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Standards-Based Grading in a Small, Suburban District: Teacher Education, Confidence, and Implementation

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ABSTRACT

Standards-based grading (SBG) is a grading system in which each student is given a set of grades, each reflecting their proficiency in relation to a specific skill. The present study examined K–12 teachers' implementation of SBG practices in a small, suburban Midwestern school district, as well as their perceptions of and confidence in implementing SBG. It also examined these teachers' prior formal and informal opportunities to learn about SBG and how both pre-service and in-service opportunities to learn relate to their implementation of SBG. Results provide evidence of mixed levels of teacher SBG implementation, mixed teacher perceptions of SBG, and mixed teacher confidence in implementing such practices. In addition, the study finds that teachers' prior opportunities to learn about SBG practices formally and informally were variable. Participation in both pre-service and in-service opportunities to learn about SBG were moreover related to SBG implementation, and these relationships were partially or fully mediated by teachers' confidence in implementing SBG practices.

***Keywords*:** standards-based grading, implementation, teachers, in-service teacher education, pre-service teacher education

Standards-based grading (SBG) is a grading system in which each student is given a set of grades, each reflecting their proficiency in relation to a specific skill. It involves grouping students into performance categories at the level of individual content standards. In SBG, documenting and communicating non-academic factors such as attendance, behavior, and effort is done separately from grades, which represent academic content mastery. While implementing SBG, teachers use a proficiency scale that describes levels of proficiency or mastery of a given standard, and each student is assessed with respect to their level of mastery of each standard.

For example, instead of a student receiving a single grade of B on a report card for mathematics, a SBG report card might list a set of math standards, each associated with a number (e.g., 1, 2, 3, or 4) and a label (e.g., below standards, approaching standards, met standards, exceeded standards), representing that student's level of proficiency. To complete the work of SBG, teachers classify each student with respect to their level of proficiency or mastery of each standard using what are known as proficiency scales or tables. Like learning progressions for each skill, a proficiency scale or table describes varying levels of proficiency, competence, or mastery for a given standard.

Table 1 shows an example proficiency table for a Common Core mathematics standard HSS.ID.C.9: *distinguish between correlation and causation*. Proficiency scales or tables are different from scoring rubrics, which are used to score an individual assessment task or assessment task elements. In contrast, proficiency scales or tables are used to assign students to performance categories for a given standard based on a collective body of evidence (e.g., all tests or assessment tasks that address that standard).

Table 1

Example Proficiency Table for Common Core State Standard for Mathematical Content HSS.ID.C.9: "Distinguish Between Correlation and Causation"

Numerical Level	Performance Level	Description
Level 1	Not proficient	Student understands neither the concepts of correlation (i.e., a relationship between two variables of some form, direction, and magnitude) nor causation (i.e., a cause-and-effect relationship between two variables).
Level 2	Partially proficient	Student understands both the concept of correlation (i.e., a relationship between two variables of some form, direction, and magnitude) and the concept of causation (i.e., a cause-and-effect relationship between two variables) but does not understand the relationship between these concepts and interprets correlations as representing causal relationships.
Level 3	Proficient	Student understands both the concept of correlation (i.e., a relationship between two variables of some form, direction, and magnitude) and the concept of causation (i.e., a cause-and-effect relationship between two variables); and that all causal relationships involve correlation, but that not all correlations reflect causal relationships.
Level 4	Advanced	Student understands both the concept of correlation (i.e., a relationship between two variables of some form, direction, and magnitude) and the concept of causation (i.e., a cause-and-effect relationship between two variables); and that all causal relationships involve correlation, but that not all correlations reflect causal relationships. Student understands that correlations may not reflect causal relationships due to extraneous variables and that establishing a causal relationship requires additional elements beyond that which is required to establish a correlation (e.g., temporal precedence and ruling out extraneous variables).

Some argue that SBG helps to better align classroom assessment and grading with accountability and external assessment policies, especially policies around content and performance standards (Brookhart, 2015; Guskey et al. 2011; Marzano & Heflebower, 2011). SBG purportedly helps teachers focus grading on the cognitive content of interest rather than focusing on ancillary factors such as attendance and behavior (Brookhart, 2011; Scriffiny, 2008). Additionally, information obtained from SBG is arguably richer, more specific, and more diagnostic than information obtained by other types of assessment measures (Anderson, 2018; Guskey & Jung, 2009; O'Connor et al., 2018; Lang & Townsley, 2021; Scriffiny, 2008; Townsley, 2019). Proponents of SBG argue that it thus provides more actionable information about student strengths and weaknesses to stakeholders and parents/guardians (Brookhart et al., 2016) and is more useful for teacher data-driven decision-making (Brookhart et al., 2016; Scriffiny, 2008).

However, while there is a body of literature on various stakeholders' (e.g., teachers, students, parents/guardians) perceptions of SBG, many other important questions remain unanswered. These include questions about the impact of SBG practices, teachers' opportunities to learn about the practice of SBG, and factors associated with teacher implementation of SBG. The purpose of this study was to examine some of these questions.

LITERATURE REVIEW

Previous studies reported positive educator perceptions of SBG, stating that educators believed that SBG improves teaching, learning, and assessment (Townsley & McNamara, 2021); provides better and clearer information than traditional grades (Swan et al., 2014); and helps clarify communication about the goals and outcomes of formal education (Knight & Cooper, 2019). Some other studies found mixed educator perceptions as to whether SBG better helps students identify strengths and weaknesses and whether SBG better represents their mastery of content compared to traditional grading (Hany et al., 2016). Hany et al. (2016) also found that more experienced educators tended to hold more negative views of SBG.

Research has been conducted on student perceptions about SBG, as well as the perceptions of parents and guardians. Some studies concluded that students' perceptions about SBG were favorable. For example, previous research showed favorable perceptions of SBG among undergraduate STEM students (Carberry et al. 2012) and highlighted the flexibility afforded by SBG (Elsinger & Lewis, 2020). Other studies, for example, Peters et al. (2017), revealed that secondary students had mixed perceptions towards SBG. When it comes to parents' and guardians' perceptions about SBG, studies revealed

some resistance to the practice (Franklin et al., 2016; Guskey & Bailey, 2010; Peters & Buckmiller, 2014). Resistance may be explained due to their unfamiliarity with SBG and concerns about its implications for higher education. Students will most likely need to transition to traditional grading practices when they enter postsecondary education due to the preponderance of institutions using such methods (Franklin et al., 2016; Guskey & Bailey, 2010; Peters & Buckmiller, 2014). A study conducted by Swan et al. (2014) reported that parents/guardians preferred SBG report cards over traditional report cards due to the additional clarity and detail, but some still emphasized the importance of providing traditional grades (i.e., letter grades and percentages).

Studies have also examined challenges with the implementation of SBG practices. Reported challenges included insufficient teacher knowledge of content standards and SBG principles (Hany et al., 2016; Michael et al., 2016; Tierney et al., 2011; Townsley & McNamara, 2021); parental resistance to SBG (Guskey & Jung, 2006; Peters & Buckmiller, 2014); increased teacher workload and time required (Diegelman-Parente, 2011; Spencer, 2012; Swan et al., 2014); teacher challenges prioritizing content standards (Spencer, 2012); and student information systems not being able to accommodate SBG (Peters & Buckmiller, 2014).

Others have reported issues around fidelity of implementation, with teachers continuing to include non-academic factors in grades such as effort and homework completion (Knight & Cooper, 2019; Tierney et al., 2011; Townsley & McNamara, 2021). Such research also identified differences in how teachers classified students into performance categories, which was often a judgmental process (Tierney et al., 2011). Still others have noted a so-called "implementation dip" phenomenon wherein student performance suffers initially as students orient toward the practice (Knight & Cooper, 2019; Peters & Buckmiller, 2014).

An obvious and important question to ask about SBG practices is whether they positively (or negatively) affect student academic achievement and attainment. This question has been taken up by only a handful of studies, which collectively provide mixed evidence and generally do not feature research designs that warrant strong causal inferences. In a study at the secondary level, Pollio and Hochbein (2015) found that the percentage of students earning either an A or B as the final course grade was about twice as high among those whose instruction featured SBG; however, these observed differences may have been due to existing differences between those groups who were compared or other components of programming they received. Next, Carberry et al. (2012) claimed that SBG was associated with increased student domain-specific self-efficacy and STEM beliefs among undergraduate STEM students, though those changes might have occurred anyway or for other reasons.

While the two aforementioned studies report apparent positive effects of SBG, Townsley and Varga (2018) found no such evidence. Townsley and Varga (2018) used regression modeling to predict ACT scores on account of grade-point average and the nature of grading practices used during high school (standards-based or traditional). They found that the use of SBG was negatively, not positively, associated with ACT scores. While this finding could be interpreted to mean that the use of SBG has a negative effect on ACT scores, the observed relationship could also be an artifact of unmeasured extraneous variables. For instance, there may have been other systematic differences between the students receiving traditional and standards-based grades, such as differences in motivation or parent involvement, which alternatively explain the observed differences in ACT scores.

With the present study, we seek to replicate the findings of some earlier studies on SBG and answer new questions. Given evidence of barriers to SBG such as insufficient teacher knowledge of content standards and SBG principles (Hany et al., 2016; Michael et al., 2016; Tierney et al., 2011; Townsley & McNamara, 2021), we aim to describe teacher implementation of various SBG practices and understand factors associates with its implementation (e.g., perceptions of SBG and confidence in implementing SBG). In addition, we seek to describe in-service teachers' opportunities to learn about SBG practices through various teacher-learning mechanisms and how these relate to the implementation of SBG.

METHODS

This study relied on a descriptive quantitative and explanatory correlational design. Accordingly, it sought to both describe the distribution of SBG practices and identify factors that may explain the implementation of SBG practices. A researcher-developed online survey was distributed to participants, who included K-12 teachers in one small, suburban school district in the Midwestern United States. Teachers provided informed before participating in the study. Data were collected in November and December 2021 after the completion of the district's first academic trimester. At this point, a multi-year SBG reform initiative was well underway in the district. This SBG initiative began with grade K-5 educators before expanding to grades 6-12 educators, and it was delayed due to COVID-19. However, by the time of data collection, all district educators, including educators new to the district in 2021-22, were expected to engage in SBG practices.

Participants

A total of N = 136 participants responded to the survey. Participants included classroom teachers (86%), special education teachers (4%), instructional coaches (5%), support personnel (2%), and those who identified their position as "other" (4%). Most participants (41%) taught in high school level, followed by middle school level (31%), elementary school level (28%), and other (1%). The average teaching experience among participants was 15 years. Participants were between 26 and 61 years old, and the average age of participants was 41 *(SD* = 9). Participants were 78% female, 100% White, and 1% Hispanic or Latino. Participants' highest attained degree was a master's degree (76%), followed by a bachelor's degree (20%), doctoral (1%), and other (3%).

Instrumentation

A researcher-developed survey comprising 71 total items was designed to collect the study data. Survey questions primarily emphasized K-12 teachers' implementation of SBG practices and their confidence in relation to those practices. Other survey sections addressed K-12 teachers' perceptions of SBG practices; K-12 teachers' perceptions of problems, barriers or challenges related to the implementation of SBG; and K-12 teachers' prior opportunities to learn about SBG during pre-service and in-service teacher educational processes.

The implementation and confidence items from the survey (16 items total) all related to the same set of eight SBG practices, such as "[aligning] your classroom assessment system (i.e., assessment tasks and scoring criteria) with standards and proficiency tables or scales;" "[using] student proficiency classifications for instructional decision-making or to personalize instruction (e.g., lesson planning, grouping, identifying students for intervention, providing feedback);" and "[classifying] student mastery using proficiency tables or scales for formative assessment purposes during instructional periods." The eight practices were specified based on our review of the literature (e.g., Guskey & Bailey, 2010; Guskey & Jung, 2009; Marzano & Heflebower, 2011), and in collaboration with the school district partner. The implementation items featured a 5-point frequency response format ranging from 1 (*Never*) to 5 (*A few times per week*), and the confidence items used a 5-point rating scale ranging from 1 (*not at all confident*) to 5 (*very confident*).

Another survey section sought to understand K-12 teachers' perceptions of SBG practices (8 items total). Toward that end, respondents indicated their level of agreement with eight statements reflecting eight positive beliefs about SBG. Items included: "Standards-based grading improves classroom assessment processes;" Standards-based grading improves communication to students about the goals of instruction;" and "Standards-based grading provides better information about student strengths and weaknesses than traditional grading systems." These items were designed based on our review of the literature, especially literature that argued for the advantages of SBG (e.g., Carberry et al. 2012; Scriffiny, 2008; Swan et al., 2014; Townsley & McNamara, 2021). These items featured a 5-point agreement response format ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*).

The next survey section pertained to K-12 teachers' perceptions of 18 problems, barriers, or challenges related to the implementation of SBG (18 items total). Items in this section included problems, barriers, or challenges such as: "The time required to implement standards-based grading;" "Understanding the difference between a proficiency scale or table and a scoring rubric;" and "Parental/guardian perceptions or challenges about standards-based grading." The response format was a 3-point scale: 1 (*Not at all a problem, barrier, or challenge*), 2 (*A minor problem, barrier, or challenge*), and 3 (*A major problem, barrier, or challenge*). The barrier items were specified based on our review of the literature (e.g., Hany et al., 2016; Michael et al., 2016; Tierney et al., 2011; Townsley & McNamara, 2021) and in collaboration with the school district partner.

An additional survey section pertained to the teachers' prior opportunities to learn about SBG during pre-service and in-service teacher educational processes (17 items total). Participants were asked whether they learned about SBG during each of the 17 formal and informal experiences. The response format for these items was binary (0 = *No* and 1 = *Yes*). Examples of these activities included in-service institute/professional development days; pre-service teacher education clinical experiences (e.g., student teaching); pre-service teacher education coursework; professional learning communities; and individual research (e.g., reading professional or research literature, watching YouTube videos, and Googling a topic). The teacher learning opportunity items were developed based on the research team's expertise in teacher education and in collaboration with the school district partner.

The survey also collected basic data on teachers' socio-demographic (e.g., age, race/ethnicity) and professional (e.g., school level taught, years of experience) characteristics (12 items total).

Analytic Approach

Prior to analysis, we conducted exploratory factor and reliability analyses to understand the score properties of different sets of items (e.g., SBG implementation, SBG confidence, SBG perceptions, SBG barriers, and opportunities to learn about SBG). Sets of such items were used to construct composite variables by taking the mean of the respective item sets. The internal consistency reliability estimates (McDonald's 1999 ωts) for the SBG implementation, SBG confidence, SBG perceptions, and SBG barriers composite measures were .86, .93, .98, and .93, respectively.

An exploratory factor analysis of item responses related to opportunities to learn about SBG revealed at least two distinct factors. One factor could be readily interpreted as *pre-service teacher education opportunities*, and another could be readily interpreted as *in-service teacher education opportunities*. There was no discernible empirical structure by which to differentiate formal versus informal in-service teacher education opportunities to learn. The items comprising the pre-service teacher education opportunities factor were *pre-service teacher education coursework* and *pre-service teacher education clinical experience* ($\alpha_{std} = .79$). The items comprising the in-service teacher education opportunity factor were *in-service institute/professional development days*; *in-service professional development workshops, seminars, or sessions*; *professional learning communities; common meeting/planning/collaboration time*; *collaborative proficiency scale/table/writing sessions*; and *informal communication or interaction with other educators or administrators* ($\omega_t = .86$).

To answer the research questions, we relied on a variety of analytic tools, including descriptive statistical, multiple regression, and mediation analysis. For regression and mediation analysis, all continuous variables were standardized prior to analysis. *School level* was dummy coded such that there were *middle school* and *high school* dummy variables with elementary schools as the reference group for the multiple regression analysis. For the mediation analyses, we used the Hayes (2017) PROCESS macro for SPSS. Missing data were addressed with mean imputation in all associational analyses.

RESULTS

Descriptive Analyses

Teachers generally reported mixed levels of implementation of the eight SBG practices. The most common practice was sharing "I can" statements with standards, for which the mean fell between *Once a week* and *A few times per week.* Most of the other means fell between *Once a month or less* and *A few times per month*. The least common practice was having students themselves use proficiency tables or scales (e.g., for student self-assessment, goal setting, or conferencing). Item statistics for the SBG implementation items are provided below in Table 2.

Table 2

Teachers' Frequency of Implementation of and Confidence with Standards-Based Grading Practices

Item	*M*	*SD*	*M*	*SD*
Share "I can" statements with students	4.71	0.69	4.60	0.73
Prioritize content standards	3.38	1.27	3.70	1.14
Align your classroom assessment system (i.e., assessment tasks and scoring criteria) with standards and proficiency tables or scales	3.19	1.26	3.08	1.33
Use student proficiency classifications for instructional decision-making or to personalize instruction (e.g., lesson planning, grouping, identifying students for intervention, providing feedback)	2.90	1.28	2.90	1.27
Classify student mastery using proficiency tables or scales for formative assessment purposes during instructional periods	2.47	1.27	2.78	1.30
Classify student mastery using proficiency tables or scales for summative assessment purposes after periods of instruction (e.g., for report-card grading, and parent-teacher conferences)	2.40	1.17	2.85	1.31
Design and develop proficiency tables or scales	2.39	0.82	2.62	1.30
Have your students use proficiency tables or scales (e.g., for student self-assessment, goal setting, or conferencing)	2.29	1.25	2.47	1.36

Note. The implementation stem was: "How often do you engage in each of the following standards-based grading processes?" The implementation response format was 1 = *Never*, 2 = *Once a month or less*, 3 = *A few times per month*, 4 = *Once a week*, and 5 = A few times per week. The confidence stem was: "How confident are you in terms of your ability to implement each of the following

standards-based grading processes?" The confidence response format was: 1 = *Not at all confident*, 2 = *Slightly confident*, 3 = *Moderately confident*, 4 = *Confident*, 5 = *Very confident*. Items are sorted by implementation mean.

Participants did not express strong confidence in their ability to implement different processes associated with SBG, in general. Teachers were most confident in sharing "I can" statements with students, $M = 4.60$, $SD = 0.73$, and least confident in having students use proficiency tables or scales for purposes such as self-assessment, goal setting or conferencing, $M = 2.47$, $SD = 1.36$. Item statistics for the SBG confidence items are provided in Table 2. With one exception, the rank ordering of teacher confidence items mirrored that observed for the frequency of their implementation of those same eight practices.

Overall, participants tended to stay neutral regarding SBG and expressed neither strong acceptance nor rejection of it. Mean values for the items focused on perceptions regarding SBG tended to be around 3 (*Neither agree nor disagree*) on the 5-point agreement scale. Teachers tended to most agree that SBG provides better information regarding student strengths and weaknesses than the traditional grading system, $M = 3.20$, $SD = 1.31$, and expressed the least favorable perceptions about SBG improving communication to parents/guardians about the goals of instruction, $M = 2.56$, $SD = 1.41$. Item statistics for the SBG perception items are provided below in Table 3.

Table 4 presents descriptive statistics for responses related to problems, barriers, or challenges related to the implementation of SBG. The means for these items ranged from 1.41 (between *Not at all a problem, barrier, or challenge* and *A minor problem, barrier, or challenge*) to 2.70 (between *A minor problem, barrier, or challenge* and *A major problem, barrier, or challenge*). The standard deviations ranged from .57 to .78.

Teachers reported the following as being the strongest barriers to the implementation of SBG: *The time required to implement standards-based grading*, *Incompatibility of standards-based grading with existing student information and grading systems*, and *Parental/guardian perceptions or challenges about standards-based grading*. Teachers were least likely to report *understanding the content standards* (i.e., content knowledge) as being a barrier to implementing standards-based grading in the classroom.

Table 3

Teachers' Perceptions about Standards-Based Grading

Item	*M*	*SD*
Standards-based grading provides better information about student strengths and weaknesses than traditional grading systems.	3.20	1.31
Standards-based grading provides a better representation of student content mastery than traditional grading systems.	3.18	1.31
Standards-based grading provides more useful information than traditional grading systems.	3.08	1.31
Standards-based grading improves communication to students about the goals of instruction.	3.08	1.33
Standards-based grading improves classroom assessment processes.	2.99	1.28
Standards-based grading provides better information than traditional grading systems.	2.99	1.29
Standards-based grading improves classroom teaching and learning processes.	2.93	1.28
Standards-based grading improves communication to parents/guardians about the goals of instruction.	2.56	1.41

Note. The stem was: "Please indicate your level of agreement or disagreement with each of the following statements about standards-based grading." The response format was: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neither agree nor disagree*, 4 = *Agree*, 5 = *Strongly agree.*

Participants indicated different venues that provided them with opportunities to learn about and receive support when it comes to SBG. In general, responses indicate that participants had varied opportunities to learn about SBG formally and informally. The most frequently endorsed opportunity to learn was in-service institute/professional development days (64%), and the least frequently endorsed opportunity to learn was pre-service teacher education clinical experiences (3%). For context, 18% of the sample indicated that they experienced none of the 17 SBG opportunities to learn that were assessed. The mean number of opportunities to learn was 4.28 ($SD = 3.33$). Table 5 below shows endorsement percentages associated with each opportunity to learn.

Because our sample was heterogeneous with respect to teaching experience and SBG is a relatively recent phenomenon, we examined, via supplemental analysis, the relationship between pre-service opportunities to learn about SBG and teaching experience. Correlational analysis revealed that the *pre-service opportunity to learn* composite variable was negatively associated with *years of teaching experience*, implying that newer teachers received more coverage during pre-service teacher education in SBG, which indicates that the practice is making its way into pre-service teacher education.

Table 4

Barriers Related to the Implementation of Standards-based Grading

Item	*M*	*SD*
The time required to implement standards-based grading	2.70	.57
Incompatibility of standards-based grading with existing student information and grading systems	2.68	.57
Parental/guardian perceptions or challenges about standards-based grading	2.67	.59
Lack of teacher "buy-in" regarding standards-based grading philosophy and principles	2.56	.64
Determining the right "grain size" for reported content standards	2.54	.57
The availability of relevant, timely evidence for standards-based grading	2.54	.60
Lack of teacher preparation to implement standards-based grading	2.54	.64
Lack of available resources related to standards-based grading (e.g., learning progressions, proficiency tables or scales)	2.54	.64
Student perceptions or challenges about standards-based grading	2.49	.68
The selection and/or aggregation of available evidence for standards-based grading	2.48	.62
Exclusion of non-cognitive factors such as attendance, participation, homework completion, and behavior in standards-based grading	2.40	.73
Understanding the difference between a proficiency scale or table and a scoring rubric	2.28	.76
Understanding the concept of proficiency	2.10	.75
Understanding standards-based grading philosophy and principles	2.08	.78
Collaborating with other educators to prioritize content standards and/or develop proficiency scales or tables	2.06	.74
Distinguishing among products, processes, and progress	2.04	.78
Prioritizing content standards	1.73	.63
Understanding the content standards (i.e., content knowledge)	1.41	.59

Note. The stem was: "To what extent are each of the following problems, barriers, or challenges related to the implementation of standards-based grading?" The response format was 1 = *Not at all a problem, barrier, or challenge*, 2 = *A minor problem, barrier, or challenge,* 3 = *A major problem, barrier, or challenge.*

Table 5

Opportunities to Learn about Standards-Based Grading

Item	Percent
In-service institute/professional development days	64
Collaborative proficiency scale- or table-writing sessions	54
In-service professional development workshops, seminars, or sessions	46
Professional learning communities	40
Common meeting/planning/collaboration time	40
Coaching or mentoring	35
Informal communication or interaction with other educators or administrators	35
Speakers/keynote addresses	28
Individual research (e.g., reading professional or research literature, watching YouTube videos, Googling a topic)	28
Online activities or resources (e.g., virtual communities, blogs, podcasts, webcasts)	13
Conferences	10
Graduate-level coursework	8
Peer observation or modeling	8
Pre-service teacher education coursework	7
New teacher induction program	4
Other	4
Pre-service teacher education clinical experiences (e.g., student teaching)	3

Associational Analyses

Pearson correlation analysis was performed to examine simple bivariate relationships between different variables and the implementation of the SBG grading. Bivariate associations among key variables are shown in Table 6 below.

Table 6

Correlations Among All Variables

Variable	Frequency of implementation	Confidence	Perceptions	Barriers	In-service opportunities	Pre-service opportunities
Frequency of implementation	1.00***	.57***	.30***	-.30***	.30***	.28***
Confidence		1.00	.34***	-.32***	.30***	.19*
Perceptions			1.00	-.38***	.20*	.15*
Barriers				1.00	-.15*	-.19*
In-service opportunities					1.00	.12
Pre-service opportunities						1.00

Note. *Statistically significant at the $p < .05$ level. ***Statistically significant at the $p < .001$ level. Correlations with school level and years of teaching experience not shown.

Multiple regression analysis was used to determine if the variables of school level, number of years of teaching experience, perceptions of SBG, barriers to SBG, and confidence with SBG relate to teachers' frequency of SBG use in the classroom. Confidence in using SBG was statistically significantly associated with SBG implementation, $b = .49$, $t = 5.68$, $p < .001$. When holding all other variables constant, a one *SD* increase in confidence was associated with a .49 *SD* increase in SBG implementation. In addition, pre-service teacher education ($b = .17$) and in-service teacher education ($b = .13$, $p = .09$) opportunities were significantly and marginally significantly related to the frequency of SBG implementation. The regression model accounted for a moderate amount of variability in SBG implementation ($R^2_{Adj} = .36$).

The correlational and regressional analyses indicated small-to-moderate correlations among SBG implementation, confidence, and teacher learning opportunities. Consequently, mediation analysis was performed to test if confidence mediates the relationship between in-service and pre-service opportunities to learn about SBG and the frequency of SBG implementation in the classroom.

Table 7 summarizes our analysis examining whether confidence mediates the relationship between pre-service opportunities to learn about SBG and the frequency of SBG implementation. The results revealed a significant indirect effect of pre-service opportunities to learn on SBG implementation ($b = .094$, $t = 1.946$, $p < .05$). Furthermore, the direct effect of pre-service opportunities to learn on SBG implementation frequency in presence of the mediator was also significant ($b = .170$, $p < .05$). Hence, confidence *partially* mediated the relationship between pre-service opportunities to learn and frequency of SBG implementation.

Table 7

Pre-Service Opportunities to Learn Mediation Analysis Summary

Relationship	Total effect	Direct effect	Indirect effect	Confidence interval		*t*- statistics	Conclusion
Pre-service opportunities to learn -> Confidence -> SBG implementation	.264 (.001)	.170 (.011)	.094	Lower bound .0099	Upper bound .2046	1.946	Partial mediation

Note. Relationship refers to the indirect relationship between pre-service opportunities to learn and SBG implementation by way of (mediated by) confidence.

Table 8 summarizes our analysis examining whether confidence mediates the relationship between in-service opportunities to learn about SBG and the frequency of SBG implementation. The results revealed a significant, indirect effect of in-service opportunities to learn on SBG implementation ($b = .149$, $t = 3.035$, $p < .05$). Furthermore, the direct

effect of in-service opportunities to learn on SBG implementation frequency in presence of the mediator was found to be non-significant (b = .134, p = .05). Hence, confidence *fully* mediated the relationship between in-service opportunities to learn and SBG implementation frequency.

Table 8

In-Service Opportunities to Learn Mediation Analysis Summary

Relationship	Total effect	Direct effect	Indirect effect	Confidence interval		*t*- statistics	Conclusion
In-service opportunities to learn -> Confidence -> SBG implementation	.283 (.000)	.134 (.052)	.149	Lower bound .0592	Upper bound .2496	3.035	Full mediation

Note. Relationship refers to the indirect relationship between in-service opportunities to learn and SBG implementation by way of (mediated by) confidence.

DISCUSSION

Our findings imply that K-12 educators—at least in this context—have mixed views of SBG, mixed levels of confidence with SBG, and ultimately, mixed levels of SBG implementation. As it relates to the implementation of SBG practices, variation in the level of implementation of a given SBG practice among teachers may imply differences in the uptake of SBG practices and/or that not all teachers implement SBG with the same fidelity. On the other hand, this may be because certain SBG practices are simply more suitable or feasible for teachers of particular grades, subjects, or student populations.

The observed absolute levels of implementation of SBG practices may also not necessarily indicate implementation problems. SBG practices are only a subset of many practices teachers might implement during the course of their work, and it is probably unreasonable to expect that all teachers implement all such practices "*a few times per week."* At the same time, variation in the levels of implementation of *different* SBG practices may be unproblematic in practice. The fact that some SBG practices are more common than others may also reflect the fact that some of these practices simply vary in their utility and occur on different time scales.

The observed variation in teacher confidence in implementing SBG practices may be an area of concern, however. Indeed, confidence in SBG practices was strongly associated with implementation of SBG practices in our multiple regression analysis. It is logical to assume that teacher confidence in implementing SBG may be an important precursor for the implementation of such practices.

We also identified several problems, barriers, or challenges related to the implementation of SBG, as perceived by teachers. Chief among these were the time required to implement SBG; the incompatibility of SBG with existing student information and grading systems; and parental/guardian perceptions or challenges. These findings well comport with earlier studies on SBG (Diegelman-Parente, 2011; Guskey & Jung, 2006; Peters & Buckmiller, 2014; Spencer, 2012; Swan et al., 2014).

We also documented varied levels of in-service opportunities for educators to learn about SBG formally and/or informally—especially limited pre-service opportunities to do so. While some participants had no such opportunities, most had had multiple. In addition, we found that newer teachers had received more instruction during pre-service teacher education about SBG. This implies that SBG practices are being addressed during pre-service teacher education among more recent teacher cohorts. Our findings also suggest that both pre-service and in-service opportunities indirectly relate to SBG implementation, through increased confidence.

The study has implications for K-12 administrators and professional development providers as well as faculty in higher education institutions who work with pre-service and in-service teachers. Firstly, our findings imply that it may behoove administrators seeking to implement SBG to anticipate mixed or uneven teacher SBG implementation, confidence, and "buy-in" problems. At the same time, our findings related to barriers to SBG implementation may help administrators optimize the design and/or implementation of SBG initiatives. Secondly, our study suggests that teachers may need to be offered more pre-and/or in-service learning opportunities to promote teacher buy-in, confidence, and adoption of SBG.

The study had several important limitations. Chief among them are limitations to external validity related to the sampling of teachers from only a single small, suburban district. The nature of SBG systems can vary across schools and districts (Marzano & Heflebower, 2011), and future studies should attempt to replicate our findings in teachers sampled

from other contexts. Future research on SBG should also compare the student achievement outcomes of classrooms that use traditional versus SBG, preferably using rigorous research designs.

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