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Students' motivation and engagement in higher education: the importance of attitude to online learning

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Abstract
The emergence of online environments has changed the landscape of educational learning. Some students thrive in this learning environment, but others become amotivated and disengaged. Drawing on self-determination theory, we report the findings of a study of 574 undergraduate business students at an Australian higher education institution on their attitude toward online learning, and its impact on their motivation and educational engagement. Data was collected via an e-mail survey and analysed using structural equation modelling and the Hayes' bootstrapping method. The results of the study were mixed. Attitude to online learning mediated the relationships of both intrinsic motivation to know and extrinsic motivation with engagement, indicating that the design of online learning environments can play a role in enhancing learning experiences. However, attitude to online learning was not found to mediate the intrinsic motivation to accomplish and engagement relationship. A negative mediation effect was partially supported between amotivation and engagement, with study mode found as a moderated mediator to this effect, being stronger and significant for online students as opposed to on-campus students. These results have implications for how students can be engaged online, and the need for educators to design online learning environments that support the learning experience for all students.

Keywords Student engagement · Motivation · Higher education · Attitude to online learning · Study mode

Introduction

The concepts of student motivation and engagement in tertiary study are well established in the literature. For decades, these ideas have been at the forefront of pedagogical debate on how to best engage our students and, in turn, enhance their learning outcomes. Conversely, there is also a need to understand the circumstances under which we sometimes fail to

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achieve these outcomes. It is widely acknowledged that when students are actively engaged in the learning process, and get pleasure and instrumental value from what they are doing, they have a propensity to achieve better learning outcomes (Carini et al. 2006; Kahu 2013; Ryan and Deci 2000). The opposite is also true for disengaged students who exhibit a lack of interest and enthusiasm (Skinner et al. 2008), and a general amotivation toward studying (Ryan and Deci 2000). Student disengagement is commonly associated with poor learning outcomes, and lower university retention and completion rates (Sanders et al. 2016). In recent years, the increased use of information and communication technology (ICT) in higher education for online education delivery (Lawlor et al. 2016) has resulted in diverse learning environments and/or contexts for students. Consequently, we see some students learning in a traditional on-campus face-to-face classroom environment, some learning solely in an online environment, and others in a hybrid (or blend) of both environments. Such diversity adds further complexity to the efforts to understand the potential drivers of, and impacts on, students' motivation and engagement (Meyer 2014). The aim of this paper is to develop an understanding of the mechanisms that link students' motivation to engagement within online learning environments, specifically considering mode of study (on-campus versus online) as a boundary condition.

Literature review

Student engagement, as a concept, suffers from a lack of definitional clarity and consensus, with its exact meaning proving both nebulous (Gordon et al. 2015) and subject to considerable ongoing debate (Appleton et al. 2008). The available definitions denote engagement as a student-centred approach to learning focussed on the student's *connectedness* (connection with learning and learning environments; Axelson and Flick 2010), *involvement* (active participant in learning; Kuh et al. 2007; Sun and Rueda 2012), and *effort*, *energy*, and *time* (quality of the effort towards learning; Krause and Coates 2008; Kuh and Hu 2001; Reschly and Christenson 2012; Robinson and Hullinger 2008). The literature agrees that engagement is dynamic, complex, and multi-faceted (Trowler and Trowler 2010). However, with debates centring on definition, operationalisation, and measurement ongoing (Fredricks et al. 2016; Henrie et al. 2015; Kahu 2013; Skinner et al. 2008), the concept remains contested (for a systematic review of student engagement and, in turn, a critique, see Macfarlane and Tomlinson 2017; Quin 2016). There is substantial support for engagement as a student-centred focus on the active contribution (effort, energy, and time) that students make towards their own learning through involvement and participation in activities in different modes of study. In a review of the research, Kahu (2013) identified three core approaches to student engagement as behavioural, psychological, and sociocultural. In further refinement of a conceptual approach to engagement, Kahu and Nelson (2018) position student engagement as influenced by both student and institutional factors, where the university environment makes a significant contribution.

Explicitly related to engagement, motivation is a centrally held tenet of teaching and learning (Mitchell 2011). Motivation has long held roots in self-determination theory (SDT) (Deci et al. 1991; Ryan and Deci 2000), building on social learning theory (Bandura 1971). SDT posits that behaviour is self-determined; as individuals we make decisions about whether to act or not dependent on the apparent value that we determine from the task as driven by motivated actions. The theory helps to differentiate between self-determined and controlled types of self-regulation (Deci et al. 1991). SDT maintains

that there are three universal, innate, and psychological needs that people have: autonomy, competence, and psychological relatedness. These antecedents determine how we motivate and are motivated. As a multi-dimensional construct, motivation according to Ryan and Deci (2000) encapsulates three core motivators: amotivation, extrinsic, and intrinsic. SDT confirms that each of these motivators is distinct from each other and operates on a continuum (Chen and Jang 2010). Amotivation, as lacking an intention to act, is a controlled dimension at one end. Intrinsic motivation, where motivation for an action comes from the internal value it presents, can be viewed at the opposite end of the continuum—as self-determined and derived from an internal locus of control. At the middle of this continuum sits extrinsic motivation, where the external focus or reward could be determined by others or the individuals themselves (Chen et al. 2010; Deci et al. 1991; Ryan and Deci 2000).

The connection between motivation and engagement is explicit and direct, with a focus on motivation leading to and/or facilitating engagement (Dabbagh 2007; Lee and Reeve 2012; Reeve 2012; Skinner et al. 2008). SDT, when used as a lens, maintains that student engagement arises from motivation (Chen and Jang 2010; Dabbagh 2007; Fried and Konza 2013; Leach and Zepke 2012; Newbery 2012). As proposed by Ryan and Deci (2009), the taxonomy of human motivation represents an effective nexus to inform student engagement through an SDT lens; motivation is a private subjective experience and engagement is more objective with observed effect (Dabbagh 2007). Gourlay (2015) maintains that engagement is positioned as an 'activity, arising from a mindset of high motivation and determination' (p.405). SDT enables 'a synthesis of findings about how motivation and learner agency lead to engagement and identifies innate psychological needs for competency, autonomy, and relatedness' (Leach 2016, p.25), positioning the directional relationship between motivation and its effects on engagement.

Engaging in an online learning environment is fraught with additional complexities, but with increasing numbers of students choosing online education as an alternative to traditional on-campus classes, an understanding of motivation and engagement in this context is critical. One should not simply assume that the motivation and engagement theories established in relation to the traditional on-campus classroom translate to the online learning environment. Online learning refers to either full or partial (i.e., 'blended') delivery of online courses often using learning materials through learning management systems (LMS) (Meyer 2014). Online learning is augmented through the adoption of advanced digital tools and other technological platforms (Chen et al. 2010; Cole 2009). Online learning is not just about online learners; for some students, this form of learning delivery is a strategic choice often to bring better balance to their lives (Dabbagh 2007; Farrel et al. 2018). Thus, technology offers students greater flexibility, which can advance their learning and subsequent engagement through the utilisation of self-directed learning to suit their needs (Wengrowicz et al. 2018). The autonomy of studying in this way was found to be a significant intrinsic motivator for online students than compared with traditional students (Stevens and Switzer 2006), where students that are intrinsically motivated will seek out autonomous online learning environments.

Whilst there is ample evidence of the increased growth of online learning, understanding the perceptions that students hold towards online learning is increasingly important. From an SDT perspective, the student has control over the decisions associated with how they will interact in an online environment, and much of this is determined through their attitudes and experiences (Yatz 2002). For instance, Wengrowicz et al. (2018) found that the perceptions that a student holds towards collaborative online learning will impact on their satisfaction and the way they engage with peers, lending itself to the importance of student perceptions or attitudes towards online

learning (Mehra and Omidian 2011). Liaw et al. (2008) also found that the attitude of students in the online context has significant implications for learning and learning outcomes. In essence, they identified that most students hold positive attitudes towards online learning, and in turn students see the value that they can derive from studying in an online mode. In addition, Liaw et al. (2008) found that the experience with technology-based learning helped to shape the positive attitudes of students in this respect.

These various findings point to students with a positive attitude towards online learning being more likely to identify personal benefits that online learning will provide. This leads us to the following hypothesis:

Hypothesis 1: Students' attitudes towards online learning will mediate the relationship between motivation and engagement.

As previously identified, mode of study adds additional complexity and would be expected to influence the attitudes and subsequent engagement in online learning. Chen et al. (2010) identified that those students who enrolled in online courses are more likely to adopt technology in order to advance their learning. They argue that technology is correlated with engagement measures, and the way that students engage is different for online and on-campus students. According to Rovai et al. (2007), the intrinsic outcomes from studying in an online environment are seen as more rewarding and lead to greater satisfaction, where online students are more intrinsically motivated than those that study on campus. However, Wong and Fong (2014) found that those students that preferred online learning found traditional modes of learning less effective. It is believed that enrolment (or study) mode will have a moderating effect on the relationship between motivation and attitude to online learning. The hypothesis reads:

Hypothesis 2: Study mode will moderate the strength of the mediated relationships between motivation factors with engagement factors via attitude to online learning, such that the mediated relationship will be stronger for online students than on-campus students.

The conceptual framework for the study is depicted below in Fig. 1. The figure identifies the conceptual model that will be tested in the current study, as well as providing a visual cue of the general relationships in question.

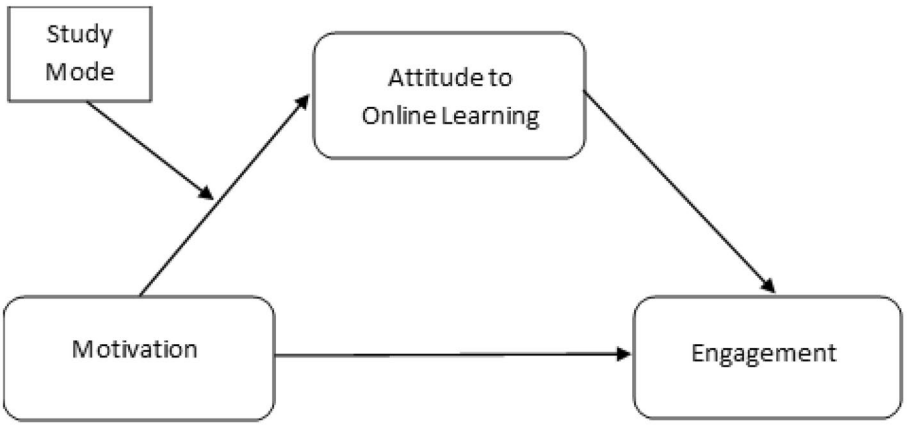

Fig. 1 Conceptual framework

Method

The research was conducted in a large higher education institution in a metropolitan city in Australia. The institution was selected for the study because of its strong focus on, and use of, technology to facilitate learning. This approach is not unique to this higher education institution, particularly within Australia, but the institution had engaged with technology to deliver on-campus and online learning for a prolonged period. The study sought the views of undergraduate students within a business faculty. At the time of the data collection there were 17 courses offered by the faculty. All courses offer online learning. The large-scale survey was administered to the undergraduate student cohort with an active enrolment in one semester via email; the email provided a link to an online survey provider.

The responses to the questionnaire resulted in 574 usable responses (32 were excluded due to incomplete demographic details) for analysis of the conceptual model (see Fig. 1) following data preparation. The demographic composition of the sample provided for 40.4% males and 59.4% females. The age composition, as to be expected for an undergraduate degree, saw 15.2% of respondents in the 15–19 years of age category, 51% were 20–25 years of age, 13.2% were 25–29 years of age, whilst the remaining respondents were 30 years of age or older. Further to this, 89.9% of the respondents were domestic students and 10.1% were international students; this is not representative of the overall split between domestic and international students within the faculty (74.2% vs. 25.8%). Finally, 67.3% of the respondents were on-campus students, whilst the remaining 32.7% were studying online. Of the on-campus students, 42.9% were male and 56.9% were female (group that preferred not to disclose 0.2%) and 86.9% were aged between 15 and 29 years. For the online students, 35.3% were male and 64.7% were female. About 45% were aged between 15 and 29 years, with the age group 30–49 years accounting for 45%; this is consistent with the expectation that online students are often more mature-aged and are returning to study whilst managing other aspects of their life (such as work, family, and caring responsibilities).

Questionnaire

The questionnaire was constructed using previously established measures within the higher education domain. Students' motivation was measured using the well-established Academic Motivation Scale (AMS) as developed by Vallerand et al. (1992). The scale is characteristic of three subsets of motivation, namely, intrinsic, extrinsic, and amotivation. Intrinsic motivation (IM) was measured as two separate constructs: intrinsic motivation to know (for the enjoyment of learning new things), and intrinsic motivation to accomplish (for the satisfaction of accomplishing something). Extrinsic motivation was measured as the external motivators that drive behaviour such as payment and rewards. Amotivation is when the subject is neither intrinsically nor extrinsically motivated.

The student engagement scale was an adapted version of that used in the First Year Experience Questionnaire (FYEQ) (Krause et al. 2005). Whilst there are many student engagement scales, the decision to adopt this scale was twofold: the scale had been validated in the context of Australian student populations and the structure of the engagement scale incorporated items relating to academic, intellectual, and online engagement. Whilst the FYEQ incorporates several different engagement subscales which contribute to

an overall engagement score, it was deemed that a more meaningful and nuanced understanding around student engagement for the benefit of this study would be derived from the three selected subscales, with the rationale for each scale as follows. The Academic Engagement Scale (AES) is focussed on measuring the engagement of students with their study and whether they are engaging with the learning activities. The items were adjusted to reflect both on-campus and online enrolment status, as items such as 'I regularly borrow books from the university library' and 'I regularly make class presentations' assumed students were studying in on-campus mode. The revised scale had 7 items and was measured on a 7-point Likert scale. The Intellectual Engagement Scale (IES) is concerned with students' engagement with their studies and the intellectual challenge and stimulation of learning; this scale had 5 items, with all items from the original IES in the FYEQ included, with slight alteration. For the Online Engagement Scale (OES), which captures students' engagement with online learning resources and online learning communities, additional items were added to those in the FYEQ OES to reflect the LMSs more commonly used by universities at the time of conducting the questionnaire. The institution's name was substituted in the OES item statements where relevant. Each of these engagement dimensions provide a distinct focus on how students engage, in relation to learning activities, knowledge, and the online environment, respectively.

A series of item statements were developed for the benefit of this study and formed an Attitude to Online Learning Scale (AOLS). These statements were developed based on in-depth interviews and focus groups with students at the institution around their thoughts and feelings towards online learning. A total of six in-depth interviews were conducted with four on-campus and two online students, and six focus groups (including five on-campus and one online group). The themes identified in the thematic analysis of these interviews and focus groups provided the basis for the item statements in the scale. Ten items were developed (as provided in Appendix 1), incorporating three attitudinal components: cognitive, affective, and behavioural. For the purposes of this research, the cognitive component is defined as students' beliefs and opinions about online technology for learning, the affective component is defined as students' feelings towards their own ability to use online technology to enhance learning, and the behavioural component is defined as students' intentions with respect to using various elements of the available online learning environment. Some examples of the scale items include 'My lecturers/tutors encourage me to use the [institution name] online technologies' and 'I feel positive about the use of technology to enhance my learning'.

Gender, age, and academic progress (length of time in course) were included in the questionnaire as control variables. The final measurement model included four measures of motivation, and three measures of student engagement. For simplicity, Fig. 2 provides a visual representation of the paths tested for one type of engagement (academic); similar relationship testing occurred for intellectual and online engagement.

Data analysis

Data analysis was conducted in two stages. First, the psychometric properties of construct measures were tested through confirmatory factor analysis (CFA). This was done by examining convergent and discriminant validity, reliability, and overall fit of the measurement model. Once the measurement part of the model was examined, we tested the structural paths and research hypotheses using structural equation modelling (SEM) (Anderson and Gerbing 1988). Here, we followed Hayes' (2009) approach by using the bootstrapping

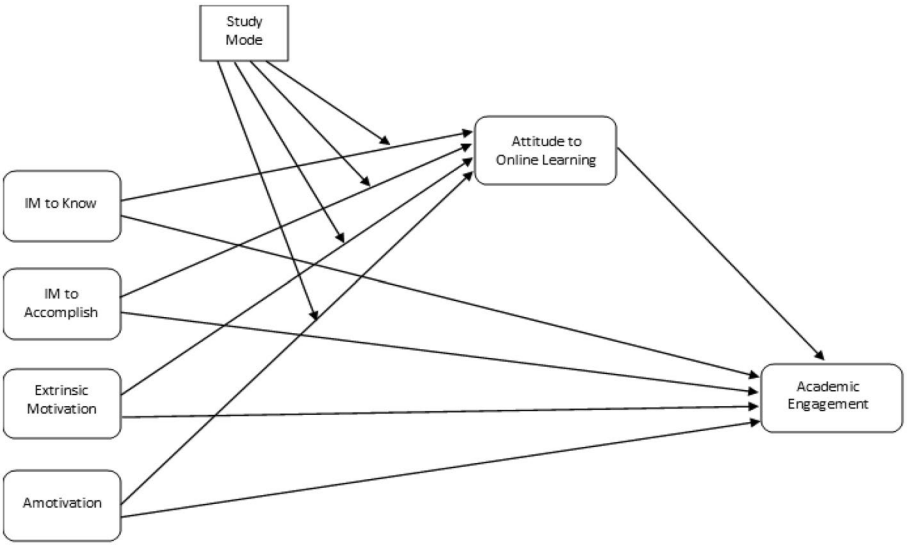

Fig. 2 Tested model for academic engagement

method to test the significance of mediation as well as moderated mediation effects (Preacher et al. 2007). The entire data analysis (including CFA, SEM, and moderated mediation analysis) was conducted using the IBM AMOS 24.0 software package. Where needed, model fit was assessed by reviewing χ^2 value and its significance, normed χ^2(df), standardised root-mean-square residual (SRMR), root-mean-square error of approximation and its confidence interval limits (RMSEA (90% CI), Tuker-Lewis index (TLI), and comparative fit index (CFI). For a model to demonstrate good fit to the sample data the following cut off points are recommended: normed χ^2(df) less than 5.00, and preferably less than 3.00; SRMR and RMSEA values less than 0.06; TLI and CFI values greater than 0.90, or preferably greater than 0.95 (Hu and Bentler 1999).

Results

Measurement model

Following the two-step approach introduced by Anderson and Gerbing (1988), we tested the measurement part of the research model in order to evaluate the model fit as well as the psychometric properties of the study constructs including reliability and factorial validity. First, two alternative CFA models were tested: (a) a second-order three-factor model of attitude comprising cognitive, affective, and behavioural dimensions of attitude and (b) a single first-order factor of attitude measured by attitude to online learning (AOL) in which all items were loaded on a single latent construct. The fit indices suggested that the former model (three-factor model, $\chi^2_{(29)} = 162.251$, SRMR = 0.042, $\text{RMSEA}_{(90\%\ \text{CI})} = 0.090_{(0.076,\ 0.103)}$, TLI = 0.926, CFI = 0.952) had a better fit to sample data than the later model (one factor model, $\chi^2_{(35)} = 929.284$, SRMR = 0.103, $\text{RMSEA}_{(90\%\ \text{CI})} = 0.211_{(0.200,\ 0.223)}$, TLI = 0.589, CFI = 0.681). Additional χ^2 difference test indicated that a second-order factor model of attitude provides a significantly better fit to sample data than the alternative model

($\Delta\chi^2_{(6)} = 767.033$, $p < 0.001$). These results provided support for the hypothesised second-order three factor model of (AOL).

Subsequently, all observed measures (items) were loaded on their respective hypothesised latent factors and the resulting CFA model (including seven first-order constructs together with the second-order construct of AOL) was tested for its fit to the sample data as consistent with Hair et al. (2014). A review of fit indices revealed that the CFA measurement model fit the data well with $\chi^2_{(665)} = 1609.774$, SRMR = 0.053, $\text{RMSEA}_{(90\%\ \text{CI})} = 0.050_{(0.047,\ 0.053)}$, TLI = 0.918, and CFI = 0.927. The results indicate that the items load on their respective a priori constructs.

Once the overall fit of the measurement model was established, we examined reliability as well as convergent and discriminant validity of latent constructs. Table 1 reports means, standard deviations, bivariate correlations, and the composite reliability of the study constructs. Composite reliability values ranged from 0.759 for online engagement to 0.920 for amotivation, all of which surpassing the minimum recommended value of 0.70 (Fornell and Larcker 1981; Hair Jr et al. 2010).

Convergent validity of constructs was examined by reviewing the magnitude and significance factor loadings as well as the average variance extracted (AVE) of the latent constructs. For a construct to demonstrate convergent validity, both factor loadings and the AVE value of the construct should be greater than 0.50 (MacKenzie et al. 2011). A review of the CFA results showed that all measures were significantly loading ($p < 0.001$) on their hypothesised latent constructs with factor loadings ranging from 0.533[1] to 0.963. Apart from online engagement (AVE = 0.433) and affective attitude (AVE = 0.484), all study constructs met the minimum recommended AVE value of 0.50. Given the significance and magnitude of all measures loading on online engagement and affective attitude constructs, we deemed a small departure from an acceptable AVE value as tolerable for both constructs.

The discriminant validity of latent constructs was tested using constrained correlation and combined constructs methods (Gefen 2003). Using χ^2 difference test (Arbuckle 2016), we first compared the original measurement model with a series of nested models in which the estimated correlation between one pair of latent constructs was constrained to 1.00 (i.e., perfect correlation) (Gefen et al. 2011). In the second method, each pair of latent constructs was combined into one, and the resulting nested models (i.e., combined models) were compared against the original measurement model based on the change in χ^2 value. In either method, a significant increase in χ^2 value in constrained nested models is indicative of discriminant validity for the latent constructs (Gefen et al. 2011). In all pair-wise comparisons the difference in χ^2 value was significant at $p < 0.001$, providing evidence of discriminant validity for all study constructs.

Structural model and hypotheses testing

Next, we tested a hypothesised structural model in which motivation factors (i.e., IM to know, amotivation, IM to accomplish, and extrinsic motivation) predicted students' engagement (intellectual, academic, and online) both directly and indirectly via the second-order factor of AOL. The effect of background variables was controlled in the structural model

[1] Only affective attitude → *att8* loading was less than .50 in magnitude. Given the significance of the loading (t value = 12.569, $p < .001$), this loading was deemed as tolerable.

Table 1 Means, standard deviations, correlations, and reliability coefficients of study constructs

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	IM to know	5.660	1.003	(.907)											
2	Amotivation	2.382	1.568	−.129**	(.920)										
3	IM to accomplish	5.348	1.268	.741***	−.057	(.830)									
4	Extrinsic motivation	5.630	1.170	.258***	−.013	.400***	(.860)								
5	Attitude to online learning (AOL)	5.605	.848	.386***	−.190***	.315***	.230***	(.824)							
6	Intellectual engagement	5.522	1.139	.615***	−.366***	.376***	.051	.391***	(.871)						
7	Academic engagement	5.558	1.042	.471***	−.193***	.296***	.072	.361***	.681***	(.810)					
8	Online engagement	5.977	.918	.354***	−.252***	.279***	.088	.627***	.472***	.386***	(.759)				
9	*Age* *(1 =less than 20, to 9 = 65 and over)*	2.680	1.640	.139***	−.173***	−.007	−.304***	.008	.277***	.087	.215***	-			
10	*Gender* *(1 = Male, 2 = Female)*	-	-	.125**	−.132**	.128**	.004	.102*	.098*	.088	.178***	.041	-		
11	*Academic progress*	4.530	2.130	−.061	−.049	−.078	−.016	−.179***	−.048	−.040	−.043	.065	−.040	-	
12	*Residency status* *(1 = Domestic, 2 = International)*	-	-	.126**	.338***	.039	.061	.130**	.050	.057	.004	−.131**	−.050	−.135**	-

Composite reliability coefficients are in parentheses. Control variables are in italic

$n = 574$.

*$p < .050$; *$p < .010$; ***$p < .001$

by drawing direct paths from gender, age, and academic progress to endogenous dependent factors, and co-varying them with exogenous independent constructs. For the purpose of model parsimony, we only retained the paths between the control variables and the main study constructs that were significant. These included the direct paths from age to intellectual engagement ($\beta = 0.126$, $p < 0.001$) and online engagement ($\beta = 0.169$, $p < 0.001$), from gender to online engagement ($\beta = 0.092$, $p < 0.05$), and from academic progress to AOL ($\beta = -0.156$, $p < 0.001$). The goodness-of-fit indices of the structural model indicated that the hypothesised model fit the sample data well: $\chi^2_{(668)} = 1712.480$, SRMR = 0.057, $\text{RMSEA}_{(90\%\ \text{CI})} = 0.055_{(0.049,\ 0.055)}$, TLI = 0.910, and CFI = 0.919. Table 2 reports the magnitude and significance of direct paths along with indirect effects, via AOL, of motivation factors on students' engagement.

Mediation results

A review of indirect effects reported in Table 2 suggested that with the exception of IM to accomplish, AOL is a significant mediator in the relationships between motivation factors and students' engagement. First, partial mediation effects were obtained in the relationships from IM to know to intellectual engagement ($\beta_{\text{Indirect}} = 0.061$, $p < 0.01$), academic engagement ($\beta_{\text{Indirect}} = 0.075$, $p < 0.01$), and online engagement ($\beta_{\text{Indirect}} = 0.178$, $p < 0.01$). The effect sizes varied, being moderate on intellectual and academic engagement, and small for online engagement (Kline, 2005). Despite its significant direct relationship with intellectual ($\beta_{\text{Direct}} = 0.110$, $p < 0.01$) and academic engagement ($\beta_{\text{Direct}} = 0.209$, $p < 0.05$), IM to accomplish did not show a significant relationship with AOL ($\beta_{\text{Direct}} = 0.029$, *ns*). Therefore, no mediation effect was observed between IM to accomplish and engagement factors via AOL.

Full mediation effects were observed in the relationships from extrinsic motivation to academic ($\beta_{\text{Indirect}} = 0.034$, $p < 0.05$) and online engagement ($\beta_{\text{Indirect}} = 0.080$, $p < 0.05$) although the effect sizes are quite small (Kline, 2005). A partial mediation effect was obtained in the path between extrinsic motivation and intellectual engagement ($\beta_{\text{Indirect}} = 0.028$, $p < 0.05$). Lastly, AOL partially mediated the paths from amotivation to intellectual engagement ($\beta_{\text{Indirect}} = -0.029$, $p < 0.01$) and online engagement ($\beta_{\text{Indirect}} = -0.083$, $p < 0.01$); the effect sizes were relatively small in magnitude (Kline, 2005). Despite the non-significant direct relationship between amotivation and academic engagement ($\beta_{\text{Direct}} = -0.083$, *ns*), the bootstrapping results indicated a significant indirect effect between these two constructs ($\beta_{\text{Indirect}} = -0.035$, $p < 0.05$). Consequently, hypothesis 1 is partially supported, except for IM to accomplish which was not significantly related to AOL.

Moderated mediation results

In order to assess the moderated effect of study mode on the strength of mediated relationships in the research model, we examined four conditions (Hayes 2013; Preacher et al. 2007): (a) significant effects of motivation factors on students' engagement in the academic environment; (b) significant effects of motivation factors on AOL; (c) significant difference between on-campus and online sub-samples with regard to the relationships between motivation factors and students' engagement (moderation effect); and (d) different conditional indirect effect of motivation factors on engagement, via AOL, across on-campus and online sub-samples. The last condition, which is the main premise of moderated mediation,

Table 2 Decomposition of effects of the independent variables in the hypothesised mediation model

Independent Variables	Dependent Variable(s)												
	Attitude to online learning			Intellectual engagement			Academic engagement			Online engagement			
	Direct	Indirect	Total	Direct	Indirect (95% CI)	Total	Direct	Indirect (95% CI)	Total	Direct	Indirect (95% CI)	Total	
IM to know	.307***	-	.307***	.699***	.061** (.024, .140)	0.760***	.562***	.075** (.033, .154)	.637***	.150**	.178** (.079, .309)	.328**	
Amotivation	−.143*	-	−.143*	−.242***	−.029** (−.069, −.006)	−.271***	−.083	−.035* (−.077, −.008)	−.118*	−.130**	−.083* (−.151, −.021)	−.213***	
IM to accomplish	.029	-	.029	.110**	.006 (−.031, .062)	.116**	.209*	.007 (−.038, .074)	.217**	.000	.017 (−.101, .142)	.017	
Extrinsic motivation	.138*	-	.138*	.190**	.028* (.005, .071)	.219**	.054	.034* (.007, .081)	.088*	.089	.080* (.014, .163)	.170*	
AOL	-	-	-	.200***	-	0.200***	.245***	-	.245***	.581***	-	.581***	
R^2	0.207			.341			.561			.477			

The effect of background variables is controlled for prior to calculating estimates. Values in the table are standardised regression coefficients. Indirect and total effects were calculated via bootstrapping procedure (with bias-corrected standard errors) using 2000 random draws

$n = 574$.

*$p < .050$; *$p < .010$; ***$p < .001$

establishes whether the strength of the mediation via AOL differs across on-campus and online student cohorts (Edwards and Lambert 2007; Ng et al. 2008; Preacher et al. 2007).

The results of the mediation analysis demonstrated that, except for IM to accomplish, all motivation factors were significantly related to students' engagement factors either directly or indirectly via AOL (see Table 2). Thus, IM to know, amotivation, and extrinsic motivation met Condition 1 and 2 for moderated mediation. To test for Condition 3, we conducted a multi-group analysis to find out whether the structural relationships significantly differ between on-campus and online students, i.e., moderating effect of study mode. We applied multi-group analysis, instead of using product (interaction) term approach, in order to test for moderation effect because the moderator variable in this study is categorical (nominal) in nature—see Plewa et al. (2015) for similar application of multi-group analysis in education research.

We conducted multi-group analysis by first testing for the measurement model invariance. The non-significant results of χ^2 difference test ($\Delta\chi^2_{(26)} = 36.146$, *ns*) indicated that the measurement part of the research model operates equally across both sub-samples.[2] Once the measurement invariance was established, we proceeded with a structural invariance test. Imposing equality constraints on the structural part of the model significantly increased the χ^2 value ($\Delta\chi^2_{(21)} = 50.721$, $p < 0.001$), leading us to conclude that structural paths operate differently across on-campus and online sub-groups. The results of multi-group analysis are reported in Table 3.

Table 3 shows that a significant difference exists between on-campus and online sub-samples in the relationships from IM to know to intellectual and academic engagement on the one hand, and the paths from amotivation to AOL, intellectual and online engagement on the other. Hence, Condition 3 was satisfied for both IM to know and amotivation, as their respective paths demonstrated significant differences across the two sub-samples (i.e., multi-group moderation). Overall, the results based on the first three conditions indicate that study mode could moderate the mediation for IM to know and amotivation factors.

To further validate the effect of moderated mediation, we examined Condition 4 which requires the magnitude of the conditional indirect effects of IM to know and amotivation via AOL to be different across on-campus and online sub-groups. Again, bootstrapping method with 2000 iterations were used to compute standard errors and critical ratio for conditional indirect effects (Preacher et al. 2007). Table 4 presents standardised estimates, standard errors, and critical ratio of conditional indirect effects from IM to know, amotivation, IM to accomplish, and extrinsic motivation across on-campus and online sub-groups.

As shown in Table 4, only the conditional indirect effect of amotivation on engagement factors was stronger and significant for online students ($\beta_{\text{intellectual}} = -0.047$, $p < 0.01$; $\beta_{\text{academic}} = -0.064$, $p < 0.01$; $\beta_{\text{online}} = -0.146$, $p < 0.001$) but were weaker and non-significant for on-campus students ($\beta_{\text{intellectual}} = -0.016$, *ns*; $\beta_{\text{academic}} = -0.022$, *ns*; $\beta_{\text{online}} = -0.051$, *ns*). Results also indicated that there was no moderated mediation for IM to know with study mode, because the conditional indirect effects for both on-campus and online sub-groups were significant and were not different from each other (on-campus: $\beta_{\text{intellectual}} = 0.043$, $p < 0.01$; $\beta_{\text{academic}} = 0.059$, $p < 0.01$; $\beta_{\text{online}} = 0.138$, $p < 0.01$; online: $\beta_{\text{intellectual}} = 0.051$, $p < 0.01$; $\beta_{\text{academic}} = 0.069$, $p < 0.01$; $\beta_{\text{online}} = 0.156$, $p < 0.01$). The analysis further supported our observation that there was no moderated mediation for either IM to accomplish or extrinsic motivation as the difference in conditional indirect effects between

[2] Goodness-of-fit statistics for tests of multi-group analysis and invariance tests can be provided. Please contact authors.

Table 3 $\Delta\chi^2$ test for invariance of structural direct paths across study mode sub-groups

Independent variables	Dependent variable(s)																			
	Attitude to online learning				$\Delta\chi^2$ $_{(\Delta df = 1)}$	Intellectual engagement				$\Delta\chi^2$ $_{(\Delta df = 1)}$	Academic engagement				$\Delta\chi^2$ $_{(\Delta df = 1)}$	Online engagement				$\Delta\chi^2$ $_{(\Delta df = 1)}$
	On-campus		Online			On-campus		Online			On-campus		Online			On-campus		Online		
	β	CR	β	CR		β	CR	β	CR		β	CR	β	CR		β	CR	β	CR	
IM to know	.386***	3.590	.130	1.040	3.576	.746***	8.104	.544***	5.473	5.627*	.657***	6.404	.296*	2.292	6.644**	.150	1.508	.013	.105	1.085
Amotivation	−.081	−1.451	−.312***	−3.646	6.455*	−.222***	−4.964	−.345***	−5.052	4.457*	−.080	−1.617	−.230*	−2.542	2.802	−.064	−1.233	−.330***	−3.797	7.804**
IM to accomplish	−.057	−.475	.184	1.480	1.680	−.206*	−2.185	−.046	−.484	1.679	−.240*	−2.259	−.073	−.570	1.245	.014	.129	.181	1.51	.679
Extrinsic motivation	.139	1.898	.184	2.265	.003	−.061	−1.065	−.158*	−2.511	.695	.018	.272	−.190*	−2.227	3.199	−.054	−.798	−.023	−.292	.181
AOL	-	-	-	-	-	.182***	3.317	.120	1.608	.382	.244***	3.864	.155	1.538	.403	.613***	7.557	.396***	3.715	3.561
R^2	0.179		0.264			.541		.572			.422		.242			.475		.461		

Values in the table are standardised regression coefficients (β). For the final moderated structural model, the $\chi^2 = 2647.221$, df = 1378, normed chi-square = 1.921, RMR = .138, SRMR = .065, $RMSEA_{(90\%\ CI)} = .040_{(.038,\ .042)}$, NFI = .819, TLI = .896, and CFI = .903

$n_{\text{on-campus}} = 386$, $n_{\text{online}} = 188$.

*$p < 0.050$; *$p < 0.010$; ***$p < 0.001$

Table 4 Moderated mediation results for intellectual, academic, and online engagement across on-campus and online students

Independent variable(s)	Multigroup moderator	Intellectual engagement			Academic engagement			Online engagement		
		Conditional indirect effect	SE	CR	Conditional indirect effect	SE	CR	Conditional indirect effect	SE	CR
IM to know	On-campus	.043**	.020	2.150	.059**	.023	2.565	.138**	.054	2.556
	Online	.051**	.025	2.040	.069**	.027	2.556	.156**	.060	2.600
Amotivation	On-campus	−.016	.013	−1.231	−.022	.017	−1.294	−.051	.037	−1.378
	Online	−.047**	.025	−1.880	−.064**	.032	−2.000	−.146***	.056	−2.607
IM to accomplish	On-campus	.010*	.017	.588	.014	.023	.609	.032	.057	.561
	Online	.012*	.021	.571	.017	.028	.607	.038	.066	.576
Extrinsic motivation	On-campus	.024*	.013	1.846	.033**	.016	2.063	.078**	.033	2.364
	Online	.030*	.016	1.875	.041**	.019	2.158	.092**	.038	2.421

Conditional indirect effects are completely standardised. Conditional indirect effects were calculated via bootstrapping procedure (with bias-corrected standard errors) using 2000 random draws. AMOS does not report CR values from bootstrapping. CRs were calculated by dividing indirect effects from standard errors

$n_{\text{on-campus}} = 386$, $n_{\text{online}} = 188$.

$^{*}p < 0.050$; $^{*}p < 0.010$; $^{***}p < 0.001$

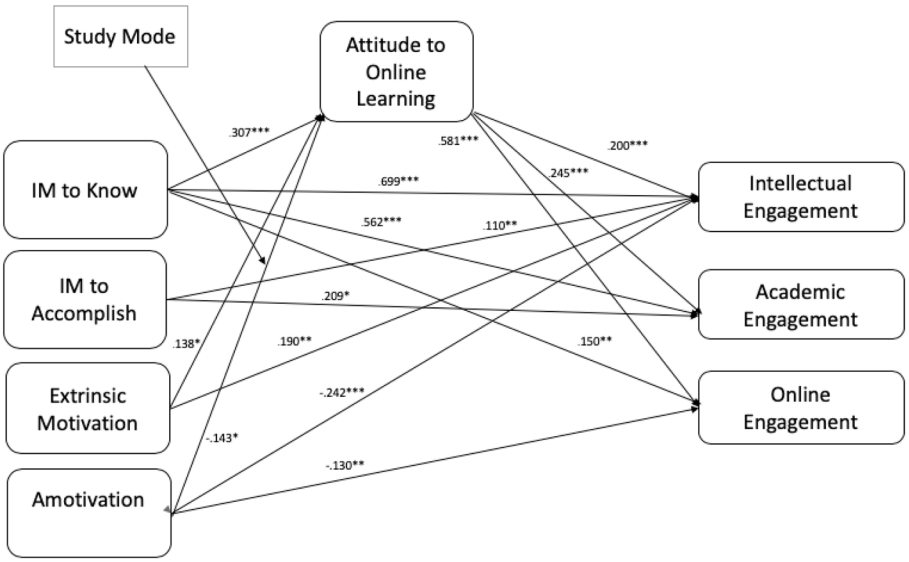

Fig. 3 Significant paths in the full model (standardised regression weights of direct effects) $N = 574$, $^{*}p < 0.050$; $^{**}p < 0.010$; $^{***}p < 0.001$

on-campus and online sub-samples was only trivial. Taken together, these results provided partial support for Hypothesis 2. Figure 3 provides a visual model of all significant paths as derived from this research.

Discussion

Students' attitude to online learning was found to have a mediating role in several of the relationships tested. As blended learning delivery continues to grow in the higher education environment, in addition to the range of courses delivered solely online, it is timely to consider the meaning and implications of attitude to online learning in relation to student motivation and engagement.

A positive attitude towards online learning was found to partially mediate the relationships of both intrinsic motivation to know and extrinsic motivation with each of the engagement constructs. Individuals with high *intrinsic motivation to know* gain pleasure and satisfaction from learning or trying to understand something new (Vallerand et al. 1992). They have an inherent curiosity for new knowledge and ideas (Ryan and Deci, 2020). The mediation effect of attitude to online learning to the relationship of intrinsic motivation to know with all three forms of engagement suggests that this curiosity also extends to 'new' ways of learning, with those students seeing the online learning environment as an opportunity for new forms of content and experience. In contrast, students with high *extrinsic motivation* are driven to engage with learning activities as a 'means to an end' rather than for the sake of gaining new knowledge (Vallerand et al. 1992). The various mediation effects for the relationships between extrinsic motivation and the three forms of engagement studied (particularly the full mediation effect for academic and online

engagement) would suggest that extrinsically motivated students with a positive attitude to online learning see the potential for online learning systems to assist their completion of necessary study tasks. This could be via a repository of resources to assist in assessment completion or the potential for quick responses to queries via online forums with teachers and other students.

Despite the findings in relation to intrinsic motivation to know, attitude to online learning did not mediate the relationship between intrinsic motivation to accomplish and student engagement. For individuals with high intrinsic motivation to accomplish, pleasure is derived from the sense of accomplishment in achieving mastery of new knowledge or skills rather than the particular object learned (Vallerand et al. 1992). Thus, it would appear that feelings towards learning in an online environment (whether positive or negative) do not play a role in students' decision to engage for the purposes of a sense of accomplishment.

Attitude to online learning had a partial and negative mediation effect on the relationships between *amotivation* and all three forms of engagement. In addition, these were the only relationships where moderated mediation for study mode was found, specifically, the negative mediation effect of attitude to online learning was stronger and significant for online students. With amotivation representing the absence of both intrinsic and extrinsic motivators, it has been argued that individuals who are amotivated are unable to identify the connection between their own actions and learning outcomes, and may feel a lack of control or even incompetence (Vallerand et al. 1992). With the finding that a negative attitude to online learning further decreases the likelihood of student engagement, it may be that these students view online learning as yet another 'issue' they need to deal with. This suggestion is supported by the finding of study mode as a moderated mediator in the relationships between amotivation and engagement. The higher average age of the online cohort, and the related likelihood of increased family and work commitments (as previously discussed), may contribute to negative attitudes towards online learning—and the 'added burden' this imposes—despite choosing this mode of study over on-campus. Amotivation is, of course, a difficult issue for educators and students, and would point to the need for a multi-faceted response that is beyond the scope of the current discussion. However, as we next discuss, working to find ways to increase students' positive attitude to online learning is a valuable contribution to student engagement.

There are several implications that arise from this study. First, given the identified role of students' attitudes to online learning in relation to engagement, there is a need for educators to give greater attention to increasing positive attitudes. The two broad domains associated with attitude formation are personal experience, and social influences or norms. Existing literature on ways to promote student retention and success recognises the importance of developing positive social norms in relation to traditional forms of teaching in higher education, including creating a supportive classroom environment and actively managing participation of all students (Booth-Butterfield et al. 1992; Tanner 2013). In a similar way, educators' words and actions about and within online learning environments play a key role in 'normalising' this mode of delivery. One example would be educator skills and comfort in the use of online technology. Indeed, showing a comfort level with less-than-perfect technological skills can also have a normative effect in relation to online learning, as evidenced by the humorous embracing of 'Zoom fails' associated with the necessarily rapid adoption of online teaching for the first time by many educators and institutions during the 2020 global pandemic environment (Plante 2020). Another example, within the context of blended delivery, would be how educators positively reinforce the interconnectedness of the different delivery formats rather than (consciously or unconsciously) presenting the

online environment as 'over there' and a poor second (Ellis and Bliuc 2019) to on-campus delivery.

Of course, such norms cannot arise in isolation. The term 'norm' itself indicates that individual behaviours need to be supported by a culture within a higher education institution that values and supports online learning. For example, do the institution's teaching faculty have the requisite capabilities, qualifications, and experience to effectively drive the online student learning experience? Gray and DiLorento (2016) argue that teachers need the requisite expertise in order to develop something meaningful; higher education institutions should invest in learning designers for this purpose if their teaching faculty do not meet these requirements. Further to this, given the significance of instructor presence and timely feedback in this collaborative online learning model seemingly required, institutions and teaching staff alike need to give serious consideration to the staffing resource and the time commitments of teaching staff to ensure students are satisfied with the online learning experience and develop positive attitudes to online learning as a result. Many institutions have failed to understand the unique requirements of online education delivery in contrast to the traditional on-campus model as they have transitioned from one to the other, and have equated the two in terms of how it is delivered and the time staff require to do so effectively. This approach seemingly needs to be revisited, along with the skill set required of teaching faculty, and the investment required of the institution to ensure teaching staff develop the required capabilities and expertise.

In relation to attitude formation from direct experience, it is evident that even a commencing student will already have begun to shape beliefs about online learning, whether through past educational experiences, the application process, or the use of online formats more generally. Nevertheless, each point of contact online adds to that experience and provides opportunity to challenge negative beliefs and feelings. Indeed, the need for educators to consider the different forms of student engagement within an online learning environment was reinforced by this study's findings, specifically in relation to academic, intellectual and online engagement.

With *academic* engagement relating to students' engagement with course-specific learning activities as well as broader academic opportunities, the need for both engaging design and careful curation of resources is highlighted. The online environment provides educators opportunity to improve the relevancy of learning activities via real-time updating of current events during a teaching period, or through drawing on students' personal and meaningful daily experiences (Purnomo et al. 2019), especially amongst the mature-aged students who can draw on their life and industry experiences to enhance the learning experience. In addition, one of the exploitable strengths of an online learning environment is the ability to hyperlink to various resources students will need for their learning activities, including those in other areas of the institution. Curation of resources relating to assessment tasks (such as online readings, guides to searching journal databases, and other academic guidance) in an easily accessible manner is particularly key for extrinsically motivated and/or time-poor students.

Online learning environments, whether used as the sole form of learning delivery or as part of a blended approach, also open up avenues of opportunities to enhance *intellectual* engagement of students. First, as discussed above, a wider range of resources can be provided, both core to the topic being studied and extension options for greater cognitive and analytical challenge (Annansingh 2019). Indeed, having these optional activities online, as opposed to requiring a formal 'opt-in' in on-campus delivery, may provide some students a more comfortable environment to personally engage and explore. Second, the use of online technology invites novel ways to stimulate student discovery, such as gamification

(Sailer and Sailer 2020), augmented reality (Marcel 2019), and virtual reality (Radianti et al 2020).

The discrete nature of *online* engagement highlights the importance of not only the utilisation of online resources but how the online environment is used for student communication and interaction with the educator, fellow students and the broader educational community. Similar to teaching methods that identify different ways interaction and collaboration in learning can be encouraged among diverse students in a face-to-face classroom (Sims and Sims 1995; Wlodkowski and Ginsberg 1995), it is important to consider how to provide a safe and welcoming environment that offers a range of opportunities for students to connect (Martin and Bolliger 2018). Some examples are establishing etiquette or protocols for online interaction, modelling by educators of thoughtful (and thought-provoking) contributions to discussion forums, and skilfully using small group areas (such as break-out rooms in online teaching platforms) to provide opportunities for all students to ask and answer questions.

This discussion has looked at a range of opportunities connected to the various forms of both motivation and engagement, but this diversity in students' wants and needs can also be limiting. For example, how can an educator balance the seemingly competing demands of easily accessible (and potentially standardised) presentation of key learning materials with provision of variety and novelty? Such concerns again point to the imperative of a whole-institution approach to incorporating online technologies into delivery of student learning. A strong information technology infrastructure is crucial, including accessible technical support, sufficient bandwidth and storage capabilities, and a learning management system that enables student individualisation and personalisation (Davis et al. 2008; Demski 2012). There is potential for substantially enhanced student engagement and learning through various sections of the educational institution working together.

Limitations and future research

As consistent with studies of this nature, the cross-sectional approach of the data collection would be deemed a limitation; however, the results have provided valuable preliminary insights with relatively few studies examining this conceptual model to date. Future research could examine these variables using a time series approach, or a more longitudinal approach, tracking students through their experience at university. Further extension of the current research could consider additional aspects within self-determination theory, such as the role of students' psychological needs in self-regulated motivation (Hsu et al. 2019) and continuing nuanced consideration of both intrinsic and extrinsic motivation. In addition, we would encourage research within educational institutions with a shorter or fragmented track-record of online learning delivery to discover how this affects the various mediation pathways.

Whilst our discussion has highlighted a number of ways in which educators' might seek to increase students' positive attitude towards learning, the findings point to the need for more research on how this particular attitude is formed. For example, there is some research to suggest that gender will impact on motivational factors and engagement in online learning environments (Bolliger and Halupa 2018; Ong and Lai 2006; Wong and Fong 2014). Most findings suggest that females have higher engagement in online learning than their male counterparts; could attitude to online learning play a role? Gender effect

was beyond the scope of the current study, but this and other demographic attributes may be shown as important factors in future research.

Conclusion

Irrespective of its prominence in relation to other forms of delivery, the use of online technology in higher education learning is here to stay. Similar to face-to-face interactions and physical classrooms, student motivation and engagement online is crucial to their learning. Whilst this study presented mixed results, it identified the significant role of student attitude to online learning in a number of motivation-engagement pathways. Both individual- and institutional-level contributions are required to cultivate positive experiences for students within online learning environments and usage of online learning tools in order to improve their attitudes to online learning.

Appendix

Table 5 Attitude to online learning scale (AOLS)

1	My Lecturers/Tutors encourage me to use the [institution name] online technologies
2	I feel that using the online technologies is the best way for me to get assistance from my Lecturers/Tutors
3	I believe my Lecturers/Tutors are positive about the use of technology in teaching
4	I believe my Lecturers/Tutors are skilled in their use of technology in teaching
5	I feel that using the online technologies is the best way for me to interact with my Lecturers/Tutors
6	I feel that using the online technologies is the best way for me to interact with other students
7	I believe that my fellow students are positive about the use of technology in their learning
8	I believe that my fellow students are competent in the use of technology in their learning
9	I feel positive about the use of technology to enhance my learning
10	I feel competent to use technology to enhance my learning

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