show that the positive effect persists among students with different characteristics. These findings highlight the useful role of student online engagement in learning and provide support for universities to allow students to choose their preferred course delivery format.

Introduction

Research on student online engagement has primarily adopted an either–or approach in comparing fully traditional in-classroom learning to fully online learning. Online learning is perceived as transforming teaching and learning in higher education, and thus influencing the way students in the face-to-face (i.e. in-classroom) format engage with their studies (Coates, 2007). However, not much is known about how these students engage with online learning. In this regard, Jordan and Samuels (2020) identify the need to investigate the delivery mode of online content and its relationship to student success in accounting courses. Accordingly, in this study, we examine the impact of online engagement on the academic performance of accounting students – for both distance learning (DL) and face-to-face learning with online components (F2F+) – and whether such impact is conditional on their choice of course delivery format.

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The current study is undertaken in a 'choice-based learning' environment, in which accounting students can choose the course delivery format. Choice-based learning is consistent with the movement towards greater autonomy in the workplace (Lewis & Hayward, 2003). However, students in higher education rarely have opportunities to exercise choice in their learning. Universities often make assumptions about what students want and need to achieve academic success, and these assumptions may not be congruent with students' perspective, thus resulting in academic underperformance (Voss & Gruber, 2006). Therefore, student preference about the course delivery mode is an important issue in contemporary accounting education, particularly given the shift from face-to-face classroom teaching to online and blended forms of learning (Taplin et al., 2017). Nevertheless, few studies have focused on choice-based learning in accounting education research. To the best of our knowledge, only Opdecam and Everaert (2019) have investigated students' choice-based learning between the lecture- and team-based modes. They conclude that team-based learning has a positive effect on learning outcomes.

Thus, this study is important for two reasons. First, student online engagement is critical to student learning and highlights the need for flexibility in, and accessibility to, learning in the post-COVID-19 era. Accountants' increasing reliance on digital technology requires them to use critical thinking to analyse results. Therefore, online engagement via virtual communication (e.g. webinars) and written communication (e.g. forum postings) can develop students' logic reasoning and critical thinking skills because this form of engagement provides them with more time to consider, gather and read relevant information to better synthesise arguments (Sautter, 2007).

Second, the study provides insights into how choice-based learning affects accounting students' performance. The findings are timely and beneficial for post-pandemic teaching because students are increasingly seeking more choice and flexibility in their education in the post-COVID-19 era. Our study demonstrates how the student self-selected course delivery format in accounting courses triggers a different way of student online engagement, leading to greater autonomy, motivation and interest in learning (Deci & Ryan, 2016). Therefore, the study provides insight for accounting educators who wish to balance effectiveness, efficiency and student preferences when making decisions concerning the additional and voluntary online services they offer.

Studies on student online engagement have focused either on predetermined learning environments by instructors (e.g. Duncan et al., 2012) or on distance online delivery (e.g. Clark et al., 2021). The latter has been particularly evident as a result of the COVID-19 pandemic, which left students with no choice but to engage online, and thus has led to increased research on online engagement for distance online learning. In contrast, this study focuses on well-designed, high quality online education, distinct from emergency remote teaching during crises, such as the COVID-19 pandemic (Tharapos, 2022). We examine the relationship between the online engagement of both face-to-face and distance learning accounting students and their academic performance when they can choose their preferred course delivery format, and we consider whether this relationship is influenced by their choice of course delivery format. Our study suggests that choice-based learning promotes student learning and eliminates differences in accounting students' performance across course delivery formats when taking into account the differences in student online engagement.

This study considers 'choice-based learning' as a choice between two course delivery formats at a New Zealand university: DL and F2F+.[1] The choice of format is introduced at the time of enrolment, and accounting students must choose between the two formats and remain in the same format of study for the course. DL is defined as teacher instruction that takes place entirely online (video recordings), supplemented with both real-time (e.g. webinars) and non-real-time (e.g. online forum discussions) learning activities. In F2F+ learning, formal lessons on subject concepts are conducted entirely face-to-face in a physical classroom, supplemented by the same online learning activities offered to distance learners (e.g. webinars and online forum discussions). Since both F2F+ and DL students can engage in their studies online, the study focuses specifically on the online engagement of these two student groups and does not consider student engagement in a face-to-face (i.e. in-person) classroom.

We consider two forms of online engagement for accounting students in our study: synchronous (real-time) and non-synchronous (non-real-time) engagement. 'Synchronous' online engagement occurs in real time when the instructors and students simultaneously engage in discussions about course-related content (Francescucci & Rohani, 2019) – for example, in webinars. 'Non-synchronous' online engagement is when students and instructors post questions and comments on these posts intermittently in course-related communication threads, or when students engage with online instructional materials at times of their choice (Duncan et al., 2012). We posit that the two forms of online engagement both enable accounting students to interact with their peers and instructors and support the development of different forms of critical thinking, thereby improving student academic performance.

Hence, our first research question examines the relationship between synchronous/ non-synchronous online engagement and student academic performance. In addition, student choice of their preferred course delivery format provides them with flexibility in how they want to engage in their learning. For example, DL students may be more committed to using non-synchronous online engagement, as it offers a sense of freedom while allowing them to learn at their own pace, whereas F2F+ students will have more opportunities to engage with their instructors and peers not only in the physical classroom but also online. The additional synchronous offline engagement that F2F+ students have in the classroom coupled with their online engagement ought to influence their performance. Therefore, we argue that the course delivery format influences the relationship between accounting students' online engagement and their academic performance. Thus, our second research question examines whether the impact of online engagement on student' academic performance is conditional on their choice of course delivery format – that is, it examines the interaction effect between online engagement and course delivery format on student academic performance.

We use social constructivism theory to understand the relationship between accounting students' online engagement and its impact on their academic performance. This theory considers learning a social activity that is shaped by the context in which it takes place and by engagement with others (Bozkurt, 2017; J. S. Brown et al., 1989), which thereby enhances understanding as well as creates meaning and knowledge (Swan, 2005).

Using online engagement data collected from accounting students for three consecutive years prior to the COVID-19 pandemic, we document a positive relationship

between their online engagement (both synchronous and non-synchronous) and their academic performance. Further, the positive effect of synchronous online engagement is amplified when accounting students choose F2F+ study. Our additional analyses show that the positive effect of both forms of online engagement persists among students with different characteristics, but the effect magnitude varies.

Contribution

This study offers several contributions. First, we respond to Jordan and Samuels's (2020) call for research into the mode of delivery for online content and its impact on accounting students' success. We demonstrate that these students' online engagement is positively associated with their academic performance. Interestingly, the course delivery format has no effect on student performance, suggesting that it is students' preference for the course delivery format that enables them to engage effectively with the course and hence improve their academic performance, rather than the delivery format itself.

Second, our study complements the literature on student online engagement. Although there is rich evidence on the impact of distance learning students' online engagement on their academic performance, little is known about how face-to-face students' online engagement affects their performance. Thus, our study fills this gap by highlighting the incremental effect of synchronous online engagement on improving the performance of face-to-face accounting students. The widespread adoption of online learning due to the COVID-19 pandemic has challenged the face-to-face format, with some debating whether it should be replaced with online learning (e.g. B. W. Brown & Liedholm, 2022). Our results reveal that synchronous online engagement complements rather than substitutes face-to-face classroom learning. This finding suggests that well-designed online education, as this study shows, differs from emergency remote teaching, which provides temporary learning options in crisis situations, such as the COVID-19 pandemic (Tharapos, 2022). In the context of well-designed online education, synchronous online engagement complements face-to-face classroom learning, rather than replacing it entirely.

Third, the present study enriches the literature on choice-based learning in the accounting discipline. We find that the favourable effect of synchronous online engagement on student academic performance is larger for F2F+ students than for DL students. Although the DL students engage in more synchronous online activities than F2F+ students, such as asking more questions during webinars offered synchronously to both groups of students, the F2F+ students have a distinct advantage, namely, they can also participate in face-to-face classroom discussions. This additional classroom engagement with instructors and student peers may influence F2F+ student performance as they have the opportunity to interact not only through synchronous online engagement but also through face-to-face in-class debates. Through these interactions, F2F+ students may gain a deeper understanding of accounting concepts; develop their verbal communication, negotiation, persuasion, listening and questioning skills; and build and maintain trust with their student peers. This multifaceted learning experience for F2F+ students likely reinforces the positive effect of synchronous online engagement on their performance. Given the practice-oriented nature of accounting, interpersonal skills are essential

for accounting graduates (Dolce et al., 2020; Jackling & De Lange, 2009), but DL students may find it challenging to acquire these skills because of the relative isolation of the DL delivery mode. Therefore, this study's findings would help accounting faculty to understand how students engage in online learning and thus determine the best strategies for online accounting education.

Last, the current study overcomes the problem of bias in prior studies that have used self-reported data from surveys measuring student online engagement (e.g. Francescucci & Rohani, 2019). In this study, we analyse archival data on student online engagement collected from a New Zealand university's online learning platform for three consecutive years in order to quantify the influence of students' online engagement on their academic performance. Most prior accounting education studies have focused on a single course, but accounting courses are often 'scaffolded' (Jordan & Samuels, 2020). Our study also shows that the form of students' online engagement differs depending on the level of the accounting course. Thus, this study provides insights to assist accounting instructors in developing timely, evidence-based interventions that transform usable information into measurable learning outcomes.

The remainder of this paper is organised as follows. In the following section, we describe the theoretical framework. Next, we review the relevant literature and then develop the hypotheses. We describe the research methodology and variables before we present the empirical results and discuss the study's findings. In the last section, we conclude the paper and also discuss the study's implications and limitations.

Theoretical framework

Social constructivism expounds the view that learning is essentially a social activity constructed through communication, collaborative activity and engagement with others (Swan, 2005; Vygotsky, 1962). The nature of the learning environment is one of experimentation and dialogue, in which knowledge is seen within the context of problems to be discussed and solved (Adams, 2006, p. 245). The instructor's role within this paradigm is that of facilitator, mediator and provider of a safe environment in which learning can take place – 'the process of scaffolding the learning journey is the key teacher requisite' (Adams, 2006, p. 250). Advocates of the theory argue that social interaction and the construction of personal meaning are both crucial to the learning process (Bozkurt, 2017). Therefore, knowledge is constructed socially through its discussion and mediation with others (Bozkurt, 2017, p. 211). Proponents argue further that knowledge is not innate; rather, interactions and engagement among learners, digital platforms and other contextual elements scaffold learning and inner discourse (Barak, 2017). Thus, social constructivism theory offers fresh insights to explain whether online engagement affects student performance and how student choice of course delivery format (e.g. Fortin et al., 2019; Wisneski et al., 2017) influences the impact of synchronous and non-synchronous online engagement on student academic performance in accounting subjects.

Social constructivism regards social interactions, engagement and collaboration as the principal methods for learning and acknowledges the need for peer engagement, as social engagement enables learners to gradually take greater control of their own learning (Torrance & Pryor, 1998). Social constructivism recognises the instructor's role as

facilitator and guide rather than director or dictator (Powell & Kalina, 2009). The instructor not only provides the scaffolding but also serves as the 'Master Weaver' who supports the students in integrating ideas (Bryceson, 2007, p. 193) through channels such as webinars and online forum discussions. For example, when students need guidance from an instructor on complex accounting concepts and topics in their respective subject areas, the instructor facilitates discussions on each topic in various ways, by using examples or asking leading questions for discussion in an online forum. Thus, students are engaged and enabled to draw on their own experiences, which thereby facilitates them to create meaning, develop cognitive skills and acquire knowledge based on their interactions.

Some argue that the lack of vocal and visual cues in online learning reduces the quality of social interactions and engagement online to an extent that renders the social construction of knowledge all but impossible (e.g. Picard, 1997). However, this argument fails to consider that it is not media competence that matters, but rather, personal perceptions (Adams, 2006; Poole, 2000). Online course learning platforms engage students' interest at distance and actively encourage online socialisation from which deep learning develops. A few studies have documented relationships between learners' perceptions of social presence and their satisfaction with their perceived learning from online courses (e.g. Borup et al., 2012; Richardson & Swan, 2003). These affirm the underlying assumptions of social constructivism theory – that learning and creating knowledge take place within a social context. Therefore, learning is an active process in which learners construct concepts or ideas based on their current knowledge (Bruner, 1987). Accordingly, we ground our study within this theory with the view that learning is an active process, which can be used to build and perfect student understanding of accounting concepts and their applications.

Using social constructivism theory, we view instructor presence in both student synchronous and non-synchronous online engagement. For example, webinars and online forum discussions promote a perceived social presence and engage students' interests and experiences when they interact with each other. Students may feel that they are talking to their instructor when participating in or watching the webinars, which helps them perceive the online presence of instructors as physical. Webinars are regarded as a means of improving the social presence exhibited by instructors. Thus, online learning platforms provide a safe environment in which students construct knowledge through engagement with instructors and other students. In this way, students learn more effectively when they have others to assist them through engagement. According to social constructivism theory, cooperative learning is an integral part of creating a deeper understanding as well as of creating a social constructivist classroom (Powell & Kalina, 2009). Knowledge is internalised more effectively when there is social engagement and interaction. When learning online, students receive learning materials via technology, process the information these materials contain and then internalise, personalise and contextualise it. In the transformation process, learners engage with the content, other learners and instructors to confirm ideas (Ally, 2008). Therefore, our study draws on social constructivism theory, on the premise that cognitive skills are developed, learning takes place and knowledge is created through social engagement via online learning tools, which influences student academic performance. The instructor's role is accepted as that of a facilitator

and catalyst who enables learning and provides a pathway for students to learn effectively.

Literature review and hypothesis development

In this section, first, we describe the rationale for selecting synchronous and non-synchronous online engagement as the topic of this study. Next, we review the literature on the effect of these two types of engagement on student performance and then develop our hypotheses.

Student online engagement

Engagement is an essential part of the learning process, and various types of engagement are employed in both face-to-face and distance courses. Hrastinski (2008) suggests that studies on web-based learning education should consider the contribution of synchronous and non-synchronous engagement activities to student learning. Therefore, this type of engagement is the focus of this study. Non-synchronous (non-real-time) online engagement has been the traditional method for engaging students in a web-based learning environment, commonly facilitated by media such as threaded discussions or recorded lectures. The primary benefit of such engagement is the flexibility it provides for anytime, anywhere learning (Watts, 2016). For instance, threaded non-synchronous discussions have advantages such as time-independent access, opportunities for heightened levels of peer engagement and support for multiple learning styles (Oztok et al., 2013). Hence, non-synchronous online engagement is embedded in the core tenets of constructivist-based education, as these discussions encourage participatory learning, provide extra time for reflection and high-order processing, embrace multiple perspectives and produce more balanced contributions (Sautter, 2007).

Conversely, synchronous (real-time) online engagement provides immediate social interaction and co-construction of knowledge, using digital technologies such as video-conferencing and instant messaging. In this type of interactive learning, experiences are live, real time and more engaging. Further, instant feedback allows both students and instructors to recognise difficulties in understanding the course material immediately and keeps students active, engaged and motivated in the learning process. Student difficulties are perceived as challenges that can be overcome by engaging with the course instructor, peers, digital media and self-reflection.

Synchronous and non-synchronous literature

Studies on synchronous and non-synchronous online engagement have focused on how these two types of engagement affect student attrition and retention (Macfadyen & Dawson, 2012), student preferences for delivery modes (e.g. Beyth-Marom et al., 2005), learning behaviours (Yang et al., 2021) and student satisfaction (Mathews & Bhanugopan, 2014). Along this line, an increasing strand of literature has examined the relationship between the online engagement and academic performance of business students. Strang (2013) separates students in a management course into synchronous and non-synchronous groups and establishes that the former group collaborates in a more

in-depth manner, resulting in a higher final project grade. Using a pre- and post-semester questionnaire for students in a marketing course, Francescucci and Foster (2013) find no statistical differences in student performance and engagement factors between VIRI (virtual, interactive, real-time, instructor-led) and face-to-face classrooms in terms of expected attendance, engagement, attention span, academic workload and instructor inter-actions. Similarly, Francescucci and Rohani (2019) state that a synchronous marketing course delivered using VIRI technology produces the same level of student performance as face-to-face learning. Nevertheless, in this emerging stream of literature, there is limited focus on how synchronous and non-synchronous online engagement affect account-ing students' performance and the role of student choice of course delivery format in this relationship (Lento, 2019). Hence, this gap in the literature has prompted our study.

Among researchers in the accounting education field, Perera and Richardson (2010) are pioneers in documenting the relationship between student online engagement and student academic achievement. Using data on a second-year accounting course, they show that accounting students' final exam grades are positively related to non-synchronous online engagement, as measured by the number of online files viewed and discussion messages posted. Further, Duncan et al. (2012) report similar results. They distinguish between the quality and frequency of online engagement and document a positive relationship between the total quality of student online engagement and the final examination performance of students in an Executive Master of Business Administration accounting course. However, they find that the total quantity of online engagement is related to overall course performance. In addition, they report that the impact on examination grades and overall grades for synchronous online participation (combined quality and quantity), such as in an online chatroom, is twice that for non-synchronous online participation, such as posting on an online discussion board.

Further, Coetzee et al. (2018) provide evidence of the positive relationship between attendance at videoconferencing tutorials and accounting students' academic perform-ance. Likewise, D'Aquila et al. (2019) claim that although lecture and information videos improve accounting students' performance, they do not necessarily want video classes to replace traditional face-to-face classes. In addition, Delaney et al. (2019), who examine the impact of the use of an online discussion board as an assessment item in an accounting course on group-work performance, find a positive correlation between the two. Azzali et al. (2022) investigate changes caused by COVID-19 in the engagement of students enrolled in a Master in Business Administration course and the associated impact on accounting subject performance. They discover that although higher student engagement improves student performance, the pandemic has diminished the advantages that students typically gain from engagement. The sudden shift from face-to-face learning to online learning due to the pandemic has reduced the effectiveness of student engagement in improving student performance.

A summary of the reviewed studies is presented in Table 1. These studies were under-taken in a learning environment predetermined by instructors. The commonality among the cited studies is that they focused on one course on business or accounting in a single year, and most of the studies did not consider the online engagement of face-to-face stu-dents. In contrast, our study extends the literature by considering the online engagement of both F2F+ and DL accounting students to predict their academic performance in a

Table 1. Summary of the literature on the impact of online engagement on business and accounting students' academic performance.

Study	Research setting	Sample	Interaction measurement	Main findings
Strang (2013)	• Entirely online • No choice of course format	• Management course • One year of data • N = 81 students	• Synchronous: video, audio and text messaging • Non-synchronous: discussion forum	Synchronous interaction provides opportunities for more cooperation than does non-synchronous interaction, thus resulting in a higher final project grade
Perera and Richardson (2010)	• Entirely online • No choice of course format	• Second-year accounting course • One year of data • N = 600 observations	Non-synchronous only: • online files and discussion messages viewed • amount of time spent on the subject's course webpage	Positive relationship between exam performance and online files and discussion messages viewed
Duncan et al. (2012)	• Entirely online • No choice of course format	• EMBA accounting courses • One year of data • N = 272 students	• Synchronous: aggregate number of times a student made a comment, posted a question in any online chatroom • Non-synchronous: online discussion board posts	• Total quality interactions (including synchronous and non-synchronous) positively affect final exam performance • Total number of interactions (including synchronous and non-synchronous) correlate with overall course performance
Coetzee et al. (2018)	• Entirely online • No choice of course format	• Second-year accounting course • One year of data • N = 449 students	Synchronous: attendance of web-conference-based tutorials	Attendance of web-based tutorials positively affects student performance
Francescucci and Foster (2013)	• Blended learning (face-to-face with VIRI) • Face-to-face • No choice of course format	• Introductory marketing course • One year of data • N = 44 students (face-to-face) N = 36 (blended)	Self-report measures for engagement on expected class attendance, participation in class, interest in course, attention span, academic workload and instructor interaction	No statistical differences found in student performance between the face-to-face and blended groups
Francescucci and Rohani (2019)	• Entirely online • Face-to-face • No choice of course format	• Introductory marketing course • One year of data • N = 698 students	Self-report measures for student engagement, following Francescucci and Foster (2013)	Synchronous courses using VIRI classroom technology have the same level of student performance outcomes as face-to-face learning

(*Continued*)

Table 1. Continued.

Study	Research setting	Sample	Interaction measurement	Main findings
D'Aquila et al. (2019)	• Face-to-face • Hybrid class • No choice of course format	• Introductory financial accounting course • One year of data • N = 246 students	Non-synchronous: frequency of student self-reported viewing of instructor-generated videos and YouTube analytics	Video usage improves student academic performance
Delaney et al. (2019)	• Entirely online • No choice of course format	• Second-year undergraduate accounting course • One year of data • N = 706 students	Non-synchronous: number of posts on discussion board	Positive relationship between number of discussion board posts and group-work performance
Azzali et al. (2022)	• Forced to move from face-to-face to online learning as a result of COVID-19 • No choice of course format	• Three first-year business courses and one second-year business course • One year of data: before COVID-19 v. during COVID-19 • N = 712 students in total	Non-synchronous: number of days in which the student uses and logs on to Moodle	• High use of online materials produces better results for students than low use in both the pre- and during-COVID-19 pandemic periods • Sole use of online materials during pandemic not as efficacious as use of those before pandemic by students attending face-to-face lectures

Note: Synchronous = real time; Non-synchronous = non-real time; EMBA = Executive Master of Business Administration; VIRI = virtual, interactive, real time, instructor-led; Hybrid class = 2/3 of the classes are taught via videos and 1/3 of the classes are face-to-face consultations.

choice-based learning environment. Our first research question therefore examines the impact of online engagement on student performance. Then, we argue that when students are given a choice of course delivery format, it increases their engagement, motivation and interest in learning. In the choice-based learning environment, they can control their own learning process and choose their preferred form of online engagement to reflect their needs. For example, if students choose to learn at their own pace using the distance mode, they may be more committed to non-synchronous online engagement, which allows them to learn more effectively and therefore has a positive impact on their academic performance. This argument raises our second research question: whether student choice of course delivery format affects the relationship between students' online engagement and their academic performance – that is, this question examines the interaction effect between course delivery format and online engagement on student academic performance.

Hypothesis development

Both synchronous and non-synchronous online engagement keep students involved in an online setting and foster collaborative meaning-making by providing different perspectives on problems (Jonassen, 1996). When students are engaged, course outcomes, such as grades, tend to improve (Watts, 2016). High synchronicity increases motivation and reduces ambiguity (Hrastinski, 2008; Rockinson-Szapkiw & Wendt, 2015), promoting social and teacher presence whereby students can reach a shared understanding (Stein et al., 2007), leading to more collaboration and higher course grades. Synchronous online engagement makes students feel connected to the class; therefore, it increases interaction and collaboration, promotes class continuity and creates a sense of urgency and immediacy. In this sense, synchronous online engagement fosters cognitive presence and perceived learning (Hrastinski, 2008). This view is consistent with social constructivism theory, which suggests that learning occurs through social engagement with teachers and student peers (Barak, 2017). We argue that social collaboration and engagement between students and instructors in the synchronous environment can result in higher desirable learning outcomes, as synchronous engagement provides accounting students with the opportunity to discuss any course-related matter and to receive immediate feedback in live meetings, promoting deeper learning. Therefore, we develop the following hypothesis.

> H1a: Students' synchronous online engagement is positively related to their academic performance.

Further, non-synchronous online engagement allows students to assess their peers' ideas critically, feel they are part of the learning community and engage with course content more deeply, thereby encouraging cognitive effort and higher order processing (Hrastinski, 2008). Such engagement supports collaborative learning and inquiry, with the instructor playing a greater role as facilitator among students. In addition, recorded lecture videos allow students to feel connected to their instructors and provide a learning experience that engages students, stimulates their interest in a topic and facilitates the absorption and processing of information (Holtzblatt & Tschakert, 2011). This participatory learning and social interaction with teachers and student

peers support critical thinking, thus improving student academic performance. We therefore hypothesise:

> H1b: Students' non-synchronous online engagement is positively related to their academic performance.

Moreover, choice-based learning provides students with empowerment, control and flexibility in the learning process. If they learn according to their preferred course delivery format, this will increase their engagement, motivation and interest in learning. Distance courses provide a sense of freedom, whereby students can learn at their own pace and rely on their intrinsic motivation to learn. In contrast, students who choose face-to-face learning in a physical classroom as their primary means of learning prefer the structured and logical focus of a traditional learning environment (Byrne et al., 2004). Further, student diversity is growing in universities (Santangelo & Tomlinson, 2009), and one aspect of diversity is that students have different preferences for learning and engagement (Hu & McCormick, 2012). Different forms of student online engagement have been shown to correlate with academic achievement (Northey et al., 2018). The choice of course delivery format allows for different learning strategies, engagement and various student needs. Students who require more teacher presence and synchronous engagement may benefit from choosing face-to-face learning, whereas distance learners enjoy the freedom and self-control offered by DL.

The US Department of Education Office of Planning, Evaluation, and Policy Development (2010) finds that learning via a blended delivery mode (e.g. F2F+ in this study, combining both online and in-classroom learning) is more effective than learning via an online mode alone, because students achieve greater learning outcomes by receiving the same content through multiple media (Daft & Lengel, 1986). Adam and Nel (2009) provide evidence that blended learning involving face-to-face teaching and digital media and communication leads to positive student perceptions of course content. Educause (2010) claims that the 'double attendance' of face-to-face and online classes helps students learn the material faster and more thoroughly. Thus, we posit that when students choose to learn via F2F+, they gain the advantage of having synchronous engagement in the physical classroom as well, in addition to online synchronous engagement (e.g. webinars), which may lead to F2F+ students achieving higher academic performance than DL students. This gives rise to the following hypothesis on the expected interaction effect:

> H2a: The impact of synchronous online engagement on student academic performance is more pronounced for F2F+ students than for DL students.

However, the advantage of having both online and classroom engagement disappears for F2F + students in the non-synchronous environment (e.g. online forum posts) because they have the same opportunities for non-synchronous online engagement as DL students in such an environment. Therefore, we argue that the impact of non-synchronous online engagement on student academic performance is similar for both F2F+ and DL students and expect that the interaction effect is non-significant. Following this line of argument, we hypothesise:

> H2b: The impact of non-synchronous online engagement on student academic performance is the same for both F2F+ and DL students.

Research method

This section describes the study context, the sample selection and the measurement of the variables used in the regression analysis.

Study context

The students who participated in this study were all accounting majors enrolled in an undergraduate programme at a New Zealand university, that is, students in the introductory financial accounting course in their first year in 2014, intermediate financial accounting course in their second year in 2015 and advanced financial accounting course in their third (final) year in 2016.

Each course is offered in two formats: online DL and F2F+.[2] Students are aware of the two course delivery formats and can choose their preferred format for each course at the time of enrolment. They are then assigned to the format of their choice throughout the course. Attendance at the face-to-face classes and the online webinars is not mandatory. For each course, DL and F2F+ students are both provided with identical learning materials, including the textbook, lecture notes, tutorial questions, course and study guides, and supplementary readings. Therefore, student academic performance is measured using the same assessments in both course delivery formats. All teaching materials are developed by the instructors teaching the course, who have years of experience, including in teaching DL courses. Teaching materials are available on the online learning platform for each course, where students can share, communicate and engage with their peers and instructors. Instructors use the course online learning platform to distribute information, to create online discussion forums for enabling engagement in collaborative learning and to encourage students to engage in threaded discussions. Students can create threads and posts in the course online forums to raise and answer questions and to provide insights and views on queries and comments from fellow students and instructors.

In the DL course format, each accounting course offers 12 webinars for DL learners, via Adobe Connect, in which instructors and students can engage simultaneously and discuss course-related content. All webinars are recorded, and video recordings are available for all students, including F2F+ students. During the webinars, instructors explain the topic and provide practical exercises. Students can engage with their instructors as well as their peers as they would in a physical classroom environment. The instructor in this instance plays a pivotal role as a facilitator and scaffolder, thereby enhancing student knowledge. DL delivery is also accompanied by diverse types of non-synchronous online engagement, including viewing or creating online forum posts to raise or comment on a question and accessing the recordings of both webinars and face-to-face lectures for F2F+ students. With the flexibility of DL delivery, distance learners have the option of scheduling their study time around their individual commitments.

In the F2F+ course format, a blended learning environment is provided for all three accounting courses. Formal lectures and tutorials on subject concepts are conducted entirely through face-to-face meetings for F2F+ students. All face-to-face meetings are recorded and accessible to all students, including DL students. In addition, F2F+ students

Table 2. Specifics of the synchronous and non-synchronous online engagement in three accounting courses by course delivery format

Activity	Course delivery format	
	Face-to-face with online components (F2F+)	Distance learning (DL)
Lecture	Formal lectures on subject concepts are delivered in a face-to-face (i.e. in-person) format in a physical classroom, supplemented by an online learning element Although there is no compulsory attendance requirement, the average F2F+ attendance rate is approximately 90%	For students taking a DL course, video recordings of face-to-face lectures are provided
Synchronous (real-time) online engagement	Twelve webinars are provided for all students regardless of course delivery format • Student attendance at webinars is voluntary • Students can ask and comment on questions in webinars	
Non-synchronous (non-real-time) online engagement	Discussions are facilitated through online forums for all students regardless of course delivery format • Each student can ask, comment on and answer questions in the online forums • Each student can view the discussion threads in the online forums Traditional and multimedia learning resources are available to all students regardless of course delivery format • Each student can access face-to-face lecture recordings • Each student can access recordings of 12 webinars • Each student can access study materials, including lecture notes, study and course guides, and tutorial questions and solutions	

have access to the same online learning activities as DL students. For example, they can attend the 12 webinars conducted for DL students,[3] ask and answer queries in online discussion forums and access recordings of webinars and face-to-face lectures. Table 2 shows the specifics of the DL and F2F+ courses in relation to synchronous and non-synchronous online engagement.

Sample

To provide a structured view of student academic performance based on synchronous and non-synchronous online engagement, we track 95 students enrolled in three financial accounting courses at a large New Zealand university over three years (2014–2016). Students who drop out and students who complete all three accounting courses in a gap year are not considered in this study to control for any possible bias associated with the course and the instructor (e.g. changes in textbooks, learning outcomes and instructor). We gather student online engagement data from each course's online learning platform. Student demographics, including gender, mode of study (i.e. course delivery format) and overall course marks, are collected from the university's student database. In this study, we employ balanced panel data, which allows the same number (95) of observations each year, with 285 student-year observations for three years. The use of balanced panel data reduces the noise introduced by participant heterogeneity, hence reducing the impact of omitted variables and improving the efficiency of econometric estimates (Hsiao, 2007; Wooldridge, 2010).

Measurement of variables

Dependent variables

It has long been a tradition to measure student academic performance using overall course marks (e.g. Fortin et al., 2019; Opdecam & Everaert, 2019). However, this measure may not always capture the authentic learning abilities and knowledge acquisition of students because of issues such as biased marking, inconsistent markers and mismatch between the contents that are delivered and those that are assessed (Dalziel, 1998). Despite these issues, the overall course marks are universally used and often considered reliable indicators of student academic performance (Suskie, 2004). To overcome these concerns, all assessments for each course in this study are tested by non-teaching staff with subject knowledge before being released to students.[4] When possible, marking is performed on a question-by-question basis to ensure that all student scripts are graded by the same marker; when this is not possible, sample marking is undertaken to ensure marking consistency. In New Zealand, the attainment of qualifications through academic achievement is considered a key indicator of student academic performance and is an important means of tertiary sector funding (Scott, 2009). Further, the use of total course scores allows researchers to compare performance between students. Following prior literature, we use overall course scores expressed as a percentage to assess student academic performance. For each accounting course in this study, the overall course mark consists of two individual coursework assignments contributing 30% of the total course grade and a final examination contributing 70%.[5] Regardless of the delivery format of each course, all students have the same assignments and examination questions.

Independent variables

Data on student online engagement are collected through the course online learning platforms and are used to measure the independent variables. Each course online learning platform records all clicks made by each student; describes them in terms of elements such as context, component and name; and stores them in a log file. We download the log files of 95 students over three years to extract measures of online engagement. To make the analysis manageable, we restrict our study to four types of clicks for measuring synchronous and non-synchronous online engagement.[6]

Synchronous online engagement is measured using $SYN_{WEBINAR\_Q}$, which is the number of times a student raises, answers or comments on questions during the webinars. A webinar is 1.5 hours long, on average, and each course offers 12 webinars. Participation in the webinars is not mandatory but is highly recommended.

Non-synchronous online forums are available for each course, including forums for course administration issues,[7] lectures and tutorials (including webinars), and assessments. Student engagement in online forums is voluntary. When students post messages, the instructors first encourage fellow students to respond, thus stimulating discussion, and then provide a summarised answer to overcome misunderstandings. In this study, three measures of non-synchronous online engagement are used, measured in the same manner as the synchronous engagement measure. $NONSYN_{FORUM\_Q}$ measures the number of times a student comments on, posts and updates a question or raises any issue related to disciplinary concepts in any of the forums. We see this form of

engagement as higher order thinking, since written communication is closely connected with critical thinking and requires students to manipulate, analyse and interpret information, rather than simply memorise it. $NONSYN_{FORUM\_V}$ is the number of times a student views forum threads. Although message reading may reflect student motivation, it requires less critical thinking than posting messages. Therefore, we regard this type of engagement as medium order thinking. $NONSYN_{ACCESS}$ is the number of times a student accesses traditional and multimedia learning resources. The term 'traditional learning resources' refers to materials such as lecture notes, course and study guides, assessment briefs, and tutorial questions and solutions. The term 'multimedia learning resources' refers to materials such as recorded face-to-face lecture videos and recorded webinars. This type of engagement demands the routine, mechanistic application of previously acquired knowledge only; for example, students need to download lecture notes, review assessment tasks and check the course materials. Thus, such engagement is considered lower order thinking. Following Duncan et al. (2012), we use total non-synchronous engagement, $NONSYN_{AGG}$, to perform our regression analysis, which is the sum of these three separate measures of non-synchronous online engagement.

Control variables

Various factors affect student academic performance, including those that can be directly observed (e.g. age and gender) and those beyond the control of researchers (e.g. family income and size, and parents' education level). In this study, we include the control variables commonly used in the prior literature that can be collected from the course online learning platforms and university student database: gender, age, grade point average (GPA), student's origin (i.e. international or domestic) and course delivery format. Arthur and Everaert (2012) claim that women outperform men academically, but Keller et al. (2009) report the opposite. Given the mixed results in prior studies, the effect of gender on performance merits consideration in our study. The evidence on the relationship between age and academic performance in accounting is also mixed, with Guney (2009) reporting a positive relationship and Liu et al. (2013) reporting the opposite. Since most DL students are mature (i.e. studying part-time, more than 21 years old or both of these), we control for age in this study. Further, as prior academic performance is found to be positively related to subsequent academic performance (e.g. Engel, 2018; Koh & Koh, 1999), we control for GPA, which is measured on a 0–9 scale by the university. In addition, we control for students' origin (i.e. international v. domestic), following Tan and Laswad (2015). We also control for course delivery format.

Model specification

To assess the effect of students' synchronous and non-synchronous online engagement on their academic performance, we estimate the following regression (Equation 1), selecting a set of control variables from prior studies.

$$SCORE = \beta_0 + \beta_1 GENDER + \beta_2 ORIGIN + \beta_3 GPA + \beta_4 AGE + \beta_5 MODE$$
$$+ \beta_6 SYN_{WEBINAR\_Q} + \beta_7 NONSYN_{AGG} \tag{1}$$

where *SCORE* measures students' overall course scores; *GENDER* equals 1 if students are female and 0 if they are male; *ORIGIN* measures students' origin, equalling 1 if students are international and 0 if they are domestic; *GPA* is the grade point average of students; *AGE* is the student age; *MODE* measures the course delivery format and equals 1 if it is F2F+ and 0 if it is DL; and $SYN_{WEBINAR\_Q}$ and $NONSYN_{AGG}$ are the variables of interest to measure synchronous and non-synchronous online engagement, respectively.

If both synchronous and non-synchronous online engagement are positively associated with student performance, as hypothesised in H1a and H1b, the coefficients on $SYN_{WEBINAR\_Q}$ and $NONSYN_{AGG}$ will be positive. Then, we expand Equation 1 with interactive terms, $SYN_{WEBINAR\_Q}$*MODE, and $NONSYN_{AGG}$*MODE. A statistically significant coefficient of $SYN_{WEBINAR\_Q}$*MODE will lend support to H2a, which examines the interaction effect of synchronous online engagement and course format on student performance. A non-significant coefficient of $NONSYN_{AGG}$*MODE will support H2b, which tests the interaction effect of non-synchronous online engagement and course format on student performance.

Results

This section first explains the descriptive statistics, and then presents the univariate and regression results.

Descriptive statistics and univariate analysis

Panel A of Table 3 reports the descriptive statistics. The course mean score is 65 with a relatively large standard deviation, indicating a great discrepancy in student course performance. Likewise, there is a large variation in both synchronous and non-synchronous online engagement. On average, a student asks and answers questions 0.67 times ($SYN_{WEBINAR\_Q}$) during live webinar sessions, with the most active student undertaking this engagement a total of 38 times. The average for non-synchronous online engagement, such as creating and commenting on threads in online forums ($NONSYN_{FORUM\_Q}$), is 1.02 times; in contrast, students view discussion threads ($NONSYN_{FORUM\_V}$) frequently, with each student engaging in this activity an average of 54 times and a maximum of 714 times. They frequently use traditional and multimedia resources ($NONSYN_{ACCESS}$) – on average, a student uses them 84 times and a maximum of 405 times. In terms of learner characteristics, 64% of the students choose F2F+, and 25% are international students. The sample shows a wide age range, and more than half (67%) of the students are female. The average GPA is 4.64.[8]

The correlations between variables are shown in Panel B of Table 3. Both synchronous and non-synchronous online engagement measures are positive and significantly correlated with *SCORE*, in line with our expectations. A test for multicollinearity shows that the variance inflation factors for each variable are less than 10, ranging from 1.15 to 2.67, indicating that multicollinearity is not an issue in this study (Neter et al., 1983).

Since both course formats offer the same learning materials and online learning activities, the question arises whether there are significant differences between the F2F+ and DL courses in terms of student academic performance, learner characteristics and online engagement. Panel C of Table 3 reports the univariate test of differences in

Table 3. Descriptive statistics, correlations, and univariate analysis

	Panel A: Descriptive statistics					
Variable	Description	Mean	Median	Max.	Min.	Standard deviation
SCORE	Overall course scores	65.00	64.0	96.0	28.00	13.00
GPA	Grade point average. Measured on a 0–9 scale by the sample university	4.64	4.6	8.8	1.25	1.70
AGE	Student age	24.00	22.0	60.0	18.00	7.00
GENDER	A dummy variable; 1 = female, 0 = male	0.67	1.0	1.0	0.00	0.47
ORIGIN	Student origin; 1 = international, 0 = domestic	0.25	0.0	1.0	0.00	0.44
MODE	Course delivery format; 1 = F2F+, 0 = DL	0.64	1.0	1.0	0.00	0.48
$SYN_{WEBINAR\_Q}$	Webinar engagement, measured by number of times a student raises and comments on a question	0.67	0.0	38.0	0.00	4.00
$NONSYN_{FORUM\_Q}$	Number of times a student makes comments, posts and updates a question in forums	1.02	0.0	30.0	0.00	4.00
$NONSYN_{FORUM\_V}$	Number of times a student views forum threads	54.00	20.0	714.0	0.00	92.00
$NONSYN_{ACCESS}$	Number of times a student accesses traditional and multimedia learning resources	84.00	66.0	405.0	0.00	69.00

Note: DL = distance learning; F2F+ = face-to-face with online components.

	Panel B: Correlations of model variables				
Variable	SCORE	GPA	AGE	$SYN_{WEBINAR\_Q}$	$NONSYN_{FORUM\_Q}$	$NONSYN_{FORUM\_V}$
GPA	0.76***					
AGE	0.14**	0.18***				
$SYN_{WEBINAR\_Q}$	0.18***	0.13**	0.33***			
$NONSYN_{FORUM\_Q}$	0.25***	0.25***	0.31***	0.32***		
$NONSYN_{FORUM\_V}$	0.29***	0.35***	0.48***	0.27***	0.48***	
$NONSYN_{ACCESS}$	0.10*	0.13**	0.24***	0.09	0.14**	0.39***

Note: ***The correlation coefficient is different from zero at the 1% significance level. **Significance level of 5%. *Significance level of 10%. Variables are defined in Panel A of Table 3.

Table 3 Continued

Panel C: Univariate analysis: means of all variables across course delivery format: face-to-face with online components (F2F+) v. distance learning (DL)				
Variable	F2F+	DL	t stat.	p-value
SCORE	63.487	66.362	−1.831	0.068
GPA	4.495	4.913	−2.003	0.046
AGE	22.169	28.284	−8.059	0.000
GENDER	0.678	0.667	0.188	0.851
ORIGIN	0.383	0.020	7.350	0.000
$SYN_{WEBINAR\_Q}$	0.126	1.637	−3.505	0.001
$NONSYN_{FORUM\_Q}$	0.333	2.245	−4.428	0.000
$NONSYN_{FORUM\_V}$	29.519	97.324	−6.385	0.000
$NONSYN_{ACCESS}$	77.781	96.039	−2.141	0.033

Note: This table reports the mean difference tests between F2F+ and DL students. The F2F+ and DL subsamples have 183 and 102 observations, respectively. Variables are defined in Panel A of Table 3.

Panel D: Univariate analysis: means of variables across accounting subjects				
Variable	Introductory financial accounting (first-year course)	Intermediate financial accounting (second-year course)	Advance management accounting (third-year course)	ANOVA F test stat.	p-value
SCORE	65.032	67.095	61.420	4.950	0.008
GPA	4.645	4.645	4.645	0.000	1.000
AGE	23.358	24.358	25.358	2.072	0.128
GENDER	0.674	0.674	0.674	0.000	1.000
ORIGIN	0.253	0.253	0.253	0.000	1.000
$SYN_{WEBINAR\_Q}$	0.316	0.979	0.705	0.832	0.436
$NONSYN_{FORUM\_Q}$	0.432	1.947	0.674	4.977	0.008
$NONSYN_{FORUM\_V}$	15.989	74.653	70.726	13.179	0.000
$NONSYN_{ACCESS}$	47.947	66.232	139.768	66.379	0.000

Note: This table reports the mean difference tests across the three accounting courses. Each subsample has 95 observations. Variables are defined in Panel A of Table 3.

Table 4. Effect of synchronous and non-synchronous online engagement on student academic performance (H1 testing and subsample analyses)

Variable	(1) Whole sample DV: *SCORE*	(2) Introductory financial accounting (first-year course) DV: *SCORE*	(3) Intermediate financial accounting (second-year course) DV: *SCORE*	(4) Advanced financial accounting (third-year course) DV: *SCORE*
GENDER	−0.550	0.198	−3.416	1.321
	(1.200)	(1.732)	(1.281)	(2.009)
ORIGIN	2.467	0.458	−2.506	9.427***
	(3.014)	(1.713)	(1.577)	(1.981)
GPA	5.629***	5.257***	5.344***	6.205***
	(0.225)	(0.438)	(0.375)	(0.535)
AGE	−0.068	−0.012	−0.123	−0.078
	(0.046)	(0.140)	(0.141)	(0.111)
MODE	−0.208	0.347	−1.293	1.361
	(0.539)	(2.151)	(1.375)	(2.221)
$SYN_{WEBINAR\_Q}$	**0.252***	0.882***	0.247***	0.036
	(0.021)	(0.293)	(0.085)	(0.159)
$NONSYN_{AGG}$	**0.010***	0.030	0.010*	0.009*
	(0.002)	(0.018)	(0.006)	(0.005)
Adjusted R^2	0.62	0.60	0.75	0.60
F stat.	52.53	21.32	41.41	21.18
Observations	285	95	95	95

Note: This table reports the results of regressing student overall course performance (*SCORE*) on synchronous ($SYN_{WEBINAR\_Q}$) and non-synchronous ($NONSYN_{AGG}$) online engagement and control variables (variables are defined in Panel A of Table 3). Columns 1–4 report regression results for the full sample and subsamples by accounting course. Standard errors are in parentheses below coefficient estimates; *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

mean values of the regression variables. The results show that there is marginally significant ($p < 0.10$) difference between DL and F2F+ student performance. On average, the DL students perform better than the F2F+ students, but this result is not significant when taking into account the differences in student online engagement (see the regression results in Table 4). Student online engagement differs significantly between DL and F2F+ learners, with DL students being more engaged in both synchronous and non-synchronous forms. We further find significant differences in GPA, age and student origin but not in gender. These results reveal that F2F+ students are younger than DL learners, with an average age of 22, and 38% of them are international students. DL students are more mature (28 years old, on average), and most of them are domestic (i.e. local) students – only 2% are international students. The results are consistent with those of Bryant et al. (2005), who find that distance learners are, on average, more mature, more likely to be female and to have work experience, and therefore exhibit higher competence overall. The results allude to the social constructivism premise that knowledge is not just innate; it is constructed socially by virtue of engagement, discussion, mediation and the context within which learning takes place (Bozkurt, 2017).

We split the sample further by accounting course to examine whether student characteristics, academic performance and online engagement differ across these courses. Panel D of Table 3 shows the mean difference tests for variables. We find significant differences between accounting courses in non-synchronous online engagement but not in synchronous online engagement. The results show an upward trend in each type of non-synchronous engagement from the first to the second year, followed by a slight decline in the third year, except for $NONSYN_{ACCESS}$, suggesting that students may form different

study habits during their studies. High growth in online engagement may translate into higher course grades, as evidenced by the students' higher course performance in their second year. This suggestive evidence is in favour of our claim of a positive correlation between student online engagement and academic performance. The differences in learner characteristics remain consistent across courses and present no significant differences because of the use of balanced panel data.

Regression results

Effect of synchronous and non-synchronous online engagement on student academic performance: H1 testing and additional analyses

The first hypothesis proposes that both forms of online engagement are positively related to the academic performance of accounting students. Using the entire sample, consisting of all observations over three years, and the fixed-effect panel estimation method, our results in Column 1 of Table 4 support H1a and H1b, which show that both synchronous ($SYN_{WEBINAR\_Q}$) and non-synchronous ($NONSYN_{AGG}$) online engagement have a positive impact on student academic performance (**the coefficients are 0.252 and 0.010, $p <$ 0.01, respectively**). These results also have economic significance; for example, our results reveal that a one standard deviation increase in synchronous online engagement is associated with an approximate 2% increase in student performance around its mean ($[0.252*4]/65$).

Among the control variables, the coefficient for GPA is significant and positive, suggesting that students' previous academic performance contributes to subsequent academic performance, in line with prior studies (e.g. Engel, 2018; Fortin et al., 2019). Other control variables have no effect on academic performance. The results indicate that despite the significant differences in learner characteristics between F2F+ and DL students, these have no impact on student course performance, as evidenced by the non-significant coefficients for student *ORIGIN*, *GENDER* and *AGE* reported in Column 1 of Table 4. These results are consistent with Fortin et al.'s (2019) findings but differ from those of Arthur and Everaert (2012) and Tan and Laswad (2015). More importantly, we find that students' choice of course delivery format has no effect on their course performance, as indicated by the non-significant coefficient for *MODE* in Column 1. This result can be explained by equivalency theory (Bryant et al., 2005), which argues that when DL and F2F+ learning provide identical content and design, they should produce similar learning outcomes.

Next, we divide the sample into the three accounting courses to examine whether the positive impact of student online engagement on academic performance is consistent. We argue that the impact varies across the courses because students may develop different study habits as they progress through their studies, reflecting their choice of online engagement. Columns 2–4 of Table 4 report the results for each accounting course. The results support our prediction, showing that synchronous online engagement has a positive effect on student academic performance in the first- and second-year accounting courses (the coefficients are 0.882 and 0.247, $p < 0.01$, respectively).

Further, we partition the sample by assessment type to understand how different forms of online engagement could be related to different assessment types. Duncan et al. (2012) find that student online engagement has a differential impact on students'

Table 5. Effect of synchronous and non-synchronous online engagement on assessment types.

Variable	DV *Quiz*	DV *Essay*	DV *PracticeSet*	DV *Exam*
GENDER	1.000	0.411	0.842	−0.955
	(1.832)	(1.615)	(2.007)	(1.744)
ORIGIN	8.612***	−0.116	5.082**	0.743
	(1.989)	(2.305)	(2.227)	(1.767)
GPA	3.755***	2.630***	3.979***	6.615***
	(0.472)	(0.555)	(0.564)	(0.462)
AGE	0.126	−0.102	−0.177	−0.070
	(0.121)	(0.129)	(0.153)	(0.132)
MODE	2.718	0.126	6.559***	−2.432
	(2.086)	(1.880)	(2.330)	(1.739)
$SYN_{WEBINAR\_Q}$	−0.219	−0.077	0.446**	0.298**
	(0.224)	(0.105)	(0.191)	(0.132)
$NONSYN_{AGG}$	0.002	0.019***	0.014**	0.008
	(0.010)	(0.006)	(0.006)	(0.007)
Adjusted R^2	0.307	0.305	0.351	0.561
F stat.	11.478	6.904	18.063	41.273
Observations	190	95	285	285

Note: This table reports the results of regressing student performance by the assessment types *Quiz*, *Essay*, *PracticeSet* and *Exam* on synchronous ($SYN_{WEBINAR\_Q}$) and non-synchronous ($NONSYN_{AGG}$) online engagement and control variables (variables are defined in Panel A of Table 3). Standard errors are in parentheses below coefficient estimates; *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

final exam performance and overall course performance. Thus, we conjecture that different assessment types may require different forms of online engagement, and therefore have different effects on student assessment performance. The results in Table 5 show that synchronous online engagement is significantly related to *PracticeSet* and *Exam* performance (coefficients are 0.446 and 0.298, $p < 0.05$, respectively), while non-synchronous online engagement has a positive impact on *Essay* and *PracticeSet* performance (coefficients are 0.019 and 0.014, $p < 0.01$ and 0.05, respectively). No significant relationship is found between the two forms of online engagement and *Quiz*. The results underpin the general conclusion that both forms of engagement have an impact on *PracticeSet* performance; however, synchronous online engagement has a larger positive impact (the coefficient of $SYN_{WEBINAR\_Q}$ is 0.446) relative to non-synchronous online engagement (the coefficient of $NONSYN_{AGG}$ is 0.014).

Effect of student online engagement on academic performance is conditional on student choice of course delivery format: H2 testing and additional analyses

H2a posits that the positive relationship between synchronous online engagement and student academic performance is more pronounced for F2F+ accounting students than for DL students. To test this argument, we perform an analysis by employing the interaction term $SYN_{WEBINAR\_Q}*MODE$. Column 1 in Panel A of Table 6 shows that both coefficients for $SYN_{WEBINAR\_Q}$ and $SYN_{WEBINAR\_Q}*MODE$ are positively significant (**coefficients are 0.236 and 0.709, $p < 0.01$, respectively**), suggesting that the positive effect of synchronous online engagement persists among both F2F+ and DL students, but the magnitude of the effect varies. The effect is more pronounced for students who choose F2F+, therefore supporting H2a. Specifically, synchronous online engagement (e.g. asking and commenting on questions in a webinar), is associated with a 0.709-mark increase in the course overall score for F2F+ students, compared with a

Table 6. Effect of student choice of course delivery format on the relationship between online engagement and student academic performance (H2 testing and additional analyses)

Panel A: Student choice of course delivery format, student demographics and synchronous online engagement

Variable	(1) F2F+ v. DL students DV: *SCORE*	(2) Domestic v. international students DV: *SCORE*	(3) Higher v. lower GPA students DV: *SCORE*	(4) Older v. younger students DV: *SCORE*	(5) Male v. female students DV: *SCORE*	(6) F2F+ v. DL students (excluding top students) DV: *SCORE*
GENDER	−0.641	−0.640	−1.185	−0.622	−0.639	−0.179
	(1.186)	(1.190)	(1.056)	(1.202)	(1.269)	(1.398)
ORIGIN	2.532	2.550	2.054	2.549	2.531	2.900
	(3.064)	(3.001)	(3.236)	(3.074)	(3.025)	(3.084)
GPA	5.580***	5.583***	−14.217***	5.544***	5.580***	4.396***
	(0.189)	(0.185)	(0.139)	(0.207)	(0.175)	(0.202)
AGE	−0.076	−0.076	−0.017	−0.389	−0.076	−0.108***
	(0.051)	(0.047)	(0.072)	(1.139)	(0.050)	(0.015)
MODE	−0.380	−0.389	1.813***	0.120	−0.381	−0.088
	(0.441)	(0.436)	(0.475)	(0.363)	(0.393)	(0.421)
$SYN_{WEBINAR\_Q}$	0.236***	0.236***	0.509***	0.912**	0.238***	0.310***
	(0.035)	(0.036)	(0.096)	(0.434)	(0.081)	(0.076)
$NONSYN_{AGG}$	0.010***	0.010***	0.020***	0.009***	0.010***	0.014***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)
$SYN_{WEBINAR\_Q}$*MODE	**0.709*** **	0.719***	2.242***	0.414**	0.710***	1.070***
	(0.157)	(0.096)	(0.255)	(0.197)	(0.139)	(0.165)
$SYN_{WEBINAR\_Q}$*ORIGIN		−0.292				
		(3.224)				
$SYN_{WEBINAR\_Q}$*GPA			0.316**			
			(0.142)			
$SYN_{WEBINAR\_Q}$*AGE				0.719*		
				(0.420)		
$SYN_{WEBINAR\_Q}$*GENDER					−0.003	
					(0.147)	
Adjusted R^2	0.620	0.619	0.418	0.618	0.618	0.440
F stat.	47.315	42.858	19.574	42.846	42.856	20.620
Observations	285	285	285	285	285	246

Note: Columns 1–5 report the results of regressing student overall course performance (*SCORE*) on synchronous online engagement ($SYN_{WEBINAR\_Q}$), and interaction terms between course delivery format, student characteristics and $SYN_{WEBINAR\_Q}$, and control variables (variables are defined in Panel A of Table 3). Column 6 reports the regression results using the redefined sample that excludes top-performing students. Standard errors are in parentheses below coefficient estimates; *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. F2F+ = Face-to-face with online components; DL = distance learning.

Panel B: Student choice of course delivery format, student demographics and non-synchronous online engagement

Variable	(1) F2F+ v. DL students DV: *SCORE*	(2) Domestic v. international students DV: *SCORE*	(3) Higher v. lower GPA students DV: *SCORE*	(4) Older v. younger students DV: *SCORE*	(5) Male v. female students DV: *SCORE*
GENDER	−1.126	−0.258	−1.205	−0.552	−1.258
	(1.344)	(1.168)	(1.078)	(1.174)	(1.318)
ORIGIN	1.355	−4.107	2.144	2.811	2.611
	(2.771)	(1.935)	(3.234)	(2.985)	(3.104)
GPA	5.508***	5.530***	−15.753***	5.696***	5.582***
	(0.180)	(0.196)	(0.405)	(0.211)	(0.192)
AGE	−0.072	−0.068	−0.009	−2.772	−0.067
	(0.055)	(0.044)	(0.062)	(1.296)	(0.045)
MODE	−1.244**	−0.39	1.799*	−0.16	−0.329
	(0.577)	(0.470)	(0.544)	(0.385)	(0.469)
$SYN_{WEBINAR\_Q}$	0.251**	0.248**	0.344**	0.258**	0.241**
	(0.017)	(0.039)	(0.050)	(0.048)	(0.035)
$NONSYN_{AGG}$	0.009 **	0.008 **	0.015 **	0.019 **	0.007 ***
	(0.004)	(0.001)	(0.002)	(0.005)	(0.002)

(Continued)

Table 6. Continued.

	(1)	(2)	(3)	(4)	(5)
		Domestic		Older	
	F2F+ v. DL	v. international	Higher v. lower	v. younger	Male v. female
	students	students	GPA students	students	students
Variable	DV: *SCORE*	DV: *SCORE*	DV: *SCORE*	DV: *SCORE*	DV: *SCORE*
$SYN_{WEBINAR\_Q}*MODE$	0.651**	0.785**	2.221***	0.541**	0.665**
	(0.309)	(0.173)	(0.209)	(0.118)	(0.148)
$NONSYN_{AGG}*MODE$	**0.005**				
	(0.008)				
$NONSYN_{AGG}*ORIGIN$		0.072**			
		(0.013)			
$NONSYN_{AGG}*GPA$			0.014***		
			(0.001)		
$NONSYN_{AGG}*AGE$				0.019*	
				(0.006)	
$NONSYN_{AGG}*GENDER$					0.005**
					(0.002)
Adjusted R^2	0.639	0.650	0.421	0.626	0.619
F stat.	46.61	48.92	19.747	44.259	42.939
Observations	285	285	285	285	285

Panel B: Student choice of course delivery format, student demographics and non-synchronous online engagement

Note: This table reports the results of regressing student overall course performance (*SCORE*) on non-synchronous online engagement ($NONSYN_{AGG}$), and the interaction terms between course delivery format, student characteristics and $NONSYN_{AGG}$, and control variables (variables are defined in Panel A of Table 3). Standard errors are in parentheses below coefficient estimates; *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. F2F+ = Face-to-face with online components; Distance learning = DL.

0.236-mark increase for DL students, suggesting synchronous online engagement plays an incremental role in boosting F2F+ student performance.

To examine whether the results are driven by top-performing F2F+ students (e.g. students with A grades scoring 80 out 100 or higher according to the sample university's grading system), we perform an additional analysis with a redefined sample excluding the top-performing students, rerunning Equation 1 with the interaction term $SYN_{WEBINAR\_Q}*MODE$. We document a consistent conclusion in Column 6 of Panel A in Table 6 (the coefficient of $SYN_{WEBINAR\_Q}*MODE$ is 1.07, $p < 0.01$). This result shows that synchronous online engagement is complementary to classroom learning. Although technology is increasingly being used to engage students in the learning of accounting (Taylor et al., 2018), provided that accounting courses have numbers and mathematical formulae (Lucas & Meyer, 2005), F2F+ learning can play an incremental role in improving student performance. Further, accounting is a highly practical discipline that requires interpersonal skills to facilitate student academic success (Buckless & Krawczyk, 2016). The relatively isolated nature of DL makes it difficult for DL students to acquire these skills, as compared with F2F+ students (Myers et al., 2014), which may influence the performance of DL students.

H2b hypothesises that student choice of course delivery format has no effect on the relationship between non-synchronous online engagement and student academic performance; that is, that the effect of non-synchronous online engagement remains the same for both F2F+ and DL accounting students. To test this conjecture, we add the interaction term $NONSYN_{AGG}*MODE$ to the analysis. Column 1 in Panel B of Table 6 reports that the coefficient of $NONSYN_{AGG}$ (0.009) is significant ($p < 0.05$), confirming our main results that non-synchronous online engagement is positively related to

student academic performance. However, the coefficient of $NONSYN_{AGG}*MODE$ (**0.005**) is not significant (**$p > 0.1$**), suggesting that student choice of course delivery format has no influence on the relationship between non-synchronous online engagement and student academic performance. Therefore, H2b is supported.

Additional analyses

Since we conduct our study in a choice-based learning environment and our results (Panel C of Table 3) show significant differences between student demographics in terms of the choice of course delivery format, we investigate further whether differences in student demographics reflected in the choice of course format influence the relationship between students' online engagement and their overall course performance. We modify our baseline Equation 1 to include the interaction terms between student characteristics, and synchronous and non-synchronous online engagement, in which student characteristics take the value of 1 for international ($ORIGIN$), female ($GENDER$), lower GPA (based on the median value of GPA) and younger students (based on the median value of AGE). We find that the positive effects of synchronous and non-synchronous online engagement, and the interaction effect between synchronous online engagement and course delivery format, persist, which are supported by the significant and positive coefficients of $SYN_{WEBINAR\_Q}$, $NONSYN_{AGG}$ and $SYN_{WEBINAR\_Q}*MODE$ in Columns 2–5 of both Panels A and B in Table 6, confirming our main results (supporting H1a, H1b and H2a). Notably, the coefficients of GPA are negative and significant in Table 6 (–14.217 and –15.753, $p < 0.01$, in Column 3 of Panels A and B, respectively), indicating a negative relationship between students with lower GPAs and their course performance, but the interaction variables $SYN_{WEBINAR\_Q}*GPA$ and $NONSYN_{AGG}*GPA$ are positive and significant (coefficients are 0.316 and 0.014, $p < 0.05$ and 0.01, in Column 3 of Panels A and B, respectively), suggesting that both forms of online engagement have a moderating effect on the course performance of lower GPA students. Similarly, the interaction variables $SYN_{WEBINAR\_Q}*AGE$ and $NONSYN_{AGG}*AGE$ are positive and significant (coefficients are 0.719 and 0.019, $p < 0.1$, in Column 4 of Panels A and B, respectively), mitigating the negative effect of age on academic performance in younger students. Columns 2 and 5 in Panel B show that the positive effect of non-synchronous online engagement is greater for international students and female students (coefficients of $NONSYN_{AGG}*ORIGIN$ and $NONSYN_{AGG}*GENDER$ are 0.072 and 0.005, $p < 0.05$, respectively).

Propensity score matching

We adopt propensity score matching (PSM) to address potential self-selection problems and to reduce estimation bias. We use PSM to match the treatment group with the control group that has similar characteristics according to a function of covariates (Rosenbaum & Rubin, 1983). The treatment group consists of those students who asked at least one question in webinars. The control group is selected using the nearest-neighbour one-on-one matching method. Then, we estimate a probit model using the full sample to calculate a propensity score, which is the conditional probability that each student asks at least a question in webinars, given all the observable data. We assess covariate balance by testing whether the means of the covariates differ between the treatment group and the control group. Panel A of Table 7 shows that the t statistics

Table 7. Propensity score matching (PSM) results

Panel A: Variable covariate matching post PSM				
Variable	Treated ($SYN_{WEBINAR\_Q} > 0$)	Controlled ($SYN_{WEBINAR\_Q} = 0$)	t stat.	p-value
GENDER	0.875	0.958	1.034	0.306
ORIGIN	0.083	0.125	0.464	0.645
AGE	32.458	30.208	−0.753	0.455
MODE	0.250	0.333	0.624	0.536
GPA	6.034	6.008	−0.051	0.960
$NONSYN_{AGG}$	313.167	257.750	−1.007	0.319
Panel B: Regression results using PSM matched sample				
Variable	DV: SCORE			
GENDER	−1.404			
	(2.345)			
ORIGIN	−1.252			
	(3.977)			
GPA	6.239***			
	(0.549)			
AGE	−0.205**			
	(0.098)			
MODE	3.257			
	(3.109)			
$SYN_{WEBINAR\_Q}$	0.351***			
	(0.091)			
$NONSYN_{AGG}$	0.011**			
	(0.005)			
Adjusted R^2	0.70			
F stat.	14.88			
Observations	48			

Note: This table reports the results of using PSM to alleviate the concern of self-selection and to reduce bias. Panel A shows the results of matching. Panel B reports the PSM regression results. Standard errors are in parentheses below coefficient estimates; *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. Variables are defined in Panel A of Table 3.

comparing the mean of the variables between the treatment and the control group are all insignificant, suggesting that the matching is effective – that is, the control group resembles the treatment group in all dimensions. Next, we rerun Equation 1 with the treatment group and matched control groups. Panel B of Table 7 shows that the coefficients of $SYN_{WEBINAR\_Q}$ and $NONSYN_{AGG}$ are both positive and significant, consistent with the main results reported in Table 4.

Discussion

This study focuses on the online engagement of F2F+ and DL accounting students, its impact on their academic performance and whether this impact is dependent on students' choice of course delivery format. Therefore, the offline engagement of accounting students in face-to-face classes is not considered in this study.

The first research question (H1) considers the relationship between accounting students' online engagement and their academic performance. Choice-based learning allows students to adopt the learning strategies they prefer and to fulfil their various learning needs (Opdecam & Everaert, 2019). Students gain more autonomy with choice-based learning. When they feel more autonomous and competent, they become more engaged in learning activities and are motivated to take greater initiative in their learning, leading to positive educational outcomes. In essence, students' construction

of meanings associated with accounting concepts is perceived to be the outcome of both synchronous and non-synchronous online engagement (Swan, 2005). Synchronous online engagement in webinars increases social presence, which, in turn, induces high levels of commitment and contribution (e.g. asking, and attending to, queries in webinars) that are necessary for the development of higher order thinking skills and, therefore, improve student academic performance.

Our results also highlight the importance of non-synchronous online engagement in enhancing the academic performance of accounting students. Such engagement reveals the prevalence of social constructivism, whereby students share their experiences and connect them to their learning through online discussions, engaging in critical thinking by sorting concepts and creating arguments and rebuttals, which facilitate the evolution of higher order thinking (Brierton et al., 2016). In addition, although they do not constitute the creation of original content, other types of non-synchronous online engagement – including viewing the opinions of fellow students on online forums and retrieving lecture recordings – help students relate to others and build a sense of commitment to the course. This engagement is also considered to constitute information exchange among students. From these findings, we can conclusively state that both synchronous and non-synchronous online engagement with instructors and among peers are important for accounting students to learn and develop cognitive skills effectively.

Interestingly, there is a significant difference in online engagement between DL and F2F+ accounting students, with students selecting DL engaging more in both online synchronous and non-synchronous activities, as reported in the t-test results in Panel C of Table 3. This finding shows that online engagement reflects accounting students' choice of course delivery format, indicating the effectiveness of the choice-based learning approach. When students choose DL, they are more likely to use online engagement frequently, considering that online engagement is the only means for DL students to engage with their instructors and student peers in the course. Notably, course delivery formats show no effect on student course performance, as evidenced by the non-significant coefficient of MODE reported in Column 1 of Table 4. Prior literature offers conflicting findings on the relationship between course delivery format and student performance. Some scholars report that face-to-face classroom environments provide more favourable outcomes than online learning environments for students in advanced accounting courses and Certified Public Accountant exam performance when students do not have a choice of course delivery format (e.g. Chen et al., 2013; Morgan, 2015). Others find no significant differences (e.g. Redpath, 2012). Our results suggest that choice-based learning promotes student learning and makes differences in student performance disappear across course delivery formats. Providing accounting students with a choice of course delivery format increases their engagement and competence because it empowers accounting learners, allowing them to take control of their learning experience and providing them with the autonomy to choose how they want to engage with their accounting courses. Student choice allows accounting students to select the resources they want to utilise, therefore encouraging positive learning behaviour and creating a positive learning environment in which they want to engage. Thus, it is not the format of the course delivery itself that is important to student academic performance but, rather, the students' preference for the course delivery format that allows them to engage effectively in the course.

Our second research question (H2) argues that accounting students' choice of the course delivery format can influence the relationship between their online engagement and academic performance. The results show that the positive effect of synchronous online engagement is larger for F2F+ students; however, the effect of non-synchronous online engagement is not dependent on the course delivery format. When students choose F2F+, the additional layer of synchronous classroom (i.e. face-to-face) engagement and teacher presence that F2F+ students have, coupled with their synchronous online engagement, may enhance their quality of learning when compared with DL students who have synchronous online engagement only. It also increases F2F+ students' sense of competency and connectedness through more direct and personal social engagement and content-related feedback, thereby improving their academic performance. Our further analysis reveals that this interaction effect between synchronous online engagement and course delivery format on student performance is not attributed to the top-performing students, indicating the robustness of the result.

In contrast, the autonomy and flexibility of non-synchronous online engagement allow students to be more autonomous in steering their own learning process, thus promoting motivation and effective learning (Rienties et al., 2009). Since accounting is a highly applied subject, non-synchronous online engagement allows students to self-reflect and practise to master it. For example, in comparison to the fast-paced delivery of a webinar, students can pause to ponder, reflect and practise examples from the recorded lecture videos when watching it, thus facilitating their understanding and learning of the course materials. Thus, the course format chosen by a student has no effect on the relationship between non-synchronous online engagement and student academic performance.

Our additional analyses suggest that the positive effect of online engagement on student academic performance depends on specific assessment types. Non-synchronous online engagement is positively correlated to the performance of essay and practice-set assessments. Most of the non-synchronous online engagement consists of student-to-student interactions. Students feel comfortable in online discussion forums where they can ask each other for help within the context of the range of assessments, and these discussion threads may advance application, synthesis and evaluation (Duncan et al., 2012) and create opportunities to hear and digest a variety of viewpoints on assessment contents. In addition, non-synchronous online engagement removes time constraints, which allows students time to review and reflect on learning materials, resulting in deeper understanding, thus driving the positive relationship between non-synchronous online engagement and student coursework performance. In contrast, students' exam and practice-set assessment performance is positively related to synchronous online engagement. This makes intuitive sense because during synchronous webinars, instructors lead the webinars for most of the time, motivating students by making comments and asking a series of questions that may be indicative of the assessment questions in the final exam or in the practice set. Moreover, we find that the positive effect of online engagement on student academic performance differs across the three accounting courses.

Further analyses demonstrate that the impact of online engagement on student academic performance varies by student characteristics. The positive impact of both forms of online engagement is stronger for younger and lower GPA students. According

to Parasuraman (2000), young people tend to embrace new technologies for accomplishing learning goals; further, they actively use online peer-to-peer knowledge-sharing communities and favour interactive learning (Szymkowiak et al., 2021). Real-time online engagement with instructors and peers and the flexibility offered by non-synchronous online engagement provide students who have lower GPAs with more opportunities to raise questions ranging from those on basic concepts to more advanced questions that enhance their understanding of the subject matter. In addition, the positive effect of non-synchronous online engagement is more evident among international and female students. Because of concerns about English proficiency, international students may prefer to engage non-synchronously and feel more at ease asking and commenting on questions on online discussion forums, as non-synchronous online engagement provides them with time for reflection and high-order processing, thus contributing to improvement in their academic performance. Prior studies (e.g. Gunn et al., 2003; Lee, 2002) find that female students tend to have a higher level of social engagement, use more online materials, and post and read more information online, which may explain the difference in the impact of non-synchronous online engagement on female and male students' academic performance.

Conclusion

This study investigates the impact of accounting students' synchronous and non-synchronous online engagement on their academic performance based on student choice of course delivery format. First, we document a positive relationship between both forms of online engagement and student academic performance. This positive effect varies across the accounting courses and assessment types, indicating that the effect depends on the specific accounting course and assessment type. Second, we find that synchronous online engagement plays an increasing role in enhancing the academic performance of F2F+ accounting students; however, the effect of non-synchronous online engagement on accounting students' academic performance is not dependent on the course delivery format. This result suggests that the additional synchronous engagement F2F+ students have in the classroom environment and the interpersonal skills they acquire in the classroom, combined with synchronous online engagement, enhance their understanding of the course contents, indicating that synchronous online engagement complements classroom learning. Last, our results show that both forms of online engagement have a positive impact on diverse student characteristics, with varying effects. We find that, in accounting courses, both synchronous and non-synchronous online engagement moderate the negative student performance of lower GPA and younger students, and the effect of non-synchronous online engagement is more evident among international and female students. The results are particularly useful for understanding how accounting students with different characteristics engage in learning online and the impact of their online engagement on their academic performance.

Our study has some practical implications. First, it provides accounting faculty with a means of predicting student academic performance, by demonstrating that students gain and strengthen their knowledge of accounting concepts through online engagement. The current study shows that the impact of online engagement varies across accounting courses and assessment types. Therefore, accounting instructors need to consider the

different effects of student online engagement when developing online accounting courses in order to enable effective learning.

Second, this study contributes to the understanding of how the course delivery format that students choose can affect their academic performance through online engagement. Given that students have the autonomy to determine how they want to study their course, they are encouraged to be more engaged and take greater initiative in their learning for positive learning outcomes. The study is particularly useful for post-pandemic teaching in accounting courses because students may have the option of attending face-to-face or online on any class day. However, this also presents challenges for accounting instructors and students. Providing choice-based learning requires more effort on the part of instructors and an understanding that not all accounting learning activities are appropriate for both online and face-to-face teaching. Given the applied nature of accounting, experiential learning, such as field trips and simulations, are beneficial to students. However, the question is whether these activities can be incorporated into online learning and be as effective as face-to-face learning in accounting courses. Although choice-based learning allows students to customise their mode of attendance, it requires them to have a degree of digital literacy, be self-motivated and self-determined and to self-manage. Accounting faculty need to take these aspects into account when designing a choice-based learning course.

Nevertheless, our results should be interpreted with care. First, some factors that are not observable from the course learning platforms may influence student academic performance, such as parental education level, family size and income. Second, the sample is obtained at a single university and may not be representative of accounting students at other universities. Replication studies at other universities are encouraged in this area. Third, owing to data limitations, we are unable to distinguish the impact of synchronous classroom engagement on our results. Fourth, there is a possibility that some F2F+ students may choose not to attend the physical classes. In such cases, the quality of their choices may be similar to those of DL students. Since we do not possess specific data on these instances, this may introduce a potential bias in our results, despite the attendance rate for F2F+ students being approximately 90%, on average. Fifth, the sample data were collected prior to the COVID-19 pandemic, and there may have been changes in how students learn in the subsequent years. Therefore, we encourage more research on choice-based learning using the most recent data on accounting students. In addition, our analysis relies on the frequency of student engagement, but we did not analyse the content of the engagement – for example, the content of forum posts – which could be an interesting avenue for future research. Furthermore, we do not explore the distinction between students who actively raise questions and those who do not. This aspect could be a valuable area for future research, as it may shed light on the impact of student online engagement on learning outcomes.

Notes

1. Different from prior studies, in this study, we use DL to mean distance learning that includes both real-time and non-real-time online learning components. 'Distance online learning' refers to online learning, either real time or non-real time. We use 'F2F+' for students who have access to both in-person teaching and real-time and non-real-time online components. 'Face-to-face' means in-person classes on campus only.

2. The sampled university is widely recognised for its commitment to delivering high-quality online education. DL has been available at the university for the past 60 years. The university, which has a dedicated team of experts, focuses on designing online courses that are crafted to enhance the effectiveness and success of the online learning experience. This emphasis on quality distinguishes high-quality online education from emergency distance learning, which offers temporary learning opportunities during extraordinary circumstances, such as the COVID-19 pandemic.

3. The 12 webinars for DL learners are also open to F2F+ students. However, the attendance rate for F2F+ students is lower because they can attend the face-to-face (i.e. in-person) classes. The 12 webinars are not conducted at the same times as the face-to-face lectures.

4. The moderator must ensure the following is achieved before allowing the course instructor to release an assessment to students: (1) the assessment is consistent with course learning outcomes; (2) the question style is appropriate to the level of the accounting course as well as the discipline; (3) each question is solvable and does not include inconsistent, contradictory or incorrect information; and (4) the length of the assessment is appropriate.

5. The introductory financial accounting course is assessed by two coursework items, quizzes and a practice set. The intermediate financial accounting course coursework includes an essay and a practice set. The advanced financial accounting course coursework includes quizzes and a practice set. Students are required to solve practical accounting problems and provide discussion on short answer questions in a practice set.

6. The university's online learning platforms do not collect the data on the amount of time students spend on each type of engagement; therefore, these data are not included in our regression analysis.

7. In this study, student engagement in the course administration forum is excluded from the regression analysis because the administrative queries are not related to course content.

8. We have conducted the Jarque–Bera tests on each variable reported in Panel A of Table 3. The results reveal that the dependent variable, *SCORE*, follows a normal distribution (Jarque–Bera test statistic = 0.264), but the independent variables are not normally distributed. This outcome is not surprising, considering that many of the independent variables are either binary variables (e.g. female, origin, mode), or discrete variables with a narrow range (e.g. GPA, age). Moreover, the variables measuring synchronous and non-synchronous online engagement span a very wide range, including zero values.

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