



# Real-time motivation and engagement during a month at school: Every moment of every day for every student matters<sup>☆</sup>



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## ABSTRACT

This study collected intensive intra-individual real-time longitudinal motivation and engagement data using mobile electronic devices for one month. A four-level model consisted of within-day ratings at the first level (3 ratings per day), between-day ratings at the second level (5 days per week), between-week ratings at the third level (4 weeks), and between-student ratings at the fourth level (60 possible time points per student). After controlling for socio-demographics and prior achievement, multilevel modeling showed substantial within-day (intra-individual) variability in motivation and engagement ( $M = 23\%$ ) and substantial between-student variability ( $M = 67\%$ ). There was not so much variability between days ( $M = 3\%$ ) – and not so much between weeks ( $M = 6\%$ ). Linear and non-linear (quadratic) effects through the day, week, and month were predominantly non-significant. It is concluded that for optimal motivation and engagement to occur and be sustained, every moment of every day for every student matters.

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## 1. Introduction

What is the pattern of student motivation and engagement over the course of a day, a week or a month at school? Is there more or less variation in motivation and engagement within a day than between days and weeks? How do patterns of variation for motivation and engagement within and across days and weeks compare with patterns of variation for non-academic factors (e.g., self-esteem, life satisfaction)? Are there particular points in a day, week or month where educational practice is best directed to enhance student motivation and engagement? What conceptual, operational and methodological lessons can be learnt from 'real-time' intensive longitudinal motivation and engagement research? In this study, we address these questions using mobile technology to collect intensive real-time multidimensional motivation and engagement data, with three data collections per day, every school day, across four school weeks. Whereas the bulk of quantitative motivation and engagement research is typically focused on large samples at one point in time, the present study inverts this approach through its focus on intensive intra-day assessment.

While studies in personality and psychiatry have for some time focused on intra-individual variability such as in mood (e.g., Eid & Diener, 1999) and emotions (e.g., Trull et al., 2008), psycho-educational researchers tend to know less about intra-individual ebbs and flows of engagement and motivation. Indeed, knowledge about motivation and engagement variation within and between days would enhance our knowledge on important constructs in educational psychology. Empirical attention to intra-individual variability follows Cattell's (1952) early calls for focus on occasions within persons and Molenaar's (2004) more recent calls to return the focus to the individual in psychology. Similar to the approach of investigating (in)stability of personality traits from day to day (Hamaker, Nesselrode, & Molenaar, 2007), we investigated the within daily and between daily patterns of motivation and engagement factors. In our ecological momentary assessment study we have uniquely collected an average of 38 longitudinal responses from each of 20 case studies of high school students.

## 2. Theoretical perspectives on intra- and inter-individual educational phenomena

### 2.1. Child development and transactional approaches

Following Vygotsky (1978), there has been substantial recognition of the interaction and reciprocity between individual and environment that undergirds the importance of examining how an individual may

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vary from situation to situation and context to context. Subsequently, contemporary theories of child development have recognized the interplay of individual and environment and with some recognition of multilevel (situated) considerations that can explore intra-individual variability (Shonkoff & Phillips, 2000). Thus, “no two children share the same environment, and no environment is experienced in exactly the same way by two different children” (Shonkoff & Phillips, 2000, p. 24). That is, although sharing the same educational environment, each student experiences a distinct reality that gives rise to the need to look closely at student factors that are relevant to educational development. Furthermore, because environment does interact with the individual to shape responses, there is likely to be intra-individual variability that responds to the different stimuli occurring in every school day.

The transactional model also emphasizes the dynamic interplay between individual and environment shaping intra-individual changes over time (Sameroff, 2009). The transactional model has intra- and inter-individual heterogeneity as a foundation, with individual development seen in terms of a set of possibilities depending on how the individual and the environment dynamically transact. Indeed, because of the dynamic transactions between the individual and environment, “the transactional model emphasizes discontinuities” (Sameroff, 2009, p. 17) – a hallmark of intra- and inter-individual variance and heterogeneity. Thus, transactional approaches are founded on inherent heterogeneity that is a function of the dynamic interplay of person and environment. Through individual differences in psycho-educational phenomena and in the way the academic environment is received and experienced by the individual, there is a transactional rationale for predicting intra- and inter-student variation in motivation and engagement.

Transactional emphases on heterogeneity, levels of phenomena, and the dynamic interplay between individual and environment have also led some to suggest that multilevel modeling is an ideal data analytic approach to test transactional contentions (Gonzalez, 2009). Whereas ‘traditional’ analytic techniques focus on group-level variance and seek to control for individual-level variance, more cutting-edge multivariate approaches (such as multilevel modeling) explicitly model individual-level variance because assumptions about group homogeneity are substantively and empirically unsustainable: “One freeing aspect of modern statistics is that it is no longer necessary to make simplifying assumptions that all participants within a treatment group are the same or respond to treatment in the same way ... this is the major benefit that random-effects [multilevel] models offer – they allow one to model heterogeneity” (Gonzalez, 2009, p. 231). We extend this concept even further by exploring the extent to which there is also intra-individual (i.e., momentary experiences nested under the individual) heterogeneity that might have implications for educational research and practice.

## 2.2. Ecological perspectives

Ecological perspectives emphasize the unique processing of and interaction with the environment by each individual and the inherent intra- and inter-individual factors and processes at play in this interaction (Bronfenbrenner, 1979, 1992, 2001). According to Bronfenbrenner, a key principle of the ecological approach is that “the scientifically relevant features of any environment for human development include not only its objective properties but also the way in which these properties are subjectively experienced by the persons living in that environment ... very few of the external influences significantly affecting human behavior and development can be described solely in terms of objective physical conditions and events” (Bronfenbrenner, 2001, p. 6964). Bronfenbrenner (1979, 1992, 2001) further proposed a model of human development that has the child (and intra-child attributes) at the center of a system comprising the microsystem, then mesosystem, then exosystem, then macrosystem, and then the more recently proposed chronosystem (the passage of time). The ecological levels described under Bronfenbrenner’s model are useful for thinking about

the possible levels (intra-student or otherwise) that may be sources of influence for motivation and engagement.

Given our investigation is essentially focused on student cases, it is the lower levels of students’ ecologies that are of central interest. Thus, we do not attend to or test the upper structural levels of Bronfenbrenner’s framework. Of relevance to this, it is notable that Bronfenbrenner and Morris (2006) identified the inner (‘lower’) layers of the ecological system as being particularly influential on development; relative to the more distal ecologies, the moment-to-moment interactions were deemed particularly salient for development. It is these intra- and inter-day interactions that are the basis of the present study that explores variation in motivation and engagement multiple times in a school day. The passage of time (chronosystem) tends to be seen from a broader developmental perspective (over years, for example) such that the lower order systems operate across time, reflecting human development. Nevertheless, it may also be the case that intra-day and day-to-day time passages are also influential. Indeed, this too is a focus of the present study.

In sum, although we do not apply Bronfenbrenner’s complete framework, we do use it as a guiding approach to considering intra- and inter-individual factors in the academic domain. We also make the point that Bronfenbrenner’s approach was not formally framed in terms of the interactive, dynamic, and highly differentiated nature of the educational ecology. Here we turn to sociocultural approaches in education that more directly address this intra- and inter-individual momentary academic variation that our study seeks to examine.

## 2.3. Sociocultural approaches

Sociocultural researchers study the internalization of social phenomena (Nolen & Ward, 2008). They see the origins of psycho-educational factors such as motivation and engagement as social, but the outcome or expression of these psycho-educational factors as individual. Thus, the same environment will evoke different motivational and engagement expression (McCaslin, 2004; Walker, 2010; Walker, Pressick-Kilborn, Arnold, & Sainsbury, 2004). According to Walker, motivation and engagement may be conceptualized as social in nature and can also be internalized as an individual process (Walker, 2010). Turner and colleagues (Turner, 2001; Turner & Patrick, 2004) also talk about how constraints and opportunities provided by context impact students’ experience and the expression of motivation and engagement. Sociocultural approaches, then, quite explicitly argue for the salience of the individual experience in a shared environment. From a sociocultural perspective, psycho-educational factors are very much processed through the perspective and orientation of the student. Particularly for research that seeks to investigate intra- and inter-student motivation and engagement, a sociocultural perspective would predict substantial variance within and across days as different events impact students and also substantial variance between students as students perceive and process these events in idiosyncratic ways.

## 3. Methodological perspectives on intra-individual educational phenomena

### 3.1. Real-time data and mobile technology

In order to facilitate research on motivation and engagement as it unfolds in real time in real world settings, valid and reliable instrumentation is needed. Technical innovation enables the use of expedient and participant-friendly data collection methods (e.g., via Personal Digital Assistants, PDAs; iPads; iPods) and commercially available software (e.g., SurveyMonkey) enables ready and adaptive administration of items to which participants respond. In questionnaire studies, responses are subject to retrospection bias (Beal & Weiss, 2003; Clark & Teasdale, 1982; Robinson & Clore, 2002; Stone & Shiffman, 2002) such that individuals’ retrospections of their states, experiences, and behaviors are not always reliable depictions of their true history. Thus, delays

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