

# Online or On-Site, Does It Matter? Behavioural and Cognitive Engagement with Large Groups of Students

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**Abstract.** The rise of videoconference lectures has sparked concerns about their potential negative impact on college and university student engagement. In this study, we review prior research on engagement, focusing on its behavioral and cognitive dimensions, which we investigate empirically using a novel methodology. Our analysis centers on active-learning approaches in large-group teaching settings. Contrary to concerns about potential harm, our findings reveal no evidence supporting the alleged detrimental effects. On the contrary, our results indicate that neither behavioral engagement nor course cognitive engagement is higher for in-class students, and levels of engagement may even be greater with virtual live lectures. If taken at face value, these findings carry significant pedagogical and policy implications.

**Keywords:** online learning, in-class learning, behavioural engagement, cognitive engagement.

## 1. Introduction

Research shows that learners in online settings often face challenges such as higher attrition rates, lower academic performance, and reduced overall success and progress. Specifically, university students in online environments tend to perform worse academically than their in-person counterparts and exhibit lower retention and degree completion rates (Cavinato et al., 2021; Francescucci & Rohani, 2019; Whalen, 2020; Yang & Ghislandi, 2024). A key factor contributing to this underperformance is likely a lack of student engagement, as more engaged students are generally more successful learners (Chi, 2009; Martin & Borup, 2022). This issue is especially pronounced within large groups, which pose additional challenges for fostering engagement, particularly in online settings where meaningful interaction is often difficult to achieve (Agogue and Robinson 2021; Wurdinger & Allison 2017). Furthermore, higher-education institutions

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frequently rely on lectures as the primary teaching method in large-class environments (Lund, Dean & Wright, 2017), a practice that may be exacerbated in online formats (Agogue & Robinson 2021; Wurdinger & Allison 2017).

Accordingly, matters of student engagement during lectures is of critical interest for business administration, management and finance university programs, given their traditionally large cohorts. In particular, an understanding of how engagement in online lectures compares to their in-class counterpart, especially if we consider the lower costs of the former, becomes paramount. Such a comparison is even more relevant in the wake of the COVID-19 pandemic. We observe that higher-education institutions worldwide removed their in-classroom teaching during that period and many chose to simply replace face-to-face lectures with live sessions online. Hence, a different breed of online learning has proliferated, where synchronous interaction is present to the same degree of a conventional course. This is in strong contrast to how such online learning was often implemented earlier, with such learning taking place in a largely asynchronous way. Also, before the pandemic most standard teaching had already embraced digital platforms for the delivery of course material. Hence, the only distinguishable feature of the dichotomy when this new format is considered, is that the online student sits behind a screen to attend the lectures, whereas their counterpart sits in a classroom in the company of a teacher and peers. We observe that this practice has continued after the pandemic and a challenge remains for business administration programs to leverage quality interaction and learning for students in online learning settings (Estelami & Bezzone, 2022).

To date, there is a lack of robust empirical evidence to support the negative and positive claims about student engagement in large class online contexts (Venn et al., 2023). While recent work suggests that online learning facilitates students' cognitive, behavioural and emotional engagement (Yang & Ghislandi, 2024), we argue it falls short of comparing different modalities of teaching, namely on-site and online, a comparison that we consider necessary to determine if the latter can deliver teaching that is, at least, on par with the former. The goal of this paper is to put the above claims to the test by examining the afore mentioned modalities of teaching with a novel methodology for the levels of engagement, properly defined and proxied for, under both on-campus and on-site lectures.

This paper is structured as follows: First, we review a selection of research on engagement, with a particular focus on recent studies relevant to learning in business education contexts. Next, we outline our research model and hypotheses, followed by a description of the teaching implementation, highlighting how it unfolds in both classroom and online settings. We then present a detailed discussion of our methodology, data, and empirical approach. The results section follows, where we share our empirical findings and analysis of their possible drivers, and the final section provides a discussion of these results along with our conclusions.

## **2. Previous Research on the Measurement of Engagement**

Previously a number of studies demonstrate a relationship between engagement and motivation (Mohamed & Alsayed, 2021; Reeve & Woogul, 2014). Engagement in learning activities is thought to facilitate students' learning as they are less likely to mind wander and can be more active in processing material (Jing, Szpunar & Schacter, 2016). Substantial efforts have been devoted to the categorization of engagement, and several proxies for engagement have been identified, See Henrie et al. (2015) for a comprehensive review. such as emotions, motivation and self-regulation (Christie et al., 2008; Mann, 2001; Marks, 2000; Reschly and Christenson, 2012). Research shows positive relationships between engagement and academic success (Heaslip, Donovan, & Cullen (2014) Ketonon et al., 2016; Phan et al., 2016; Vytasek et al., 2020). Some scholars emphasize engagement's short-run dimension accentuating measurable aspects like participation (Kuh et al., 2007). It is thus no surprise that contributions aimed at developing empirical measures of engagement have mostly relied on definitions with the above short-run dimension in mind. Gleason (2012) measures engagement by using homework completion percentages whereas Stewart et al. (2011) use attendance as a proxy, while Hayden et al. (2011) examine "non-engagement" and informally record proportion of students displaying persistent lack of attention or disruption. Wise et al. (2013) and Giesbers et al. (2014) target posts to online discussions. These earlier works inspired our novel methodology.

However, according to Henrie et al. (2015) studies examining engagement collect data in a range of different ways but most predominantly through self-reported questionnaires and qualitatively through interviews. Fewer studies examine students' performance on academic learning tasks as a way to measure their levels of engagement. Price et al. (2007) and Exeter et al. (2010) which, although relying on self-reported data or interviews, focus on immediate aspects of learning. A common target of all these studies is online teaching or outside-classroom activities. Our approach shares with them an empirical orientation but it concentrates on engagement during live lectures for large groups and it uses observational rather than self-reported data. Elsewhere, measuring engagement in learning has relied on definitions of engagement based on distraction and use of technology to record body movements and face orientation (Raca and Dillenbourg, 2013). Other contributions understand engagement as absence of mind wandering (Smallwood & Schooler, 2006). For example, Risko et al. (2011) record students' self-reported states of mind wandering at different times of the viewing of a video lecture. Wilson and Korn (2007) review the literature documenting short attention spans within lectures but warn about the weakness of this evidence. Still, decline in engagement as a function of time seems to be a well-established result.

Building on a long tradition of engagement research from both a psychological and educational technology perspectives (Fredricks et al., 2004),

Martin and Borup (2022) further distinguish three different forms of engagement *cognitive, behavioural, affective*, acknowledging that while it is meaningful to define them as separate entities, the three dimensions overlap when students engage in learning. We acknowledge that the different dimensions of engagement co-occur and that when measuring one construct (cognitive, behavioural or affective engagement) the other dimensions may also contribute (Barlow et al., 2020; Pepple, 2022) and together play a role when students engage in learning. These dimensions have been studied previously in business learning, albeit with a focus on simulations (Kulkarni & Sivaraman, 2022). They suggest simulation games lead to enhanced learning through both cognitive and behavioural as well as emotional engagement (Buil & Catalán, 2020). Similarly Lee et al. (2021) identify that behavioural engagement through simulated games lead to better performance (Lee et al., 2021). Behavioural and cognitive engagement can be targeted through different stimuli where elements of gamification lead to enhanced performance (Xiao & Hew, 2023). It is also suggested that collaboration with other students plays a role (Martin & Borup, 2022), but we do not examine directly this aspect in this study although it may help understanding our results.

In summary, this review presents three important lessons which give support to our empirical efforts. The first one emphasizes the importance of engagement as a path to learning (Chi, 2009; Ketonon et al., 2016; Phan et al., 2016; Vytasek et al., 2020). Secondly, we note that the current model of measuring student engagement in online learning is predominantly done through self-reported means (Henrie et al., 2015), and finally, we establish that we can operationalize engagement as having cognitive, behavioural and affective dimensions (Martin & Borup, 2022; Pepple, 2022).

### **3. Research Model and Hypotheses**

This study uses a quasi-experimental design. Inspired by Gleason (2012) we identify performance as a proxy for cognitive and behavioural engagement and we compare in-class student performance with that of students in online settings. Two important points should be made before we present the arguments of this section. First, given that we examine a course where the difference between online teaching and classroom teaching is only meaningful when it comes to lecture implementation, the focus here is on tasks which are to be completed during such lectures. Second, it will be fruitful for our purposes to conjure a stricter interpretation of the concepts under evaluation. This is a necessary step since most conceptualizations around student engagement have not been constrained by the feasibility of their mapping into empirical data. In doing so and as already anticipated, we will leave aside affective engagement. In addition, we emphasize an interpretation of behavioural and cognitive engagement closely