Initial Development and Validation of the *Student Engagement for Students for Flexible*

Learning Environments (*STUD-E Sflex*)

Assessment for Effective Intervention

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Abstract

Student engagement has been researched from multiple perspectives due to its impact on academic skill attainment. However, most of this research has focused on grades above elementary school, leaving a gap in student engagement at the elementary level. This study reports on the psychometrics of a newly developed instrument designed to measure elementary school student engagement. The hypothesis assumes that student engagement for elementary school students is a meta-construct comprised of several specific constructs (e.g. Participation, Effort, Autonomy, Competence, Sense of Belonging and Positive Relationships). This study reports on preliminary development and validation of a 42-item, multidimensional, self-report measure of elementary students' engagement. This instrument, The Student Engagement for Students for Flexible Learning Environments (STUD-E Sflex) was piloted employing a target sample of 202 students in third and fourth grade. Confirmatory factor analyses indicated the model specified above provided evidence for the each of the six hypothesized constructs. Discussions and implications of these findings are presented in the context of elementary student engagement.

Keywords: student engagement, elementary age students, measurement

For close to 35 years the student engagement concept has been researched from multiple perspectives (Mosher & MacGowan, 1985). This work has produced a wealth of knowledge that has improved understanding of student engagement (SE) while also showing that much more work is required to predetermine if a unified SE theory exists. It has also delineated the constructs that contribute to the idea of SE and the boundaries that delimit its scope (Appleton, Christenson, & Furlong, 2008). Research suggests high levels of SE at the secondary and postsecondary levels may lead to positive developmental and educational outcomes (Lei, Cui & Zhou, 2018). However, the volume of knowledge specific to elementary school students is not as well understood (Lam et al., 2014).

In order to measure engagement, researchers need to first operationally define the construct. Throughout the literature there are two main areas of debate within the construct of engagement, including the number and nature of dimensions and the distinction between indicators versus facilitators of SE (Skinner, Furrer, Marchand, & Kindermann, 2008). There is agreement; however, among most researchers that SE is a meta-construct encompassing students' involvement in school and their learning (Appelton, Christenson, & Furlong, 2008).

Defining Student Engagement

The current study is intended to test a theory of SE which uses peer-reviewed, commonly accepted constructs to operationally define SE: *behavioral, emotional* (or affective) *and cognitive engagement*. *Behavioral* engagement refers to students' levels of participation, task completion, effort, and involvement in the learning activities (Birch & Ladd, 1997; Appleton et al., 2006). *Emotional* engagement refers to students' sense of belonging, positive relationships, interest in learning and their identification with schools (Fredericks et al., 2004; Newmann, Wehlage, & Lamborn, 1992). *Cognitive* engagement refers to students' level of autonomy,

competence and the cognitive and self-regulation strategies students' use during the learning process (Appleton et al., 2006). Given the above, it is imperative to study SE as a meta-construct in order to provide a comprehensive understanding of student learning (Lam et al., 2014).

Developing a New Measure

Since there are several potential benefits of assessing students' engagement, accurate measurement is necessary before researchers and interventionists can benefit fully from the construct. Many instruments have been developed to measure SE. Currently, ten self-report instruments have been used to assess SE and each have a variety of strengths in measuring the construct. However, considering the changes, needs and interest of school districts that are not only interested in SE but its benefits in light of the use of technology and innovative classroom environments a new instrument was created to measure this. There is a need for a self-report instrument specifically designed to measure SE at the elementary level as a multi-dimensional construct with sound psychometric properties (Fredricks et al., 2011).

Six self-report instruments exist to assess engagement as a multi-dimensional construct. These include *The SE Survey* for high school (α = .63 - .85) (Lam, et al., 2014), *The 4 – H Study for Positive Youth Development: School Engagement Scale* (4-H) for grades 5 to 12 (α = .63 - .90; Learner et al., 2008), *Motivation and Engagement Scale* (MES) self – report questionnaire for ages 9 to 13 (α = .70 - .87; Martin, 2003), *School Engagement Measure* (SEM) for grades 3 to 5 (α =.55 -.86; Fredricks, Blumenfeld, Friedel, & Paris, 2005), and *The Student School Engagement Survey* (SSES) for upper elementary to high school (α =.49 - .92; Finlay, 2006). Only two of the six apply to upper elementary grades, and both either report low alpha ranges for some constructs or require items to be individually read to students by a trained test administrator.

There are also four bi-dimensional self-report instruments *The Engagement versus Disaffection with Learning* for grades 3 to 6, measures behavioral/disaffection and emotional engagement/disaffection (α = .61 - .85; Skinner, Kindermann, & Furrer, 2009). *The Research Assessment Package for Schools*, assesses behavioral and emotional engagement for upper elementary (α = .68 - .77; Connell & Wellborn, 1991). *The Student Engagement Instrument* grades 3 – 5 (α =.63 - .81; Carter et al., 2012). Finally, there is one unidimensional self-report instrument for elementary students assessing academic engagement, the *Consortium on Chicago School Research/Academic Engagement Scale* (α = .65 - .68; Fredricks et al., 2011). To date there is only one instrument developed to assess SE as a four-dimensional construct, the *Student Engagement in School-Four-dimensional Scale*, SES-4DS for middle and high school students (α = .70 - .87; Veiga, 2013).

Design of the STUD-E Sflex

Two pilot studies and an instrument development study were created to develop the STUD-E Sflex. Results from these pilot studies plus adapted items from various engagement instruments were used to produce the most current version of the STUD-E Sflex. The STUD-E Sflex item development and adaptation was a two-phase process. First, a review of the relevant literature using computerized databases (e.g., Education Full Text, ERIC, and PsycINFO) and searches from reference lists from selected articles was examined. Terms including engagement, motivation, self-regulation, academic engagement, behavioral engagement, cognitive engagement, psychological engagement and motivation were used in the literature search. Secondly, after proper permission was obtained, items were adapted and modified from various engagement instruments to account for the developmental level of elementary-aged students.

Items were reviewed to ensure the complete scope of the construct was covered (e.g. face validity) and that wording of survey items was developmentally appropriate. The items were also reviewed for various types of biases with the aid of multiple elementary school teachers across a large geographical area within central Texas. Scale construction involved creating a detailed scale blueprint that captured the broad researchers' conceptualization of *the general elementary SE* construct along with the domain-specific constructs of engagement. The final version of the STUD-E Sflex consists of 42 items measuring the general construct of SE for elementary school: 9 items examine *participation*, 9 items examine effort, 6 items measure autonomy, 6 items measure competence, 6 items examine sense of belonging and 6 items examine positive relations. All items are scored using a 4-point Likert-type rating scale (1 - *Never*, 4 – *Almost Always*) with items were coded so that higher scores indicate higher levels of engagement.

The purpose of this study was to develop and conduct the initial validation of a self-report instrument designed to measure the general construct of SE and its domain specific constructs of engagement at the elementary level. The primary research question addressed is what are the latent variables that comprise the meta-construct of elementary school SE?

Method

Participants

Participants were 202 elementary students consisting of 46% in grade 3 and 54% in grade 4, attending a public elementary school located in a suburban city within the southern region of the United States. Demographic information was provided by the school district. Cultural group/ethnicity was as follows: 29.3% Hispanic, 58.8 White, 1.8% Asian, 9.3% Black or African American, 0% Native Hawaiian or Pacific Islander, 0.4% American Indian or Alaskan Native, and 1.3% Mixed (two or more ethnicities). Approximately 49.4% of students were identified as

female, 50.6% as male. In the year the survey was administered, 5.0% of students were classified as English Language Learners, and 3% were monitored for English proficiency, 35% are considered economically disadvantaged.

Participating students completed the STUD-E Sflex at the beginning of the fall semester. Survey administration took place in the computer lab within the school building. The students used individual computers to complete an online survey; items were formatted using *Qualtrics* with one item per page and presented in a random order within each measure for each student. Students were closely monitored by the survey administrator to assure accurate responding and to also assist students with technical or reading support. On average, students were able to complete the measure within 18–22 minutes. Prior to beginning the study, all measures, data collection procedures, and consent methods were approved by both the authors' and the school district institutional review board.

Analysis

The content validity assessment of the interpretation of the results from the STUD-E Sflex was conducted using factor structure analysis. The original set of items was analyzed using Confirmatory Factor Analysis (CFA) and maximum-likelihood (ML) estimation. The factor loadings resulting from this estimation helped determine the number of items that were retained. All analysis was conducted in *IBM SPSS* Statistics for Windows Version 25.0 and R.

CFA. Based on the elementary school SE developed by the collaborative aforementioned, multiple CFAs were conducted to investigate the operationalized proposed hypothesis of SE for elementary school students. The elementary school SE hypothesis developed by the authors guided the selection of a final model and its items; however, this was also supported by the statistical results obtained by the conducted CFAs including accepted scores for indices of fit

(McDonald & Ho, 2002; Kline, 2015). This final model supports the hypothesis that there are

six first order components of elementary school SE (e.g., *Participation, Effort, Autonomy,*

Competence, Sense of Belonging and Positive Relationships). These first order factors contribute

to three second order factors (e.g., behavioral, cognitive and emotional). Specifically, the current

study tests items within the *effort* and *participation* scales with the *behavioral* factor. The

behavioral factors is believed to be the child's internal process for learning within the learning

environment. In addition, the *autonomy* and *competence* factors share a common factor named

the *cognitive* factor which is related to self-efficacy of the child. Finally, the *sense of belonging*

and *positive relationships* factor was tested as the *emotional* factor which is related to how the

child internalizes the interactions the child experiences in the learning environment.

First, descriptive statistics was conducted to check for extreme levels of skewness and

kurtosis with items outside the accepted ranges properly transformed to correct for the extreme

values. In this study there were no missing cases in the obtained dataset; thus, the models tested

used the full data set. Of the multiple specifications set to determine the relationship between all

the constructs present in the hypothesis, individual CFA models were specified for each of the

six first order constructs (e.g., autonomy, effort, etc.). Once appropriate model fit was found,

each of the first order constructs were assessed for fit in a second order latent variable (e.g.

cognitive, emotional, and behavioral) using the theory described above.

Results

Initial analysis found support for the six first order constructs (e.g., *Participation*, *Effort*,

Autonomy, *Competence*, *Sense of Belonging and Positive Relationships*). See Table 1 for model

fit statistics for each factor. In this model the loadings for the participation construct ranged from

0.268 to 0.630, only one item score was below 0.300 out of nine items. In the *Effort* construct all

the loadings score ranged from 0.129 to 0.503 and four items out of nine scored below the 0.300

threshold. The *Autonomy* factor was comprised of six items which their scores ranged from

0.214 to 0.557 and two of these items scores less than 0.300. The competence factor was

comprised of six items and all of the items scored above the 0.300 threshold. The *Sense of*

Belonging construct had loading scores that ranged from 0.243 to 0.763 and only one item out of

six scored below 0.300. The *Positive Relationships* construct had loading scores that ranged

from 0.422 to 0.746. Thus, as mentioned there were some items that had low loading scores;

however these items were retained for multiple reasons: 1) it helped maintain proper internal

consistency scores, 2) it helped keep the indices of fit within the desired cutoff and 3) it was

considered essential for the their given construct. With regard to the second order factors, the

current study found appropriate model fit for each of the three latent factors (see Table 1). With

regard to the *Behavioral* construct the current model found loadings of 0.521 and 0.829 for *Effort*

and *Participation* respectively. For the *Cognitive* construct, standardized regression weights of

0.545 were found for *Competence* and 0.949 *Autonomy*. Finally, within the Emotional construct,

weights of 0.689 were found for *Positive Relationships* and .701 for *Sense of Belonging*.

Internal Consistency

Reliability for the each of the six constructs (i.e. domain specific constructs) were

estimated by Cronbach's alpha and are reported in Table 1. With a few imposed constrains on

the CFAs (i.e. the correlation of some of the items) all of the Cronbach's alpha scores were

within the accepted values; this indicated that STUD-E Sflex items hung together as

hypothesized and make them potentially good indicators for all the constructs that comprise the

elementary school SE meta-construct. These results, along with the indices of fit are reported in

Table 1.

Discussion

The results of the current study suggest that the STUD-E Sflex is a promising measure for assessing students' perceptions of engagement in elementary school learning environments. Thus, use of this instrument would allow measurement of SE at the elementary level and also would give researchers the ability to build a theory of SE that could be tested across different populations and locations. These initial results have practical significance since both researchers and practitioners would then have a deeper understanding of what SE is at the elementary level and eventually how it correlates to academic goals. This correlation is of interest to stakeholders in education, as one of the primary goals in any education setting is to increase student attainment, which is believed to be positively correlated to SE. However, there is also a strong interest in the holistic development of the child, and the construct of elementary school SE has the potential of measuring beyond the compliance and behavior component of engagement. Thus, this instrument has the potential to inform both the growth of the elementary school students at all levels and point at the domain specific portion of the SE construct where students need the most support. Ultimately, the goal of this work is to provide opportunities so that students can be successful not only in their knowledge building and acquisition process but can also be successful in all other components of their school life.

Going beyond the ability to create plans for interventions that can increase SE, the information provided by the instrument can also help produce effective professional development for teachers. This professional development offers possibilities to deepen teachers' abilities in identifying students who at the surface level may seem like they are growing according to expectations but that in reality need support to increase some of the more-difficult-to-directly- observe specific domain constructs of SE. In reality, identifying the lack of growth

in areas other than school grades and compliance is a rather difficult task, but researchers hope that the development of the theory of elementary school SE and this instrument may help in this process.

Limitations

As a pilot study, this work must be viewed in light of several limitations. The sample size is small and CFA analysis on a Likert scale survey with less than five options (i.e. categorical data) could be problematic. A mitigating factor is that a teacher version of this instrument was created along with an observation instrument that allows research for triangulation of the data. The CFA constraints discussed earlier also provide certain limitations to full acceptance of the described hypothesis as presented in this work. These constraints could be attributed to the low sample size or indicate that modifications to the theory are required. The authors also recognize the study needs to include students of different ethnic and racial backgrounds across all elementary grade levels in order to approach generalizability of the hypothesis of elementary school SE presented in this work.

Future Research

It is essential to underscore that as limited as this work may be, its current results suggest that the STUD-E Sflex is a promising measure of students' perceptions of their engagement in the learning environment. Therefore, the STUD-E Sflex has the potential to advance our understanding of SE and its impact on elementary students' educational experiences and academic achievement. Additionally, researchers also hope to use the STUD-E Sflex as a predictor of behaviors that can be identified at an early stage of students' academic lives.

Table 1. Model fit and Reliability of SE factors

Confirmatory Factor Analysis Results for the STUD-E Sflex

		Df	RMSEA	90% CI for RMSEA	CFI	TLI	Cronbach's Alpha
Autonomy	245.000	15	.054	.000 - .107	.980	.962	.722
Competence	239.159	15	.000	.000 - .044	1.00	1.03	.719
Sense of Belonging	280.723	15	.064	.000 - .118	.978	.954	.738
Effort	335.529	36	.076	.048 - .105	.905	.858	.736
Participation	349.069	36	.043	.000 - .077	.971	.956	.712
Positive Relationships	280.625	15	.055	.000 - .108	.981	.965	.748
Cognitive	50.320	47	.019	.000 - .051	.994	.991	
Emotional	53.543	36	.049	.016 - .209	.973	.951	
Behavioral	141.821	109	.039	.017 - .056	.958	.941	

References

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology, 44*(5), 427-445. doi:10.1016/j.jsp.2006.04.002

Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools, 45*(5), 369-386.

Birch, S. H. & Ladd, G. W. (1997). The teacher child relationship and children's early school adjustment. *Journal of School Psychology, 35*, 61 – 79. doi:10.1016/S0022-4405(96)00029-5.

Carter, C., Reschly, A., Lovelace, M., Appleton, J., & Thompson, D. (2012). Measuring Student Engagement Among Elementary Students: Pilot of the student Engagement Instrument-Elementary Version. *School Psychology Quarterly*, 27(2), 61-73.

Connell, J.P. & Wellborn, J.G. (1991). Competence, autonomy, and relatedness: a motivational analysis of self-system processes. In M.R. Gunnar and L.A. Sroufe (Eds.), *Minnesota symposium on child psychology: Vol.23. Self-processes and development*. Hillsdale, NJ: Erlbaum.

Fredricks, J., Mccolskey, W., Manweiler, J., Mordica, J., Montrosse-Moorhead, B., & Mooney, K. (2011). Measuring Student Engagement in Upper Elementary through High School: A Description of 21 Instruments. Issues & Answers. REL 2011-No. 098. Regional Educational Laboratory Southeast.

Fredricks, J., Blumenfeld, P., Friedel, J., & Paris, A. (2005). School engagement. In K.A. Moore and L. Lippman (Eds.), *Conceptualizing and measuring indicators of positive*

development: what do children need to flourish? New York: Kluwer Academic/Plenum

Press.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford

publications.

Lam, S.F. et al. (2014). Understanding and measuring student engagement in school: The results

of an international study from 12 countries. *School Psychology Quarterly, 29*(2), p.213.

Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic

achievement: A meta-analysis. *Social Behavior and Personality: An International

Journal,46*(3), 517-528. doi:10.2224/sbp.7054

Martin, A. (2003). The student motivation scale: further testing of an instrument that measures

school students' motivation. *Australian Journal of Education, 47*(1), 88 – 106.

McDonald, R.P., Ho, M. H. (2002). Principles and practice in reporting structural equation

analyses. *Psychological Methods, 7*, 64–82.

Mosher, R., & MacGowan, B. (1985). Assessing Student Engagement in Secondary Schools:

Alternative Conceptions, *Strategies of Assessing, and Instruments*. University of

Wisconsin, Research and Development Center. (ERIC Document Reproduction Service

No. ED 272812).

Finlay, K. (2006). Quantifying school engagement: Research report. Denver, CO: National

Center for School Engagement

Newman, F. M., Wehlage, G. G., & Lamborn, S. D. (1992). The significance and sources of

student engagement. In F.M. Newmann (Ed.), Student engagement and achievement in

American secondary schools (pp. 11-39). New York: Teachers College Press.

Skinner, E., Kindermann, T., & Furrer (2008). A motivational perspective on engagement and

disaffection: conceptualization and assessment of children's behavioral and emotional

participation in academic activities in the classroom. *Educational and Psychological

Measurement*, 69 (3), 493-525.

Skinner, E., Furrer, C., Marchand, G., & Kindermann, T. (2008). Engagement and disaffection in

the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology,

100,* 765-781. doi:10.1037/a0012840.

Veiga, F. (2016). Assessing Student Engagement in School: Development and validation of a

four-dimensional scale. *Procedia – Social Behavioral Sciences*, 217, 813 – 819.