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Sara Dominguez
University of New Mexico, USA

Vanessa Svihla
University of New Mexico, USA

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Sara Dominguez, Vanessa Svihla

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Abstract

In the spring of 2020, schools across the United States closed due to the COVID-19 pandemic, forcing a sudden change from the traditional way education was provided. When schools resumed, many teachers found themselves teaching and scaffolding learning in a new situation, online. However, there is limited information on how teachers implement scaffolding—both in-person as well as online. As such scaffolding depends on teachers' perceptions, this suggests the need for a measure of teachers' perceptions of scaffolding across these modalities. This paper reports the design and development of a survey created to measure teacher perceptions of their agency/control related to and self-efficacy for implementing various forms of scaffolding and the forms of scaffolding they use. K-12 teachers who taught before and during the pandemic (N=105) completed the survey in spring/summer 2021. Using exploratory factor analysis, we found that the survey measured these constructs, and that constructs loaded separately by modality (online versus face-to-face). This suggests the survey could be used in shorter forms to provide information about teacher perceptions of scaffolding specific to their modality, in turn providing more information about the kinds of professional development they might benefit from.

Introduction

As teachers implement instruction in a school setting, they apply scaffolds to assist student learning. This is related to Vygotsky's (1978) zone of proximal development (ZPD), which describes the range in which a learner can complete a task with assistance (Hausfather, 1996). Scaffolds can considerably aid in student learning (Frederick, Courtney, & Caniglia, 2014; McNeill, Lizotte, Krajcik, & Marx, 2006) and decrease frustration (van de Pol, Volman, & Beishuizen, 2010; Wood, Bruner, & Ross, 1976). Scaffolding often happens in-the-moment. Therefore, measuring teacher-implemented scaffolding can be challenging, and there is not currently a tool to measure what, when, and how much support teachers give students. Additionally, with the recent changes in education due to the COVID-19 pandemic, teachers may be more aware of ways their typical scaffolding practices were interrupted, providing an opportunity to gain clearer insight into teachers' perceptions of scaffolding.

Traditionally, K12 education has taken place in-person, though it is no longer limited to this modality due to technology. Online instruction has been studied for decades and there is abundant research on various aspects of teaching in this modality. Although online learning conveys mixed emotions and often thoughts of reduced quality, decreased communication, and lower expectations, research has found that not to be accurate (McNiff &

Aicher, 2017; R. Schultz, 2012; Tanis, 2020). Understandably, most of the research regarding scaffolding in an online modality has involved computers rather than teachers applying the scaffolding, with much of the focus on metacognitive scaffolds (Doo, Bonk, & Heo, 2020). Much less is known about teachers' perceptions and decision-making related to implementing scaffolds, especially regarding the responsive and contingent decision-making on which much of scaffolding depends (Dominguez & Svihla, 2023). As interactions and tools are different online, we would expect that teachers' perceptions of scaffolding may vary as well.

The sudden change to emergency remote teaching due to COVID-19 restrictions means that most teachers taught online for at least two months. The term emergency remote teaching was coined by Hodges, Moore, Lockee, Trust, and Bond (2020) to distinguish between the instant change in the modality of learning rather than a class deliberately designed with a systematic model and a prepared teacher. As pointed out by R. B. Schultz and DeMers (2020), the most effective method to teach online is by supporting students so that they can focus on learning rather than on the modality in which learning is taking place. While teachers' perceptions of scaffolding during emergency remote instruction may differ from those who have had time to learn and prepare for online teaching, the situation provided a stark contrast, in turn creating an opportunity to investigate teachers' perceptions of scaffolding across their typical in-person and emergency remote teaching. To provide more insight into teachers' perceptions of scaffolding in their classrooms and during online teaching, we developed a survey. The purpose of this study was to develop and validate a survey to measure how teachers' perceptions of their scaffolding prior to and during the pandemic, to study teacher agency and self-efficacy.

Framework

We first frame our study by considering characterizations of ways teachers implement scaffolding. Scaffolds can vary in *mode*, from planned and static to emergent and dynamic (Saye & Brush, 2002). Teachers implement scaffolds in *contingent ways*, using ongoing diagnosis, responsive support, and fading (Lajoie, 2005; Saye & Brush, 2002). To understand how teachers engage in such complex practice, which is highly dependent on decision making, we also consider research on teacher agency and control (Christ & Wang, 2013). Given the study context and uncertainty presented by the rapid shift to online teaching, we also consider self-efficacy (Gabriele & Joram, 2007), as we might expect that differences in self-efficacy related to scaffolding learning in the classroom could transfer to online teaching.

Mode of Scaffolding

Teachers can provide assistance that is planned or that is implemented interactionally. Planned scaffolds, also called hard scaffolds, are described as static support that is intentional and predicted based on known areas that students will struggle (Saye & Brush, 2002). Teachers plan hard scaffolds prior to the lesson. These scaffolds can be presented in different ways, for example as materials to be completed, such as worksheets and graphic organizers; as supportive materials, such as word banks; or informative materials, such as rubrics or information on the board. For instance, Kang, Thompson, and Windschitl (2014) conducted a study of student responses to teacher-designed science assessments, finding that using two hard scaffolds together, like providing concrete

examples of abstract phenomena and a rubric or checklist helped students provide better explanations of their understanding. Similarly, McNeill, Lizotte, Krajcik, and Marx (2006) investigated how providing a mix of discipline-specific and generic prompts could support students to construct explanations. Such hard scaffolds may be carefully planned based on research and/or experience about student performance. In contrast, soft scaffolds occur during an interaction between the teacher and the student. Soft scaffolds are situational and dynamic. They may be anticipated ahead of time but happen in the moment based specifically on student responses and needs. Teachers continuously monitor and diagnose students' understanding to provide timely support and scaffold their needs (Saye & Brush, 2002). For instance, Johnson (2019) found that teachers who used open-ended questions had an increase in student interactions with the teacher and were able to accomplish tasks without decreasing the difficulty. Maloch (2004) observed third-grade literature discussion groups and found that with consistent teacher scaffolding, including asking questions and providing strategies, students participated and practiced while the teacher was afforded the ability to adapt scaffolding to students' needs. In the current study, we were interested in knowing what types of scaffolds teachers used in the classroom and how quickly moving to a remote setting impacted the scaffolds they used.

Contingent Processes of Scaffolding

Scaffolding is a contingent process involving the adaptation of support based on a student's needs. In particular, there are three contingent processes: ongoing diagnosis, responsive support, and fading. These contingent processes include the range of scaffolding, from implementation decisions to decreasing and eventual removal of support. Teachers continually diagnosis during instruction by monitoring what the student can and cannot do independently (Lajoie, 2005; Saye & Brush, 2002). Therefore, ongoing diagnosis is rarely a stand-alone process; it happens during dialogue, in completion of work, or questions asked and answered by students. This makes it rather hidden work, and as a result, it is seldom the focus of research, leaving ongoing diagnosis in scaffolding understudied (Ge, Law, & Huang, 2012), except in the cases where technology implements scaffolds, rather than in teacher-implemented scaffolding.

Responsive support is dynamic and based on observation and monitoring the student's need for support (Azevedo, Cromley, Fielding, Moos, & Greene, 2005). Responsive support may be based on an entire class or individual students, and rather than being one size fits all, a range of support can be provided (Stone, 1998). For instance, Athanases and de Oliveira (2014) found that high school teachers who prompted and restated information for the class based on student input improved student participation and depth of information. Similarly, Songer, Shah, and Fick (2013) found that teachers customized verbal scaffolds by clarifying terms, directing to content, and creating answer options that are responsive to student needs in-the-moment; these responsive supports helped students answer questions with more abstract or unfamiliar concepts.

Fading is the removal of support in a gradual manner. Scaffolding by definition is temporary support (Stone, 1998). For instance, Peregoy and Boyle (1999) studied teachers who gradually reduced scaffolds during reading activities as the students were able to do more on their own. They found that over time, bilingual students increased their language acquisition and learning. Similarly, Fullerton, McCrea-Andrews, and Robson (2015) studied

teachers scaffolding student writing over time. When teachers started by scribing then slowly had the students do more as they gained experience, students increased in participation and success independently. Fading is the culmination of the systematic application and removal of support based on the student's demonstration of independence in the task at the time. This is done by the teacher's ability to have control in what and how much scaffolding to apply, contingent on the student's needs. The application and fading of scaffolds may be based on the teacher's knowledge and agency, or the control they have in the moment. In the current study, we are interested in teachers' perceptions of these contingent processes.

Agency and Control

Agency is the phenomenon of how an individual has the ability to control or affect the desired outcome in a specific context (Bandura, 2005). Teacher agency has been described as a teacher's ability to make decisions that impact students and to adapt instruction based on student needs (Christ & Wang, 2013) and can be structured by the grade level or subject they teach, as well as school context. Teacher agency has been defined as choices and actions taken in an intentional manner to make an impact (Toom, Pyhältö, & Rust, 2015). For instance, in a study of primary school teachers, teachers discovered that their agency was dependent on context and realized how they collectively could use their agency to impact change (Wallen & Tormey, 2019). McMullen (1999) found that teacher agency was related to the use of developmentally appropriate practices in preschool and elementary school teachers. In-service teachers who have higher agency learn more by putting new knowledge into use by generalizing new skills and knowledge in the classroom (Kauppinen, Kainulainen, Hökkä, & Vähäsantanen, 2020). Thus, having agency can enhance the effectiveness of professional development (Kohnen & Whitacre, 2017).

Recently, teacher agency was also impacted by COVID-19 restrictions, as teachers had to change their instructional method suddenly, altering their control over the scaffolds they could use and how they could use them. Teachers' prior technology experiences and other contextual factors (e.g., grade level, subject taught, school context, teaching experience) may intersect and influence their sense of agency and control over scaffolding during the pandemic. The sudden move to remote teaching created an opportunity for teachers to exercise agency while having to alter their teaching due to circumstances created by COVID restrictions. Research has shown that some teachers were creative in communication and adapted their presentation of instruction (Thumvichit, 2021). Likewise, some teachers were able to support their peers while they themselves improved and enhanced their own skills during the change to remote teaching (Fu & Clarke, 2021). Teacher agency is important for understanding how teachers create learning environments and respond to changes in their teaching (Biesta, Priestley, & Robinson, 2015). Regardless of whether that teaching happens face-to-face or in a remote setting, teachers' ability to impact student learning and the confidence to do so are crucial components. In the current study, we sought to investigate teachers' agency and control over how they provide instruction and scaffolding support.

Self-Efficacy

Teachers' self-efficacy, commonly thought of as confidence, is based on their knowledge and experiences and is

a crucial component in agency (Bandura, 2005). Teachers' self-efficacy impacts their effectiveness in the classroom and their uptake of new practices (Gabriele & Joram, 2007; Gibson & Dembo, 1984). Teachers with high self-efficacy provide higher quality instruction and create a more conducive learning environment (Guo, Connor, Yang, Roehrig, & Morrison, 2012; Holzberger, Philipp, & Kunter, 2013). Students can benefit from having a teacher with high self-efficacy; Zee and Koomen (2016) found a connection between teachers' self-efficacy and student achievement and motivation. Researchers have also found that self-efficacy affects the kind of feedback teacher provide; specifically, teachers with higher self-efficacy provide more support and have higher expectations for their students (Gibson & Dembo, 1984; Guo et al., 2012).

Teachers with high self-efficacy are more likely to focus on how to master skills for their changing needs because high self-efficacy is associated with being resilient and open to change (Guskey, 1988). While teaching skills did not change, how the skills are implemented needed to change in response to the pandemic. Many studies have linked teacher self-efficacy to experience, and recently, remote/online teaching self-efficacy has likewise been linked to experience (Putman, 2012). For instance, Robinia and Anderson (2010) found that after teaching three online courses, teachers' self-efficacy increased. Similarly, taking courses or professional development related to teaching online has the potential to increase teachers' self-efficacy (He, 2014; Wright, 2010). Teachers' general interest and attitudes toward teaching online can also be positively associated with their self-efficacy. Lee and Tsai (2010) found that teachers with higher self-efficacy in teaching online had a more affirmative mindset about teaching online. In this way, self-efficacy is context-specific, meaning high self-efficacy in one aspect of teaching may or may not translate to other areas. The pandemic provided an opportunity to research teacher self-efficacy related to scaffolding specifically, with the contrast between in the classroom versus remote settings.

Method

Study Design

The purpose of this study was to develop a survey that can provide new insight into teachers' perceptions of their agency/control and self-efficacy related to scaffolding, as well as a snapshot of the kinds of scaffolding they report using. We sought to collect evidence about whether the survey can measure the intended constructs.

To address our research aim we first sought existing surveys to draw from. In addition to a more general review, with a librarian's assistance, we reviewed databases for existing, related surveys. First, we identified surveys related to self-efficacy (Bandura, 2006), which we were able to adapt. Next, we reviewed other instruments and surveys of teacher practice and scaffolding. Our search turned up various observation protocols that can be used to evaluate teacher practice, including their use of scaffolding (Marshall, Smart, & Alston, 2016; O'Connor et al., 2021), surveys completed by students reporting on specific practices they experienced, including scaffolding (Cho & Cho, 2016), and subject-specific measures of teacher perceptions of scaffolding, such as in relation to teaching English as a foreign language (Awadelkarim, 2021). For our purpose, a common limitation to many of these instruments was that they focused on scaffolding as just one practice among many measured, meaning these instruments did not offer adequately nuanced questions to cover the breadth of scaffolding as described in our literature review. Based on our review, we decided to develop new items to measure the study constructs.

Instrument Development and Design

We followed guidelines for survey development found in Dillman, Smyth, and Christian (2014). We developed the survey of teacher-implemented scaffolding through multiple steps, including a literature review, question development, revisions based on subject matter expert review, and a pilot of the survey (see Appendix A). We conducted a literature review of studies over the last two decades in the United States (Dominguez & Svihla, 2023), extending prior reviews. Collectively, these reviews highlighted aspects of scaffolding that have been understudied, such as fading and ongoing diagnosis, and that although varied frameworks are used to categorize scaffolding, there is a consistent focus on contingency and fading (Bakker, Smit, & Wegerif, 2015; Dominguez & Svihla, 2023; Lin et al., 2012; Reynolds, 2017; van de Pol et al., 2010). Collectively, these reviews suggested the importance of including questions about fading and contingency. From the literature, we selected articles that reported on in-service K12 teachers and their students. From this review we found examples of scaffolding mode and contingent processes that became the core stem for our survey questions. We developed three hard scaffolding core stems (Materials to be completed- worksheets, graphic organizers, etc.; Supportive materials - Cheat Sheets, checklist, rubric, etc.; Informative materials - rubrics, static written information [on the board, class post, etc.]) and seven soft scaffold core stems (Modeling or demonstrating; Rewording, explaining in a different way; Multiple repetitions and examples; Prompts, questioning; Guidance, hints; Feedback; Break down task into smaller steps).

Gaining information of teachers' accounts of their scaffolding practices can provide evidence into their implementation of scaffolds. The contingent decision-making teachers use to implement scaffolding is sparsely studied because it is a covert process, but as discussed in the literature review, these decisions are connected to teacher agency and self-efficacy. We therefore developed a set of stems questions related to timing and decision making—*when* and *how much* support to provide as well as *when* and *how to decrease* support. We then placed each stem into questions about self-efficacy and agency & control. The questions were repeated in classroom versus emergency remote teaching settings. We included open-ended questions so teachers could explain their answers. How survey questions coordinated the constructs from the framework is detailed in Table 1.

Table 1. Construct Basis of Survey Questions

Construct	Examples of close-ended questions for the survey
Mode	Which supports did you use to help students learn: (specific examples provided)
Agency & Control	How much control did you have in ….
Self-Efficacy	How confident were you in ….
Contingent processes	*Using stems in Control & Self-Efficacy*
	when to support students?
	how much to support students?
	when to decrease support to students?
	how much to decrease support to students?

We developed the survey items based on research-based guidelines found in Dillman et al. (2014). Specifically,

we wrote questions in an adult-adult communication style, with accessible language and typical word choice used in K12 settings rather than for a researcher. For instance, we used the word “confidence” in the survey questions for the construct of self-efficacy. Questions were written in a clear and succinct manner. Closed and open questions were used to allow participants to provide examples and experiences if they chose without limiting participation from others who prefer to answer questions with options provided. Likert style questions had the same scale, other than self-efficacy, where we maintained the typical 10-point scale (Bandura, 2006). We labeled scales with words rather than numbers that could be seen on each question. We chose a 5-point unipolar scale to represent the continuum of Likert answers without increasing the complexity or burden to the respondent.

We created the survey in Google Forms. This format allowed us to send a link to potential respondents, who could then forward the link to others to facilitate snowball sampling. We reviewed the layout on multiple devices (computer, tablet, and phone) to ensure the format was accessible across platforms. The survey is written to keep visual distractions to a minimum. The layout was selected to make it more user-friendly and decrease either non-responses or frustration that may keep respondents from completing the survey. A graphical progress indicator was not used as it is not recommended for longer studies (Dillman et al., 2014). The questions were grouped by subconstruct to keep related concepts together and to maintain the question order across constructs. Questions were also asked in a similar order to the events as they would occur, with questions related to planning coming before questions about scaffolding during instruction, followed by questions about fading the support. We likewise grouped the question sets, first asking about their experiences before the pandemic and then asking the same set of questions “during online/remote teaching.” All demographic questions were placed at the end of the survey to let respondents know the questions posed before asking for personal information. In addition, an optional text box was placed at the end of the survey for participants to share concerns or additional information, allowing them to provide information they feel is important and not included or provide an outlet for other concerns they may want to share. Lastly, no questions were required. This study received approval as exempt from the authors’ IRB (#2250030353).

The survey was initially validated using expert review by obtaining feedback from teachers. The survey was sent to teachers who were asked to respond to the survey in the presence of an interviewer per guidelines by Dillman et al. (2014). Their feedback on the survey was used to verify appropriate language, that questions measure the intended concepts, that questions are being asked in a clear, concise manner, and that no concepts are missed. We completed the reviews with a small group of experienced teachers (n=3), two of whom taught at different schools, grades, and subjects in the same district in New Mexico and one of whom taught in another state. None of the teachers attended the same teacher education program. The teachers had over 60 years of experience between them and represented each grade level (elementary, middle, high) and had experience teaching core classes, electives, and special education (both pull-out and co-teaching). They were asked to review the survey and express concerns related to measuring the intended concepts, using appropriate teacher language, and fully covering concepts.

Based on feedback, two main changes occurred. The first was to change the term "scaffold" to "support." All the teachers made comments about using the word scaffold; they felt it was not part of the everyday lexicon of

teachers. Although "support" can represent many different things, it is a common description of scaffolds. Even the literal construction-related definition of scaffold references the placement of *support* that is later removed (Stone, 1998). It is common to use "support" as a definition, purpose, or example of scaffolding learning (E. Johnson, 2021; Kang et al., 2014). Second, questions were rearranged so that the questions before 2020 and during online/remote teaching were asked consecutively to decrease uncertainty and frustration from answering the same question in two different situations. This was changed due to teachers going back in the survey to compare their initial responses to make changes to the questions posed the second time. Again, this was done to decrease uncertainty and frustration in answering similar questions in two different time frames.

The pilot study was completed by sending the survey to a small convenience group of experienced teachers (n=10). They were asked to complete the survey, and then evaluate and reflect on whether questions were measuring the intended concepts, if appropriate language was used for the audience, whether concepts were missing, and if it was easy to complete the survey. Based on feedback, three minor changes were made to the survey; all were additions. First, one of the sub-questions did not have a matching question in online/remote format; this was added. The option of 'more than a year' was added to the questions regarding the length of time teaching online occurred. The last addition was to request abbreviations for the state of employment. These were minor changes but were noted by respondents as confusing in how to answer the question; therefore, they were changed to decrease any uncertainty. Overall, the responses were similar, supporting the fact that the questions were understood. We noted alignment between related sets of Likert and open-ended responses. Additionally, similarities were noted in the open-ended responses comparing the two teaching timeframes, before 2020 and online/remote, which further supports that the questions are distinct and understood by the respondents.

Survey Data Collection and Analysis

The survey was sent to teachers known by the researchers through email invitation to participate. The survey link was also posted on Facebook on personal pages and group pages aimed at teachers. One hundred ten responses were recorded through the summer and fall of 2021. Two responses were eliminated as they did not meet the criteria of being a teacher for at least two years. Three were eliminated during the pilot process due to duplication of response submission. That left 105 responses, including the ten responses from the pilot. All questions beyond the initial inclusion criteria were optional; therefore, the total number of respondents varies by question. Respondent's gender percentages correspond to the national statistics (Table 2), which stated that 24% of teachers are men and 76% are women (National Center for Education Statistics, n.d.). Additionally, most of the respondents were from the same state in the southwest 75% (77), while the remaining respondents (26) reported teaching in 8 other states within the United States.

Respondents answered 96.9% of all questions. Of these, 98.6% of Likert questions and 82.6% of open-ended questions were completed; therefore, less than 4% of the survey data were incomplete. Schumacker (2015) stated that when less than 5% of data is missing, any method of dealing with missing data is likely to be effective. Therefore, pairwise deletion was used in SPSS for all analyses. As expected, multivariate normality was not met. Scaffolding is commonplace in teaching; therefore, we expected that most respondents would report using

scaffolds commonly, meaning we did not expect a traditional bell curve. The data have a negatively skewed distribution; the mean was shifted to the right. One reason for this is that Likert questions on the right represented an increased frequency. Many studies have violated assumptions of normality (Micceri, 1989). As our data were primarily to be compared to itself for an EFA, normality is not required (Beavers et al., 2013; Russell, 2002).

Table 2. Demographic Characteristics

Survey Respondents		N	%
Gender	Men	26	25.5
n = 102	Women	74	72.5
	Other	2	2.0
Type of school	Private	7	6.7
n = 104	Charter	24	23.1
	Public	73	70.2
Grade Level	High School	41	39.4
n = 104	Middle School	27	26
	Elementary	36	34.6
Years Taught	2-5 years	12	11.5
n = 104	6-10 years	15	14.4
	11-15 years	23	22.1
	16-20 years	19	18.3
	21+ years	35	33.7

Furthermore, factor analysis looks at the relationship of variables to each other, and therefore does not require multivariate normality. There are several criteria to review to assess the appropriateness of data for an exploratory factor analysis (EFA). Often the first criterion is the sample size; however, researchers have stated that stringent adherence to rules regarding sample size for EFA has diminished as the size may have less impact than considering other data/statistics (Arriendell & van der Ende, 1985; Costello & Osborne, 2005; MacCallum, Widaman, Zhang, & Hong, 1999). Instead, those authors recommend using data with high communalities without cross loading and strong variables loading on each factor. This is echoed by Hogarty, Hines, Kromrey, Perron, and Mumford (2005) with the addition of overdetermined factors, as well as by Bujang, Ghani, Soelar, and Zulkifli (2012), who provided examples of other evidence when using small sample sizes. Overdetermination is when a sufficient number of variables represents a factor; this is considered to be at least three variables (Hogarty et al., 2005). Using these criteria, a sample size of even less than 100 can have good results with strong data (Fabrigar, Wegener, Maccallum, & Strahan, 1999; Hogarty et al., 2005). MacCallum, Widaman, Zhang, and Hong (1999) found that the impact of sample size is reduced when commonalities are high, greater than 0.6. Although this study is a smaller study with 105 respondents, the data met the criterion of high communalities of greater than 0.6.

Factors with strong loading and overdetermination were also met; this is further discussed in our results. Tabachnick and Fidell (2001) recommended factor loading to be greater than or equal to 0.32. We used this criterion, and only variables that met this were retained. Next, the Kaiser-Meyer-Olkin (KMO) (Kaiser, 1974)

measure of sampling adequacy was .747, which met the recommendation of ≥ .70 (Lloret, Ferreres, & Tomás, 2017). Finally, Bartlett's test of sphericity was found to be statistically significant at $p < .001$ (Bartlett, 1950). Both tests indicate that the data could be used in EFA.

Results

Factors Retained

Using the results of the EFA, scores above 0.4 and below -0.4 were considered (Guadagnoli & Velicer, 1988). After that, three requirements were adopted in determining which factors would be retained. First, each factor needed to be overdetermined with at least three variables. Second, any variables that were cross-loaded were removed. Third, factors needed to have a Cronbach's alpha of ≥ .70 (Costello & Osborne, 2005; Fabrigar et al., 1999; Velicer & Fava, 1998; Watkins, 2018). Following the requirements adopted above, the factors were checked for having a minimum of 3 variables; this decision eliminated 2 factors. Next, variables that were cross loaded were removed; this described two variables which led to one factor being removed as it no longer had at least three variables. Finally, one factor was removed due to the Cronbach's alpha score below .70.

After removing eleven variables, the EFA was re-run without these items to get a more developed view of each factor (Beavers et al., 2013; Costello & Osborne, 2005; Russell, 2002; Samuels, 2016; Yong & Pearce, 2013). Again, the previously stated criteria were implemented. One factor was removed due to only having two variables. After that, no variables were cross-loaded, and all factors had a Cronbach's alpha of ≥ .70.

The second iteration had only one variable removed. This left six factors that met the criteria (see Table 3). In a further attempt to substantiate the factors, several criteria were incorporated to support the decision of factors reported. Following the Guttman-Kaiser rule, these factors each had an eigenvalue of greater than one (Finch, 2013). Streiner (2003) suggested that retained factors should explain at least 50% of the total variance. The retained factors accounted for 71.2% of the variance (see Table 4). It was determined that further removal of variables was not needed as this appeared to be a good fit with the data, and we proceed in interpreting the results.

Table 3. Factor Loadings for Retained Variables

Variable	1	2	3	4	5	6	M	SD	α if removed
Factor 1: Supports provided online, Cronbach's alpha = 0.92									
Which supports did you use to help students learn:									
Informative materials – rubrics, etc.	0.53	-0.06	-0.11	0.02	0.20	0.05	3.82	1.16	0.94
Modeling or demonstrating	0.86	-0.03	-0.13	0.09	0.02	0.03	4.13	1.02	0.91
Rewording, explaining in a different way	0.92	0.10	-0.04	-0.04	-0.05	0.04	4.34	0.97	0.90
Multiple repetitions and examples	0.83	0.23	0.03	-0.13	-0.16	-0.02	4.23	1.00	0.91
Prompts, questioning	0.77	-0.07	0.11	-0.06	-0.02	0.03	4.33	0.92	0.91

Variable	1	2	3	4	5	6	M	SD	α if removed
Guidance, hints	0.8	-0.11	0.02	0.03	0.08	-0.04	4.29	0.97	0.91
Feedback	0.82	-0.03	-0.02	0.18	0.13	-0.19	4.16	1.03	0.91
Breakdown task into smaller steps	0.74	-0.04	0.14	-0.18	0.02	0.22	4.29	0.91	0.91
Factor 2: Self-efficacy supporting students online, Cronbach's alpha = 0.92									
How confident were you in….									
providing instruction?	0.08	0.82	0.04	0.01	-0.03	-0.06	6.57	1.88	0.92
planning instruction?	0.02	0.94	0.02	-0.04	-0.10	0.04	6.91	2.09	0.92
when to support students?	0.05	0.86	-0.08	0.05	-0.11	-0.03	6.22	2.10	0.92
how much to support students?	0.03	0.73	0.01	0.04	0.13	0.03	6.36	2.24	0.91
when to decrease support to students?	-0.09	0.57	0.04	0.15	0.38	-0.09	5.99	2.56	0.92
how much to decrease support to students?	-0.18	0.74	0.07	0.06	0.19	-0.03	5.94	2.37	0.91
Factor 3: Supports provided in-person, Cronbach's alpha = 0.86									
Which supports did you use to help students learn:									
Modeling or demonstrating	-0.01	-0.07	0.67	0.08	-0.11	-0.04	4.79	0.43	0.84
Rewording, explaining in a different way	0.06	0.00	0.62	0.15	-0.15	-0.11	4.75	0.48	0.85
Multiple repetitions and examples	0.08	0.04	0.82	-0.06	0.10	-0.09	4.68	0.58	0.83
Prompts, questioning	0.01	0.04	0.77	-0.02	-0.09	-0.01	4.65	0.57	0.83
Guidance, hints	-0.10	0.03	0.74	-0.05	0.12	0.15	4.51	0.59	0.84
Feedback	0.19	-0.09	0.43	0.39	0.02	-0.06	4.57	0.67	0.85
Break down task into smaller steps	-0.13	0.05	0.73	-0.18	-0.01	0.28	4.59	0.63	0.85
Factor 4: Self-efficacy in providing support in-person, Cronbach's alpha = 0.89									
How confident were you in ….									
providing instruction?	-0.02	0.06	0.03	0.84	0.05	-0.08	9.08	1.05	0.86
planning instruction?	-0.05	-0.01	0.02	0.72	0.12	-0.02	9.08	1.08	0.89
when to support students?	0.05	0.09	-0.12	0.77	-0.22	0.25	9.14	1.00	0.87
how much to support students?	-0.05	0.04	0.00	0.81	-0.11	0.21	8.98	1.08	0.85
Factor 5: Control in providing support online, Cronbach's alpha = 0.91									
How much control did you have in ….									
when to support students?	0.10	0.16	-0.02	-0.22	0.65	0.12	3.10	0.99	0.90
how much to support students?	0.06	0.15	0.00	-0.06	0.76	0.06	3.09	1.05	0.87
when to decrease support to students?	0.03	0.10	-0.01	0.02	0.81	0.01	3.14	1.16	0.89
how much to decrease support to students?	0.01	-0.06	-0.02	0.06	0.95	-0.07	3.12	1.14	0.88

Variable	1	2	3	4	5	6	M	SD	α if removed
Factor 6: Control in providing support in-person, Cronbach's alpha = 0.75									
How much control did you have in ….									
providing instruction?	0.02	0.06	-0.13	0.18	-0.02	0.51	4.42	0.67	0.79
when to support students?	0.10	-0.04	0.12	0.09	-0.05	0.67	4.40	0.65	0.69
how much to support students?	-0.03	-0.06	0.06	0.17	0.11	0.81	4.38	0.64	0.51

The factors aligned well with the initial constructs; therefore, the factor names were kept similar to the original constructs they were designed to measure. Variables within each factor measured the same construct, were originally conceptualized together, and each construct loaded on a different factor by setting—in-person or remote/online.

Table 4. Variance of Factors Retained

Factor	Total	% of Variance	Cumulative %
1	7.66	23.22	23.22
2	5.94	18.00	41.23
3	5.02	15.21	56.44
4	1.85	5.60	62.04
5	1.64	4.96	67.00
6	1.39	4.20	71.20

Items Removed

Items removed were reviewed to ensure a comprehensive view of the survey and to address any similarities or notable relationships to substantiate why these questions may have been excluded in the EFA. In the first iteration, 11 questions were removed, and in the second iteration, one additional question was removed. Therefore, we examined the removed items for commonalities. The difference in the modality was the most obvious, as eight of the 12 questions related to in-person scaffolding.

The next trend noted in the items removed for the EFA was regarding the scaffolding examples. There were five questions that listed examples of scaffolds that were removed. Four of those removed were variants of the same form of scaffolding across modalities: scaffolding of materials to be completed, such as worksheets or graphic organizers; and supportive materials provided to students, such as cheat sheets or word banks. The last scaffolding example question that was removed only in the in-person modality was about the informational supports provided, such as rubrics or static written information presented to students.

All the example scaffolding questions removed were regarding hard scaffolds. There were 3 paired questions, for a total of 6 questions about hard scaffolds, which means that all but one of the hard scaffolding examples were removed. The question that remained was in the online modality regarding informational supports. Another

curious trend regarding items removed during the EFA was the concept of fading. There were eight questions about when teachers decreased support and about how much they decreased support they provided. The in-person questions regarding fading of scaffolds were removed after the first factoring. The online questions regarding fading of scaffolds factored either into control or confidence rather than together.

Discussion and Conclusion

Based on the EFA results, this study found that 32 of 44 items on the survey were contained in 6 factors. These factors incorporated all the main constructs presented in the survey, and these were meaningfully and distinctly different from each other. As these aligned well with their constructs, we named them using their original constructs: support provided while online, supports provided in-person, self-efficacy supporting students online, self-efficacy supporting students in-person, control in providing supports online, control in providing supports while in-person. Thus, the EFA identified underlying dimensions in the survey questions that grouped modalities of in-person and online into factors separate from each other. This was anticipated and encouraging to find. These results support the hypothesis that scaffolding did indeed change due to the change in modality. However, it was unclear what aspects or type of scaffolds may have been impacted.

Considering the questions that were removed, we first focus on the sets of hard scaffold questions that asked about providing materials like worksheets or graphic organizers and cheat sheets or word banks. These hard scaffolds may be so commonly used—and across modalities—as to have comparatively little variance. Second, the variables related to fading did not cluster for in-person teaching. One explanation for this is that teachers may have misunderstood that fading should happen (Azevedo et al., 2005; Pea, 2004; Stone, 1998). It is possible that their answers about fading differed by modality because they tended to believe they should not remove support unless they had to, due to the overwhelming experience of emergency remote teaching. Perhaps they viewed the online resources and learning management system as a teaching partner that allowed them to lower their use of supports, rather than fading responsively. Understanding more about teachers' perceptions of fading is important, because fading is part of scaffolding, allowing the student to take on more responsibility gradually.

Scaffolding is widely accepted as beneficial to student learning. The rapid move, prompted by COVID-19 restrictions, from in-person instruction to online teaching provided an opportunity to gain new insights, beyond how teachers might deliver content online. Specifically, the shift, which was not accompanied by significant professional development, provided an opportunity to study teachers' perceptions of both typical in-person teaching and their online experiences. This shift also invites many questions about the ways teacher experience, agency/control, and self-efficacy intersect with scaffolding approaches undertaken, both in-person as well as online. As many aspects of teachers' decision-making, especially related to responsive and contingent processes (Lajoie, 2005; Saye & Brush, 2002), are understudied, surveys like this may shed light on how teachers' agency/control and self-efficacy relate to how teachers deploy scaffolding. Our results support the use of our survey in a range of settings to better understand these relationships.

That each construct separated by modality affirms the contextual nature of these constructs. While this is widely

acknowledged for self-efficacy, it is less studied in relation to human agency. Our results align with those of Lee and Tsai (2010) who found that teachers varied in self-efficacy related to teaching online, and this related to their other beliefs about teaching online. This more fine-grained approach to self-efficacy is common, but comparatively rare in studies of agency, which tend to treat all decisions as relatively equivalent. Yet if teacher agency is taken to mean making intentional and consequential decisions (Toom et al., 2015), it is clear that not all situations are equivalent. Our work therefore aligns with research suggesting agency is context-dependent (Wallen & Tormey, 2019).

There were several limitations in this study. One of the most obvious is the limited number of respondents. The small sample size decreased the power, in turn increasing the possibility of a type II error. Additionally, the respondents were predominantly (75%) from one state in the southwest United States. As this survey was online and mainly presented through snowball sampling, there was no way to personalize emails or send reminders to complete the survey, which Dillman et al. (2014) suggest can increase responses in surveys. Due to the sampling method, we were unable to determine the response rate. We acknowledge these limitations can lead to sampling bias and limit the ability to generalize. These areas could be investigated empirically in future studies. Surveys are also self-reported data, based on respondents' experiences and perceptions.

Another limitation to the study is the constraint of timing. This study took advantage of the situation created due to the pandemic and associated restrictions, which varied by state and even by school district. This survey assumed that the change from in-person to online/remote was fresh in the teachers' minds to describe their feelings and abilities during this time accurately.

Although the concept of scaffolding is not new, much of the research literature has focused on computer-implemented rather than teacher-implemented scaffolding. Even as the integration of technology into education continues, understanding how teachers dynamically and responsively support student learning continues to be important. In particular, understanding how teachers' scaffolding self-efficacy and agency/control relate to their scaffolding implementation can lead to more effective professional development.

Future research could contrast the emergency remote teaching compared to teaching online with adequate preparation to do so. Certainly, with professional learning and time for planning, teachers may become more self-efficacious in scaffolding online. Research could also consider how demographics, such as subject taught, grade level, or years of teaching may relate or impact the implementation of scaffolds while online. Additionally, understudied areas of scaffolding, such as ongoing diagnosis and fading, can be further examined in future studies through this survey.

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Author Information

Sara Dominguez

https://orcid.org/0000-0001-5299-3946

University of New Mexico

Albuquerque, NM 87131

USA

Contact e-mail: *sara.dominguez.slp@gmail.com*

Vanessa Svihla

https://orcid.org/0000-0003-4342-6178

University of New Mexico

Albuquerque, NM 87131

USA

Appendix A. Survey of Teacher Implemented Scaffolding

The survey contained two versions of each question. For brevity, we indicate the versions using square brackets.

[While teaching in-person before 2020 / During online/remote teaching], how much control did you have in providing instruction?

- Total control
- A lot of control
- Some control
- Minimal control
- No control

[While teaching in-person before 2020 / During online/remote teaching], how confident were you in providing instruction?

- Not at all confident (10 point scale)
- Very confident

[While teaching in-person before 2020 / During online/remote teaching], how much control did you have in PLANNING instruction?

- Total control
- A lot of control
- Some control
- Minimal control
- No control

[While teaching in-person before 2020 / During online/remote teaching], how confident were you in PLANNING instruction?

- Not at all confident (10 point scale)
- Very confident

Thinking about [your teaching in-person before 2020 / your online/remote teaching], provide a couple of specific examples of how you decided WHEN to provide students with support.

- Text box

While [teaching in-person before 2020 / online/remote teaching], how much control did you have in WHEN to support students?

- Total control
- A lot of control
- Some control
- Minimal control
- No control

While [teaching in-person before 2020 / online/remote teaching], how confident were you in WHEN to provide students with support?

- Not at all confident (10 point scale)
- Very confident

Thinking about [your teaching in-person before 2020 / your online/remote teaching], provide a couple of specific examples of how you decided how MUCH support to provide students.

- Text box

While [teaching in-person before 2020 / online/remote teaching], how much control did you have in how MUCH to support students?

- Total control
- A lot of control
- Some control
- Minimal control
- No control

While [teaching in-person before 2020 / online/remote teaching], how confident were you in how MUCH support to provide students?

- Not at all confident (10 point scale)
- Very confident

Thinking about [your teaching in-person before 2020 / your online/remote teaching], provide a couple of specific examples of how you decided WHEN to decrease support to students.

- Text box

While [teaching in-person before 2020 / online/remote teaching], how much control did you have in WHEN to decrease support students?

- Total control
- A lot of control
- Some control
- Minimal control
- No control

While [teaching in-person before 2020 / online/remote teaching], how confident were you to know WHEN to decrease support to students?

- Not at all confident (10 point scale)
- Very confident

Thinking about [your teaching in-person before 2020 / your online/remote teaching], provide a couple of specific examples of HOW you decreased support to students.

- Text box

While [teaching in-person before 2020 / online/remote teaching], how much control did you have in how MUCH to decrease support to students?

- Total control
- A lot of control
- Some control
- Minimal control
- No control

While [teaching in-person before 2020 / online/remote teaching], how confident were you to know HOW to

decrease support to students?

- Not at all confident (10 point scale)
- Very confident

What was your experience with teaching online before 2020?

- Text box