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Understanding student behavioral engagement: Importance of student interaction with peers and teachers

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ABSTRACT

Recent theoretical conceptualizations of student engagement have raised questions about how to measure student engagement and how engagement varies not only across schools, but also within school and within classrooms. The authors build on existing research on student behavioral engagement and extend this research to emphasize a continuum of disengagement, active engagement, and passive engagement. They review common approaches to measuring engagement and highlight areas where new theoretical conceptualizations of engagement require new approaches to measurement. The authors analyze how student behavioral engagement changed depending on the context and demonstrate the need of a finer scale of engagement. They find there was not a uniform association of higher behavioral engagement and student interaction with peers, but it was the interaction with other students and the teacher that was predictive of increased engagement. Their work suggests that disaggregating behavioral engagement into disengagement, active engagement, and passive engagement has important research and conceptual implications.

Three decades ago, American public high schools were indicted as large, impersonal bureaucracies where teachers make an implicit bargain with students to not expect too much of them in exchange for compliance (Sedlak, Wheeler, Pullin, & Cusick, 1986; Sizer, 1984). Instruction was criticized as teacher centered and not engaging for students. In the intervening years, the United States has seen numerous reforms targeted at changing high schools to increase standards, focus on college and career readiness, equalize opportunities, and create more engaging learning environments for students. Despite these numerous reforms, national and international comparisons of student achievement indicate that underperformance in high school is a persistent problem, even as gains have been made in the elementary grades (Rampey, Dion, & Donahue, 2009). Research on school reform and implementation has found that past efforts to scale up interventions in schools often results in little change in the core work of teaching and learning (Elmore, 1996). That is, there are often few changes in the ways in which students are asked to engage with school, and student engagement continues to decline as students enter middle and high schools, with 40–60% of high school students chronically disengaged (Klem & Connell, 2004; Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006).

The last several decades of high school reform have not been inconsequential for schools, however. Indeed, these various reforms have resulted in tremendous increases in expectations on teachers and students, which has placed new pressures on students (Fredricks, Blumenfeld, & Paris, 2004). Perhaps not surprising, these increased expectations have coincided with steep declines in student motivation (Fredricks & Eccles, 2002). This decline in student motivation is noteworthy given the large body of research that emphasizes academic and social engagement as key predictors of high school success, including achievement and dropping out (Lee & Burkam, 2003; Rumberger, 2011; Wang & Holcombe, 2010; Wigfield et al., 2006). Substantial research suggests that student engagement varies by the environment created by the school and teacher, and by the learning opportunities teachers create in their classrooms (Boaler & Staples, 2008; Kelly & Turner, 2009; Nasir, Jones, & McLaughlin, 2011; Walker & Greene, 2009; Watanabe, 2008). Despite this large body of research on student engagement, recent theoretical conceptualizations of student engagement have raised questions about how to measure student engagement and how engagement varies not only across schools, but within schools and within classrooms (Azevedo, 2015; Cooper, 2014; Fredericks et al., 2004; Sinatra, Heddy, & Lombardi, 2015).

Here we build on existing research to make two contributions to existing knowledge of high school student engagement. First, we use an observation technique that follows students throughout their day to observe the same students in multiple learning environments. Our observation approach also allows for capturing qualitative differences in engagement and leads to findings that distinguish between passive and active

engagement (Azevedo, 2015; Sinatra et al., 2015). Second, we use measures of teacher instructional practices to identify patterns in student engagement across interactions with peers and teachers. The article is organized as follows. First, we define student engagement in its various forms and review previous literature on the student and classroom characteristics that are associated with student engagement in high schools. In so doing, we also review common approaches to measuring engagement and highlight areas where new theoretical conceptualizations of engagement require new approaches to measurement. We then describe the data used and the analytic methods. Next, we describe the findings and focus on the classroom and instructional characteristics associated with active and passive engagement. Finally, we discuss the implications of this article for future research on student engagement in high schools.

Prior research on student engagement

Defining student engagement

Student engagement is a broad construct that researchers have studied through three primary domains: cognitive, emotional and behavioral engagement (Cooper, 2014; Fredricks et al., 2004; Yazzie-Mintz & McCormick, 2012). These domains highlight the complexity of student engagement and encourage specificity in the instruments and measures used to study student engagement. Cognitive engagement is focused on the student's internal investment in the learning process, which incorporates the inner psychological qualities of the students or their nonvisible traits that promote effort in learning, understanding, and mastering the knowledge or skills that are promoted in their academic work (Cooper, 2014; Friedricks et al, 2004; Shernoff, 2013; Yazzie-Mintz & McCormick, 2012). Similarly, the cognitive engagement domain is selected when investigating the investment required, by the student, in understanding and mastering the knowledge and skills explicitly taught in schools (Yazzie-Mintz & McCormick, 2012). This lens is important for understanding how a student's psychological motivations are associated with student engagement.

The emotional engagement domain concerns questions regarding students' feelings of belonging or value to their teacher, their classroom or their school (e.g., interest, boredom, happiness, sadness, anxiety) (Fredricks et al., 2004; Renninger & Bachrach, 2015; Shernoff, 2013; Stipek, 2002; Walker & Greene, 2009; Yazzie-Mintz & McCormick, 2012). Studies in this domain also investigate the students' feelings of belonging and value through the students' identification with their school (e.g., the students' feelings of importance, the students' feelings of success in school-related outcomes; Cooper, 2014; Fredricks et al., 2004; Jones, Marrazo, & Love, 2008; Voelkl, 2012; Wang & Holcombe, 2010). This line of inquiry is important when investigating a student's affection for her school and individuals within the school (i.e., teachers, administrators, peers).

The behavioral engagement domain concerns questions regarding, student conduct in class, student participation in school-related activities, and student interest in their academic task (Cooper, 2014; Fredricks et al., 2004; Shernoff, 2013; Yazzie-Mintz & McCormick, 2012). Studies focused on student conduct in class investigate the students' behaviors with regard to classroom or school norms, expectations, or rules. Students can either exhibit positive behaviors (i.e., when a student follows classroom or school expectations), which are indicators of higher student engagement, or they can exhibit negative behaviors (i.e., when a student is being disruptive in the classroom or disobeying an administrator), which are indicators of lower engagement or disengagement (Finn, 1993; Finn, Pannozzo, & Voelkl, 1995; Finn & Rock, 1997). The second dimension of behavioral engagement is student participation in school-related activities, which consists of student participation in the school or student participation within the classroom. Research on school participation focuses on the student's support (e.g., attendance, positive interactions) of school-sponsored activities (e.g., pep rallies, sports teams, clubs, other extracurricular activities), which has provided insight into the student's motivation to be a part of the school (Finn, 1993; Finn et al., 1995; Jones, Marrazo, & Love, 2008; Wang, & Holcombe, 2010). The research on student participation in classroom activities focuses on how the myriad of classroom activities increase student engagement compared to disengagement (Birch & Ladd, 1997; Buhs & Ladd, 2001; Cooper, 2014; Yazzie-Mintz & McCormick, 2012). A third dimension of behavioral engagement is the students' interest in their academic task, which refers to the tangible behavioral actions exhibited by the students to show their will to engage in classroom activities as well as their will to overcome challenging material (Birch & Ladd, 1997; Finn et al., 1995). Research under this dimension provides insight into the classroom activities that produce tangible behavioral engagement by the student, including persistence, focus, asking questions, and contributing to class discussion (Cooper, 2014; Fredricks et al., 2004; Yazzie-Mintz & McCormick, 2012).

In the present study we focused on behavioral engagement and encompassed all three dimensions of student conduct in class, participation in school-related activities, and student interest in the academic task. As described subsequently, we build on this conceptualization of behavioral engagement to develop an approach to measuring engagement that considers student conduct and participation in school-related activities as passive behavioral engagement (i.e., follows classroom expectations and participates in the classroom activity set forth by the teacher) and interest in the academic task as active behavioral engagement (i.e., moves beyond following expectations to ask questions, contribute to class discussion, persist despite distractions).

Instructional factors associated with behavioral engagement

Given the positive effect of behavioral engagement on student achievement (Caraway et al., 2003; Fredricks et al., 2004; Marks, 2000; Shernoff, Csikszentmihalyi, Shneider, & Shernoff, 2003; Wang & Holcombe, 2010), and on decreasing student dropout rates (Bridgeland, DiIulio, & Morison, 2006; Fredricks et al., 2004; Rumberger, 2011; Shernoff et al., 2003; Yazzie-Mintz & McCormick, 2012) a substantial amount of research has focused on identifying the school and classroom characteristics that are associated with behavioral engagement. Researchers have identified two school-level characteristics in

particular—school size and rigid rules—that have a great deal of research on their association with student behavioral engagement (Finn & Voelkl, 1993; Shernoff, 2013). Although schools have an important influence on student behavioral engagement, engagement also varies by classrooms within a school (Cooper, 2014). Accordingly, there has been a substantial amount of research focused on identifying classroom instructional factors associated with greater behavioral student engagement (Kelly & Turner, 2009). This research can generally be categorized into three main groups: How students interact with the teacher, how students interact with peers, and how students interact with the content.

Student interactions with teachers are important as a strong, positive relationship between the student and teacher is critical for increasing student behavioral engagement (Birch & Ladd, 1997; Cooper, 2014; Crosnoe, Johnson, & Elder, 2004; Valeski & Stipek, 2001). Students who believe teachers care about them tend to have higher engagement than those who do not (Patrick, Ryan, & Kaplan, 2007; Ryan & Patrick, 2001). This teacher support can take the form of any classroom activity in which the teacher is directly involved with a student or group of students (e.g., one-on-one instruction or group work). In particular, there is a wealth of literature on the importance of the interaction between teacher and student for increased student behavioral engagement (Kelly & Turner, 2009; Marks, 2000; Martin & Dowson, 2009; Ryan & Patrick, 2001). Teachers that promote discussion and dialogic instruction (e.g., when teachers encourage students to expand on their responses rather than provide short responses to questions) have students with greater engagement as evidenced by extended curricular conversations and more substantive and sustained contributions to the class discussion (Applebee, Langer, Nystrand, & Gamoran, 2003; Wang & Holcombe, 2010). Students also report that class discussions excite and engage them (Yazzie-Mintz & McCormick, 2012).

Student interactions with their peers are also important for student engagement as a positive interpersonal climate is positively associated with engagement (Davis & McPartland, 2012). Teachers that promote interactions among students around academic tasks have higher levels of student engagement (Jones et al., 2008; Ryan & Patrick, 2001). Similarly, students who think their peers will help them are more behaviorally engaged (Patrick et al., 2007). Peers with high engagement who cluster together, have been associated with increasing their behavioral engagement and the behavioral engagement of those they interact with (Kindermann, 1993). The increased engagement would be due to the highly engaged students and other students interacting with each other as they participate in the same classroom activities.

One way to promote student interaction on academic tasks is by designing group work activities. Some research suggests that group work activities are associated with higher levels of student engagement (Shernoff et al., 2003; Yazzie-Mintz & McCormick, 2012). Other research, however, suggests that it is not the structure of group work, per se, but how teachers promote sustained student interaction over academic content (Cooper, 2014; Kelly & Turner, 2009).

How students interact with the content is also related to student engagement. The literature shows that authentic and challenging tasks are associated with higher behavioral engagement (Blumenfeld et al., 2004; Fredricks et al., 2004; Marks, 2000; Shernoff et al., 2003). Students are more likely to engage when they perceive the relevance of the task (Davis & McPartland, 2012; Walker & Greene, 2009). Most research on engagement is either conducted within a single subject area (i.e., exploring engagement in literacy instruction) or does not focus on content. As such, there has been less evidence on the relationship between subject matter and engagement. One study suggests student engagement is higher in electives than in core subject areas (Cooper, 2014). However, the subject content (i.e., mathematics, science, social studies, English, art) plays a role in teachers' choice of classroom activities, and the structure of classroom activities greatly influences student behavioral engagement in the classroom (Kahne, Chi, & Middaugh, 2006; Larson, 2011; Rossman, Schorr, & Warner, 2011; Wilhelm & Novak, 2011).

Measuring behavioral engagement

Although student engagement has been conceptualized as a multidimensional construct consisting of cognition, emotion, and behavior, behavioral engagement is easier to operationalize and measure as it is directly observable, and thus it is most often assessed. Student engagement is most commonly measured by surveys of either the students themselves or teachers who report about individual students. On student and teacher surveys, the measure of behavioral engagement is most often an index or a scale consisting of a few to several items about students' engagement with the school or with their classes overall (Green, Martin & Marsh, 2007; Yonezawa, Jones, & Joselowsky, 2009; Wang & Holcombe, 2010). For example, Wang and Holcombe used a 14-item student engagement index that measured school participation, school identification, and use of self-regulation strategies. These measures are useful for capturing broad patterns, but do not allow for more fine-grained analyses on how or why engagement may change from class to class, day to day, or even moment to moment. That is, despite the intention to understand classroom characteristics that are associated with engagement, they only gather data about students in one classroom context. This broad nature of the wording of student engagement surveys is reinforced by the ways in which data are collected. Most such surveys are cross-sectional in nature with no ability to capture how a single individual's engagement may vary over time, or the time points are so far apart that many other relevant contextual variables have also changed. One notable exception is Cooper (2014) who used a five-item student engagement scale from a survey of the National Center for School Engagement (e.g., "How often do you do all of your work in this class?"; "If you don't understand something in this class, how often do you try to figure it out?") and collected separate data from high school students about all their classes. Finally, surveys of student engagement are limited by other properties well documented in survey methodology literature, such as the limited ability of individuals to recall information and social desirability bias (Fisher & Katz, 2008;

Greene, 2015; Kreuter, Presser, & Tourangeau, 2008; Presser & Stinson, 1998).

Specificity of behavioral engagement

Another way behavioral engagement has been measured is through the use of classroom observations, though it is less frequently measured this way. When observations are used, students' behavioral engagement is often operationalized as engaged or not engaged (Fredricks et al., 2004; Sinatra et al., 2015; Yonezawa et al., 2009). This raises three particularly important issues: (a) student engagement can exist along a continuum and thus marking a student as engaged reduces much potential variation in his level of engagement, such as whether they are passively or actively engaged; (b) student engagement is not constant; it can change from moment to moment depending on the context of the situation; and (c) classroom observations often focus on the teacher or the classroom as a whole rather than the detailed experience of individual students.

To address these shortcomings, this study used student observational logs and shadowed individual students throughout their entire day where students' engagement behaviors were recorded as active, passive, or not engaged every 5 min along with a number of other measures. Shadowing students puts the focus on how an individual student experiences classroom instruction. Moreover, it is a unique tool that allows a researcher to capture the quality and quantity of student and teacher interactions in a typical school day (Wilson & Corbett, 1999). There is little research on the systematic use of student shadowing logs, although the use of experience sampling method (ESM) is a similar technique and has been used to understand activities that facilitate student engagement in high schools and how people and contexts affect students' experience (Greene, 2015; Shernoff et al., 2003; Zirkel, Garcia, & Murphy, 2015). ESM has advantages over year-end surveys and other one-point-in-time methods because they reduce the error resulting from poor recall and social desirability bias (Hektner, Schmidt, & Csikszentmihalyi, 2007). ESM is also more likely to capture activities that appear inconsequential but occur relatively frequently for brief moments. For this reason, ESM and shadowing logs are better suited than surveys to capture the shift in student behavioral engagement from moment to moment within a class. One limitation of ESM is that it places the burden on participants to record the logs, potentially introducing bias and interrupting the activity. Our approach reduces the need to interrupt the participant and trained researchers can reliably code shadowed activities (Horng, Klasik, & Loeb, 2010).

Here we examine the relationship between behavioral engagement and classroom characteristics while addressing several of the challenges in measuring behavioral engagement. First, we have a unique dataset of longitudinal engagement data by using the student observational log. Second, the data are observational data of student engagement and not student or teacher survey, which is the norm in the engagement literature. Third, behavioral engagement is differentiated among active, passive, and not engaged. Fourth, the dataset also includes additional classroom variables such as subject, the student's academic track, and with whom the student is interacting. This is a rich longitudinal dataset with a number of not-often-observed variables that allow us to analyze student engagement on a finer grain size and in a more nuanced manner. In the analysis section, we will observe that the findings on student engagement would have been interpreted differently if the variables and level of details that exist in the dataset were absent.

Methods

The data for this article came from a multiyear study of effective practices in high schools in a large, urban district. The research began with the study of programs and practices in two higher and lower value-added schools in a single district that may explain the differences in outcomes between schools. The number of schools chosen was due to practical limitation of studying the schools in depth and balancing the number of higher and lower value-added schools. Value-added measures were chosen as a criterion of studying these schools because they are designed to measure overall school effectiveness, controlling for factors associated with student achievement, but not under the control of schools, including prior student achievement and student characteristics associated with growth in student achievement (Meyer & Dokumaci, 2014). At the time of this study, this district was one of the largest districts in Texas and in the top 50 largest in the country, serving approximately 70,000–100,000 students most of whom were predominantly Hispanic (50–75%), African American (20–35%), and economically disadvantaged (65–80%). The schools serve primarily low-income (free and reduced price lunch eligible) and racial minority students, reflecting the populations of this urban district. Two noteworthy differences were that one school had less than 60% economically disadvantaged students and another school served more African American students than Hispanic students. The details of demographic characteristics of the schools are reported in Table 1.

Value-added measures created from three years of achievement data were used to identify two high schools that have relatively higher value-added scores in reading and language arts, mathematics, and science and two high schools that have relatively lower value-added scores in these subjects. Averaging three years of data creates more stable value-added estimates. The model included the Texas Assessment of Knowledge and Skills test scores and a vector of student demographic variables such as race, gender, free and reduced-price lunch eligibility, and limited English proficiency (for more information, see the technical report from the Value-Added Research Center

Table 1. Demographic characteristics of the high schools.

School characteristics	School A (HVA)	School B (HVA)	School C (LVA)	School D (LVA)
Enrollment	700–1200	>1500	700–1200	>1500
Percent African American	<20%	<20%	>50%	<20%
Percent Hispanic	>75%	41–75%	<40%	>75%
Percent economically disadvantaged	>75%	<60%	60-75%	>75%
Percent limited English proficient	>7%	<7%	<7%	>7%
2011 Graduate rate	>85%	>85%	<80%	<80%

Note. Source: District administrative data, 2012–2013 school year.

[2014]). As part of intensive case studies of these four schools, three week-long visits were made to each of these high schools over the course of a school year. In the first two visits, we interviewed administrators and teachers, observed classroom instruction, and conducted focus groups of students. The initial findings from the first two visits prompted us to what to learn more about the student experience, which led to the development of the student shadowing log used in this study. In addition to shadowing students, we also interviewed administrators, students, and teacher leaders, and conducted focus groups with students on the third visit. The shadowing data were collected in late spring, after the administration of state assessments, during the third and final visit to each school. A total of 37 students in Grade 10 were shadowed. Tenth-grade students were chosen because most of the test data used to create value-added measures come from ninth- and 10th-grade students, and 10th-grade students could tell us more about their high school experience due to their longer amount of time in the school. The number of students shadowed was due to practical limitation of the number of researchers and agreement with the district to make the logistics possible and to reduce interruption throughout the school. The students were split evenly by gender and, when possible, students were shadowed by a researcher of the same gender. Moreover, students were evenly distributed among the four schools.

The sampling strategy was based on the educational track students tend to take (i.e., half the students were to be selected among honors/advanced track students and half were to be selected among regular/remedial track students). This sampling strategy was chosen because earlier visits suggested that student experiences differ by student track trajectory and the research team wanted to understand the extent of these differences. Part of the design was the decision to identify the track of specific courses in which the student was enrolled, rather than just the overall track of the student. Thus although the sampling strategy still selected students based upon track (i.e., students who took mostly advanced courses and students who did not), we have track information at the level of each course rather than the student. In the sample, 23% of observational segments were in advanced track courses, 40% were in regular or remedial track courses, and 36% were in courses with other or unknown track placements. This third type of courses was often elective courses or those for a designated student population, such as English language learner (ELL) students. Beyond gender and track placement, specific students were selected by an assistant principal based on convenience and ease of obtaining parental consent.

Each student was followed by a single researcher for a full school day, going from class to class and during transition periods and breaks. The goal was to understand how students experienced the school. Starting at the beginning of the school day, the researcher logged the student's activities every 5 min on a log with predetermined categories. The log asked for several pieces of information: the time, the period of the day (i.e., first period, second period), where the student was located, what the student was doing, with whom the student was interacting, and whether the student was on task or off task. The log had specified categories for the location, activity, and with whom the student was interacting, although the researcher could also write in

other activities or provide more details. By the end of the day, the researcher has a picture of what the student experienced that day in 5-min intervals. Horng, Klasik, and Loeb (2010) used a similar shadowing log to observe principals as they engaged in their regular daily activities. As our goal was to understand student experiences throughout the day, the shadowing log by Horng et al. provided a model on how to gather information throughout the day, including the content of the activity, their location, and the interaction with other individuals. Similar to Horng et al., we used the shadowing logs to reduce the need to interrupt the participants and class activities as well as the potential of introducing participant bias when they record the logs themselves.

Variables and descriptive statistics

Table 2 provides a description of the logs. First, as mentioned previously, there was information about the track for each course. Second, the log included space for the course title, allowing us to determine the subject area of each course. Third, description of what the student was doing at each 5-min interval was recorded. The research first noted what the teacher expected the student to be doing based on the teacher's verbal and written directions, whether the student was in fact engaged in that activity, and if not, what off-task behavior the student was doing. Finally, the log used a nuanced indicator of on task or off task by having the researcher note whether the student was actively or passively engaged in the task rather than just on task. Before going into the field, the researchers had extensive discussions and multiple training on the instrument. First, the log was piloted in a different district, with researchers participating in a 2-hr training to understand how to use the log. After the initial pilot, researchers debriefed on their experience using the log, which led to a revised shadowing log that differentiated between different levels of engagement. In a third 2-hr training session, researchers then discussed the revised log, paying particular attention to indicators they would use to differentiate between levels of engagement and using classroom observation videos to discuss how they might code specific examples of student behavior in class. Directions to researchers indicated that active student engagement included asking questions, responding to questions, volunteering information, sharing ideas, or manipulating materials, focusing on the behavioral aspect of students' engagement. Students who are actively engaged are on task and focused on their class-related goals. Passive engagement

Table 2. Details of shadowing instrument.

Log category	Log details
Identification codes	Date, student ID, researcher ID, school code, time, number of advanced courses
Course codes	Class period, location, course title, course track/student population
Student activity codes	Indication of whether student is not engaged/passively engaged/actively engaged in that assigned activity, type of off-task behavior (if applicable)
Student interaction codes	The individual(s) with whom the student is currently interacting

Table 3. Number of students and five minute observational segments for student shadowing.

	HVA	School A (HVA)	School B (HVA)	LVA	School C (LVA)	School D (LVA)
Number of students	18	8	10	19	10	9
Total observation segments	1379	602	777	1415	737	678
Excluded segments						
Dentist	35	35	0	0	0	0
Transition	100	45	55	74	50	24
Homeroom/tutorial/lunch	114	44	70	36	12	24
Number observation segments not excluded	1131	478	652	1305	675	630
Number of observation segments in the analytic sample	1050	429	621	1209	613	596

Note. HVA = higher value added; LVA = lower value added.

includes behaviors such as listening but not responding to questions, not asking questions, and being involved but appearing disinterested in the assigned task. Students are not engaged if they are unresponsive, disinterested, distracted, or involved in off-task behaviors. Finally, the log included more space for the researcher to make comments if they had difficulty using the predetermined codes in the log.

Table 3 provides basic information on the data. A total of 2,794 five-minute segments were observed. These segments are roughly equally distributed across schools. Some observational segments were excluded from analysis. One student missed three class periods due to a dentist appointment. Because a dentist appointment does not help us see what typical student experiences are, these observational segments were excluded. The intention was to observe students during lunch, homeroom classes, and/or tutorial periods. However, whether the researcher was able to observe during these periods varied within and among schools, particularly during lunch when students moved frequently and the researcher needed to take a daily break. Because these parts of the day were not uniformly observed, they are excluded from the analysis. Observations that occurred during the transition between classes are also excluded as this analysis is focusing on what happened during class, resulting in 2,436 five-minute observational segments. Finally, due to missing data and the use of casewise deletion, the final analytic sample was further reduced to 2,259 five-minute observational segments.

Descriptive statistics of the dependent and independent variables for the analytic sample are included in Table 4. For each row, the sum of the first three columns (no engagement, passive engagement, and active engagement) is always one representing 100% and the last column of each row represents the percentage of the time that particular variable was observed in the dataset. For example, when students were interacting with other students (row 4), we observed no engagement 41.6% of the time, passive engagement 19.6% of the time, and active engagement 38.8% of the time. Within each of the four types of student interactions, we observed that students were disengaged most often when they were with other students (row 4), passively engaged most often when they were alone (row 7), and actively engaged most often when they were interacting with the teacher and other students (row 5). When students were interacting with the teacher alone, they were either passively or actively engaged almost all of the time (row 6), 97.6%. This is well-illustrated in Figure 1. These descriptive statistics indicated some associations between the type of interactions and behavioral engagement.

Overall, we observed that students were interacting with other students 23.7% of the time, with the teacher alone 14.5% percent of the time, with both the teacher and other students 8.3% of the time, and students not interacting with anyone was observed 53.4% of the time. In terms of subjects, the core subject areas were distributed evenly at close to 15% of the time each and almost 40% of the time was elective classes. In terms

Table 4. Mean of dependent and independent variables.

Variable	No engagement	Passive engagement	Active engagement	Total
Passive engagement	0	1	0	0.533
Active engagement	0	0	1	0.285
Passive or active engagement	0	1	1	0.818
Student interacting with other students	0.416	0.196	0.388	0.237
Student interacting with students and teacher	0.053	0.287	0.660	0.083
Student interacting with teacher alone	0.024	0.482	0.494	0.145
Student alone	0.141	0.736	0.123	0.534
Subj: English	0.191	0.657	0.151	0.155
Subj: Math	0.213	0.503	0.284	0.143
Subj: Science	0.233	0.497	0.270	0.144
Subj: SocStu	0.116	0.699	0.186	0.153
Subj: Interdisc	0.474	0.211	0.316	0.008
Subj: Elective	0.168	0.453	0.380	0.396
Advance track	0.151	0.599	0.249	0.307
Regular track	0.216	0.507	0.277	0.401
Reg and ELL	0.165	0.580	0.255	0.089
Remed/SPED	0.129	0.710	0.161	0.027
Unknown	0.182	0.533	0.285	0.176
Observations	2,259			

Note. The sum of no engagement, passive engagement, and active engagement is 1 for each row.
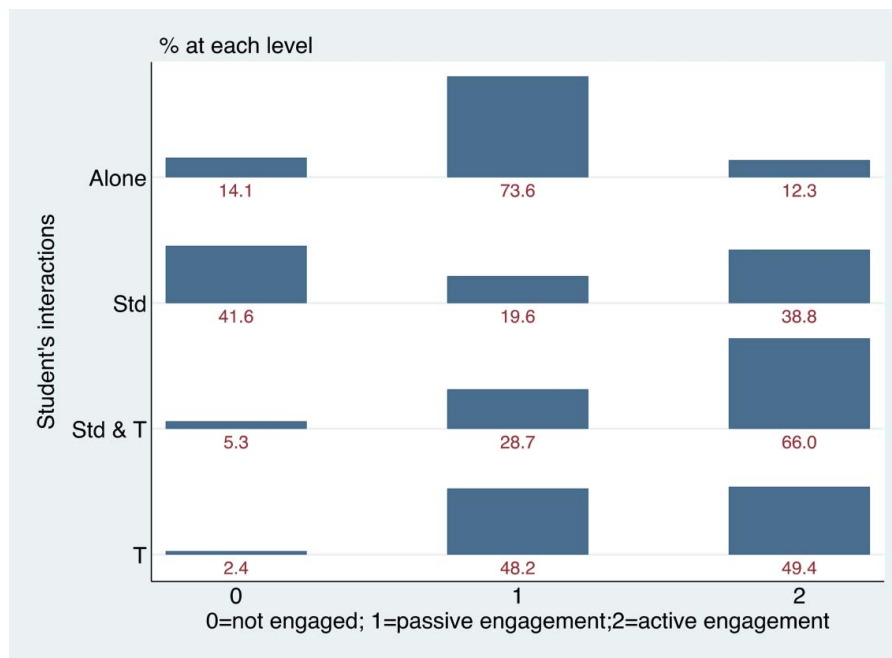
Figure 1. Behavioral engagement and student interactions.

of tracks, 30.7% of the observed segments were in the advanced track, 40.1% in the regular track, and 17.6% were unknown.

Analytic model

We employed three analytic approaches given the nature of our data, all of which used logistic regression because the dependent variable is a categorical measure of behavioral engagement as not engaged, passively engaged, and actively engaged. In one model of logistic regressions given by Equation 1, we compared passive engagement versus no engagement, active engagement versus no engagement, and total engagement (actively or passively engaged) versus no engagement with student fixed effects and controlling for student tracks.

$$logit(\Pr(Y_{it} = 1)) = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + D_i + e_{it}$$

Y_{it} is the log odds ratio of the outcome of interest (passive, active, or total engagement) for student i at time t, X_1 are dummy variables for subjects, X_2 are dummy variables for track, X_3 are dummy variables indicating with whom the student is interacting, D_i is student fixed effects, and e_{it} is the error term. It should be noted that the student fixed effects control for time invariant factors such as which school they attended. The results of this analytic model can be found in Table 5. In another model, we used multinomial logistic regression comparing passive and active engagement against no engagement, also including student fixed effects and controlling for student tracks. The results of the multinomial logit model can be found in Table 6. Given the way the data were collected and structured, it was also possible to think of the data in a multilevel model where the observations were nested within students. We

Table 5. Logistic regression analysis of student engagement.

Variable	Engaged versus not engaged (1)	Passive versus no engagement (2)	Active versus no engagement (3)
Math	1.07	1.11	1.63
	(0.25)	(0.29)	(0.58)
Science	0.85	0.63	1.67
	(0.19)	(0.16)	(0.55)
SocStu	1.77*	1.55	2.87**
	(0.43)	(0.41)	(1.07)
Intrdisc	0.48	0.22	1.55
	(0.34)	(0.21)	(1.29)
Elective	1.59*	1.17	4.13***
	(0.35)	(0.29)	(1.31)
Regular track	0.95	0.69	1.25
	(0.23)	(0.19)	(0.40)
Reg and ELL track	1.84	2.04	1.21
	(0.71)	(0.89)	(0.64)
Remed/SPED track	0.72	0.63	0.64
	(0.37)	(0.34)	(0.50)
Unknown track	0.91	0.81	1.04
	(0.26)	(0.27)	(0.39)
Student interacting with other students	0.25***	0.09***	1.25
	(0.04)	(0.02)	(0.23)
Student interacting with students and teacher	3.35***	0.98	24.52***
	(1.19)	(0.39)	(10.15)
Student interacting with teacher alone	7.93***	4.38***	40.91***
	(3.02)	(1.81)	(17.22)
Student fixed effects	X	X	X
Observations	2259	1616	1054
DF model	12	12	12
AIC	1544.90	1153.43	872.84
χ^2	273.03	337.23	264.96

Note. Reference categories are English, advance track, and student alone. Student fixed effects account for time-invariant student characteristics such as race and gender. Number of iterations for model identification: 3. Exponentiated coefficients; Robust standard errors in parentheses. AIC = Akaike information criterion; ELL = English language learner; SPED = special education.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 6. Multinomial logistic regression analysis of student engagement.

Variable	Passive engagement (1)	Active engagement (2)
Subj: Math	0.96	1.91*
	(0.24)	(0.54)
Subj: Science	0.73	1.29
	(0.18)	(0.36)
Subj: SocStu	1.64*	1.96*
	(0.41)	(0.61)
Subj: Interdisc	0.34	1.10
	(0.30)	(1.08)
Subj: Elective	1.05	3.59***
	(0.24)	(0.93)
Regular track	0.86	1.11
	(0.23)	(0.31)
Reg and ELL track	2.33*	1.32
	(1.00)	(0.62)
Remed/SPED track	0.67	0.74
	(0.35)	(0.43)
Unknown track	0.72	1.36
	(0.21)	(0.42)
Student interacting with other students	0.09***	1.20
	(0.02)	(0.22)
Student interacting with students and teacher	0.96	24.83***
	(0.37)	(9.81)
Student interacting with teacher alone	3.56**	44.89***
	(1.46)	(19.75)
Observations	2259	
DF Model	96	
AIC	3441.55	
χ^2	13539.48	

Note. Reference categories are English, advance track, and student alone. Base group is no engagement. Student fixed effects are absorbed. Number of iterations for model identification: 10. Exponentiated coefficients, robust standard errors in parentheses. AIC = Akaike information criterion; ELL = English language learner; SPED = special education.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 7. Multilevel modeling logistic regression analysis of student engagement.

Variable	Total versus no engagement	Passive versus no engagement	Active versus no engagement
Math	1.08	1.11	1.79
	(0.51)	(0.55)	(1.13)
Science	0.91	0.67	1.92
	(0.41)	(0.30)	(1.05)
SocStu	1.78	1.56	2.81
	(0.67)	(0.58)	(1.82)
Intrdisc	0.40*	0.15***	1.43
	(0.15)	(0.07)	(0.66)
Elective	1.67	1.22	4.86**
	(0.60)	(0.42)	(2.62)
Regular track	0.74	0.55	0.88
	(0.30)	(0.22)	(0.45)
Reg and ELL track	1.25	1.28	1.05
	(0.53)	(0.66)	(0.55)
Remed/SPED track	0.65	0.57	0.47
	(0.54)	(0.43)	(0.43)
Unknown track	0.82	0.68	0.92
	(0.34)	(0.31)	(0.43)
Student interacting with other students	0.23***	0.08***	1.22
	(0.06)	(0.02)	(0.42)
Student interacting with students and teacher	3.23**	1.00	23.86***
	(1.20)	(0.41)	(13.11)
Student interacting with teacher alone	7.91***	4.52**	42.50***
	(3.66)	(2.40)	(23.77)
Observations	2259	1616	1054
DF model	12	12	12
AIC	1783.35	1382.24	1084.34
χ^2	1231.88	401.30	699.85

Note. Reference categories are English, advance track, and student alone. Number of iterations for model identification: 4. Exponentiated coefficients, robust standard errors in parentheses. AIC = Akaike information criterion; ELL = English language learner; SPED = special education.
*$p < .05$; **$p < .01$; ***$p < .001$.

wanted to run this model to see how robust our findings were if we conceptualized the data in a different way. Models 1 and 2 of Table 6 match up with models 2 and 3 of Table 5 and models of 2 and 3 of Table 7, respectively. The substantive findings of the three models are equivalent and the parameter estimates are comparable. Our preferred analytic model is the first logit model as it also allows us to compare engagement versus no engagement and allows us to account for time-invariant student characteristics such as race and gender with student fixed effects. The area-under-the-curve analysis indicated that we have good model fits (Figure A1). We wanted to make sure that our selection of modeling approach was not influencing the findings and thus we have included all the results, but we have focused our analysis using the logistic regression models from Table 5. All analyses were done with Stata/IC 13 (StataCorp, College Station, TX).

Results

Model 1 of Table 5 presents results similar to other research on engagement, focusing on overall engagement versus disengagement. Our results are consistent with prior research that finds that interaction with the teacher (either alone or with other students) increases the odds of being engaged. The odds of being engaged are 3.4 times greater when students are interacting with other students and the teacher compared to when they are by themselves. Furthermore, the odds of being engaged are 7.9 times greater when students are

interacting with the teacher alone than when they are by themselves. Taken together, our evidence suggests that students are more likely to be engaged when the teacher is interacting with them either as individuals or in groups. However, the odds of being engaged decrease by a factor of 4 when they interact with other students compared to when they are by themselves. In other words, holding everything else constant, individual students are more likely to be disengaged than engaged when students are interacting with other students during a class activity than when they are working by themselves. Contrary to our expectation that students would have different levels of engagement varying tracks based on prior observations, our results indicate that tracks do not play a statistically significant role in predicting student behavioral engagement with the exception of a track that combines regular and ELL students in Model 1 of Table 6. There are differences in engagement across subject areas, with the odds of being engaged in social studies and elective classes are 1.8 and 1.6 times greater respectively compared to the odds of being engaged in English classes.

The story is more nuanced when we disaggregate the type of engagement into active and passive in comparison with being disengaged. When passive engagement is the outcome of interest in comparison with being disengaged (Model 2 of Table 5), there are no significant differences in the odds of being passively engaged across subjects. In terms of students' interactions, the odds of being passively engaged decreased by a factor of 11 when students are interacting with other students in groups compared with when they are by themselves. In other
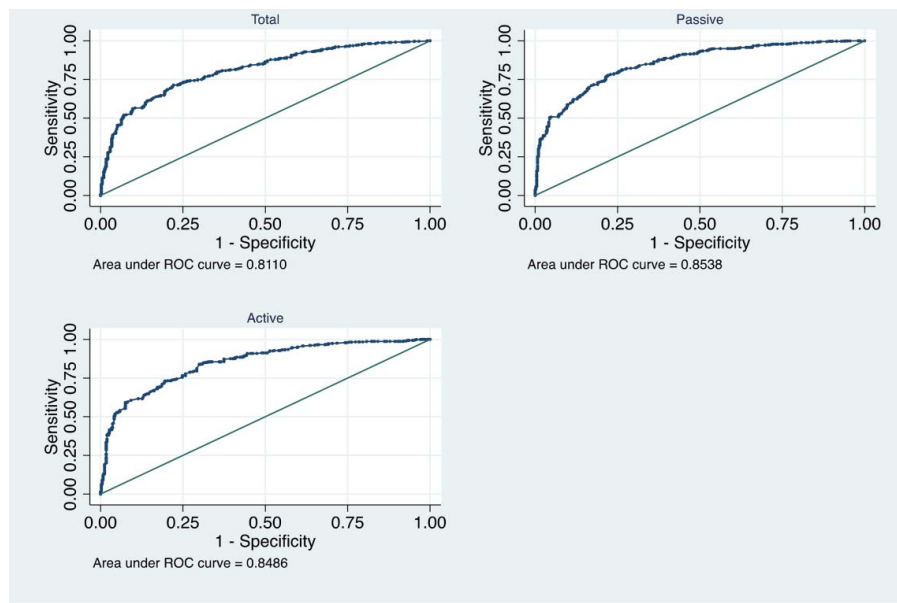
Figure A1. Receiver-operating characteristic (ROC) curve for total, passive, and active engagement. *Note.* The cutoff for the area under ROC curve is .80 for a good-fitting model (Hanley & McNeil, 1982).

words, students were less likely to be passively engaged and more likely to be disengaged when they are interacting with other students. The odds of being passively engaged are 4.4 times greater when they are interacting with the teacher alone holding everything else constant. This particular finding, taken along with the finding about engagement and students' interaction with teacher from both Models 1 and 3, seemed to indicate that when teachers are involved students are more likely to be engaged either passively or actively than to be disengaged. Our data then suggest when a teacher is interacting with a student, the student is less likely to engage in off-task behavior or be unresponsive, and, holding other factors constant, this interaction seems to favor active engagement than passive engagement as discussed in the next section.

When active engagement is the outcome of interest in comparison to being disengaged (Model 3 of Table 5), the odds of being actively engaged are 2.9 and 4.1 times greater for social studies and elective classes, respectively, than for English classes. In terms of student interactions, the odds of being actively engaged are 24.5 times greater when they are interacting with other students and the teacher than when they are by themselves. Moreover, the odds of being actively engaged are 40.9 times greater when they are interacting with the teacher alone compared to when they are by themselves. As these estimates are quite large, we checked the number of observations where students were recorded as being actively engaged and interacting with others and the teacher or with the teacher alone. In Model 3 of Table 5, of 1,054 observations, there were 107 observations recorded for active engagement and 10 for not engaged when students were interacting with other students and the teacher, and 148 observations for active engagement and eight for not engaged when students were interacting with the teacher alone. These numbers could potentially indicate that they were purely a construct of our definition of active engagement so researchers were likely to mark students as being

actively engaged when a teacher was involved. However, we feel that our conceptualization of active engagement (asking questions, responding to questions, volunteering information, sharing ideas, or manipulating materials) is indicative of active engagement and agrees with prior research (Cooper, 2014; Fredricks et al., 2004; Yazzie-Mintz & McCormick, 2012). The result indicates that when students are interacting with the teacher, either alone or in a group setting, they are much more likely to be actively engaged than disengaged compared to when they are by themselves. The magnitudes of this increase in active engagement are depressed when engagement is captured only as a binary outcome of engaged or not engaged.

The results of using multinomial logistic regression can be found in Table 6. Tracks remain statistically insignificant except for regular and ELL in Model 1. One small difference between the results in Tables 5 and 6 is that some subject dummy variables were statistically significant in the multinomial logit model that were not significant in the logit model. However, the key findings are equivalent across these two models and the magnitudes of the coefficients are also comparable. For instance, when comparing passive engagement versus no engagement, the multinomial logit model predicted that the odds of being passively engaged decreased by a factor of 11.0 when students are interacting with other students in groups compared to when they are by themselves. For the comparison of active versus no engagement, the odds of being actively engaged are 24.8 times greater (vs. 24.5 in Model 3 Table 5) when they are interacting with other students and the teacher than when they are by themselves. The odds of being actively engaged are 44.9 (vs. 40.9 in Model 3 of Table 5) when they are interacting with the teacher alone compared to when they are by themselves. We chose to focus our discussion using the results from Table 5, but it was reassuring that the two analytic models produced comparable results and that they reflected the descriptive statistics discussed earlier (Table 4).

Multilevel modeling specification

The results of using a two-level logit model with random intercepts for students utilizing the same covariates and controls as the previous models can be found in Table 7. We found that the substantive findings of the previous models as well as the magnitudes of the estimates were directly comparable using the multilevel modeling except for the statistical significance of some of the subject dummy variables. For instance, looking at Model 1 in Table 7, the odds of being engaged are 7.9 times greater (compared to 7.9 in Model 1 of Table 5) when students are interacting with the teacher alone than when they are by themselves. The odds of being engaged decreased by a factor of 4.3 (compared to 4.0 in Model 1 of Table 5) when they interact with other students compared to when they are by themselves. Similarly, in Model 3 of Table 7, the odds of being actively engaged are 4.9 times greater (compared to 4.1 in Model 3 of Table 5) when students are in elective classes than when they were in English. The comparability of the main findings across the three models was highly encouraging to us.

Limitations

One limitation of the study is the sample size of students, which limits the generalizability of the study. Part of the challenge of observing students and using shadowing tools is that it is more time and resource consuming than the use of a survey. To observe 50–100 students would require more observers (and along with that, more training) or spending more time in the field, either of which is very costly. However, when we think of the data in a multilevel model structure, then our sample of 37 students or groups at the level 2 and on average about 60 observations for each student, the number of students was not an issue of small n anymore under the multilevel model (Kreft, Kreft, & Leeuw, 1998). Another limitation is that we did not measure the other two types of engagement, cognitive and emotional engagement. Having those two measures of engagement would have undoubtedly enriched the study and allow a more detailed and comprehensive analysis.

Discussion

In terms of student interactions, we found there was not a uniform association of higher behavioral engagement and student interaction with peers as prior research indicated (David & McPartland, 2012). In particular, we found that if students were only interacting with other students, they were less likely to be engaged and that they were more likely to be engaged when they were interacting with other students and the teacher. Student interaction among peers alone was not predictive of increased engagement, but it was the interaction with other students and, more importantly, the teacher. The results reinforce research that it is not the use of peer group work by itself that matters but how the teacher is involved during group work matters a great deal (Cooper, 2014; Kelly & Turner, 2009). Moreover, the results highlighted the role of teacher support to foster active participation in students, consistent with much prior research on student engagement (Jones et al., 2008; Wang & Holcombe, 2010).

Our findings also indicated that tracks did not play a significant role in predicting the odds of engagement, and the statistical significance of core subject areas was not robust, varying based on model specifications. The only robust finding was elective classes. Similar to Cooper (2014), students were more likely to be engaged in elective classes. More specifically, students were more likely to be actively engaged in elective classes and not passively engaged. Two possible reasons why students were more likely to be to be actively engaged in elective classes are student selection and content or the types of activities that occur in elective classes. Because students can choose their elective classes, it is possible that they may have chosen classes that are intrinsically more interesting to them or that they are more invested in the class since they chose it, which would perhaps contribute to why students were found to be more likely to be actively engaged during class (Renninger & Bachrach, 2015). Another possibility is the content and activities in elective classes are more activity oriented, making it more likely that students would be actively engaged in the activity.

Last, our findings suggested that disaggregating behavioral engagement into disengagement, active engagement and passive engagement was important. On a conceptual level, we know that behavioral engagement is not a binary outcome but rather a continuum, so researchers need to differentiate the types of behavioral engagement to capture the conceptual distinction (Sinatra et al., 2015). Prior research on behavioral engagement has focused on differentiating between conduct in class or following directions and displaying interest in academic tasks (Cooper, 2014; Fredricks et al., 2004; Shernoff, 2013; Yazzie-Mintz & McCormick, 2012). Our method enabled us to discuss whether students were more passively or actively engaged when a predictor was found to be statistically significant. Moreover, not disaggregating engagement into passive and active could depress the strength or magnitude of a predictor in predicting the odds of being engaged in class.

Our findings also have implications for future research. Future researchers need to examine how teacher behaviors such as the type of questions asked could elicit different student engagement, why tracks and subjects other than elective classes seem to have little influence over student engagement, and how student cognitive and behavioral engagement vary across track, subject, interaction, and teacher behaviors. This work would further our understanding of student engagement and indicate what we can do as teachers and educators to increase how students engage in school, behaviorally, cognitively, and emotionally. Relatedly, future researchers should also consider pairing shadowing students with student and teacher interviews to explore classroom conditions where students are systematically disengaged and where they are more likely to be actively engaged. Additionally, refinement of the observation log, such as the addition of cognitive or emotional indicators, would address the limitations of the present study and improve the scholar study and understanding of student engagement.

Conclusion

By using longitudinal engagement data with the use of student observational log that differentiated behavioral engagement into active engagement, passive engagement, and disengagement,

our work overcomes the issue of using survey data to measure student engagement, and extend our understanding of behavioral engagement and the need for more specificity in how we conceptualize and operationalize student behavioral engagement. Moreover, with the additional classroom variables of track, subject, and student interaction, we are able to analyze how students' behavioral engagement varies across different contexts. Specifically, our findings highlight the role of teacher and peers in engaging students during class and point to the importance of differentiating engagement into passive and active engagement.

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