Introduction

Student emotions are a constant in learning environments and play a vital role in the learning process (Pekrun, 1992). Both positive and negative emotions can affect student outcomes, like their attention, cognitive processes, and sense of belonging in the classroom (Respondek et al., 2017). Positive emotions, such as curiosity, excitement, and joy increase students' engagement with curricular material and their motivation to learn (Titsworth et al., 2013). On the other hand, negative emotions like boredom, shame, and anxiety can decrease student engagement, sense of belonging, and overall academic performance (Mazer et al., 2014; Pekrun & Stephens, 2010).

One emotion that is especially relevant in undergraduate learning environments is *anxiety*, a feeling of worry or nervousness about prospective future events (Pekrun, 2006). Undergraduate students frequently report experiencing significant anxiety in their courses, a concerning trend as elevated anxiety levels are frequently associated with decreased student performance and persistence (Akgun and Ciarrochi, 2003; Authors, 2017; 2019; Center for Collegiate Mental Health, 2021;). As such, a better understanding of student anxiety and its impacts may facilitate improvements in undergraduates' academic success and retention.

Facilitating student success and retention is especially relevant within introductory courses, such as introductory Biology. These courses are not only taken by a large proportion of undergraduate students but are also prerequisites for entry into many Science, Engineering, Technology, and Mathematics (STEM) careers (AAAS, 2011). Despite this, fewer than 40% of undergraduates who initially intend to major in STEM fields complete a degree in these areas (PCAST, 2012; Hurtado et al., 2012). Introductory courses, including Biology, significantly contribute to student attrition (Rask, 2010; Fiorini et al., 2023), and students who encounter negative emotional experiences in these courses are more likely to leave STEM majors (Authors 2017; 2019; Witt et al., 2014). In particular, students in introductory Biology courses often face high levels of anxiety, adversely affecting their academic performance and experience (Ballen et al., 2017; Authors, 2021a). Given this, studying anxiety is important as a potential factor in student retention in Biology.

Student anxiety and other emotional experiences in the classroom have been measured in a variety of ways. Historically, one common approach to studying student anxiety has been to use *dual-time-point surveys* (i.e., pre-post surveys), which ask participants to report their emotional state before and after an event of interest, such as a semester of a class (Authors, 2019) or even the COVID-19 global pandemic (Fruehwirth, et al., 2021). Pre-post survey methods are extremely common within disciplinary education research (Pike, 2007), although they have several limitations, especially related to studying emotional experiences, including temporal undersampling, recall bias, and time cost, among others (Zurbriggen et al., 2021; Molsa et al., 2022). For example, it may be that student anxiety increases as exam dates approach, but because of the nature of pre-post survey methods, this variation in emotion may not be adequately captured (i.e., temporal undersampling), or students may be unable to accurately recall these feelings by the next survey event (i.e., recall bias). Thus, while it is imperative for researchers to better understand students' emotional experiences in these courses, the prevailing methods for measuring student anxiety may not fully capture the details necessary to meaningfully address students' experiences.

One methodological answer to the limitations of pre-post surveys is the use of intensive longitudinal methods, where participants are repeatedly surveyed over a specified time period (Bolger & Laurenceau, 2013). One of the most commonly used intensive longitudinal method in