2026

TEACHER-IMPLEMENTED SCAFFOLDING

Sara Dominguez
University of New Mexico

Vanessa Svihla
University of New Mexico

Sara Dominguez
Candidate

Organization, Information and Learning Sciences
Department

This dissertation is approved, and it is acceptable in quality and form for publication:

Approved by the Dissertation Committee:

Vanessa Svihla, Chairperson

Victor Law

Mark Emmons

Carolyn Hushman

TEACHER-IMPLEMENTED SCAFFOLDING

by

SARA DOMINGUEZ

BS., Speech Pathology and Audiology & Biology, Whittier College, 1999
M.S., Speech and Hearing Sciences, University of New Mexico, 2004
M.S., Education Nova Southeastern University, 2012

DISSERTATION

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy
Organization, Information & Learning Sciences

The University of New Mexico

Albuquerque, New Mexico

Date:
May 2024

Acknowledgments

I want to thank my committee for working with me through the challenges of the dissertation process. For taking the time to give constructive feedback to help make me a better researcher and giving me encouragement to continue.

I want to expressly thank my advisor, Vanessa Svihla, for helping me push through the setbacks and hurdles, especially due to the pandemic. If it wasn't for your patience and pressure, I would never have completed this process, for which I am immensely grateful.

Lastly, I want to thank my husband. His utmost support, regardless of the situation or timing by always putting me first and allowing me to pursue and complete this process.

TEACHER-IMPLEMENTED SCAFFOLDING

by

Sara Dominguez

BS., Speech Pathology and Audiology & Biology, Whittier College, 1999

M.S., Speech and Hearing Sciences, University of New Mexico, 2004

M.S, Education, Nova Southeastern University, 2012

Ph.D., Organization, Information, and Learning Sciences, University of New Mexico, 2024

Abstract

Teacher-implementing scaffolding is fundamental in teaching that was disrupted by the sudden move to emergency remote teaching during the pandemic. A review of research found trends based on grade and subject and that teacher's responsiveness was the main contingent processes reported. Based on this a survey was developed and an exploratory factor analysis was completed. An analysis of the survey results found differences in teacher agency, self-efficacy, and the supports used when comparing in-person and online teacher-implemented scaffolding. Qualitative results further support findings and describe teachers' perspective on the change to the environment, adaptations made, and hinderances noted while supporting student learning while online.

Table of Contents

List of Figures

List of Tables

Chapter 1 – Introduction

Background

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. Unfortunately, there is limited information on how teachers implement scaffolding both in-person as well as online. Although many teachers and students have returned to their classrooms, some may choose to continue online or have other remote learning options (Baird, 2022; Kaufman, Schwartz, & Diliberti, 2021; Kurtz, 2021). Thus, there is an increased demand for information to help the K-12 education field understand online teaching and learning processes.

Statement of the Problem

While online content delivery is well studied, even in K12 settings, much less is known about teacher-implemented scaffolding and differences during transitioning to online instruction. Scaffolding is a common, critical component of K12 education in which students are supported to achieve more than they can do on their own—often in the form of help from a teacher. However, fewer studies have focused on the role of the teacher in scaffolding. As scaffolding is a responsive and adaptive process, more research is needed to understand teachers' perceptions of these contingent processes and how these differ from in-person to an online setting.

Significance of the Study

Scaffolding is specific to an activity and is performance-based (Pea, 2004). Wood, Bruner, and Ross (1976) described scaffolding as support "for *this* tutee in *this*

task at *this* point in the task mastery. The actual pattern of effective instruction, then, will be both *task* and *tutee* dependent" (p. 97). Therefore, the level of support needed varies by student and overtime as students learn new information and complete more tasks. This indicates that the setting—online versus in-person—may also consequentially influence scaffolding.

Although the metaphor of scaffolding is reasonably accessible, both the definition and understanding of scaffolding vary in research and practice (Palincsar, 1998). Instructional scaffolds are dependent on the tasks and learners' needs at the time. But identifying what students need, when to provide support, and when to fade support are contingent processes often overlooked in the research (Puntambekar & Hübscher, 2005). Many studies have focused on the impact of scaffolds on student learning; less attention has been paid to *how* teachers plan and implement scaffolds, even though this directly impacts student success. Understanding how teachers plan and implement scaffolding can provide more information for teachers, those who support teacher professional learning, and curriculum designers. The COVID-19 pandemic provided a window into altered and interrupted practice, offering an opportunity to understand teachers' perceptions via contrasting their typical and emergency remote instruction. In other words, the shift to emergency remote instruction may have sharpened their awareness of what their typical practice was.

Study Purpose and Research Questions

Scaffolding is a regular occurrence in the classroom; however, information is lacking on how and when teachers implement scaffolding to increase student success and

how this was impacted in the COVID-19 pandemic and attendant shift to emergency remote instruction. This hybrid dissertation investigated this through three papers:

Paper 1: To help frame and understand current research, my research questions are:

1. Under what conditions and contexts have teachers' scaffolding been studied?
2. To what extent have studies of teachers' scaffolding focused on hard, soft, or both modes of scaffolding?
3. What have studies of teachers' contingent scaffolding processes found?

Paper 2: Based on my literature review, the contingent processes of teacher-implemented scaffolding were the least described, stated and addressed in the current literature. Therefore, my research develops a survey to provide information on these contingent processes.

1. Content validity: Is the survey measuring aspects of scaffolding in practice that provide information to inform contingency processes of teacher implanted scaffolding?
2. Quality assurance: Which subconstructs are identified using exploratory factor analysis (EFA)?

Paper 3: Based on results of the survey both quantitative and qualitative results were analyzed to provide insight into teachers' perceptions and the impact the change in modality had on their agency and self-efficacy in providing teacher-implemented scaffolds.

1. Do teachers' perceptions of self-efficacy and agency and their reported use of scaffolds vary by modality (in-person versus online)?

2. How and in what ways do teachers' descriptions of their use of scaffolds change by modality (in-person versus online)?

Overview of Paper Set

My first paper was a literature review that analyzed research on hard and soft scaffolds and contingent processes. Based on my findings, I created a survey to further pursue information on contingent scaffolding processes. As I was unable to find a survey to address this need, my second paper discusses the survey development and quality assurance processes. While my third paper reports quantitative and qualitative analysis of the survey results (Table 1.1).

Table 1.1. Overview of proposal for hybrid dissertation papers

Title	Publication citation or status
A Review of Teacher Implemented Scaffolding in K-12	Dominguez, S., & Svihla, V. (2023). A review of teacher implemented scaffolding in K-12. *Social Sciences and Humanities Open, 8*(1), 100613. https://doi.org/10.1016/j.ssaho.2023.100613
Development of the Survey of Teacher Implemented Scaffolding	Dominguez, S., & Svihla, V. (2024). Development of the survey of teacher-implemented scaffolding. *International Journal of Research in Education and Science, 10*(1), 138-160. https://doi.org/10.46328/ijres.3335
Teacher Agency & Self-Efficacy in Teacher-Implemented Scaffolding Before and During the Pandemic	Formatted for: *Teaching and Teacher Education*

Framework

Teacher-implemented scaffolds includes the selection of scaffolds to utilize and coordinate their use (Hammond & Gibbons, 2005). Scaffolds can vary by mode, contingent processes, and the modality of how they are implemented. When taken together, these provide a framework to discuss and describe and portray the use of teacher-implemented scaffolds.

Scaffolding Modes

Two modes were used in this study, "hard" and "soft" scaffolds as described by Saye and Brush (2002). Hard scaffolds are static and often planned ahead of time based on students' predicted needs. Whereas, soft scaffolds, which are dynamic and in-the-moment. These two modes of scaffolds can be used individually or combined, and they can be increased or faded over time based on the context and need.

Contingent Scaffolding Processes

Scaffolding is an active process that depends on both students and teachers; as such, how and when scaffolding is applied is contingent on learners and the task, as judged by the teacher. I focus on three specific contingent processes: ongoing diagnosis (Stone, 1998), responsive support (Tharp & Gallimore, 1988), and fading (Collins, Brown, & Newman, 1987). These encompass the scaffolding process, from the decision to implement scaffolding to decreasing support until it is no longer needed.

Agency

Agency is the ability to make decisions, in the case of teachers this impacts their delivery and interaction during instruction. Agency has been found to beneficial in teachers use of developmentally appropriate practices (Christ & Wang, 2013; McMullen,

1999). Understanding how teachers are impacted and react to change can be impacted by their agency (Biesta, Priestley, & Robinson, 2015). Teacher agency can impact the ability to perform tasks, such as scaffolding.

Self-Efficacy

Self-efficacy is confidence based on knowledge and experience (Bandura, 1982). Self-efficacy is important for teachers' application of effective teaching and implementation of strategies (Gabriele & Joram, 2007; Gibson & Dembo, 1984). High self-efficacy has been found to be related to teachers being more resilient and willing to accept and adapt to changes (Guskey, 1988). Self-efficacy can influence the scaffolds teachers use and how they implement scaffolding.

Modality

Modality became a construct due to the pandemic. Teacher-implemented scaffolding had to change as teachers and students moved from in-person to online due to emergency remote teaching (ERT) (Hodges, Moore, Lockee, Trust, & Bond, 2020). This construct was included to describe and delineate differences due to this novel situation.

Key Terms

As some terminology is used differently in different settings or backgrounds, I choose the following constructs and definitions from the literature (Table 1.2).

Table 1.2. *Variables/constructs investigated in this study.*

Study constructs	*Definition*
Hard Scaffold	Hard scaffolds are static and planned based on predicted needs (Saye & Brush, 2002).

Soft Scaffold	Soft scaffolds are dynamic and situational. Happening in-the-moment, they are responsive to specific needs (Saye & Brush, 2002).
Ongoing Diagnosis	Ongoing diagnosis is a process of monitoring student progress and the need for support. It is continuous and often informal (Stone, 1998).
Responsive scaffolds	Scaffolding support that is based on the student and the task; it is adaptive, responsive, calibrated, or contingent on the student's need (Tharp & Gallimore, 1988).
Fading	Fading is the removal of support in a gradual manner; the removal is based on the student's need or lack thereof (Collins, 1988).
Teacher Agency	Teacher agency is the ability to make choices and take action as a teacher (Toom, Pyhältö, & Rust, 2015)
Self-Efficacy	Self-efficacy is the belief in our ability to perform tasks at an accurate level (Bandura, 1989).

Scope and Delimitation

Due to the contextual nature of teaching, I did not include previous research or gather data from teachers working outside of the United States. Research and information gained was restricted to the K-12 setting, excluding pre-school and higher education settings, as contextual differences and expectations exist. Additionally, due to the abrupt changes to setting only research with in-service teachers were included in order to compare settings. Finally, my focus is to gain insight into the teacher's role in scaffolding, a focus complementary to past reviews that have primarily focused on the role of technology. These decisions were made to provide structure and focus my study.

References

Baird, L. L. (2022). What families should know about K-12 online. Retrieved from https://www.usnews.com/education/k12/articles/what-families-should-know-about-k-12-online-schools

Bandura, A. (1982). Self-Efficacy Mechanism in Human Agency. *American Psychologist*, *37*(2), 122–147. https://doi.org/10.1016/0006-8993(86)91535-0

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology*, *25*(5), 729.

Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. *Teachers and Teaching: Theory and Practice*, *21*(6), 624–640. https://doi.org/10.1080/13540602.2015.1044325

Christ, T., & Wang, X. C. (2013). Exploring a community of practice model for professional development to address challenges to classroom practices in early childhood. *Journal of Early Childhood Teacher Education*, *34*(4), 350–373. https://doi.org/10.1080/10901027.2013.845630

Collins, A. (1988). *Cognitive Apprenticeship and Instructional Technology: Technical Report*. Retrieved from https://files.eric.ed.gov/fulltext/ED331465.pdf

Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics*. *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. https://doi.org/10.4324/9781315044408-14

Gabriele, A. J., & Joram, E. (2007). Teachers' reflections on their reform-based teaching in mathematics: Implications for the development of teacher self-efficacy. *Action in Teacher Education*, *29*(3), 60–74. https://doi.org/10.1080/01626620.2007.10463461

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569–582. https://doi.org/10.1037/0022-0663.76.4.569

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching & Teacher Education*, *4*(1), 63–69. https://doi.org/https://doi.org/10.1016/0742-051x(88)90025-x

Hammond, J., & Gibbons, P. (2005). *What is scaffolding? Teachers' Voices 8: Explicitly Supporting Reading and Writing in the Classroom*. Retrieved from http://www.ameprc.mq.edu.au/docs/research_reports/teachers_voices/Teachers_voices_8.pdf#page=15

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause*, 1–12. Retrieved from http://hdl.handle.net/10919/104648

Kaufman, J. H., Schwartz, H. L., & Diliberti, M. K. (2021). The remote learning paradox: Some educators, parents want to keep online classes option even though instruction suffered. Retrieved from https://www.rand.org/blog/2021/06/the-remote-learning-paradox-some-educators-parents.html

Kurtz, H. (2021). Most principals, district leaders predict their schools will be fully in-person this fall. Retrieved from https://www.edweek.org/leadership/most-principals-district-leaders-predict-their-schools-will-be-fully-in-person-this-fall/2021/03

McMullen, M. B. (1999). Characteristics of teachers who talk the DAP talk and walk the DAP walk. *Journal of Research in Childhood Education*, *13*(2), 216–230. https://doi.org/10.1080/02568549909594742

Palincsar, A. S. (1998). Keeping the metaphor of scaffolding fresh - A response to C. Addison Stone's "The metaphor of scaffolding: Its utility for the field of learning disabilities." *Journal of Learning Disabilities*, *31*(4), 370–373. https://doi.org/https://doi.org/10.1177/002221949803100406

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *Journal of the Learning Sciences*, *13*(3), 423–451. https://doi.org/10.1207/s15327809jls1303

Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational Psychologist*, *40*(1), 1–12. https://doi.org/10.1207/s15326985ep4001

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77–96. https://doi.org/10.1007/BF02505026

Stone, C. A. (1998). Should we salvage the scaffolding metaphor? *Journal of Learning Disabilities*, *31*(4), 409–413. https://doi.org/10.1177/002221949803100411

Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge University Press. https://doi.org/10.1017/cbo9781139173698

Toom, A., Pyhältö, K., & Rust, F. O. (2015). Teachers professional agency in contradictory times. *Teachers and Teaching: Theory and Practice*, *21*(6), 615–623. https://doi.org/10.1080/13540602.2015.1044334

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, *17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Chapter 2 - A Review of Teacher Implemented Scaffolding in K-12

Abstract

Although scaffolding—often in the form of help from a teacher—supports students to achieve more than they can do on their own, prior reviews have not focused on the role of the teacher in scaffolding. Using a systematic review, we categorized 41 articles by mode (hard or soft) and contingent processes (ongoing diagnosis, responsiveness, fading). We found that most studies took place at an elementary level, most often in language arts, and most in an intact classroom. Additionally, the combination of hard and soft scaffolds allows teachers more time to offer soft scaffolds to students who need more support.

Introduction

Scaffolding is a metaphor to explain ways students can be supported to accomplish more with assistance, referring to specific actions that support learning. After more than 40 years, the metaphor is still discussed, in part because it is such a broad concept and because it continues to be relevant in the classroom today. Scaffolding as a term was coined by (D. Wood, Bruner, & Ross, 1976) in reference to an adult supporting a child to complete a task: "it involves a kind of 'scaffolding' process that enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts. This scaffolding consists essentially of the adult 'controlling' those elements of the task that are initially beyond the learner's capacity, thus permitting him to concentrate upon and complete only those elements that are within his range of competence." (p. 90).

Learning can be thought of as movement from unknown information to known, which can be seen through the accuracy of a learner's task performance. This concept of learning is similar to Vygotsky's (1978) zone of proximal development, which describes the range in which a learner can complete a task with assistance. This assistance is usually provided by an adult or teacher. While scaffolding may also be provided by computer programs, our aim is to understand teacher roles; we therefore focus on research that details the participation of teachers and students.

Though much research incorporates Vygotsky's (1978) zone of proximal development as an underlying theory of learning, scaffolding is specific to an activity and is performance-based (Pea, 2004). Wood et al. (1976) described scaffolding as support "for *this* tutee in *this* task at *this* point in the task mastery. The actual pattern of effective instruction, then, will be both *task* and *tutee* dependent" (p. 97, emphasis in original). Therefore, the level of support needed varies by student and over time as students learn new information. Additionally, the metaphor of scaffolding is not a single type of support but includes a wide collection of strategies that support student learning.

Since Wood et al. (1976) wrote about young children being scaffolded by a parent, scaffolding has been expanded to include school-aged students and settings, where instructional scaffolding is a term sometimes used (Applebee & Langer, 1983). The use and benefits of instructional scaffolding are a cornerstone in education and how teachers support students to learn. As such, scaffolding could seem indistinguishable from the daily routines and modelling teachers enact, but scholars have offered ways to differentiate scaffolding from other forms of teaching practice by attending to the

outcome in that students learn to become independent on the particular task (Belland, 2016).

Many studies have found scaffolds to be beneficial (Azevedo, Cromley, Fielding, Moos, & Greene, 2005; Chernikova et al., 2020; Murphy & Messer, 2000; van de Pol, Volman, & Beishuizen, 2010). Studies have investigated how scaffolds benefit specific students, including with emergent bilingual students (de Oliveira & Athanases, 2017; Kayi-Aydar, 2013), low achievers (Belland, Gu, Armbrust, & Cook, 2015; Lutz, Guthrie, & Davis, 2006) and students with learning disabilities (Belland, Walker, & Kim, 2017), as well as how scaffolds support learning of specific subject matter, including reading (W. Chen, Rovegno, Cone, & Cone, 2012; Mojarrabi Tabrizi, Behnam, Saeidi, & Lu, 2019), mathematics (Pratt & Savoy-Levine, 1998; Turner et al., 1998), and science (Mercer, Dawes, Wegerif, & Sams, 2004; Reigosa & Jiménez-Aleixandre, 2007).

Past reviews have investigated scaffolding in specific academic subjects and as an interactional process between adults or software and learners. Given the aims of our study, we summarize reviews focused on teachers and their students, rather than studies of technology-mediated scaffolding. Lin et al. (2012) reviewed scaffolding research in a science context over a 15-year period (1995-2009). They reported most studies used qualitative methods, were conducted within a learning context, and most often with high school students. They also noted the number of studies increased over time, with twice as many studies in the last five years of their range compared to the prior five years. (Reynolds, 2017) reviewed 57 studies in a reading context, finding that most were observational and took place in elementary grades. In math, a review of 21 articles published from 2010-2015 investigated what was scaffolded, who, what, and how

scaffolding was provided, and outcomes (A. Bakker, Smit, & Wegerif, 2015), finding variety both in the math topics scaffolded and how scaffolding was provided, with over half involving teachers. In terms of outcomes, they noted that the paucity of experimental studies limits the potential for a meta-analysis, but also that results of observational studies highlight a need for better understanding of how teachers diagnose and respond to students. Most relevant to the current study, van de Pol et al. (2010) analyzed studies published over a decade (1998-2009) in which scaffolding was provided by a human in classrooms. They found scaffolding was effective and most studies reported on cognitive and metacognitive tasks, commonly using modeling and questioning as scaffolds. They identified a limitation as a lack of common measurement and articulated that scaffolding studies should provide information about contingency, fading, and the transfer of responsibility. The current study takes up this work, investigating how studies published since have done so, and therefore with particular attention to teachers' efforts in the scaffolding process. In doing so, we hope to synthesize the state of knowledge and identify persistent gaps in knowledge.

Although the metaphor of scaffolding is reasonably accessible, both the definition and understanding of scaffolding vary in research and in practice (Palincsar, 1998; van de Pol et al., 2010). Instructional scaffolds include a wide range of strategies that are dependent on tasks and learners' needs at the time. But identifying what students need, when to provide support, and when to fade support are contingent processes that are often overlooked in the research (Puntambekar & Hübscher, 2005), even though when there is insufficient scaffolding, students may experience frustration and decreased motivation (Belland, 2016; E. Rodgers, 2017). Many of the studies cited above have focused on the

impact of scaffolds on student learning; less attention has been paid to *how* teachers plan and implement scaffolds, even though this directly impacts student success. Understanding how teachers plan and implement scaffolding can provide more information for teachers, those who support teacher professional learning, and curriculum designers.

Framework

Implementing scaffolding includes selecting and sequencing interactions (Hammond & Gibbons, 2005). Scaffolds can be planned before instruction or used on-the-fly, responsively based on need (Belland, Walker, & Kim, 2017; Saye & Brush, 2002; van de Pol et al., 2010). These issues highlight scaffolding as highly contingent. Therefore, characterizing research on teachers' implementation of scaffolding means attending to both the degree to which scaffolds are planned or improvised and the dynamic processes used. We characterize scaffolding in terms of modes—hard and soft (Saye & Brush, 2002)-and contingent processes—ongoing diagnosis (Stone, 1998b), responsiveness (Tharp & Gallimore, 1988), and fading (Collins, Brown, & Newman, 1987). Together, these are a comprehensive framework to characterize teachers' use of scaffolding.

Scaffolding Modes

We decided to view scaffolds as "hard" and "soft," a distinction proposed by Saye and Brusch (2002). They defined hard scaffolds as "supports that can be anticipated and planned in advance" (p. 81) and soft scaffolds as a "situation-specific aid provided by a *teacher or peer* to help with the learning process" (p. 82, emphasis added). While Saye and Brush (2002) established these terms within a multimedia context, they defined it in reference to teachers. Researchers have since taken up this framework in studies of

teachers (A. Bakker et al., 2015; Berenji, Saeidi, & Ghafoori, 2020; Choo, Rotgans, Yew, & Schmidt, 2011; Martin, Dornfeld Tissenbaum, Gnesdilow, & Puntambekar, 2019; Mojarrabi Tabrizi et al., 2019; Shin, Brush, & Glazewski, 2020).

Hard scaffolds are static and designed or prepared prior to instruction based on predicted needs. These scaffolds are often written or visual supports that are fixed in the support they offer. Hard scaffolds can be seen in the curriculum as intentionally-planned materials embedded into lessons to support learning.

Soft scaffolds are dynamic and based on what the learner needs in the moment for a specific task; therefore, they are situational. Implemented during instruction, these scaffolds are interactive and responsive, adapted based on both teacher and students. Soft scaffolding is fundamental to teaching as it is how teachers support learners. Therefore, to understand *how* scaffolds are implemented within teaching, we also need a framework that accounts for contingency.

Contingent Scaffolding Processes

We focus on three specific contingent processes: ongoing diagnosis, responsive support, and fading. These encompass the scaffolding process, from the decision to implement scaffolding to decreasing support until it is no longer needed.

The first contingent process is the ongoing diagnosis of students' needs. Teachers diagnose students' abilities and knowledge in an ongoing fashion to determine the level of support needed (Puntambekar & Hübscher, 2005; Stone, 1998b). This occurs during instruction by monitoring what the student can and cannot do independently (Lajoie, 2005; Saye & Brush, 2002). What a student can do independently requires no additional support. A student who cannot complete a task needs support, but the level of support may vary by student, task, or context. This is important as providing too much support

can hinder students' learning and independence, whereas providing too little support can leave a student frustrated or unable to access lesson content.

The second contingent process is providing support responsively based on students' needs. Also described as adaptive or calibrated support (Stone, 1998b; Tharp & Gallimore, 1988), responsiveness is dynamic and depends on ongoing diagnosis (Azevedo et al., 2005). Thus, responsive support can vary by student, based on needs. Rather than one-size-fits-all, a range of supports can be provided (Stone, 1998b).

The last contingent process, fading, could be considered a form of responsive support, but because it is sometimes planned as a hard scaffold, we bring specific attention to fading. Scaffolding should be assumed to be temporary, meaning it is always intended to be faded (Azevedo et al., 2005; Pea, 2004; Stone, 1998b). Also described as gradual release or transfer of responsibility, fading can involve the teacher decreasing support to encourage students to take on more responsibility (Puntambekar & Hübscher, 2005; Tharp & Gallimore, 1988; van de Pol et al., 2010). Thus, rather than a quick withdrawal of support, fading is the removal of support in a gradual manner, based on the ongoing diagnosis of what the student needs to be successful (Stone, 1998b), and this is a key criterion for fading in this review. The common focus on "gradual" also suggests that fading happens over time and is less likely to show up in shorter duration observations. Indeed, studies have cited limitations in our understanding of fading (Belland, Kim, & Hannafin, 2013; Puntambekar & Hübscher, 2005).

Intersection of Modes and Contingent Processes

While it may be obvious that soft scaffolds are used in contingent ways, hard scaffolds can also depend on these contingent processes. Consider, for instance, that the culmination of ongoing diagnosis may lead a teacher to prepare a hard scaffold such as a

worked example of a difficult concept. The teacher may provide this static support only to those students who need it. Likewise, during a lesson, the teacher might remove some static supports for those who no longer need them, thus using hard scaffolds in a faded manner, contingent on need. To illustrate this further, we consider examples below across a variety of K-12 settings. Scaffolds may be similar across subjects but may vary in how they are implemented; therefore, these examples are not exhaustive (Table 2.2).

In math, postulates and theorems are used to teach students the rules of geometry. Many theorems can be difficult for students to remember; therefore, a hard scaffold in the form of a list theorems can help students demonstrate their understanding. This 'cheat sheet' can support students in completing math problems without giving answers, as students still need to know which theorems are appropriate for the problem. A teacher can provide soft scaffolds in the form of procedural prompts by reminding students they first need to determine what information they have been given in each problem. Teachers monitor their students' need for the 'cheat sheet,' paying attention to their work. The scaffold can also be faded by watching for when students no longer need the scaffold or by having the student ask for the scaffold when needed.

In language arts, hard scaffolds can be seen in many forms, such as a poster with examples of a letter next to a picture to help young readers remember how a short vowel sound is pronounced (such as "A is for apple"). This poster can hang in a classroom throughout the year, providing continuous support for students anytime they need help. A teacher may provide responsive soft scaffolding by modeling how an experienced reader goes through the process of sounding out new words, such as saying, "This looks like a hard word, but I can look at the poster to help me remember the middle sound, then say

each sound out loud, P-A-N says pan." As students become more accurate, the teacher collects information through ongoing diagnosis and provides responsive support only on the letters or letter combinations that students need help with. In this example, fading can be seen in the change from direct interaction to reminders to a static poster as needed.

Scientific inquiry may require multiple components—i.e., a claim, evidence, and reasoning—in a fully formed answer. While experimenting with plants, students may notice that plants given water grow more than plants without water. In this situation, a worksheet with written prompts that guide students to include all of the information needed is a hard scaffold. Because the worksheet does not provide answers, students' responses demonstrate their levels of understanding, thereby providing a diagnostic for the teacher. The teacher can use responsive soft scaffolding by posing questions and leading students to awareness of cause and effect. As students demonstrate increased ability, hard scaffolds can be faded by moving from content-specific to content-generic prompts or moving to hints rather than explicit directions. The soft scaffolds can be faded in frequency or level of support, responding to students' needs.

This framework highlights a strong connection between scaffolding and teaching and clarifies the salience of school context, as the amount of control teachers have over contingent processes can vary substantially. To mitigate some of this variability, we focus on the U.S. context. Specifically, in this review, we characterize which scaffolding modes and contingent processes have been studied, including the situations and students included in such studies, to shed light on areas that are well-backed and areas needing additional attention. To guide this study, we posed research questions:

1. Under what conditions and contexts has teachers' scaffolding been studied?
2. To what extent have studies of teachers' scaffolding focused on hard, soft or both modes of scaffolding and what impacts are reported related to each mode?
3. To what extent have studies investigated teachers' contingent scaffolding processes and what impacts are reported related to these processes?

Methods

Study Design

Systematic literature reviews aim to identify relevant studies and summarize results (Creswell, 2014). Some of the norms of systematic reviews include defining the search procedure, criteria for inclusion and exclusion, conducting the search, and analyzing the results (Walsh & Downe, 2005). In the sections that follow, we articulate how we used these norms. Among the many types of reviews, we chose to use meta-synthesis, as many of the studies reported qualitative results. A meta-synthesis depends on a transparent interpretive process of comparing studies on a specific topic (Tranfield, Denyer, & Smart, 2003). This qualitative technique can extend knowledge applicable in the area of scaffolding such as by reporting the review protocol used and applying thematic analysis (Brunton, Harden, Oakley, & Brunton, 2007; Moher et al., 2015; Thomas & Harden, 2008).

Search Procedure

We first developed search terms with reference to prior reviews. We conducted a search with the key term "scaffolding" to determine the terminology and keywords to

include. The initial results showed many papers referenced scaffolding without including it as a study focus. We therefore decided the key term "scaffold*" should be in the title (an asterisk allowed variants—scaffold, scaffolding, scaffolded, etc.—to be included). To focus the review on teachers' use of scaffolds, we included both "education" and "teacher" as required terms in the search. We further limited the search to peer-reviewed articles. We used the university library's EBSCO Discovery Service search engine with the expander of "apply equivalent subjects" turned on. This allowed for the related vocabulary words to be used for unqualified keywords. In this case "education" and "teacher" were not specified to their location in the articles to be found (title, abstract, etc.), allowing for the search engine to use other variations of these terms (EBSCO Connect, 2019). The search found 1,327 results, which we saved in an Excel file. We identified and removed 475 duplicates.

Criteria for Exclusion

In order to focus on teacher implementation, we limited the target population to teachers working with students in K-12 settings. This eliminated studies of pre-service teachers and professional development, as well as studies in which someone other than a teacher—e.g., tutor, parent—provided scaffolding. We removed 186 studies of pre-service teachers, 86 conducted outside of K-12 settings, and 78 studies that lacked either teachers or students. We excluded 277 studies that took place outside the United States due to differences that affect ways teachers use scaffolds. More specifically, although there is variability across states, there are similar pressures related to standards alignment and assessments. Specifically, scaffolding is commonly a component of teacher preparation programs, beginning teacher certification, and teacher evaluation systems

(Danielson, 2008; Learning Sciences International, 2013). We excluded 71 studies of a nonacademic focus, such as behaviors. In order to restrict focus to empirical studies—necessary to make comparisons across studies—we excluded 110 papers that did not report a methods section. We evaluated studies for their theoretical foundation to ensure alignment to operational definitions. In that process, we removed one study that used differentiation and scaffolding synonymously.

Lastly, as is common practice in review studies, we bounded the study within a time frame. Within the criteria, the earliest article was 1999; this is similar to the review by van de Pol et al. (2010), which included studies published between 1998-2009. Our choice of a twenty-year period of inclusion, from 1999-2019, provides overlap but also extension. Therefore, two studies were removed. This left 41 studies in this synthesis (Figure 2.1).

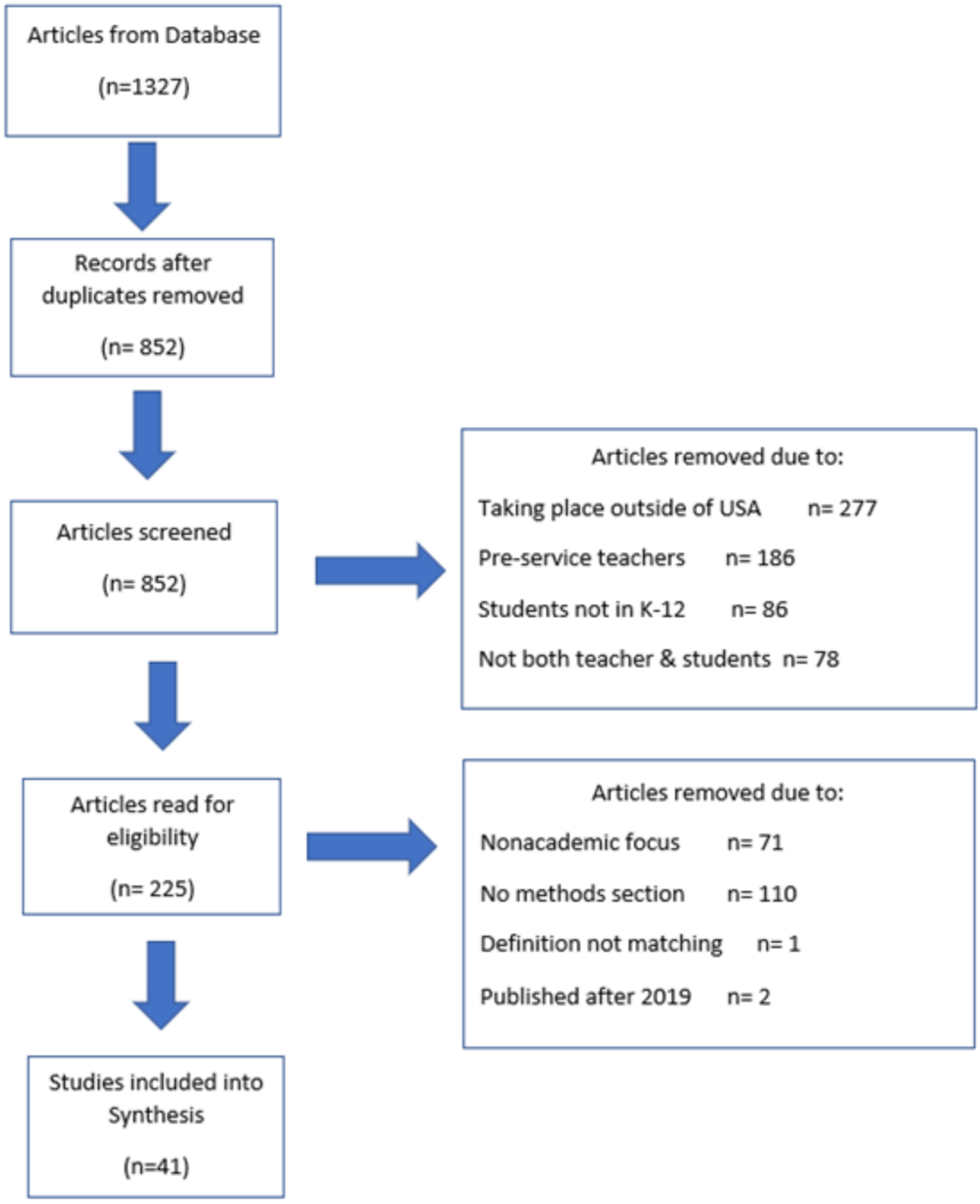

Figure 2.1. Visual representation of the method of elimination for inclusion in synthesis

Analysis of Studies

We developed a coding scheme to analyze the remaining 41 studies. This included grade level, subject area, study duration, scaffolding modes, and contingent processes. These areas were chosen based on commonalities reported in research studies. Some

studies also reported on student or teacher ethnicity, English Language Learner (ELL) status, and if the school received free or reduced meals; however, these were not consistently available within the articles. We noted if the study took place in an intact classroom; being a classroom that is typical and for the purpose of education rather than a laboratory or mainly research based location.

Grade level. All studies reported students' grade or type of school. We assumed elementary school included kindergarten through 5th grade, middle school included 6th-8th grade, and high school included 9th-12th grade, except where specified by authors. Because elementary grades cover more years than other levels, we differentiated lower elementary (K-2) from upper (3-5). Two studies included students in 6th grade but specified that this was at an elementary school (Y. Kim, 2010; Songer, Shah, & Fick, 2013); therefore, those studies were included at the elementary level. A study by Appanah & Hoffman (2014) included both middle and high school students (7^{th}-12^{th}), but there was no further specification of how many students were in either grade level, so we counted the article as a high school study.

Several studies included multiple grade levels. In such cases, we counted each grade level. For instance, if a study included 1^{st} and 2^{nd} graders, we recorded it as two lower elementary studies. If a study reported 1^{st} and 5^{th} graders, we recorded it as one lower elementary and one upper elementary study. Using this approach, we identified 20 papers that reported on 31 instances of elementary grades participating (Table 2.1). None of the studies set in middle and high school grade levels reported multiple grade levels.

Table 2.1. Number of studies with results by grade level

	Elementary	Middle	High
Number of studies	20	14	7
Number of studies, distributed by grade level	Lower: 14 Upper: 17		

Subject area. While we categorized studies by the subject setting, some studies were set in one subject area, but scaffolding focused on another subject area; for instance, teachers in a social studies classroom scaffolded a writing assignment. One study at the high school level reported both English and social studies (Athanases & de Oliveira, 2014); therefore, the total number of studies increased by one when looking at the subject area. We therefore also categorized studies in terms of the subject scaffolded. We subdivided language arts into reading, writing, or comprehension. When teachers scaffolded students' ability to increase their reading ability, we recorded that as reading, such as in the study by Rodgers (2004). However, when the teacher scaffolded students' understanding of what they read, we recorded the study as scaffolding comprehension. If students were asked to write down information, this was not recorded as writing unless it was the focus of the scaffold.

Length of study. Studies were grouped in two ways to characterize study length as one means to evaluate relevance for practice. We assume more information can be gathered from studies with an increased number of sessions and over an increased amount of time. First, we grouped studies by the duration, with five groups: <1 week to 4 weeks; 5-10 weeks; 11-16 weeks; 5-8 months (including studies described as lasting one semester), and 1 year or longer. We also grouped studies by the number of sessions: 1-5 sessions, 6-10 sessions, 11-19 sessions, 20-29 sessions, and 30 or more sessions.

Unless otherwise stated, we assumed a school week was five days, for four 9-week grading periods for a school year. . Therefore, if a study took place over the course of a school year and observations took place weekly, we assumed there were 32 observations unless otherwise specified. The length of time was grouped around traditional grading periods within public schools in the United States, with 4 ½ weeks for progress notes, nine weeks for grades, and 18 weeks for a semester. The length of study was included as an area of significance as it can provide insight into the rigor, accuracy, or information of the researcher's data collection. For example, studies that took place daily for a month could report different information than those that only made two data collection points over a semester.

Scaffolding mode and contingent processes. We read each article to understand how scaffolding was implemented in the study. We developed codes using definitions given by Saye and Brush's (2002) for hard and soft scaffolds (Table 2). Hard scaffolds include rubrics (Appanah & Hoffman, 2014), written prompts (McNeill, Lizotte, Krajcik, & Marx, 2006), and prepared sentence starters (Kang, Thompson, & Windschitl, 2014). Soft scaffolds include various interactive routines and prompts, such as questions (Young & Kim, 2010). We also developed codes for the contingent processes outlined in the framework: ongoing diagnosis, responsive scaffolds, and fading. We applied this scheme to categorize studies based on authors' descriptions. This required interpretation as several studies stated that such activities took place but did not support their claims with descriptions, or they used definitions dissimilar to our operational definitions (Table 2.2).

Table 2.2. Operational definitions for categorizing studies as including hard and/or soft scaffolds and contingent processes

Codes	Author	Definition	Example
Hard Scaffold	(Saye & Brush, 2002)	Hard scaffolds are static and planned based on predicted needs.	Worksheets, rubrics, word banks, computer journals
Soft Scaffold	(Saye & Brush, 2002)	Soft scaffolds are dynamic and situational. Happening in-the-moment, they are responsive to specific needs.	A teacher who scaffolds when a student has stopped working due to confusion)
Ongoing Diagnosis	(Stone, 1998)	Ongoing diagnosis is a process of monitoring student progress and the need for support. It is continuous and often informal.	A teacher asking questions to check for understanding
Responsive scaffolds	(Tharp & Gallimore, 1988)	Scaffolding support that is based on the student and the task, it is adaptive, responsive, calibrated, or contingent on the student need.	A teacher changes from independent to group work when students have more difficulty on a task than expected
Fading	(Collins et al., 1987)	Fading is the gradual removal of support based on student need	A teacher who was modeling how to solve a problem changes to having the student start the problem, then prompts when needed

Results and Discussion

We report results organized by research question. The first research question investigated the characteristics of students and classrooms involved in scaffolding studies and the duration of these studies. The second research question investigated the mode (hard, soft, or both) with a focus on the settings, insights, and gaps. The third question

investigated research on contingent processes (ongoing diagnosis, responsive support, and fading). In answering each question, we synthesized the findings of each aspect reviewed. Unless otherwise noted, all citations in the results are to papers identified in our search.

Research Question One: Characteristics of Participants and Subject Areas

Grade level. Of the 41 studies reviewed, 20 (49%) took place at the elementary school level (Table 2.1). A similar percentage of studies took place in the lower and upper elementary school levels. The lower elementary, K-2nd grade had 14 studies (45% of the elementary studies), and the upper elementary, 3rd-6th grade had 17 studies (55% of the elementary studies). The second-highest numbers of studies were set in middle schools, with 14 studies (34%). Seven (17%) studies were set in high schools.

Subject area by grade level. Of the elementary studies, 12 were set in language arts classes, four in science, two in math, one in physical education, and one across all subjects. However, in terms of what was actually scaffolded, 16 studies (80%) scaffolded an aspect of language arts (reading, writing, comprehension) regardless of the subject. Nine of these addressed comprehension (56%), four addressed writing (25%), and three addressed reading (19%). At the lower elementary level, all studies scaffolded an aspect of language arts (100%)—eight scaffolded comprehension, three scaffolded reading, and three scaffolded writing. At the upper elementary level, ten studies scaffolded an aspect of language arts (59%)— seven scaffolded comprehension and three scaffolded writing—five scaffolded science (29%), and two math (12%). Therefore, most studies at the elementary grade level focused on scaffolding students' comprehension. This is not a surprise as language is a crucial foundation to all academic subjects. Only studies of

lower elementary students reported on scaffolding learning to or improving reading abilities.

Of the middle school studies, nine were set in science, three in language arts, and one in choir. Five of these studies scaffolded an aspect of language arts—two scaffolded writing and three scaffolded comprehension—one scaffolded mathematics, and seven studies scaffolded science.

One high school study reported on both a language arts context and a social studies context; in both, students' comprehension was scaffolded, resulting in two instances in which comprehension was scaffolded. We thus found that two studies scaffolded math, one scaffolded science, and five scaffolded language arts, with three studies scaffolding writing and two scaffolding comprehension.

Language arts was the most common setting studied, with 17 out of 42 studies across levels (counting one high school study twice as it presented two contexts, figure 2.2). With 26 studies, language arts was also the most commonly scaffolded area.

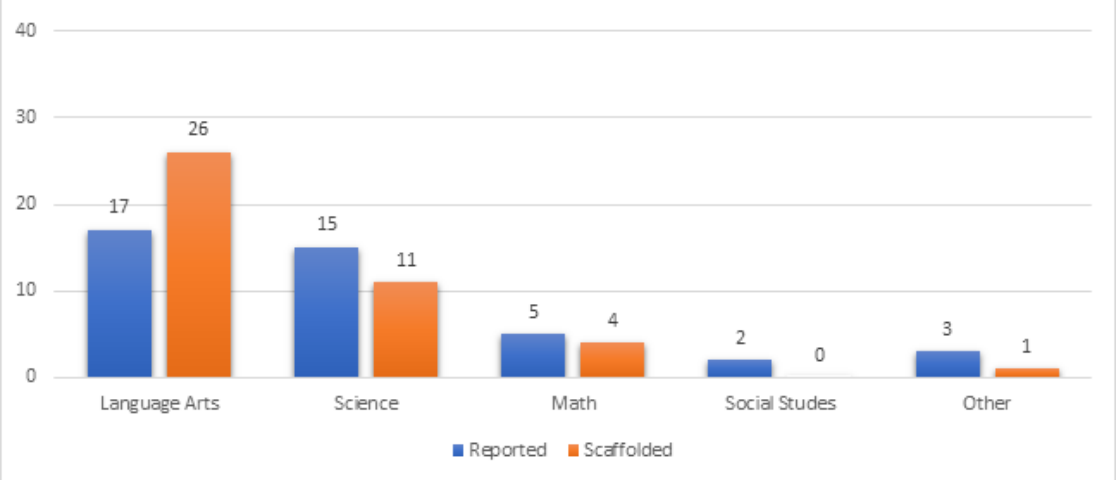

Figure 2.2. Study subject setting reported versus areas scaffolded

The focus of language arts scaffolding varied by grade level. Elementary had the most studies reporting on scaffolding language arts, and a majority of these focused on comprehension (Table 2.3). At the middle and high school levels, no studies scaffolding reading. At the high school level, writing was the most common aspect scaffolded. This may relate to students in elementary focusing more on learning to read and by older grades students using those skills to read to learn, thereby focusing on how students comprehend and that they can demonstrate their understanding through writing.

Table 2.3. Aspects of language arts scaffolded across grades (n=26)

	Elementary	Middle	High
Reading	3	0	0
Writing	3	2	3
Comprehension	11	3	1

Research Question One: Study Characteristics

We examined study characteristics, including study duration and whether the study was set in an intact classroom. As completing studies in a working classroom can be difficult, it was somewhat surprising that 34 studies (83%) took place in intact classrooms. Of the seven studies—all elementary—that were not in an intact classroom, three were for specific reading programs that required pull-outs to support English language learners. Thus, all studies in the sample may be considered educationally relevant and therefore can be more directly relatable to teachers and schools.

Despite a varied number of studies at each grade level (elementary=20, middle=14, high=7) a trend was noticed when looking at the length of study and number of sessions by grade level (Table 2.4). Elementary grade level studies were predominated

in this review and that grade level was most often had shorter studies with increased sessions. This suggests that our understanding of scaffolding may be biased by a preponderance of short-duration, higher-intensity data collection; such study approaches may prevent documentation of student progress in response to contingent scaffolding processes, especially fading, because, as noted in the literature review, fading is often a gradual process, responsive to student needs. However, the limited number of studies, especially at the high school grade level, will impact the significance of this trend.

Table 2.4. Length of study and number of sessions by grade

Length of study	*Elementary # (%)*	*Middle # (%)*	*High # (%)*	*# of sessions*	*Elementary # (%)*	*Middle # (%)*	*High # (%)*
1+ yr	2 (10%)	1 (7%)	4 (57%)	*30 +*	7 (35%)	1 (7%)	2 (29%)
5-8 months	3 (15%)	0 (0%)	1 (14%)	*20-29*	4 (20%)	1 (7%)	0 (0%)
11-16 weeks	5 (25%)	0 (0%)	0 (0%)	*11-19*	4 (20%)	4 (29%)	1 (14%)
5-10 weeks	4 (20%)	7 (50%)	0 (0%)	*6-10*	2 (10%)	7 (50%)	1 (14%)
<1-4 weeks	6 (30%)	6 (43%)	2 (29%)	*1-5*	3 (15%)	1 (7%)	3 (43%)

Research Question Two: Hard and Soft Scaffolds and their Impacts

Hard scaffolds. Only three papers (7%) reported on scaffolds prepared before classroom instruction and then implemented during instruction, and none of these were set in elementary classes. All scaffolded writing skills—two in science and one in a language arts class. Writing, as a static form of language, lends itself to hard scaffolds more so than other classroom activities.

Two studies reported on rubrics, hard scaffolds that support students understand expectations. For instance, consistent use of a rubric helped seventh-twelfth grade Deaf students improve their writing for organization, voice, word choice, sentence fluency, and writing conventions (Appanah & Hoffman, 2014). Over the course of a year, as students became more familiar with the rubric, they were able to use it independently, eventually

editing their work on their own; this demonstrated they learned how to improve their writing and no longer required the scaffold to complete the task.

Kang et al. (2014) investigated the hard scaffolds first-year high school science teachers used in their classroom assessments. The most common scaffold, asking students to both draw and explain their answer, was not associated with students' ability to explain. Contextualizing information, explanatory checklists, and simple rubrics were all positively associated with students' ability to explain their understanding. Combinations of scaffolds can be beneficial; however, scaffolding quality is more important than quantity.

McNeill et al. (2006) explored hard scaffolds in a middle school science classroom. Specifically, the students were scaffolded to construct scientific explanations that included claims, evidence, and reasoning. Across these studies, we see that hard scaffolds can be effective writing supports for middle and high school students engaged in complex, discipline-specific writing tasks.

Soft scaffolds. In general, soft scaffolding—dynamic, situational, and responsive—was reported most often, with 23 studies (56%) focused only on soft scaffolds, representing all grade levels and subject areas. These studies highlighted that teachers used soft scaffolds to establish and deepen routines, including through modeling, and how different forms of interactions supported student engagement and learning.

While often planned as a hard scaffold, teachers can also develop and implement routines as soft scaffolds, often in a developmental manner. For instance, in an immersive Spanish kindergarten setting where students were learning a new language, teachers scaffolded the morning routine through repetition of information (Peregoy & Boyle,

1999). As students developed more knowledge of the language, teachers used the same routines with more complex content. Similarly, teachers gradually supported student use of academic language with a combination of routines to constrain and focus their language, paired with responsive support to engage students in the learning process (Pacheco, Daniel & Pray, 2017). Techniques like these can improve students' language ability (Fullerton, McCrea-Andres, & Robson, 2015). Likewise, a first-grade teacher developed a routine of journal writing first through modeling, then shifted to reminders and feedback as the routine became established (Wollman-Bonilla & Werchadlo, 1999).

Flick (2000) examined routines to foster middle school student participation in science inquiry. The teacher used generative routines, asking open-ended questions paired with adaptive prompts to support engagement. Similarly, in order to form literature discussion groups in a third-grade classroom, the teacher posed questions about characters and vocabulary and asked students to make predictions and summarize (Maloch, 2004). With this and interpersonal support, students worked in groups, allowing the teacher to redirect and model as needed. Jordan (2015) reported on how a teacher fostered a newspaper reading routine in a first-grade classroom. The teacher provided scaffolds such as read-aloud and modeled making connections to students and the community. These scaffolds paired with an authentic source of information helped students make connections over time and increased student engagement.

Scaffolded actions are reciprocal; that is, the teacher's actions impact students, and the students' action can also affect the teacher's actions (González & DeJarnette, 2015). Students pick up strategies, such as specific reading behaviors (P. A. Lee & Schmitt, 2014) and even imitate teacher scaffolds, providing scaffolds to other students

(Jadallah et al., 2011). Many such soft scaffolds are visible as interactions. We detail aspects of these later in the paper. Here, we illustrate *forms* of interaction that have been described in the literature, especially related to questioning and revoicing. A comparative case study set in 4th-grade math classrooms examined teacher use of language supports, finding revoicing strategies, especially repetition and elaboration were common (Banse, Palacios, Merritt, & Rimm-Kaufman, 2017). Although open-ended questions were part of the program, neither teacher used them with students, and this limited student engagement with key concepts. The authors speculated that teachers viewed these as challenging to implement or too difficult for the students. This was similarly difficult in a study of teachers of ELL 5th grade students, in which the teacher posed open-ended questions, provided wait time, and then narrowed question (McNeil, 2012). Likewise, in a case study of how kindergarten teachers scaffold student writing, Copp, Cabell, and Invernizzi (2019) found teachers used a range of verbal scaffolds during instruction, especially during independent student work in order to focus on specific students who needed more assistance. The teachers most commonly offered high levels of support, seldom asking open-ended questions. In these studies, teachers commonly posed questions that could be answered by recall of a specific fact, rather than open-ended questions eliciting conceptual explanations. However, the teachers sometimes used these focused questions with back-and-forth interactions to enable ELL students to answer higher-level questions. Indeed, in a study of 4th-6th grade ESL students, teachers used more narrow, factual questions at the beginning of the year, and over time, posed more open-ended questions (Y. Kim, 2010). In another study contrasting two ELL middle school teachers, (E. M. Johnson, 2019) noted that the teacher who used open-ended

questions increase students' interactions with her and the material helped students work through tasks without needing to reduce the difficulty. In contrast, the teacher who used more narrow, factual scaffolds reduced the classroom interaction, and in turn, also reduced the challenge presented to students; student talk reflected lower order thinking. Across these studies, it is clear that open-ended questions that prompt explanations are important, and that teachers may need support to develop their skills in this area. However, drawing teacher attention to gaps in their scaffolding does not always result in increased use of the scaffold (Freer, 2009).

Hard and soft scaffolds combined. Fifteen articles (37%) included both scaffolding modes, combining scaffolds created prior to instruction with interactive scaffolds. Nine of these took place at a middle school level. All but four were set in a science classroom and the remaining two took place in a math classroom and two in an English language arts class.

Combining soft and hard scaffolds can increase students' level of detail in their explanations, significantly increase state test scores in math (Frederick, Courtney, & Caniglia, 2014), and enhance students' ability to label and link processes in science (Zangori, Forbes, & Schwarz, 2015). This may be because using hard scaffolds allows the teacher more time to focus on specific students that need more support (Dove & Hollenbrands, 2014; Martin et al., 2019; Shin et al., 2017). In a study of middle school science inquiry contrasting timing of teacher-provided metacognitive soft supports and computer scaffolds, students performed best with continuous hard scaffolds and early teacher support (Wu & Pedersen, 2011). Songer et al. (2013) contrasted elementary classrooms across levels, noting that while teachers supplemented hard-written scaffolds

with some of the same scaffolds, those teaching younger students provided a higher level of structure and support. In an experimental design contrasting two purposes—reader-response and cognitive-oriented—in teaching reading comprehension with 6th-grade students, hard scaffolds like worksheets provided guidance tied to purpose (i.e., prompting students to connect what they read to their own experiences in the reader-response approach and directing students to examine the text for literal versus inferential understandings and how to defend these in the cognitive-oriented approach) and teachers used soft scaffolds such as modeling and prompting (Liang, 2011). Students demonstrated increases only respective to the approach used, highlighting that carefully aligned hard and soft scaffolds can support varied learning goals. Collectively, these studies clarify that combining hard and soft scaffolds can be helpful in working with students at varied levels and for a range of purposes.

Several studies that included both hard and soft scaffolds did so in ways that combined content-specific and content-generic scaffolds. Content-specific scaffolds are support related specifically to the content. For example, in physics a prompt to include the words gravity and mass is specific to the content and topic being studied. In contrast, content-generic scaffolds are general and can be applied with varied content. For example, a prompt to provide evidence can remind students to support their answer, but it is not limited to a specific content area, it can be used in English, math, or history. Delen and Krajcik (2018) found students improved in their quality of scientific claims and reasoning when using a mobile app that provided content-generic support and receiving content-specific support from a teacher. McNeill and Krajcik (2009) combined content-specific written/hard scaffolds with teacher-presented content-generic soft scaffolds. The

teacher's ability to make the implicit structure of written explanations explicit through the use of soft scaffolds increased students' competence in supporting scientific claims. Together, these studies suggest hard and soft scaffolds can be combined in synergistic ways (Delen & Krajcik, 2018; McNeill & Krajcik, 2009), such that students can make more progress using both than when used alone.

However, the variability in teacher-provided soft scaffolds can result in varied student outcomes (Martin et al., 2019), suggesting the need to support teachers in this regard. For instance, Jung (2019) reported on classroom implementation and coaching sessions with an elementary science teacher working to include content-specific science information with language scaffolds. They worked on hard scaffolds, including sentence starters, student responses, and revisions of scaffolds based on the application and success in the classroom, and soft scaffolds included rephrasing, restating, and redirection. With coaching, the teacher made progress and became more aware of the impact of his scaffolds on student successes. Likewise, Athanases and de Oliveira (2014) compared two high school teachers, highlighting that one who relied heavily on hard scaffolds and narrow, focused questions limited students' growth, while another, who planned hard scaffolds based in students' cultural resources and used soft scaffolds responsively supported learning opportunities. Although not included in the literature search, it is worth mentioning that research by Saye and Brush (2002) found that the use of both hard and soft scaffolds can be beneficial to teachers. Using hard scaffolds provided thinking space such that teachers could decrease responsive scaffolding; this also allowed time for teachers to implement soft scaffolds with more students.

In this study we found hard scaffolds were used rarely, and only in complex, discipline-specific writing tasks with middle and high school students (Table 2.5). Hard scaffolds were found primarily in high school, with the youngest in this review being 7th grade. Whereas soft scaffolds were most commonly found at the elementary grade level in this review in 17 of the 23 studies that used this mode. Within studies that described the use of soft scaffolds, language arts was the most common topic to be scaffolded in 19 of the 23 studies. These studies, many of which involved qualitative methods, shed light on ways teachers established and modified routines, used modeling, and otherwise supported students through interactions. The combination of both scaffolding modes were found in 9 of the 15 studies reported were in the middle school grade level. Within studies that described the use of both hard and soft scaffolds, science was the most common subject. Using hard and soft scaffolds in combination was advantageous to both teachers and students. It enabled teachers to provide students with a learning experience that allowed them to be more independent in their work, while students who needed more assistance were able to get more support.

Table 2.5. Percentage of studies broken down by scaffolding mode

Scaffolding Mode	Elementary	Middle	High	Most common topic scaffolded
Hard Scaffolds (n=3)	0%	33%	67%	Writing 100%
Both Hard & Soft (n=15)	20%	60%	20%	Science 53%
Soft Scaffolds (n=23)	74%	17%	9%	Language Arts 83%

Overall, these studies highlight that providing students with both hard and soft scaffolds allowed the teacher more time with students who needed more support or functioned in synergistic ways. Using more than one type of scaffold can be more

complicated and take more initial planning, but teachers and students can benefit from the available support.

Research Question Three: Contingent Processes in Scaffolding and their Impacts

We categorized studies for results related to three contingent scaffolding processes: ongoing diagnosis, responsive support, and fading.

Ongoing diagnosis. Although an essential process in scaffolding, none of the studies in this review paid significant attention to ongoing diagnosis. This does not mean that ongoing diagnosis was not happening, and likely reflects the challenges of studying the covert processes. Teachers' post-hoc accounts may not accurately reflect their thinking during teaching, and even video records of classroom instruction may not reveal the complexity of their on-the-fly reasoning.

Responsive Support. Responsive scaffolding is contingent on the task, student, and moment. We found thirty articles (73%) that focused on responsiveness, such as by changing, increasing, or extending scaffolds to meet students' needs. Here, we summarize only those that shared details about responsiveness as implemented or results connected to responsiveness.

Teachers use scaffolds responsively in varied ways. For instance, as teachers walk around the room, they provide support as needed to small groups or individuals (Delen & Krajcik, 2018; Flick, 2000), including related to content (González & DeJarnette, 2015; Y. Kim, 2010; McNeil, 2012) as well as how to collaborate (W. Chen et al., 2012).

Researchers found that *what* was focused on during scaffolding had more impact on student outcomes than how much help or when the scaffold was provided (E. Rodgers, D'Agostino, Harmey, Kelly, & Brownfield, 2016). Focusing on key concepts can help

redirect student learning. In a high school setting, teachers prompted—sometimes repeatedly—to help students answer questions with specific information or depth, then restated the information in a cohesive statement to support students' ability to participate in classroom discussions (Athanases & de Oliveira, 2014). Clarification of terms and concepts can be seen in teachers' support based on students' questions, responses, and progress in a task (M. C. Kim & Hannafin, 2011; Songer et al., 2013). Helping students focus on critical concepts can build confidence in their abilities (Belland et al., 2015). These teachers were responsive in helping students provide more evidence or depth in their response, thereby supporting students in their learning of how to demonstrate their knowledge. Finally, teachers also use responsive scaffolding to supplement hard scaffolds that fade, an approach that can better support student learning (Martin et al., 2019).

Fading. Fading is an essential scaffolding process, providing a schema that support is not meant to be continuous, but rather, should be reduced gradually over time in response to students' increasing ability to demonstrate the skill without support. Although some studies specifically looked at fading, not all implementations were completed with the time required for students to have been successful and, therefore, ready for the support to fade. I found 12 studies (29%) that provided descriptions that fit the operational definition of fading. Hard scaffolds represent an opportunity to plan—and therefore, build-in—fading by providing different materials to students over time; however, these studies also took place over a shorter amount of time than studies that demonstrated the successful use of fading in a classroom setting.

Fading sometimes involves gradual removal of structures, like modeling. Martin et al. (2019) described how a teacher provided group instruction, modeled the task, then

had students practice in pairs before coming back to the large group to report, therefore allowing for decreased teacher control throughout the lesson. Small group work can provide opportunities for continued peer support, along with teacher-provided responsive support as needed (Dove & Hollenbrands, 2014). Teachers can fade support by changing how they ask questions, first modeling how to answer questions and then encouraging students to take more responsibility for their learning (Y. Kim, 2010) by shifting from teacher-monitored to self-monitored reading strategies (P. A. Lee & Schmitt, 2014), or by shifting from content-specific to content-generic writing scaffolds until no scaffold is needed (McNeill & Krajcik, 2009). Likewise, McNeill et al. (2006) compared continuous and faded written scaffolds. Initially, both groups received scaffolds about specific information, including content, hints, prompts, and the amount of evidence to include. While the continuous group received this level of support throughout, the faded group was progressively provided with decreased information that was more generic. No significant differences were noted between the groups while completing classwork, but on post-tests, the group with fading outperformed the other group in the absence of support. This suggests the group with fading was not reliant on the scaffolds to demonstrate their reasoning. Across these approaches, as students demonstrate independence, the teacher decreases their modeling of specific techniques.

While fading can suggest that scaffolding is removed, it fundamentally refers to a decrease of support. As seen in Wood et al. (1976) definition and discussed in the framework, fading can be the lessening of adult control over elements of the task. When fading, teachers release some of the responsibility or control to the student. This change

can be difficult for teachers (Dove & Hollenbrands, 2014), making research on fading, and that links specific fading strategies with outcomes, paramount.

Gradually increasing student responsibility requires continuous monitoring and adjusting to student needs (Maloch, 2004). A study set in a physical education course in which students designed a game illustrated this process (W. Chen et al., 2012); the teacher initially scaffolded and faded but then increased scaffolds as students needed more support. The teacher started by frequently reminding students of social expectations, then as tasks changed, the scaffolding changed to observations and questioning. The teacher changed the support to fit the students' needs, fading modeling and used questioning, which is less restrictive of support. Likewise, in teaching writing, teachers scribed for students who were able to produce verbal sentences, a technique that held students responsible for the content (Fullerton, McCrea-Andrews, & Robson, 2015). As students progressed in their abilities, teachers scribed part, gradually leaving a word, phrase, or more until the students could complete the task independently. As the student gained experience and confidence, the teacher encouraged them to incorporate their new skills into completing the task, thereby decreasing their control and fading the scaffold. In another setting, bilingual teachers initiated most activities, modeled, and completed most tasks, asking students to participate as they were able (Peregoy & Boyle, 1999). For example, in the storybook routine, responsibility is slowly shifted from teacher to student in four steps, shifting from the teacher reading, to including some student participation, to students reading the story to one another, and finally, to students reading the story independently to their parents. This demonstrates a gradual transition from a teacher-controlled activity based on students' increased ability.

A challenge reported in some studies, especially those in which fading was a hard scaffold, was that fading was reduced too quickly; in some cases, this was part of a study design. As fading is based on the learners' needs in a specific task at a specific point in time, no exact timeframe can be stated. As such, planned sequencing of scaffolds and their removal rather than set timeframes of fading will be more effective for learners. For instance, studies reported scaffolds that were faded on a regular interval, rather than according to students' needs (Martin et al., 2019), to enable a comparison between groups (Frederick et al., 2014; McNeill & Krajcik, 2009; McNeill et al., 2006), or to contrast forms of scaffolding, such as from specific to generic (Wu & Pedersen, 2011). These studies omitted the idea that fading should be gradual and responsive. This supports the concept of contingency as a tenet of scaffolding.

Looking across these studies of contingent processes (Table 2.6), we found that 9 out of 41 studies (22%) demonstrated more than one of the three contingent processes. While others did not include information on any of the contingent processes, 8 out of 41 studies (19.5%). As ongoing diagnosis was not a focus of any of the studies included in this review, none of the studies demonstrated the inclusion of all three contingent processes.

Table 2.6. Percentage of studies (n=41) that report on each of the contingent processes; some papers reported on more than one process.

Contingent Processes	All levels	Elementary	Middle	High
Ongoing Diagnosis	0%	0%	0%	0%
Responsiveness	73% (30)	41% (17)	20% (8)	12% (5)
Fading	29% (12)	15% (6)	12% (5)	2% (1)

Conclusions

Based on Wood et al. (1976) definition of scaffolding, this synthesis described how K-12 teachers have used different modes and contingent processes to support student learning. For this synthesis, we posed three research questions. The first question focused on the contexts and characteristics of extant research on teacher scaffolding. Broadly, we found that the studies can be considered educationally relevant. Almost half of the studies were set in elementary school, followed by middle school, then high school. Almost two-thirds of the studies scaffolded an area of language arts, and in the lower elementary, language arts was the only subject scaffolded. Within language arts and across grade levels, comprehension was the most common focus. Learning requires a foundation in language (Vygotsky, 1978), so it is not surprising that language arts is a main focus in scaffolding, regardless of the subject content area, especially at lower grades.

The second research question investigated modes—hard scaffolds, planned ahead of instruction and soft scaffolds, deployed dynamically. Hard scaffolds were effective when explained and used consistently to increase students' ability to use written language, which was the context for all of the studies in this review. Given this, we see potential for such scaffolds to be expanded to communication tasks related to other complex practices, such as engineering design, civics engagement, or historical research.

Soft scaffolds were reported most often, especially to support elementary students in language arts. In particular, these studies showed that teachers more commonly used narrow, focused, high-support questioning and prompting. Few teachers transitioned these into open-ended questions that prompt explanations. Thus, one implication of this

research is that more studies are needed on supporting teachers to expand their repertoires to include effective open-ended questioning as a form of scaffolding.

We found many studies that investigated the combination of hard and soft scaffolds, and particularly for supporting middle school students in inquiry science. One insight of categorization by mode is that, although studies focused on only one mode, when considering teacher implementation, we find it difficult to imagine that both modes were not used in tandem in most cases. Based on this, we encourage authors to be more explicit in reporting on both modes.

The third research question investigated contingent processes—ongoing diagnosis, responsive support, and fading. These processes were seldom the primary focus of the study. When looking over all of the studies in this review in regard to contingent processes, it is noticeable that information is lacking in this area. While some studies reported on more than one of the three contingent processes, ongoing diagnosis was not a focus of any of the studies. This may be because of the covert nature of this kind of work. One way to remedy this gap would be to recruit teachers as informants and engage them in action research specifically to better account for these processes. Co-teaching settings are particularly promising for this, as in-the-moment teacher dialogue can make such decisions visible, and it is more feasible for one teacher to step aside occasionally to make note of their ongoing insights. Further, Wood et al. (1976) point out that students must understand the information before they can complete work, otherwise feedback and support is ineffective, students' progress could provide insight into teachers' diagnostic work. Research that reports on ongoing diagnosis as an interactional process can extend our understanding of this contingent process.

Additionally, future reviews may integrate results from adjacent fields of study. Beyond the scope of this review, and therefore not included in the synthesis, ongoing diagnosis can be informed by research on teacher listening (Burgess, 2012; Worthen, 2021), formative assessment (Black & Wiliam, 1998; Buck & Trauth-Nare, 2009; Sims, Dobbs, & Hand, 2002), and teacher decision making (Chernikova et al., 2020; M. K. Cho & Kim, 2020; E. M. Johnson, 2019; Pata, Lehtinen, & Sarapuu, 2006).

Responsive scaffolding was frequently mentioned and commonly linked teachers' responses based on student work, questions, and answers that allowed the teacher to focus on key concepts or clarify terms. This contingent support was also seen in teacher-created opportunities for students to participate, practice, and demonstrate their understanding and ability to complete a task. Responsiveness was the most often reported contingent process, 30 out of 41 studies (Table 2.6). Despite being a focus in many studies, without better understanding of teachers' ongoing diagnosis—on which responsiveness is based—our understanding of this contingent process remains in need of more study.

While several studies focused on fading, many did so in ways controlled by the researcher, rather than by teachers, limiting both our understanding of how teachers implement fading, and on the value of fading, which, as a contingent process, should occur responsively based on student need, rather than according to study schedules. While a great deal of research in the field of learning analytics is addressing this gap in terms of hard scaffolds as well as technology-delivered dynamic scaffolds, further understanding of how teachers accomplish fading is needed.

These conclusions can be beneficial not only to researchers in the field but also for teacher preparation programs and universities. Explicit instruction and emphasis on the importance of scaffolding can be valuable for teachers to expand the current use and documentation of scaffolds, as well as supporting them in recognizing their ability to execute these processes in a demanding environment. Implementing scaffolds with specific focus on the rationale to support in-the-moment decisions takes practice. In addition to the recommendations made earlier in this section, an increased focus not on the subject being taught but the topic being scaffolded may help to develop a wider view of scaffolding in which to help students learn.

Based on this review, teachers may need assistance in moving from one contingent process to another. Specifically lacking in this review were empirical accounts of ongoing diagnosis and how teachers make in-the-moment decisions differentiated to the needs of students. More research on ongoing diagnosis can offer direction to teachers on providing the right amount of support to students, even as they progress.

In addition, researchers may need to broaden their view of the happenings in a classroom. Ongoing diagnosis and fading may be difficult to see and develop over time and require discussion with the teacher. Teachers may need to be partners in studying teacher-implemented scaffolding. Even studies in which scaffolding is primarily accomplished through technology may draw inspiration from more detailed accounts of how teachers accomplish ongoing diagnosis contingently.

Finally, the use of this two-stage framework, considering teacher-implemented scaffolding in terms of both mode and contingent processes, provided a comprehensive means to identify extant knowledge and gaps. Throughout this review we have

synthesized current research, found trends, and made suggestions for educators, both in-service teachers and teacher preparation. This perspective on teachers' implementation of scaffolding extends the literature in ways that may further our understanding of the ability and common practices that have been documented of teachers supporting student learning.

Limitations and Future Directions

There are several limitations to this study, suggesting future study directions. First, a meta-analysis was not possible given the limited reporting of effect sizes, but such a study could speak to the impact of various scaffolds, such as content-generic versus content specific. Because of the contextual nature of teaching, this synthesis did not include research conducted outside of the United States. Future comparative work could examine, for instance, how teacher agency varies and scaffolding vary by country. Likewise, to maintain focus, this synthesis was restricted to K-12 settings; extendibility of this synthesis to other age groups is not warranted, especially given contextual differences in pre-school and higher education settings. Technology-implemented scaffolding studies were excluded from the study, except where teacher-implemented scaffolds were also reported. This approach supported insight into the teacher's role in scaffolding, a focus complementary to past reviews that have primarily focused on the role of technology. Finally, while we did not exclude them, we did not include terms related to scaffolding (e.g., modeling, feedback, and questioning) in our primary search. Future reviews focused, for instance, on specific aspects of scaffolding should incorporate this broader range of terms. Based on the lack of documentation of contingent processes future research may want to include teacher decision making or

data-based decision making to further recognize the full scope of scaffolding in a dynamic setting. Additionally, understanding how and why teachers make decisions that impact their implementation of scaffolding may provide more information and trends.

References

Appanah, T. M., & Hoffman, N. (2014). Using scaffolded self-editing to improve the writing of signing adolescent deaf students. *American Annals of the Deaf*, *159*(3), 269–283. https://doi.org/10.1353/aad.2014.0024

Applebee, A. N., & Langer, J. A. (1983). Instructional Scaffolding: Reading and writing as natural language activities. *Language Arts*, *60*(2), 168–175. Retrieved from http://www.jstor.com/stable/41961447

Arriendell, W. A., & van der Ende, J. (1985). An empirical test of the utility of the observations-to-variable ratio in factor and components analysis. *Applied Psychological Measurement*, *9*(2), 165–178. https://doi.org/https://doi.org/10.1177/0146621685009002

Ashton, K. (2022). Language teacher agency in emergency online teaching. *System*, *105*(April 2021), 102713. https://doi.org/10.1016/j.system.2021.102713

Athanases, S. Z., & de Oliveira, L. C. (2014). Scaffolding versus routine support for Latina/o youth in an urban school: Tensions in building toward disciplinary literacy. *Journal of Literacy Research*, *46*(2), 263–299. https://doi.org/10.1177/1086296X14535328

Awadelkarim, A. A. (2021). An analysis and insight into the effectiveness of scaffolding: EFL instructors'/teachers' perceptions and attitudes. *Journal of Language and Linguistic Studies*, *17*(2), 828–841. https://doi.org/10.52462/jlls.58

Azevedo, R., Cromley, J. G., Fielding, I., Moos, D. C., & Greene, J. A. (2005). Adaptive

human scaffolding facilitates adolescents' self-regulated learning with hypermedia. *Instructional Science*, *33*, 381–412. https://doi.org/10.1007/s11251-005-1273-8

Bakker, A. B., & Bal, P. M. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology*, *83*(1), 189–206. https://doi.org/10.1348/096317909X402596

Bakker, A., Smit, J., & Wegerif, R. (2015). Scaffolding and dialogic teaching in mathematics education: Introduction and review. *ZDM - Mathematics Education*, *47*(7), 1047–1065. https://doi.org/10.1007/s11858-015-0738-8

Bandura, A. (1993). Perceived self-efficacy in cognitive develop and functioning. *Educational Psychologist*, *28*(2), 117–148. https://doi.org/https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, *52*, 1–26. https://doi.org/https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2005). The evolution of social cognitive theory. In K. G. Smith & M. A. Hitt (Eds.), *Great Minds in Management* (pp. 9–35). Oxford University Press. https://doi.org/https://doi.org/10.1093/oso/9780199276813.003.0002

Bandura, A. (2006). Guide for constructing self-efficacy scales. In *Self-Efficacy Beliefs of Adolescents* (pp. 307–337). Information Age Publishing.

Banse, H. W., Palacios, N. A., Merritt, E. G., & Rimm-Kaufman, S. E. (2017). Scaffolding English language learners' mathematical talk in the context of calendar math. *Journal of Educational Research*, *110*(2), 199–208. https://doi.org/10.1080/00220671.2015.1075187

Bartlett, M. S. (1950). Periodogram analysis and continuous spectra. *Biometrika*, *37*(1/2),

1–16. Retrieved from https://www.jstor.org/stable/2332141

Beavers, A. S., Lounsbury, J. W., Richards, J. K., Huck, S. W., Skolits, G. J., & Esquivel, S. L. (2013). Practical considerations for using exploratory factor analysis in educational research. *Practical Assessment, Research and Evaluation*, *18*(6), 1–13. https://doi.org/10.7275/qv2q-rk76

Belland, B. R. (2016). *Instructional Scaffolding in STEM Education*. *Instructional Scaffolding in STEM Education*. Springer International Publishing. https://doi.org/10.1007/978-3-319-02565-0

Belland, B. R., Gu, J., Armbrust, S., & Cook, B. (2015). Scaffolding argumentation about water quality: A mixed-method study in a rural middle school. *Educational Technology Research and Development*, *63*(3), 325–353. https://doi.org/10.1007/s11423-015-9373-x

Belland, B. R., Kim, C. M., & Hannafin, M. J. (2013). A framework for designing scaffolds that improve motivation and cognition. *Educational Psychologist*, *48*(4), 243–270. https://doi.org/10.1080/00461520.2013.838920

Belland, B. R., Walker, A. E., & Kim, N. J. (2017). A Bayesian network meta-analysis to synthesize the influence of contexts of scaffolding use on cognitive outcomes in STEM education. *Review of Educational Research*, *87*(6), 1042–1081. https://doi.org/10.3102/0034654317723009

Belland, B. R., Walker, A. E., Kim, N. J., & Lefler, M. (2017). Synthesizing results from empirical research on computer-based scaffolding in STEM education: A meta-analysis. *Review of Educational Research*, *87*(2), 309–344. https://doi.org/10.3102/0034654316670999

Berenji, S., Saeidi, M., & Ghafoori, N. (2020). The effect of problem-based learning with hard scaffolds on Iranian EFL learners' reading comprehension. *Journal of Language and Translation*, *10*(2), 121–133.

Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. *Teachers and Teaching: Theory and Practice*, *21*(6), 624–640. https://doi.org/10.1080/13540602.2015.1044325

Biesta, G., Priestley, M., & Robinson, S. (2017). Talking about education: exploring the significance of teachers' talk for teacher agency. *Journal of Curriculum Studies*, *49*(1), 38–54. https://doi.org/10.1080/00220272.2016.1205143

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00282-x

Brunton, G., Harden, A., Oakley, A., & Brunton, G. (2007). Evidence for policy and practice information and co-ordinating centre. In *Evidence in Education Linking Research and Policy*. Organisation for Economic Co-Operation and Development.

Buck, G. A., & Trauth-Nare, A. E. (2009). Preparing teachers to make the formative assessment process integral to science teaching and learning. *Journal of Science Teacher Education*, *20*(5), 475–494. https://doi.org/10.1007/s10972-009-9142-y

Bujang, M. A., Ghani, P. A., Soelar, S. A., & Zulkifli, N. A. (2012). Sample size

guideline for exploratory factor analysis when using small sample: Taking into considerations of different measurement scales. In *ICSSBE 2012 - Proceedings, 2012 International Conference on Statistics in Science, Business and Engineering: "Empowering Decision Making with Statistical Sciences"* (pp. 447–451). IEEE. https://doi.org/10.1109/ICSSBE.2012.6396605

Burgess, T. (2012). How does teacher knowledge in statistics impact on teacher listening? In J. Dindyal, L. P. Cheng, & S. F. Ng (Eds.), *Mathematics education: Expanding horizons. Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia* (pp. 146–153). Singapore.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology and Society*, *13*(4), 63–73.

Chen, J. J., & Adams, C. B. (2023). Drawing from and expanding their toolboxes: Preschool teachers' traditional strategies, unconventional opportunities, and novel challenges in scaffolding young children's social and emotional learning during remote instruction amidst COVID-19. *Early Childhood Education Journal*, *51*(5), 925–937. https://doi.org/10.1007/s10643-022-01359-6

Chen, W., Rovegno, I., Cone, S. L., & Cone, T. P. (2012). An accomplished teacher's use of scaffolding during a second-grade unit on designing games. *Research Quarterly for Exercise and Sport*, *83*(2), 221–234. https://doi.org/10.1080/02701367.2012.10599853

Chernikova, O., Heitzmann, N., Fink, M. C., Timothy, V., Seidel, T., & Fischer, F. (2020). Facilitating diagnostic competences in higher education — A meta-analysis

in medical and teacher education. *Educational Psychology Review*, *32*, 157–196. Retrieved from https://doi.org/10.1007/s10648-019-09492

Cho, M. H., & Cho, Y. J. (2016). Online instructors' use of scaffolding strategies to promote interactions: A scale development study. *International Review of Research in Open and Distance Learning*, *17*(6), 108–120. https://doi.org/10.19173/irrodl.v17i6.2816

Cho, M. K., & Kim, M. K. (2020). Investigating elementary students' problem solving and teacher scaffolding in solving an Ill-structured problem. *International Journal of Education in Mathematics, Science and Technology*, *8*(4), 274–289. https://doi.org/10.46328/IJEMST.V8I4.1148

Choo, S. S. Y., Rotgans, J. I., Yew, E. H. J., & Schmidt, H. G. (2011). Effect of worksheet scaffolds on student learning in problem-based learning. *Advances in Health Sciences Education*, *16*(4), 517–528. https://doi.org/10.1007/s10459-011-9288-1

Christ, T., & Wang, X. C. (2013). Exploring a community of practice model for professional development to address challenges to classroom practices in early childhood. *Journal of Early Childhood Teacher Education*, *34*(4), 350–373. https://doi.org/10.1080/10901027.2013.845630

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. Retrieved from http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf

Collie, R. J., Shapka, J. D., & Perry, N. E. (2012). School climate and social-emotional learning: Predicting teacher stress, job satisfaction, and teaching efficacy. *Journal of Educational Psychology*, *104*(4), 1189–1204. https://doi.org/10.1037/a0029356

Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics*. *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. https://doi.org/10.4324/9781315044408-14

Cooper, K. S., Kintz, T., & Miness, A. (2016). Reflectiveness, adaptivity, and support: How teacher agency promotes student engagement. *American Journal of Education*, *123*(1), 109–136. https://doi.org/10.1086/688168

Copp, S. B., Cabell, S. Q., & Invernizzi, M. A. (2019). Kindergarten teachers' use of writing scaffolds to support children's developing orthographic knowledge. *Literacy Research and Instruction*, *58*(3), 164–183. https://doi.org/10.1080/19388071.2019.1617374

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation*, *10*(7). https://doi.org/10.7275/jyj1-4868

Creswell, J. W. (2014). *Research design: Qualitiative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications. https://doi.org/10.5539/elt.v12n5p40

Culp-Roche, A., Hardin-Fanning, F., Tartavoulle, T., Hampton, D., Hensley, A., Wilson, J. L., & Wiggins, A. T. (2021). Perception of online teacher self-efficacy: A multi-state study of nursing faculty pivoting courses during COVID 19. *Nurse Education Today*, *106*(July), 1–5. https://doi.org/10.1016/j.nedt.2021.105064

Daniel, S. M., Martin-Beltrán, M., Peercy, M. M., & Silverman, R. (2016). Moving beyond yes or no: Shifting from over-scaffolding to contingent scaffolding in literacy instruction with emergent bilingual students. *TESOL Journal*, *7*(2), 393–

420. https://doi.org/10.1002/tesj.213

Danielson, C. (2008). *The Handbook for Enhancing Professional Practice: Using the Framework for Teaching in Your School*. ASCD.

de Oliveira, L. C., & Athanases, S. Z. (2017). A Framework to reenvision instructional scaffolding for linguistically diverse learners. *Journal of Adolescent and Adult Literacy*, *61*(2), 123–129. https://doi.org/10.1002/jaal.663

Delen, I., & Krajcik, J. (2018). Synergy and Students' Explanations: Exploring the Role of Generic and Content-Specific Scaffolds. *International Journal of Science and Mathematics Education*, *16*(1), 1–21. https://doi.org/10.1007/s10763-016-9767-1

Demirkol, T. (2022). Challenges of providing learners with scaffolding during synchronous online EFL teaching. *Journal of Theoretical Educational Science*, *15*(2), 287–306. https://doi.org/10.30831/akukeg.994322

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley & Sons, Inc. https://doi.org/10.1002/chp.20083

Dingle, M. P., Brownell, M. T., Leko, M. M., Boardman, A. G., & Haager, D. (2011). Developing effective special education reading teachers: The influence of professional development, context, and individual qualities. *Learning Disability Quarterly*, *34*(1), 87–103. https://doi.org/10.1177/073194871103400106

Dolighan, T., & Owen, M. (2021). Teacher efficacy for online teaching during the COVID-19 pandemic. *Brock Education Journal*, *30*(1), 95. https://doi.org/10.26522/brocked.v30i1.851

Dominguez, S., & Svihla, V. (2023). A review of teacher implemented scaffolding in K-

12. *Social Sciences and Humanities Open*, *8*(1), 100613. https://doi.org/10.1016/j.ssaho.2023.100613

Dominguez, S., & Svihla, V. (2024). Development of the survey of teacher-implemented scaffolding. *International Journal of Research in Education and Science*, *10*(1), 138–160. https://doi.org/10.46328/ijres.3335

Doo, M. Y., Bonk, C., & Heo, H. (2020). A meta-analysis of scaffolding effects in online learning in higher education. *The International Review of Research in Open and Distributed Learning*, *21*(3), 60–80. https://doi.org/10.19173/irrodl.v21i3.4638

Dove, A., & Hollenbrands, K. (2014). Teachers' scaffolding of students' learning of geometry while using a dynamic geometry program. *International Journal of Mathematical Education in Science and Technology*, *45*(5), 668–681. https://doi.org/10.1080/0020739X.2013.868540

Dunn, K. E., Airola, D. T., Lo, W. J., & Garrison, M. (2013). Becoming data driven: The influence of teachers sense of efficacy on concerns related to data-driven decision making. *Journal of Experimental Education*, *81*(2), 222–241. https://doi.org/10.1080/00220973.2012.699899

EBSCO Connect. (2019). What is the apply equivalent subjects expander? Retrieved from https://connect.ebsco.com/s/article/What-is-the-Apply-Equivalent-Subjects-expander?language=en_US

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962–1023. https://doi.org/10.1086/231294

Fabrigar, L. R., Wegener, D. T., Maccallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological*

Methods, *4*(3), 272–299. https://doi.org/https://doi/10.1037/1082-989X.4.3.272

Finch, W. H. (2013). Exploratory factor analysis. *Handbook of Quantitative Methods for Educational Research*, 167–186. https://doi.org/10.1007/978-94-6209-404-8

Flick, L. B. (2000). Cognitive scaffolding that fosters scientific inquiry in middle level science. *Journal of Science Teacher Education*, *11*(2), 109–129. https://doi.org/10.1023/A

Frederick, M. L., Courtney, S., & Caniglia, J. (2014). With a little help from my friends: Scaffolding techniques in problem solving. *Investigations in Mathematics Learning*, *7*(2), 21–32. https://doi.org/10.1080/24727466.2014.11790340

Freer, P. K. (2009). Focus on scaffolding language and sequential units during choral instruction. *Update: Applications of Research in Music Education*, *28*(1), 33–40. https://doi.org/10.1177/8755123309344327

Friedman, I. A., & Kass, E. (2002). Teacher self-efficacy: A classroom-organization conceptualization. *Teaching and Teacher Education*, *18*(6), 675–686. https://doi.org/10.1016/S0742-051X(02)00027-6

Fu, G., & Clarke, A. (2021). The development and impact of teachers' collective agency during Covid-19: insights from online classrooms in Canada and China. *Educational Review*, *74*(3), 1–21. https://doi.org/10.1080/00131911.2021.1997921

Fullerton, S. K., McCrea-Andrews, H., & Robson, K. (2015). Using a scaffolded multi-component intervention to support the reading and writing development of English learners. *I.E.: Inquiry in Education*, *7*(1). Retrieved from https://files.eric.ed.gov/fulltext/EJ1171670.pdf

Gabriele, A. J., & Joram, E. (2007). Teachers' reflections on their reform-based teaching

in mathematics: Implications for the development of teacher self-efficacy. *Action in Teacher Education*, *29*(3), 60–74. https://doi.org/10.1080/01626620.2007.10463461

Ge, X., Law, V., & Huang, K. (2012). Diagnosis, supporting, and fading: A scaffolding design framework for adaptive e-learning systems. In *Interactivity in E-Learning: Case Studies and Frameworks* (pp. 116–142). IGI Global. https://doi.org/https://doi.org/10.4018/978-1-61350-441-3.ch006

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569–582. https://doi.org/10.1037/0022-0663.76.4.569

Golden-Biddle, K., & Locke, K. (2006). *Composing qualitative research* (2nd ed.). Sage Publications. https://doi.org/10.4135/9781412983709

González, G., & DeJarnette, A. F. (2015). Teachers' and students' negotiation moves when teachers Scaffold group work. *Cognition and Instruction*, *33*(1), 1–45. https://doi.org/10.1080/07370008.2014.987058

Gopaldas, A. (2016). A front-to-back guide to writing a qualitative research article. *Qualitative Market Research*, *19*(1), 115–121. https://doi.org/10.1108/QMR-08-2015-0074

Greene, J. C., Carcelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, *11*(3), 255–274. https://doi.org/10.3102/01623737011003255

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin*, *103*(2), 265–275. https://doi.org/10.1037/0033-2909.103.2.265

Gudmundsdottir, G. B., & Hathaway, D. M. (2020). “We always make it work”: Teachers’ agency in the time of crisis. *Journal of Technology and Teacher Education*, *28*(2), 239–250. Retrieved from https://www.learntechlib.org/p/216242/

Guo, Y., Connor, C. M. D., Yang, Y., Roehrig, A. D., & Morrison, F. J. (2012). The effects of teacher qualification, teacher self-efficacy, and classroom practices on fifth graders’ literacy outcomes. *Elementary School Journal*, *113*(1), 3–24. https://doi.org/10.1086/665816

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching & Teacher Education*, *4*(1), 63–69. https://doi.org/10.1016/0742-051x(88)90025-x

Hammer, D., & Berland, L. K. (2014). Confusing claims for data: A critique of common practices for presenting qualitative research on learning. *Journal of the Learning Sciences*, *23*(1), 37–46. https://doi.org/10.1080/10508406.2013.802652

Hammond, J., & Gibbons, P. (2005). *What is scaffolding? Teachers’ Voices 8: Explicitly Supporting Reading and Writing in the Classroom*. Retrieved from http://www.ameprc.mq.edu.au/docs/research_reports/teachers_voices/Teachers_voices_8.pdf#page=15

Hausfather, S. J. (1996). Vygotsky and schooling: Creating a social context for learning. *Action in Teacher Education*, *18*(2), 1–10. https://doi.org/10.1080/01626620.1996.10462828

He, Y. (2014). Universal design for learning in an online teacher education course: Enhancing learners’ confidence to teach online. *MERLOT Journal of Online Learning and Teaching*, *10*(2), 283–298. Retrieved from

https://jolt.merlot.org/vol10no2/he_0614.pdf

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause*, 1–12. Retrieved from http://hdl.handle.net/10919/104648

Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Perron, J. M., & Mumford, A. K. R. (2005). The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. *Educational and Psychological Measurement*, *65*(2), 202–226. https://doi.org/10.1177/0013164404267287

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, *105*(3), 774–786. https://doi.org/10.1037/a0032198

Howe, C. (2013). Scaffolding in context: Peer interaction and abstract learning. *Learning, Culture and Social Interaction*, *2*(1), 3–10. https://doi.org/10.1016/j.lcsi.2012.12.005

Jadallah, M., Anderson, R. C., Nguyen-Jahiel, K., Miller, B. W., Kim, I. H., Kuo, L. J., … Wu, X. (2011). Influence of a teacher's scaffolding moves during child-led small-group discussions. *American Educational Research Journal*, *48*(1), 194–230. https://doi.org/10.3102/0002831210371498

Johnson, E. (2021). Contingency in context: A study of exemplary reading teachers' use of planned scaffolds in secondary English classes with emergent bilinguals. *Reading and Writing Quarterly*, *37*(3), 260–278. https://doi.org/10.1080/10573569.2020.1776654

Johnson, E. M. (2019). Choosing and using interactional scaffolds: How teachers'

moment-to-moment supports can generate and sustain emergent bilinguals' engagement with challenging English texts. *Research in the Teaching of English*, *53*(3), 245–269. https://doi.org/10.58680/rte201930036

Jones, A. L., & Kessler, M. A. (2020). Teachers' emotion and identity work during a pandemic. *Frontiers in Education*, *5*. https://doi.org/10.3389/feduc.2020.583775

Jung, K. G. (2019). Learning to scaffold science academic language: Lessons from an instructional coaching partnership. *Research in Science Education*, *49*(4), 1013–1024. https://doi.org/10.1007/s11165-019-9851-y

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575

Kang, H., Thompson, J., & Windschitl, M. (2014). Creating opportunities for students to show what they know: The role of scaffolding in assessment tasks. *Science Education*, *98*(4), 674–704. https://doi.org/10.1002/sce.21123

Kast, J., Lindner, K. T., Gutschik, A., & Schwab, S. (2021). Austrian teachers' attitudes and self-efficacy beliefs regarding at-risk students during home learning due to COVID-19. *European Journal of Special Needs Education*, *36*(1), 114–126. https://doi.org/10.1080/08856257.2021.1872849

Kauppinen, M., Kainulainen, J., Hökkä, P., & Vähäsantanen, K. (2020). Professional agency and its features in supporting teachers' learning during an in-service education programme. *European Journal of Teacher Education*, *43*(3), 384–404. https://doi.org/10.1080/02619768.2020.1746264

Kayi-Aydar, H. (2013). Scaffolding language learning in an academic ESL classroom. *ELT Journal*, *67*(3), 324–335. https://doi.org/10.1093/elt/cct016

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education*, *63*(3), 185–200. https://doi.org/10.1177/0022487111433651

Keum, S., Cho, Y. H., Huh, S. Y., & Kim, M. (2021). Types and influence factors of teacher agency in online classes during the COVID-19 pandemic. *Journal of Educational Technology*, *37*(2), 161–190. https://doi.org/10.17232/kset.37.2.161

Kim, L. E., Oxley, L., & Asbury, K. (2022). "My brain feels like a browser with 100 tabs open": A longitudinal study of teachers' mental health and well-being during the COVID-19 pandemic. *British Journal of Educational Psychology*, *92*(1), 299–318. https://doi.org/10.1111/bjep.12450

Kim, M. C., & Hannafin, M. J. (2011). Scaffolding 6th graders' problem solving in technology-enhanced science classrooms: A qualitative case study. *Instructional Science*, *39*(3), 255–282. https://doi.org/10.1007/s11251-010-9127-4

Kim, Y. (2010). Scaffolding through questions in upper elementary ELL learning. *Literacy Teaching and Learning*, *15*, 109–136. Retrieved from https://files.eric.ed.gov/fulltext/EJ910116.pdf

Kohnen, A. M., & Whitacre, M. P. (2017). What makes professional development coherent? Uncovering teacher perspectives on a science literacy project. *Action in Teacher Education*, *39*(4), 414–431. https://doi.org/10.1080/01626620.2017.1336130

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2021). Sustaining a sense of success: The protective role of teacher working conditions during the COVID-19 pandemic. *Journal of Research on Educational Effectiveness*, *14*(4), 727–769.

https://doi.org/10.1080/19345747.2021.1938314

Lajoie, S. P. (2005). Extending the scaffolding metaphor. *Instructional Science*, *33*, 541–557. https://doi.org/10.1007/s11251-005-1279-2

Learning Sciences International. (2013). *Developing a Passion for Professional Teaching: The Marzano Teaching Evaluation Manual*. Retrieved from https://www.learningsciences.com/wp/wp-content/uploads/2018/05/The-Marzano-Teacher-Evaluation-Model.pdf

Lee, M. H., & Tsai, C. C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science*, *38*(1), 1–21. https://doi.org/10.1007/s11251-008-9075-4

Lee, P. A., & Schmitt, M. C. (2014). Teacher language scaffolds the development of independent strategic reading activities and metacognitive awareness in emergent readers. *Reading Psychology*, *35*(1), 32–57. https://doi.org/10.1080/02702711.2012.674477

Leech, N. L., Gullett, S., Cummings, M. H., & Haug, C. A. (2022). The challenges of remote K–12 education during the COVID-19 pandemic: Differences by grade level. *Online Learning Journal*, *26*(1), 245–267. https://doi.org/10.24059/olj.v26i1.2609

Liang, L. A. (2011). Scaffolding middle school students' comprehension and response to short stories. *RMLE Online*, *34*(8), 1–16. https://doi.org/10.1080/19404476.2011.11462081

Lin, T. C., Hsu, Y. S., Lin, S. S., Changlai, M. L., Yang, K. Y., & Lai, T. L. (2012). A review of empirical evidence on scaffolding for science education. *International*

Journal of Science and Mathematics Education, *10*(2), 437–455. https://doi.org/10.1007/s10763-011-9322-z

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications. https://doi.org/10.1016/0147-1767(85)90062-8

Lloret, S., Ferreres, A., & Tomás, A. H. e. I. (2017). The exploratory factor analysis of items: Guided analysis based on empirical data and software. *Anales de Psicología / Annals of Psychology*, *33*(2), 417–432. https://doi.org/10.6018/analesps.33.2.270211

Lockton, M., Weddle, H., & Datnow, A. (2019). When data don't drive: Teacher agency in data use efforts in low-performing schools. *School Effectiveness and School Improvement*, *0*(0), 1–23. https://doi.org/10.1080/09243453.2019.1647442

Lutz, S. L., Guthrie, J. T., & Davis, M. H. (2006). Scaffolding for engagement in elementary school reading instruction. *Journal of Educational Research*, *100*(1), 3–20. https://doi.org/10.3200/JOER.100.1.3-20

Ma, K., Chutiyami, M., Zhang, Y., & Nicoll, S. (2021). Online teaching self-efficacy during COVID-19: Changes, its associated factors and moderators. *Education and Information Technologies*, *26*(6), 6675–6697. https://doi.org/10.1007/s10639-021-10486-3

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, *4*(1), 84–99. https://doi.org/10.1037/1082-989X.4.1.84

MacIntyre, P. D., Gregersen, T., & Mercer, S. (2020). Language teachers' coping strategies during the Covid-19 conversion to online teaching: Correlations with stress, wellbeing and negative emotions. *System*, *94*, 1–13.

https://doi.org/10.1016/j.system.2020.102352

Maloch, B. (2004). On the road to literature discussion groups: Teacher scaffolding during preparatory experiences. *Reading Research and Instruction*, *44*(2), 1–20. https://doi.org/10.1080/19388070409558424

Marshall, J. C., Smart, J., & Alston, D. M. (2016). Development and validation of Teacher Intentionality of Practice Scale (TIPS): A measure to evaluate and scaffold teacher effectiveness. *Teaching and Teacher Education*, *59*, 159–168. https://doi.org/10.1016/j.tate.2016.05.007

Martin, N. D., Dornfeld Tissenbaum, C., Gnesdilow, D., & Puntambekar, S. (2019). Fading distributed scaffolds: the importance of complementarity between teacher and material scaffolds. *Instructional Science*, *47*(1), 69–98. https://doi.org/10.1007/s11251-018-9474-0

McMullen, M. B. (1999). Characteristics of teachers who talk the DAP talk and walk the DAP walk. *Journal of Research in Childhood Education*, *13*(2), 216–230. https://doi.org/10.1080/02568549909594742

McNeil, L. (2012). Using talk to scaffold referential questions for English language learners. *Teaching and Teacher Education*, *28*(3), 396–404. https://doi.org/10.1016/j.tate.2011.11.005

McNeill, K. L., & Krajcik, J. (2009). Synergy between teacher practices and curricular scaffolds to support students in using domain-specific and domain-general knowledge in writing arguments to explain phenomena. *Journal of the Learning Sciences*, *18*(3), 416–460. https://doi.org/10.1080/10508400903013488

McNeill, K. L., Lizotte, D. J., Krajcik, J. S., & Marx, R. W. (2006). Supporting students'

construction of scientific explanations by fading scaffolds in instructional materials. *The Journal of the Learning Sciences*, *15*(2), 153–191. https://doi.org/10.1207/s15327809jls1502

McNiff, J., & Aicher, T. J. (2017). Understanding the challenges and opportunities associated with online learning: A scaffolding theory approach. *Sport Management Education Journal*, *11*(1), 13–23. https://doi.org/10.1123/smej.2016-0007

Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal*, *30*(3), 359–377. https://doi.org/10.1080/0141192041000168968 9

Micceri, T. (1989). The unicorn, the normal curve, and other improbable creatures. *Psychological Bulletin*, *105*(1), 156–166. https://doi.org/10.1037/0033-2909.105.1.156

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … PRISMA-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (prisma-p) 2015 statement. *Systematic Reviews*, *4*(1), 1–9.

Mojarrabi Tabrizi, H., Behnam, B., Saeidi, M., & Lu, X. (2019). The effect of soft vs. hard scaffolding on reading comprehension skill of EFL learners in different experimental conditions. *Cogent Education*, *6*(1), 1–13. https://doi.org/10.1080/2331186X.2019.1631562

Molla, T., & Nolan, A. (2020). Teacher agency and professional practice. *Teachers and Teaching: Theory and Practice*, *26*(1), 67–87. https://doi.org/10.1080/13540602.2020.1740196

Murphy, N., & Messer, D. (2000). Differential benefits from scaffolding and children

working alone. *Educational Psychology*, *20*(1), 17–31. https://doi.org/10.1080/014434100110353

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, *14*(3). https://doi.org/10.5812/sdme.67670

Narayanan, M., & Ordynans, J. G. (2022). Meaning making and self-efficacy: Teacher reflections through COVID-19. *Teacher Educator*, *57*(1), 26–44. https://doi.org/10.1080/08878730.2021.1990455

National Center for Education Statistics. (n.d.). Characteristics of public school teachers. Retrieved from https://nces.ed.gov/programs/coe/indicator/clr

Nunn, G. D., Jantz, P. B., & Butikofer, C. (2009). Concurrent validity between teacher efficacy and perceptions of response to intervention outcomes. *Journal of Instructional Psychology*, *36*(3), 215–218. Retrieved from https://eric.ed.gov/?id=EJ952271

O'Connor, R. E., Sanchez, V. M., Jones, B. T., Suchlit, L., Youkhanna, V., Beach, K. D., & Widaman, K. (2021). Systematic CHAAOS: Teaching Vocabulary in English/Language Arts Special Education Classes in Middle School. *Journal of Learning Disabilities*, *54*(3), 187–202. https://doi.org/10.1177/0022219420922839

Oh, S. Y. (2000). Actually and in fact in American English: A data-based analysis. *English Language and Linguistics*, *4*(2), 243–268. https://doi.org/10.1017/S1360674300000241

Palincsar, A. S. (1998). Keeping the metaphor of scaffolding fresh - A response to C. Addison Stone's "The metaphor of scaffolding: Its utility for the field of learning

disabilities." *Journal of Learning Disabilities*, *31*(4), 370–373. https://doi.org/10.1177/002221949803100406

Pata, K., Lehtinen, E., & Sarapuu, T. (2006). Inter-relations of tutor's and peers' scaffolding and decision-making discourse acts. *Instructional Science*, *34*(4), 313–341. https://doi.org/10.1007/s11251-005-3406-5

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *Journal of the Learning Sciences*, *13*(3), 423–451. https://doi.org/10.1207/s15327809jls1303

Peregoy, S. F., & Boyle, O. F. (1999). Multiple embedded scaffolds: Support for English speakers in a two-way Spanish immersion kindergarten. *Bilingual Research Journal*, *23*(2–3), 135–146. https://doi.org/10.1080/15235882.1999.10668683

Pratt, M. W., & Savoy-Levine, K. M. (1998). Contingent tutoring of long-division skills in fourth and fifth graders: Experimental tests of some hypotheses about scaffolding. *Journal of Applied Developmental Psychology*, *19*(2), 287–304. https://doi.org/10.1016/S0193-3973(99)80041-0

Priestley, M., Edwards, R., Priestley, A., & Miller, K. (2012). Teacher agency in curriculum making: Agents of change and spaces for manoeuvre. *Curriculum Inquiry*, *42*(2), 191–214. https://doi.org/10.1111/j.1467-873X.2012.00588.x

Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational Psychologist*, *40*(1), 1–12. https://doi.org/10.1207/s15326985ep4001

Putman, S. M. (2012). Investigating teacher efficacy: Comparing preservice and inservice teachers with different levels of experience. *Action in Teacher Education*, *34*(1), 26–

40. https://doi.org/10.1080/01626620.2012.642285

Reigosa, C., & Jiménez-Aleixandre, M. P. (2007). Scaffolded problem-solving in the physics and chemistry laboratory: Difficulties hindering students' assumption of responsibility. *International Journal of Science Education*, *29*(3), 307–329. https://doi.org/10.1080/09500690600702454

Reynolds, D. (2017). Interactional scaffolding for reading comprehension. *Literacy Research: Theory, Method, and Practice*, *66*(1), 135–156. https://doi.org/10.1177/2381336917718820

Robinia, K. A., & Anderson, M. L. (2010). Online teaching efficacy of nurse faculty. *Journal of Professional Nursing*, *26*(3), 168–175. https://doi.org/10.1016/j.profnurs.2010.02.006

Rodgers, E. (2017). Scaffolding Word Solving While Reading: New Research Insights. *Reading Teacher*, *70*(5), 525–532. https://doi.org/10.1002/trtr.1548

Rodgers, E., D'Agostino, J. V., Harmey, S. J., Kelly, R. H., & Brownfield, K. (2016). Examining the Nature of Scaffolding in an Early Literacy Intervention. *Reading Research Quarterly*, *51*(3), 345–360. https://doi.org/10.1002/rrq.142

Rodgers, E. M. (2004). Interactions that scaffold reading performance. *Journal of Literacy Research*, *36*(4), 501–532. https://doi.org/10.1207/s15548430jlr3604_4

Russell, D. W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in Personality and Social Psychology Bulletin. *Personality and Social Psychology Bulletin*, *28*(12), 1629–1646. https://doi.org/10.1177/014616702237645

Saldaña, J. (2009). *The Coding Manual for Qualitative Researchers*. SAGE Publications.

Samuels, P. (2016). Advice on exploratory factor analysis. *Centre for Academic Success,*

Birmingham City University, (June), 2. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77–96. https://doi.org/10.1007/BF02505026

Schegloff, E. A. (1993). Reflections on quantification in the study of conversation. *Research on Language and Social Interaction*, *26*(1), 99–128. https://doi.org/10.1207/s15327973rlsi2601_5

Schnitzler, K., Holzberger, D., & Seidel, T. (2021). All better than being disengaged: Student engagement patterns and their relations to academic self-concept and achievement. *European Journal of Psychology of Education*, *36*(3), 627–652. https://doi.org/10.1007/s10212-020-00500-6

Schultz, R. (2012). A critical examination of the teaching methodologies pertaining to distance learning In geographic education: Andragogy in an adult online certificate program. *Review of International Geographical Education Online*, *2*(1), 45–60. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Schultz, R. B., & DeMers, M. N. (2020). Transitioning from emergency remote learning to deep online learning experiences in geography education. *Journal of Geography*, *119*(5), 142–146. https://doi.org/10.1080/00221341.2020.1813791

Schumacker, R. E. (2015). *Learning Statistics Using R*. SAGE Publications Inc. https://doi.org/10.4135/9781506300160

Sewell, W. H. J. (1992). A theory of structure : Duality, agency, and transformation. *American Journal of Sociology*, *98*(1), 1–29. https://doi.org/10.1086/229967

Shaari, I. (2020). Lateral networks of teachers in a centralised education system: Structures, processes, and development of teacher agency. *Asia Pacific Journal of Education*, *40*(4), 516–532. https://doi.org/10.1080/02188791.2020.1838879

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63–75. https://doi.org/10.3233/EFI-2004-22201

Shin, S., Brush, T. A., & Glazewski, K. D. (2020). Examining the hard, peer, and teacher scaffolding framework in inquiry-based technology-enhanced learning environments: impact on academic achievement and group performance. *Educational Technology Research and Development*, (0123456789). https://doi.org/10.1007/s11423-020-09763-8

Shin, S., Brush, T. A., Glazewski, K. D., Shin, S., Brush, T. A., & Glazewski, K. D. (2017). Designing and implementing web-based scaffolding tools for technology-enhanced socioscientific inquiry. *International Forum of Educational Technology & Society*, *20*(1), 1–12. Retrieved from https://www.ds.unipi.gr/et&s/journals/20_1/1.pdf

Sims, R., Dobbs, G., & Hand, T. (2002). Enhancing quality in online learning: Scaffolding planning and design through proactive evaluation. *Distance Education*, *23*(2), 135–148. https://doi.org/10.1080/0158791022000009169

Slavin, R. E. (2015). Cooperative learning in elementary schools. *Education 3-13*, *43*(1), 5–14. https://doi.org/10.1080/03004279.2015.963370

Sokal, L., Trudel, L. E., & Babb, J. (2020). Canadian teachers' attitudes toward change, efficacy, and burnout during the COVID-19 pandemic. *International Journal of*

Educational Research Open, *1*, 100016. https://doi.org/10.1016/j.ijedro.2020.100016

Songer, N. B., Shah, A. M., & Fick, S. (2013). Characterizing teachers' verbal scaffolds to guide elementary students' creation of scientific explanations. *School Science and Mathematics*, *113*(7), 321–332. https://doi.org/10.1111/ssm.12036

Stone, C. A. (1998a). Should we salvage the scaffolding metaphor? *Journal of Learning Disabilities*, *31*(4), 409–413. https://doi.org/10.1177/002221949803100411

Stone, C. A. (1998b). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal of Learning Disabilities*, *31*(4), 344–364. https://doi.org/10.1177/002221949803100404

Streiner, D. L. (2003). *A guide for the statistically perplexed: Selected readings for clinical researchers*. Canadian Psychiatric Association. https://doi.org/10.1177/070674379403900303

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Allyn and Bacon.

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, *28*(1063519), 1–25. https://doi.org/10.25304/rlt.v28.2319

Teruya, J. (2023). Pedagogy in a pandemic: Responsibilisation and agency in the (re)making of teachers. *Pedagogy, Culture and Society*, *31*(1), 185–201. https://doi.org/10.1080/14681366.2021.1898044

Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge University Press. https://doi.org/10.1017/cbo9781139173698

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*, 1–10. https://doi.org/10.1186/1471-2288-8-45

Thumvichit, A. (2021). English language teaching in times of crisis: Teacher agency in response to the pandemic-forced online education. *Teaching English with Technology*, *21*(2), 14–37. Retrieved from https://eric.ed.gov/?id=EJ1293795

Toom, A., Pyhältö, K., & Rust, F. O. (2015). Teachers professional agency in contradictory times. *Teachers and Teaching: Theory and Practice*, *21*(6), 615–623. https://doi.org/10.1080/13540602.2015.1044334

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 189–199. Retrieved from https://eric.ed.gov/?id=EJ1257153

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202–248. https://doi.org/10.3102/00346543068002202

Tsouloupas, C. N., Carson, R. L., Matthews, R., Grawitch, M. J., & Barber, L. K. (2010). Exploring the association between teachers' perceived student misbehaviour and emotional exhaustion: The importance of teacher efficacy beliefs and emotion regulation. *Educational Psychology*, *30*(2), 173–189.

https://doi.org/10.1080/01443410903494460

Turner, J. C., Cox, K. E., DiCintio, M., Meyer, D. K., Logan, C., & Thomas, C. T. (1998). Creating contexts for involvement in mathematics. *Journal of Educational Psychology*, *90*(4), 730–745. https://doi.org/10.1037/0022-0663.90.4.730

Urhahne, D., & Wijnia, L. (2021). A review on the accuracy of teacher judgments. *Educational Research Review*, *32*, 100374. https://doi.org/10.1016/j.edurev.2020.100374

Vähäsantanen, K. (2015). Professional agency in the stream of change: Understanding educational change and teachers' professional identities. *Teaching and Teacher Education*, *47*, 1–12. https://doi.org/10.1016/j.tate.2014.11.006

van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296. https://doi.org/10.1007/s10648-010-9127-6

Velicer, W. F., & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. *Psychological Methods*, *3*(2), 231–251. https://doi.org/10.1037/1082-989X.3.2.231

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* (M. Cole, Ed.). Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Wallen, M., & Tormey, R. (2019). Developing teacher agency through dialogue. *Teaching and Teacher Education*, *82*, 129–139. https://doi.org/10.1016/j.tate.2019.03.014

Walsh, D., & Downe, S. (2005). Meta-synthesis method for qualitative research: A

literature review. *Journal of Advanced Nursing*, *50*(2), 204–211. https://doi.org/10.1111/j.1365-2648.2005.03380.x

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Weißenfels, M., Klopp, E., & Perels, F. (2022). Changes in teacher burnout and self-efficacy during the COVID-19 pandemic: Interrelations and e-learning variables related to change. *Frontiers in Education*, *6*, 1–9. https://doi.org/10.3389/feduc.2021.736992

Wisdom, J., & Creswell, J. W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*. Rockville, MS: Agency for Healthcare Research and Quality. Retrieved from www.ahrq.gov

Wollman-Bonilla, J. E., & Werchadlo, B. (1999). Teacher and peer roles in scaffolding first graders' responses to literature. *Reading Teacher*, *52*(6), 598–608. Retrieved from https://www.jstor.org/stable/20202133

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, *17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, *14*(3), 361–384. https://doi.org/10.5465/amr.1989.4279067

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, *82*(1), 81–91.

https://doi.org/10.1037/0022-0663.82.1.81

Worthen, B. (2021). *Teacher decision-making in guided reading*. University of Kentucky. Retrieved from uknowledge.uky.edu/edc_etds/35/

Wright, J. M. (2010). Effect of quality matters™ training on faculty's online self-efficacy. *Annual Distance Learning Administration Conference*. Retrieved from http://ksuweb.kennesaw.edu/~jwright/QMTraining_FacultySelf-efficacy_Wright.pdf

Wu, H.-L., & Pedersen, S. (2011). Integrating computer- and teacher-based scaffolds in science inquiry. *Computers & Education*, *57*(4), 2352–2363. https://doi.org/10.1016/j.compedu.2011.05.011

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94. https://doi.org/10.20982/tqmp.09.2.p079

Young, V. M., & Kim, D. H. (2010). Using assesments for instructional improvement. *Education Policy Analysis Archives*, *18*(19), 1–38.

Zangori, L., Forbes, C. T., & Schwarz, C. V. (2015). Exploring the effect of embedded scaffolding within curricular tasks on third-grade students' model-based explanations about hydrologic cycling. *Science and Education*, *24*(7–8), 957–981. https://doi.org/10.1007/s11191-015-9771-9

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being. *Review of Educational Research*, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

Chapter 3 - Development of the Survey of Teacher-Implemented Scaffolding

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 et al.,

2014; McNeill et al., 2006) and decrease frustration (van de Pol et al., 2010; D. Wood et al., 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 et al., 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, 1998a). 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, 1998a). 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 (M. H. 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 (A. Bakker et al., 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 3.1.

Table 3.1 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, 1998a). 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 3.2), 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.

Table 3.2 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

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). 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 (Table 3.3).

Table 3.3 - 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
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

Table 3.3 - Factor Loadings for Retained Variables Continued

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
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

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 (Table 3.4). 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 3.4 - 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

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.

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.

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.

Discussion

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, 1998a). 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.

Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant 1751369. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

References

Appanah, T. M., & Hoffman, N. (2014). Using scaffolded self-editing to improve the writing of signing adolescent deaf students. *American Annals of the Deaf*, *159*(3), 269–283. https://doi.org/10.1353/aad.2014.0024

Applebee, A. N., & Langer, J. A. (1983). Instructional Scaffolding: Reading and writing as natural language activities. *Language Arts*, *60*(2), 168–175. Retrieved from http://www.jstor.com/stable/41961447

Arriendell, W. A., & van der Ende, J. (1985). An empirical test of the utility of the observations-to-variable ratio in factor and components analysis. *Applied Psychological Measurement*, *9*(2), 165–178. https://doi.org/https://doi.org/10.1177/0146621685009002

Ashton, K. (2022). Language teacher agency in emergency online teaching. *System*, *105*(April 2021), 102713. https://doi.org/10.1016/j.system.2021.102713

Athanases, S. Z., & de Oliveira, L. C. (2014). Scaffolding versus routine support for Latina/o youth in an urban school: Tensions in building toward disciplinary literacy. *Journal of Literacy Research*, *46*(2), 263–299. https://doi.org/10.1177/1086296X14535328

Awadelkarim, A. A. (2021). An analysis and insight into the effectiveness of scaffolding:

EFL instructors'/teachers' perceptions and attitudes. *Journal of Language and Linguistic Studies*, *17*(2), 828–841. https://doi.org/10.52462/jlls.58

Azevedo, R., Cromley, J. G., Fielding, I., Moos, D. C., & Greene, J. A. (2005). Adaptive human scaffolding facilitates adolescents' self-regulated learning with hypermedia. *Instructional Science*, *33*, 381–412. https://doi.org/10.1007/s11251-005-1273-8

Bakker, A. B., & Bal, P. M. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology*, *83*(1), 189–206. https://doi.org/10.1348/096317909X402596

Bakker, A., Smit, J., & Wegerif, R. (2015). Scaffolding and dialogic teaching in mathematics education: Introduction and review. *ZDM - Mathematics Education*, *47*(7), 1047–1065. https://doi.org/10.1007/s11858-015-0738-8

Bandura, A. (1993). Perceived self-efficacy in cognitive develop and functioning. *Educational Psychologist*, *28*(2), 117–148. https://doi.org/https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, *52*, 1–26. https://doi.org/https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2005). The evolution of social cognitive theory. In K. G. Smith & M. A. Hitt (Eds.), *Great Minds in Management* (pp. 9–35). Oxford University Press. https://doi.org/https://doi.org/10.1093/oso/9780199276813.003.0002

Bandura, A. (2006). Guide for constructing self-efficacy scales. In *Self-Efficacy Beliefs of Adolescents* (pp. 307–337). Information Age Publishing.

Banse, H. W., Palacios, N. A., Merritt, E. G., & Rimm-Kaufman, S. E. (2017). Scaffolding English language learners' mathematical talk in the context of calendar

math. *Journal of Educational Research*, *110*(2), 199–208. https://doi.org/10.1080/00220671.2015.1075187

Bartlett, M. S. (1950). Periodogram analysis and continuous spectra. *Biometrika*, *37*(1/2), 1–16. Retrieved from https://www.jstor.org/stable/2332141

Beavers, A. S., Lounsbury, J. W., Richards, J. K., Huck, S. W., Skolits, G. J., & Esquivel, S. L. (2013). Practical considerations for using exploratory factor analysis in educational research. *Practical Assessment, Research and Evaluation*, *18*(6), 1–13. https://doi.org/10.7275/qv2q-rk76

Belland, B. R. (2016). *Instructional Scaffolding in STEM Education*. *Instructional Scaffolding in STEM Education*. Springer International Publishing. https://doi.org/10.1007/978-3-319-02565-0

Belland, B. R., Gu, J., Armbrust, S., & Cook, B. (2015). Scaffolding argumentation about water quality: A mixed-method study in a rural middle school. *Educational Technology Research and Development*, *63*(3), 325–353. https://doi.org/10.1007/s11423-015-9373-x

Belland, B. R., Kim, C. M., & Hannafin, M. J. (2013). A framework for designing scaffolds that improve motivation and cognition. *Educational Psychologist*, *48*(4), 243–270. https://doi.org/10.1080/00461520.2013.838920

Belland, B. R., Walker, A. E., & Kim, N. J. (2017). A Bayesian network meta-analysis to synthesize the influence of contexts of scaffolding use on cognitive outcomes in STEM education. *Review of Educational Research*, *87*(6), 1042–1081. https://doi.org/10.3102/0034654317723009

Belland, B. R., Walker, A. E., Kim, N. J., & Lefler, M. (2017). Synthesizing results from

empirical research on computer-based scaffolding in STEM education: A meta-analysis. *Review of Educational Research*, *87*(2), 309–344. https://doi.org/10.3102/0034654316670999

Berenji, S., Saeidi, M., & Ghafoori, N. (2020). The effect of problem-based learning with hard scaffolds on Iranian EFL learners' reading comprehension. *Journal of Language and Translation*, *10*(2), 121–133.

Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. *Teachers and Teaching: Theory and Practice*, *21*(6), 624–640. https://doi.org/10.1080/13540602.2015.1044325

Biesta, G., Priestley, M., & Robinson, S. (2017). Talking about education: exploring the significance of teachers' talk for teacher agency. *Journal of Curriculum Studies*, *49*(1), 38–54. https://doi.org/10.1080/00220272.2016.1205143

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00282-x

Brunton, G., Harden, A., Oakley, A., & Brunton, G. (2007). Evidence for policy and practice information and co-ordinating centre. In *Evidence in Education Linking Research and Policy*. Organisation for Economic Co-Operation and Development.

Buck, G. A., & Trauth-Nare, A. E. (2009). Preparing teachers to make the formative

assessment process integral to science teaching and learning. *Journal of Science Teacher Education*, *20*(5), 475–494. https://doi.org/10.1007/s10972-009-9142-y

Bujang, M. A., Ghani, P. A., Soelar, S. A., & Zulkifli, N. A. (2012). Sample size guideline for exploratory factor analysis when using small sample: Taking into considerations of different measurement scales. In *ICSSBE 2012 - Proceedings, 2012 International Conference on Statistics in Science, Business and Engineering: "Empowering Decision Making with Statistical Sciences"* (pp. 447–451). IEEE. https://doi.org/10.1109/ICSSBE.2012.6396605

Burgess, T. (2012). How does teacher knowledge in statistics impact on teacher listening? In J. Dindyal, L. P. Cheng, & S. F. Ng (Eds.), *Mathematics education: Expanding horizons. Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia* (pp. 146–153). Singapore.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology and Society*, *13*(4), 63–73.

Chen, J. J., & Adams, C. B. (2023). Drawing from and expanding their toolboxes: Preschool teachers' traditional strategies, unconventional opportunities, and novel challenges in scaffolding young children's social and emotional learning during remote instruction amidst COVID-19. *Early Childhood Education Journal*, *51*(5), 925–937. https://doi.org/10.1007/s10643-022-01359-6

Chen, W., Rovegno, I., Cone, S. L., & Cone, T. P. (2012). An accomplished teacher's use of scaffolding during a second-grade unit on designing games. *Research Quarterly for Exercise and Sport*, *83*(2), 221–234.

https://doi.org/10.1080/02701367.2012.10599853

Chernikova, O., Heitzmann, N., Fink, M. C., Timothy, V., Seidel, T., & Fischer, F. (2020). Facilitating diagnostic competences in higher education — A meta-analysis in medical and teacher education. *Educational Psychology Review*, *32*, 157–196. Retrieved from https://doi.org/10.1007/s10648-019-09492

Cho, M. H., & Cho, Y. J. (2016). Online instructors' use of scaffolding strategies to promote interactions: A scale development study. *International Review of Research in Open and Distance Learning*, *17*(6), 108–120. https://doi.org/10.19173/irrodl.v17i6.2816

Cho, M. K., & Kim, M. K. (2020). Investigating elementary students' problem solving and teacher scaffolding in solving an Ill-structured problem. *International Journal of Education in Mathematics, Science and Technology*, *8*(4), 274–289. https://doi.org/10.46328/IJEMST.V8I4.1148

Choo, S. S. Y., Rotgans, J. I., Yew, E. H. J., & Schmidt, H. G. (2011). Effect of worksheet scaffolds on student learning in problem-based learning. *Advances in Health Sciences Education*, *16*(4), 517–528. https://doi.org/10.1007/s10459-011-9288-1

Christ, T., & Wang, X. C. (2013). Exploring a community of practice model for professional development to address challenges to classroom practices in early childhood. *Journal of Early Childhood Teacher Education*, *34*(4), 350–373. https://doi.org/10.1080/10901027.2013.845630

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. Retrieved from http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf

Collie, R. J., Shapka, J. D., & Perry, N. E. (2012). School climate and social-emotional learning: Predicting teacher stress, job satisfaction, and teaching efficacy. *Journal of Educational Psychology*, *104*(4), 1189–1204. https://doi.org/10.1037/a0029356

Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics*. *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. https://doi.org/10.4324/9781315044408-14

Cooper, K. S., Kintz, T., & Miness, A. (2016). Reflectiveness, adaptivity, and support: How teacher agency promotes student engagement. *American Journal of Education*, *123*(1), 109–136. https://doi.org/10.1086/688168

Copp, S. B., Cabell, S. Q., & Invernizzi, M. A. (2019). Kindergarten teachers' use of writing scaffolds to support children's developing orthographic knowledge. *Literacy Research and Instruction*, *58*(3), 164–183. https://doi.org/10.1080/19388071.2019.1617374

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation*, *10*(7). https://doi.org/10.7275/jyj1-4868

Creswell, J. W. (2014). *Research design: Qualitiative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications. https://doi.org/10.5539/elt.v12n5p40

Culp-Roche, A., Hardin-Fanning, F., Tartavoulle, T., Hampton, D., Hensley, A., Wilson, J. L., & Wiggins, A. T. (2021). Perception of online teacher self-efficacy: A multi-state study of nursing faculty pivoting courses during COVID 19. *Nurse Education Today*, *106*(July), 1–5. https://doi.org/10.1016/j.nedt.2021.105064

Daniel, S. M., Martin-Beltrán, M., Peercy, M. M., & Silverman, R. (2016). Moving beyond yes or no: Shifting from over-scaffolding to contingent scaffolding in literacy instruction with emergent bilingual students. *TESOL Journal*, *7*(2), 393–420. https://doi.org/10.1002/tesj.213

Danielson, C. (2008). *The Handbook for Enhancing Professional Practice: Using the Framework for Teaching in Your School*. ASCD.

de Oliveira, L. C., & Athanases, S. Z. (2017). A Framework to reenvision instructional scaffolding for linguistically diverse learners. *Journal of Adolescent and Adult Literacy*, *61*(2), 123–129. https://doi.org/10.1002/jaal.663

Delen, I., & Krajcik, J. (2018). Synergy and Students' Explanations: Exploring the Role of Generic and Content-Specific Scaffolds. *International Journal of Science and Mathematics Education*, *16*(1), 1–21. https://doi.org/10.1007/s10763-016-9767-1

Demirkol, T. (2022). Challenges of providing learners with scaffolding during synchronous online EFL teaching. *Journal of Theoretical Educational Science*, *15*(2), 287–306. https://doi.org/10.30831/akukeg.994322

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley & Sons, Inc. https://doi.org/10.1002/chp.20083

Dingle, M. P., Brownell, M. T., Leko, M. M., Boardman, A. G., & Haager, D. (2011). Developing effective special education reading teachers: The influence of professional development, context, and individual qualities. *Learning Disability Quarterly*, *34*(1), 87–103. https://doi.org/10.1177/073194871103400106

Dolighan, T., & Owen, M. (2021). Teacher efficacy for online teaching during the

COVID-19 pandemic. *Brock Education Journal*, *30*(1), 95. https://doi.org/10.26522/brocked.v30i1.851

Dominguez, S., & Svihla, V. (2023). A review of teacher implemented scaffolding in K-12. *Social Sciences and Humanities Open*, *8*(1), 100613. https://doi.org/10.1016/j.ssaho.2023.100613

Dominguez, S., & Svihla, V. (2024). Development of the survey of teacher-implemented scaffolding. *International Journal of Research in Education and Science*, *10*(1), 138–160. https://doi.org/10.46328/ijres.3335

Doo, M. Y., Bonk, C., & Heo, H. (2020). A meta-analysis of scaffolding effects in online learning in higher education. *The International Review of Research in Open and Distributed Learning*, *21*(3), 60–80. https://doi.org/10.19173/irrodl.v21i3.4638

Dove, A., & Hollenbrands, K. (2014). Teachers' scaffolding of students' learning of geometry while using a dynamic geometry program. *International Journal of Mathematical Education in Science and Technology*, *45*(5), 668–681. https://doi.org/10.1080/0020739X.2013.868540

Dunn, K. E., Airola, D. T., Lo, W. J., & Garrison, M. (2013). Becoming data driven: The influence of teachers sense of efficacy on concerns related to data-driven decision making. *Journal of Experimental Education*, *81*(2), 222–241. https://doi.org/10.1080/00220973.2012.699899

EBSCO Connect. (2019). What is the apply equivalent subjects expander? Retrieved from https://connect.ebsco.com/s/article/What-is-the-Apply-Equivalent-Subjects-expander?language=en_US

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*,

103(4), 962–1023. https://doi.org/10.1086/231294

Fabrigar, L. R., Wegener, D. T., Maccallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272–299. https://doi.org/https://doi/10.1037/1082-989X.4.3.272

Finch, W. H. (2013). Exploratory factor analysis. *Handbook of Quantitative Methods for Educational Research*, 167–186. https://doi.org/10.1007/978-94-6209-404-8

Flick, L. B. (2000). Cognitive scaffolding that fosters scientific inquiry in middle level science. *Journal of Science Teacher Education*, *11*(2), 109–129. https://doi.org/10.1023/A

Frederick, M. L., Courtney, S., & Caniglia, J. (2014). With a little help from my friends: Scaffolding techniques in problem solving. *Investigations in Mathematics Learning*, *7*(2), 21–32. https://doi.org/10.1080/24727466.2014.11790340

Freer, P. K. (2009). Focus on scaffolding language and sequential units during choral instruction. *Update: Applications of Research in Music Education*, *28*(1), 33–40. https://doi.org/10.1177/8755123309344327

Friedman, I. A., & Kass, E. (2002). Teacher self-efficacy: A classroom-organization conceptualization. *Teaching and Teacher Education*, *18*(6), 675–686. https://doi.org/10.1016/S0742-051X(02)00027-6

Fu, G., & Clarke, A. (2021). The development and impact of teachers' collective agency during Covid-19: insights from online classrooms in Canada and China. *Educational Review*, *74*(3), 1–21. https://doi.org/10.1080/00131911.2021.1997921

Fullerton, S. K., McCrea-Andrews, H., & Robson, K. (2015). Using a scaffolded multi-component intervention to support the reading and writing development of English

learners. *I.E.: Inquiry in Education*, *7*(1). Retrieved from https://files.eric.ed.gov/fulltext/EJ1171670.pdf

Gabriele, A. J., & Joram, E. (2007). Teachers' reflections on their reform-based teaching in mathematics: Implications for the development of teacher self-efficacy. *Action in Teacher Education*, *29*(3), 60–74. https://doi.org/10.1080/01626620.2007.10463461

Ge, X., Law, V., & Huang, K. (2012). Diagnosis, supporting, and fading: A scaffolding design framework for adaptive e-learning systems. In *Interactivity in E-Learning: Case Studies and Frameworks* (pp. 116–142). IGI Global. https://doi.org/https://doi.org/10.4018/978-1-61350-441-3.ch006

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569–582. https://doi.org/10.1037/0022-0663.76.4.569

Golden-Biddle, K., & Locke, K. (2006). *Composing qualitative research* (2nd ed.). Sage Publications. https://doi.org/10.4135/9781412983709

González, G., & DeJarnette, A. F. (2015). Teachers' and students' negotiation moves when teachers Scaffold group work. *Cognition and Instruction*, *33*(1), 1–45. https://doi.org/10.1080/07370008.2014.987058

Gopaldas, A. (2016). A front-to-back guide to writing a qualitative research article. *Qualitative Market Research*, *19*(1), 115–121. https://doi.org/10.1108/QMR-08-2015-0074

Greene, J. C., Carcelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, *11*(3), 255–274. https://doi.org/10.3102/01623737011003255

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin*, *103*(2), 265–275. https://doi.org/10.1037/0033-2909.103.2.265

Gudmundsdottir, G. B., & Hathaway, D. M. (2020). "We always make it work": Teachers' agency in the time of crisis. *Journal of Technology and Teacher Education*, *28*(2), 239–250. Retrieved from https://www.learntechlib.org/p/216242/

Guo, Y., Connor, C. M. D., Yang, Y., Roehrig, A. D., & Morrison, F. J. (2012). The effects of teacher qualification, teacher self-efficacy, and classroom practices on fifth graders' literacy outcomes. *Elementary School Journal*, *113*(1), 3–24. https://doi.org/10.1086/665816

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching & Teacher Education*, *4*(1), 63–69. https://doi.org/10.1016/0742-051x(88)90025-x

Hammer, D., & Berland, L. K. (2014). Confusing claims for data: A critique of common practices for presenting qualitative research on learning. *Journal of the Learning Sciences*, *23*(1), 37–46. https://doi.org/10.1080/10508406.2013.802652

Hammond, J., & Gibbons, P. (2005). *What is scaffolding? Teachers' Voices 8: Explicitly Supporting Reading and Writing in the Classroom*. Retrieved from http://www.ameprc.mq.edu.au/docs/research_reports/teachers_voices/Teachers_voices_8.pdf#page=15

Hausfather, S. J. (1996). Vygotsky and schooling: Creating a social context for learning. *Action in Teacher Education*, *18*(2), 1–10. https://doi.org/10.1080/01626620.1996.10462828

He, Y. (2014). Universal design for learning in an online teacher education course: Enhancing learners' confidence to teach online. *MERLOT Journal of Online Learning and Teaching*, *10*(2), 283–298. Retrieved from https://jolt.merlot.org/vol10no2/he_0614.pdf

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause*, 1–12. Retrieved from http://hdl.handle.net/10919/104648

Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Perron, J. M., & Mumford, A. K. R. (2005). The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. *Educational and Psychological Measurement*, *65*(2), 202–226. https://doi.org/10.1177/0013164404267287

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, *105*(3), 774–786. https://doi.org/10.1037/a0032198

Howe, C. (2013). Scaffolding in context: Peer interaction and abstract learning. *Learning, Culture and Social Interaction*, *2*(1), 3–10. https://doi.org/10.1016/j.lcsi.2012.12.005

Jadallah, M., Anderson, R. C., Nguyen-Jahiel, K., Miller, B. W., Kim, I. H., Kuo, L. J., … Wu, X. (2011). Influence of a teacher's scaffolding moves during child-led small-group discussions. *American Educational Research Journal*, *48*(1), 194–230. https://doi.org/10.3102/0002831210371498

Johnson, E. (2021). Contingency in context: A study of exemplary reading teachers' use of planned scaffolds in secondary English classes with emergent bilinguals. *Reading*

and Writing Quarterly, *37*(3), 260–278. https://doi.org/10.1080/10573569.2020.1776654

Johnson, E. M. (2019). Choosing and using interactional scaffolds: How teachers' moment-to-moment supports can generate and sustain emergent bilinguals' engagement with challenging English texts. *Research in the Teaching of English*, *53*(3), 245–269. https://doi.org/10.58680/rte201930036

Jones, A. L., & Kessler, M. A. (2020). Teachers' emotion and identity work during a pandemic. *Frontiers in Education*, *5*. https://doi.org/10.3389/feduc.2020.583775

Jung, K. G. (2019). Learning to scaffold science academic language: Lessons from an instructional coaching partnership. *Research in Science Education*, *49*(4), 1013–1024. https://doi.org/10.1007/s11165-019-9851-y

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575

Kang, H., Thompson, J., & Windschitl, M. (2014). Creating opportunities for students to show what they know: The role of scaffolding in assessment tasks. *Science Education*, *98*(4), 674–704. https://doi.org/10.1002/sce.21123

Kast, J., Lindner, K. T., Gutschik, A., & Schwab, S. (2021). Austrian teachers' attitudes and self-efficacy beliefs regarding at-risk students during home learning due to COVID-19. *European Journal of Special Needs Education*, *36*(1), 114–126. https://doi.org/10.1080/08856257.2021.1872849

Kauppinen, M., Kainulainen, J., Hökkä, P., & Vähäsantanen, K. (2020). Professional agency and its features in supporting teachers' learning during an in-service education programme. *European Journal of Teacher Education*, *43*(3), 384–404.

https://doi.org/10.1080/02619768.2020.1746264

Kayi-Aydar, H. (2013). Scaffolding language learning in an academic ESL classroom. *ELT Journal*, *67*(3), 324–335. https://doi.org/10.1093/elt/cct016

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education*, *63*(3), 185–200. https://doi.org/10.1177/0022487111433651

Keum, S., Cho, Y. H., Huh, S. Y., & Kim, M. (2021). Types and influence factors of teacher agency in online classes during the COVID-19 pandemic. *Journal of Educational Technology*, *37*(2), 161–190. https://doi.org/10.17232/kset.37.2.161

Kim, L. E., Oxley, L., & Asbury, K. (2022). "My brain feels like a browser with 100 tabs open": A longitudinal study of teachers' mental health and well-being during the COVID-19 pandemic. *British Journal of Educational Psychology*, *92*(1), 299–318. https://doi.org/10.1111/bjep.12450

Kim, M. C., & Hannafin, M. J. (2011). Scaffolding 6th graders' problem solving in technology-enhanced science classrooms: A qualitative case study. *Instructional Science*, *39*(3), 255–282. https://doi.org/10.1007/s11251-010-9127-4

Kim, Y. (2010). Scaffolding through questions in upper elementary ELL learning. *Literacy Teaching and Learning*, *15*, 109–136. Retrieved from https://files.eric.ed.gov/fulltext/EJ910116.pdf

Kohnen, A. M., & Whitacre, M. P. (2017). What makes professional development coherent? Uncovering teacher perspectives on a science literacy project. *Action in Teacher Education*, *39*(4), 414–431. https://doi.org/10.1080/01626620.2017.1336130

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2021). Sustaining a sense of success: The protective role of teacher working conditions during the COVID-19 pandemic. *Journal of Research on Educational Effectiveness*, *14*(4), 727–769. https://doi.org/10.1080/19345747.2021.1938314

Lajoie, S. P. (2005). Extending the scaffolding metaphor. *Instructional Science*, *33*, 541–557. https://doi.org/10.1007/s11251-005-1279-2

Learning Sciences International. (2013). *Developing a Passion for Professional Teaching: The Marzano Teaching Evaluation Manual*. Retrieved from https://www.learningsciences.com/wp/wp-content/uploads/2018/05/The-Marzano-Teacher-Evaluation-Model.pdf

Lee, M. H., & Tsai, C. C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science*, *38*(1), 1–21. https://doi.org/10.1007/s11251-008-9075-4

Lee, P. A., & Schmitt, M. C. (2014). Teacher language scaffolds the development of independent strategic reading activities and metacognitive awareness in emergent readers. *Reading Psychology*, *35*(1), 32–57. https://doi.org/10.1080/02702711.2012.674477

Leech, N. L., Gullett, S., Cummings, M. H., & Haug, C. A. (2022). The challenges of remote K–12 education during the COVID-19 pandemic: Differences by grade level. *Online Learning Journal*, *26*(1), 245–267. https://doi.org/10.24059/olj.v26i1.2609

Liang, L. A. (2011). Scaffolding middle school students' comprehension and response to short stories. *RMLE Online*, *34*(8), 1–16.

https://doi.org/10.1080/19404476.2011.11462081

Lin, T. C., Hsu, Y. S., Lin, S. S., Changlai, M. L., Yang, K. Y., & Lai, T. L. (2012). A review of empirical evidence on scaffolding for science education. *International Journal of Science and Mathematics Education*, *10*(2), 437–455. https://doi.org/10.1007/s10763-011-9322-z

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications. https://doi.org/10.1016/0147-1767(85)90062-8

Lloret, S., Ferreres, A., & Tomás, A. H. e. I. (2017). The exploratory factor analysis of items: Guided analysis based on empirical data and software. *Anales de Psicología / Annals of Psychology*, *33*(2), 417–432. https://doi.org/10.6018/analesps.33.2.270211

Lockton, M., Weddle, H., & Datnow, A. (2019). When data don't drive: Teacher agency in data use efforts in low-performing schools. *School Effectiveness and School Improvement*, *0*(0), 1–23. https://doi.org/10.1080/09243453.2019.1647442

Lutz, S. L., Guthrie, J. T., & Davis, M. H. (2006). Scaffolding for engagement in elementary school reading instruction. *Journal of Educational Research*, *100*(1), 3–20. https://doi.org/10.3200/JOER.100.1.3-20

Ma, K., Chutiyami, M., Zhang, Y., & Nicoll, S. (2021). Online teaching self-efficacy during COVID-19: Changes, its associated factors and moderators. *Education and Information Technologies*, *26*(6), 6675–6697. https://doi.org/10.1007/s10639-021-10486-3

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, *4*(1), 84–99. https://doi.org/10.1037/1082-989X.4.1.84

MacIntyre, P. D., Gregersen, T., & Mercer, S. (2020). Language teachers' coping strategies during the Covid-19 conversion to online teaching: Correlations with stress, wellbeing and negative emotions. *System*, *94*, 1–13. https://doi.org/10.1016/j.system.2020.102352

Maloch, B. (2004). On the road to literature discussion groups: Teacher scaffolding during preparatory experiences. *Reading Research and Instruction*, *44*(2), 1–20. https://doi.org/10.1080/19388070409558424

Marshall, J. C., Smart, J., & Alston, D. M. (2016). Development and validation of Teacher Intentionality of Practice Scale (TIPS): A measure to evaluate and scaffold teacher effectiveness. *Teaching and Teacher Education*, *59*, 159–168. https://doi.org/10.1016/j.tate.2016.05.007

Martin, N. D., Dornfeld Tissenbaum, C., Gnesdilow, D., & Puntambekar, S. (2019). Fading distributed scaffolds: the importance of complementarity between teacher and material scaffolds. *Instructional Science*, *47*(1), 69–98. https://doi.org/10.1007/s11251-018-9474-0

McMullen, M. B. (1999). Characteristics of teachers who talk the DAP talk and walk the DAP walk. *Journal of Research in Childhood Education*, *13*(2), 216–230. https://doi.org/10.1080/02568549909594742

McNeil, L. (2012). Using talk to scaffold referential questions for English language learners. *Teaching and Teacher Education*, *28*(3), 396–404. https://doi.org/10.1016/j.tate.2011.11.005

McNeill, K. L., & Krajcik, J. (2009). Synergy between teacher practices and curricular scaffolds to support students in using domain-specific and domain-general

knowledge in writing arguments to explain phenomena. *Journal of the Learning Sciences*, *18*(3), 416–460. https://doi.org/10.1080/10508400903013488

McNeill, K. L., Lizotte, D. J., Krajcik, J. S., & Marx, R. W. (2006). Supporting students' construction of scientific explanations by fading scaffolds in instructional materials. *The Journal of the Learning Sciences*, *15*(2), 153–191. https://doi.org/10.1207/s15327809jls1502

McNiff, J., & Aicher, T. J. (2017). Understanding the challenges and opportunities associated with online learning: A scaffolding theory approach. *Sport Management Education Journal*, *11*(1), 13–23. https://doi.org/10.1123/smej.2016-0007

Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal*, *30*(3), 359–377. https://doi.org/10.1080/0141192040100016896 89

Micceri, T. (1989). The unicorn, the normal curve, and other improbable creatures. *Psychological Bulletin*, *105*(1), 156–166. https://doi.org/10.1037/0033-2909.105.1.156

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … PRISMA-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (prisma-p) 2015 statement. *Systematic Reviews*, *4*(1), 1–9.

Mojarrabi Tabrizi, H., Behnam, B., Saeidi, M., & Lu, X. (2019). The effect of soft vs. hard scaffolding on reading comprehension skill of EFL learners in different experimental conditions. *Cogent Education*, *6*(1), 1–13. https://doi.org/10.1080/2331186X.2019.1631562

Molla, T., & Nolan, A. (2020). Teacher agency and professional practice. *Teachers and*

Teaching: Theory and Practice, *26*(1), 67–87. https://doi.org/10.1080/13540602.2020.1740196

Murphy, N., & Messer, D. (2000). Differential benefits from scaffolding and children working alone. *Educational Psychology*, *20*(1), 17–31. https://doi.org/10.1080/014434100110353

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, *14*(3). https://doi.org/10.5812/sdme.67670

Narayanan, M., & Ordynans, J. G. (2022). Meaning making and self-efficacy: Teacher reflections through COVID-19. *Teacher Educator*, *57*(1), 26–44. https://doi.org/10.1080/08878730.2021.1990455

National Center for Education Statistics. (n.d.). Characteristics of public school teachers. Retrieved from https://nces.ed.gov/programs/coe/indicator/clr

Nunn, G. D., Jantz, P. B., & Butikofer, C. (2009). Concurrent validity between teacher efficacy and perceptions of response to intervention outcomes. *Journal of Instructional Psychology*, *36*(3), 215–218. Retrieved from https://eric.ed.gov/?id=EJ952271

O'Connor, R. E., Sanchez, V. M., Jones, B. T., Suchlit, L., Youkhanna, V., Beach, K. D., & Widaman, K. (2021). Systematic CHAAOS: Teaching Vocabulary in English/Language Arts Special Education Classes in Middle School. *Journal of Learning Disabilities*, *54*(3), 187–202. https://doi.org/10.1177/0022219420922839

Oh, S. Y. (2000). Actually and in fact in American English: A data-based analysis. *English Language and Linguistics*, *4*(2), 243–268.

https://doi.org/10.1017/S1360674300000241

Palincsar, A. S. (1998). Keeping the metaphor of scaffolding fresh - A response to C. Addison Stone's "The metaphor of scaffolding: Its utility for the field of learning disabilities." *Journal of Learning Disabilities*, *31*(4), 370–373. https://doi.org/10.1177/002221949803100406

Pata, K., Lehtinen, E., & Sarapuu, T. (2006). Inter-relations of tutor's and peers' scaffolding and decision-making discourse acts. *Instructional Science*, *34*(4), 313–341. https://doi.org/10.1007/s11251-005-3406-5

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *Journal of the Learning Sciences*, *13*(3), 423–451. https://doi.org/10.1207/s15327809jls1303

Peregoy, S. F., & Boyle, O. F. (1999). Multiple embedded scaffolds: Support for English speakers in a two-way Spanish immersion kindergarten. *Bilingual Research Journal*, *23*(2–3), 135–146. https://doi.org/10.1080/15235882.1999.10668683

Pratt, M. W., & Savoy-Levine, K. M. (1998). Contingent tutoring of long-division skills in fourth and fifth graders: Experimental tests of some hypotheses about scaffolding. *Journal of Applied Developmental Psychology*, *19*(2), 287–304. https://doi.org/10.1016/S0193-3973(99)80041-0

Priestley, M., Edwards, R., Priestley, A., & Miller, K. (2012). Teacher agency in curriculum making: Agents of change and spaces for manoeuvre. *Curriculum Inquiry*, *42*(2), 191–214. https://doi.org/10.1111/j.1467-873X.2012.00588.x

Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational*

Psychologist, *40*(1), 1–12. https://doi.org/10.1207/s15326985ep4001

Putman, S. M. (2012). Investigating teacher efficacy: Comparing preservice and inservice teachers with different levels of experience. *Action in Teacher Education*, *34*(1), 26–40. https://doi.org/10.1080/01626620.2012.642285

Reigosa, C., & Jiménez-Aleixandre, M. P. (2007). Scaffolded problem-solving in the physics and chemistry laboratory: Difficulties hindering students' assumption of responsibility. *International Journal of Science Education*, *29*(3), 307–329. https://doi.org/10.1080/09500690600702454

Reynolds, D. (2017). Interactional scaffolding for reading comprehension. *Literacy Research: Theory, Method, and Practice*, *66*(1), 135–156. https://doi.org/10.1177/2381336917718820

Robinia, K. A., & Anderson, M. L. (2010). Online teaching efficacy of nurse faculty. *Journal of Professional Nursing*, *26*(3), 168–175. https://doi.org/10.1016/j.profnurs.2010.02.006

Rodgers, E. (2017). Scaffolding Word Solving While Reading: New Research Insights. *Reading Teacher*, *70*(5), 525–532. https://doi.org/10.1002/trtr.1548

Rodgers, E., D'Agostino, J. V., Harmey, S. J., Kelly, R. H., & Brownfield, K. (2016). Examining the Nature of Scaffolding in an Early Literacy Intervention. *Reading Research Quarterly*, *51*(3), 345–360. https://doi.org/10.1002/rrq.142

Rodgers, E. M. (2004). Interactions that scaffold reading performance. *Journal of Literacy Research*, *36*(4), 501–532. https://doi.org/10.1207/s15548430jlr3604_4

Russell, D. W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in Personality and Social Psychology Bulletin. *Personality and Social*

Psychology Bulletin, *28*(12), 1629–1646. https://doi.org/10.1177/014616702237645

Saldaña, J. (2009). *The Coding Manual for Qualitative Researchers*. SAGE Publications.

Samuels, P. (2016). Advice on exploratory factor analysis. *Centre for Academic Success, Birmingham City University*, (June), 2. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77–96. https://doi.org/10.1007/BF02505026

Schegloff, E. A. (1993). Reflections on quantification in the study of conversation. *Research on Language and Social Interaction*, *26*(1), 99–128. https://doi.org/10.1207/s15327973rlsi2601_5

Schnitzler, K., Holzberger, D., & Seidel, T. (2021). All better than being disengaged: Student engagement patterns and their relations to academic self-concept and achievement. *European Journal of Psychology of Education*, *36*(3), 627–652. https://doi.org/10.1007/s10212-020-00500-6

Schultz, R. (2012). A critical examination of the teaching methodologies pertaining to distance learning In geographic education: Andragogy in an adult online certificate program. *Review of International Geographical Education Online*, *2*(1), 45–60. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Schultz, R. B., & DeMers, M. N. (2020). Transitioning from emergency remote learning to deep online learning experiences in geography education. *Journal of Geography*, *119*(5), 142–146. https://doi.org/10.1080/00221341.2020.1813791

Schumacker, R. E. (2015). *Learning Statistics Using R*. SAGE Publications Inc.

https://doi.org/10.4135/9781506300160

Sewell, W. H. J. (1992). A theory of structure : Duality, agency, and transformation. *American Journal of Sociology*, *98*(1), 1–29. https://doi.org/10.1086/229967

Shaari, I. (2020). Lateral networks of teachers in a centralised education system: Structures, processes, and development of teacher agency. *Asia Pacific Journal of Education*, *40*(4), 516–532. https://doi.org/10.1080/02188791.2020.1838879

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63–75. https://doi.org/10.3233/EFI-2004-22201

Shin, S., Brush, T. A., & Glazewski, K. D. (2020). Examining the hard, peer, and teacher scaffolding framework in inquiry-based technology-enhanced learning environments: impact on academic achievement and group performance. *Educational Technology Research and Development*, (0123456789). https://doi.org/10.1007/s11423-020-09763-8

Shin, S., Brush, T. A., Glazewski, K. D., Shin, S., Brush, T. A., & Glazewski, K. D. (2017). Designing and implementing web-based scaffolding tools for technology-enhanced socioscientific inquiry. *International Forum of Educational Technology & Society*, *20*(1), 1–12. Retrieved from https://www.ds.unipi.gr/et&s/journals/20_1/1.pdf

Sims, R., Dobbs, G., & Hand, T. (2002). Enhancing quality in online learning: Scaffolding planning and design through proactive evaluation. *Distance Education*, *23*(2), 135–148. https://doi.org/10.1080/0158791022000009169

Slavin, R. E. (2015). Cooperative learning in elementary schools. *Education 3-13*, *43*(1),

5–14. https://doi.org/10.1080/03004279.2015.963370

Sokal, L., Trudel, L. E., & Babb, J. (2020). Canadian teachers' attitudes toward change, efficacy, and burnout during the COVID-19 pandemic. *International Journal of Educational Research Open*, *1*, 100016. https://doi.org/10.1016/j.ijedro.2020.100016

Songer, N. B., Shah, A. M., & Fick, S. (2013). Characterizing teachers' verbal scaffolds to guide elementary students' creation of scientific explanations. *School Science and Mathematics*, *113*(7), 321–332. https://doi.org/10.1111/ssm.12036

Stone, C. A. (1998a). Should we salvage the scaffolding metaphor? *Journal of Learning Disabilities*, *31*(4), 409–413. https://doi.org/10.1177/002221949803100411

Stone, C. A. (1998b). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal of Learning Disabilities*, *31*(4), 344–364. https://doi.org/10.1177/002221949803100404

Streiner, D. L. (2003). *A guide for the statistically perplexed: Selected readings for clinical researchers*. Canadian Psychiatric Association. https://doi.org/10.1177/070674379403900303

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Allyn and Bacon.

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, *28*(1063519), 1–25. https://doi.org/10.25304/rlt.v28.2319

Teruya, J. (2023). Pedagogy in a pandemic: Responsibilisation and agency in the (re)making of teachers. *Pedagogy, Culture and Society*, *31*(1), 185–201. https://doi.org/10.1080/14681366.2021.1898044

Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge University Press. https://doi.org/10.1017/cbo9781139173698

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*, 1–10. https://doi.org/10.1186/1471-2288-8-45

Thumvichit, A. (2021). English language teaching in times of crisis: Teacher agency in response to the pandemic-forced online education. *Teaching English with Technology*, *21*(2), 14–37. Retrieved from https://eric.ed.gov/?id=EJ1293795

Toom, A., Pyhältö, K., & Rust, F. O. (2015). Teachers professional agency in contradictory times. *Teachers and Teaching: Theory and Practice*, *21*(6), 615–623. https://doi.org/10.1080/13540602.2015.1044334

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 189–199. Retrieved from https://eric.ed.gov/?id=EJ1257153

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202–248. https://doi.org/10.3102/00346543068002202

Tsouloupas, C. N., Carson, R. L., Matthews, R., Grawitch, M. J., & Barber, L. K. (2010).

Exploring the association between teachers' perceived student misbehaviour and emotional exhaustion: The importance of teacher efficacy beliefs and emotion regulation. *Educational Psychology*, *30*(2), 173–189. https://doi.org/10.1080/01443410903494460

Turner, J. C., Cox, K. E., DiCintio, M., Meyer, D. K., Logan, C., & Thomas, C. T. (1998). Creating contexts for involvement in mathematics. *Journal of Educational Psychology*, *90*(4), 730–745. https://doi.org/10.1037/0022-0663.90.4.730

Urhahne, D., & Wijnia, L. (2021). A review on the accuracy of teacher judgments. *Educational Research Review*, *32*, 100374. https://doi.org/10.1016/j.edurev.2020.100374

Vähäsantanen, K. (2015). Professional agency in the stream of change: Understanding educational change and teachers' professional identities. *Teaching and Teacher Education*, *47*, 1–12. https://doi.org/10.1016/j.tate.2014.11.006

van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296. https://doi.org/10.1007/s10648-010-9127-6

Velicer, W. F., & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. *Psychological Methods*, *3*(2), 231–251. https://doi.org/10.1037/1082-989X.3.2.231

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* (M. Cole, Ed.). Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Wallen, M., & Tormey, R. (2019). Developing teacher agency through dialogue.

Teaching and Teacher Education, *82*, 129–139. https://doi.org/10.1016/j.tate.2019.03.014

Walsh, D., & Downe, S. (2005). Meta-synthesis method for qualitative research: A literature review. *Journal of Advanced Nursing*, *50*(2), 204–211. https://doi.org/10.1111/j.1365-2648.2005.03380.x

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Weißenfels, M., Klopp, E., & Perels, F. (2022). Changes in teacher burnout and self-efficacy during the COVID-19 pandemic: Interrelations and e-learning variables related to change. *Frontiers in Education*, *6*, 1–9. https://doi.org/10.3389/feduc.2021.736992

Wisdom, J., & Creswell, J. W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*. Rockville, MS: Agency for Healthcare Research and Quality. Retrieved from www.ahrq.gov

Wollman-Bonilla, J. E., & Werchadlo, B. (1999). Teacher and peer roles in scaffolding first graders' responses to literature. *Reading Teacher*, *52*(6), 598–608. Retrieved from https://www.jstor.org/stable/20202133

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, *17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, *14*(3), 361–384.

https://doi.org/10.5465/amr.1989.4279067

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, *82*(1), 81–91. https://doi.org/10.1037/0022-0663.82.1.81

Worthen, B. (2021). *Teacher decision-making in guided reading*. University of Kentucky. Retrieved from uknowledge.uky.edu/edc_etds/35/

Wright, J. M. (2010). Effect of quality matters™ training on faculty's online self-efficacy. *Annual Distance Learning Administration Conference*. Retrieved from http://ksuweb.kennesaw.edu/~jwright/QMTraining_FacultySelf-efficacy_Wright.pdf

Wu, H.-L., & Pedersen, S. (2011). Integrating computer- and teacher-based scaffolds in science inquiry. *Computers & Education*, *57*(4), 2352–2363. https://doi.org/10.1016/j.compedu.2011.05.011

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94. https://doi.org/10.20982/tqmp.09.2.p079

Young, V. M., & Kim, D. H. (2010). Using assesments for instructional improvement. *Education Policy Analysis Archives*, *18*(19), 1–38.

Zangori, L., Forbes, C. T., & Schwarz, C. V. (2015). Exploring the effect of embedded scaffolding within curricular tasks on third-grade students' model-based explanations about hydrologic cycling. *Science and Education*, *24*(7–8), 957–981. https://doi.org/10.1007/s11191-015-9771-9

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being. *Review of*

Educational Research, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

Chapter 4 - Agency & Self-Efficacy in Teacher-Implemented Scaffolding Before and During the Pandemic

Abstract

Adjustments in education due to the pandemic impacted teachers and their usual teaching techniques. We conducted survey research to investigate how the pandemic affected teachers' perceptions of scaffolding prior to and during emergency remote instruction. Teachers reported significantly lower confidence, agency, and use of scaffolding after the shift to online, with elementary teachers particularly impacted. Regression modeling revealed teachers with higher agency were able to implement scaffolding online. Qualitative analysis provides insight into how these changes decreased teachers' opportunities to observe and diagnose, take responsive action, and make changes to the learning environment.

"I could see expression and judge by asking questions and providing activities to restructure learning environment."

Introduction and Research Purpose

The quote above, by an experienced middle school teacher describing scaffolding prior to the pandemic, succinctly summarizes the complexity teachers faced related to scaffolding in the shift from in-person to emergency remote teaching (ERT) (Hodges et al., 2020). Scaffolding, as this teacher described, depends on observing students, making ongoing decisions about their progress and learning, and dynamically reconfiguring on

the fly. The circumstances created by COVID-19—abruptly shifting to online setting for ERT — created a naturalistic experiment for understanding teachers' reported use of scaffolds and perceptions about scaffolding in a new environment. The shift to online/remote learning may also have sharpened teachers' awareness of their typical practice by placing it out of reach.

Scaffolding is an essential component of teaching. Scaffolding was defined by Wood, Bruner, and Ross (1976) as a way to support children in learning a task with adult assistance. This is similar to Vygotsky's (1978) zone of proximal development (ZPD) in that the learner can complete more difficult tasks with the assistance of a more knowledgeable other, and in education, usually with a teacher. This support helps students be successful. Scaffolding is based on learners' needs and is specific to the activity and performance of the individual (Pea, 2004). Therefore, scaffolding is an overarching construct that describes methods to support learning (Stone, 1998b) and includes many strategies, techniques, and applications that vary based on learners' needs within the context (Palincsar, 1998).

Although abundant research demonstrates that scaffolding is beneficial to student learning, a recent review identified a gap in understanding how teachers manage the contingent and responsive aspects of scaffolding (Dominguez & Svihla, 2023). Dominguez and Svihla (2023) identified just six papers that provided insight into these processes at the high school level, and across the K-12 grades, no papers specifically reported ongoing diagnosis. The current study aims to shed light on this process by investigating teachers' perceptions, an essential step in the suite of studies needed to fill this gap. The following research questions guided our study:

1. Do teachers' perceptions of self-efficacy and agency and their reported use of scaffolds vary by modality (in-person versus ERT)?
2. How and in what ways do teachers' descriptions of their use of scaffolds change by modality (in-person versus ERT)?
3. To what extent did study constructs explain variance in teachers reported online scaffolding frequency during ERT?
4. To what extent do teachers' self-efficacy and agency predict their reported frequency of scaffolding during ERT?

Framework

To situate our study, we draw on research on scaffolding, which plays a critical role in learning (Belland, Walker, Kim, & Lefler, 2017; Hammond & Gibbons, 2005; van de Pol et al., 2010). While some scaffolds are planned, we draw attention to the contingent and responsive aspects of scaffolding (Saye & Brush, 2002), including ongoing diagnosis (Stone, 1998b), responsiveness (Tharp & Gallimore, 1988), and fading (Collins et al., 1987). As teachers are responsible for implementing scaffolds, we also draw on the literature on teacher agency and self-efficacy, as these may impact how teachers perceive and implement scaffolding. Agency and self-efficacy are contextual, meaning they may be useful for understanding changes in teachers' perceptions about their scaffolding prior to the pandemic and during emergency remote instruction.

Scaffolding

Scaffolding can be provided through static or dynamic support. Static support, also referred to as hard scaffolds, are planned in advance based on known and predicted

needs of learners (Saye & Brush, 2002). Examples of hard scaffolds include rubrics, written steps to follow, or graphic organizers.

Dynamic supports, also called soft scaffolds, are situational and occur during interaction, taking place in the moment. Soft scaffolds support student needs as they occur, based on student understanding of the material (Saye & Brush, 2002). In this way, scaffolding is responsive to student needs and contingent—"for *this* tutee in *this* task at *this* point in the task mastery." (p. 97, emphasis in original, Wood et al., 1976).

Teachers' continuous monitoring and diagnosis provide information on students' abilities and needs (Lajoie, 2005; Saye & Brush, 2002). As such, ongoing diagnosis is critical in providing insight into what and how to scaffold. As it is rather hidden and difficult to observe, it is less commonly studied in research on teacher-implemented scaffolding (Ge et al., 2012; Howe, 2013; Lin et al., 2012). Ongoing diagnosis is not a stand-alone process, but without this information, scaffolding may be inaccurate; teachers may provide too little or too much help. Thus, the responsiveness of teachers' scaffolding depends on ongoing diagnosis. These scaffolds are based on the learner's need and are adaptive to the student and the task (Stone, 1998b; Tharp & Gallimore, 1988). Appropriate scaffolds use contingent processes to engage learners and encourage participation in learning (Daniel, Martin-Beltrán, Peercy, & Silverman, 2016). They include a wide range of support that can be applied for individuals, groups, or an entire class. Also dependent on ongoing diagnosis is fading—the gradual removal of support—as responsive scaffolds should be temporary (Azevedo et al., 2005; Pea, 2004; Stone, 1998b). As students demonstrate increased abilities, scaffolds are altered and lessened, thereby transferring more independence and responsibility to the student. Ongoing

diagnosis continues so that responsive scaffolds fade while continuing to help the student be successful (Stone, 1998b). The entire process is dynamic—continuously active and changing—with some processes more visible than others. Monitoring students' needs is crucial to providing support contingent on students' needs in a timely manner and depends on teachers' ability to make instructional decisions of various kinds, making teacher agency an important construct in this process.

Teacher Agency

Classic definitions of agency focus on whether humans have opportunities to make decisions, whether they intend to act, whether they act, and their perceptions of their decisions and intended actions (Bandura, 2001; Emirbayer & Mische, 1998). Such definitions draw attention to structures that limit opportunities to make decisions, to act, or that reduce the possible choices available (Sewell, 1992). Rather than suggesting free will, agency is typically viewed as constrained by context, experience, expertise, and role. In the context of teaching, the agency teachers have is therefore focused on making decisions about instruction, including how and when to use scaffolding, and this agency may be constrained by the disciplinary content, grade level, curricular standards, assessment environment, and school context (Christ & Wang, 2013; Toom et al., 2015; Wallen & Tormey, 2019). For instance, consider elementary teachers in two different districts in the US: To deal with families moving frequently and transferring students from school to school, district A provides uniform lesson plans, texts, worksheets, and tests, paired with expectations that all teachers are on the same literal page on any given day. In contrast, large, urban district B includes magnet and community schools, some of which engage teachers in selecting and designing their instruction. Teachers' agency

differs greatly across these districts, though in both districts, teachers do not have agency over which curricular standards their students should learn, how they will be assessed on state-wide assessments, or the consequences if their students perform poorly on those assessments.

Scholars have argued that teacher agency can be beneficial for student learning. When teachers have higher agency, they tend to put newly learned skills into practice (Kauppinen et al., 2020; Molla & Nolan, 2020). For instance, high school teachers with higher agency had more student and classroom engagement (Cooper, Kintz, & Miness, 2016). Likewise, elementary teachers with higher agency were able to adapt instructional designs to make them more developmentally appropriate and better fit their classroom contexts while also offering scaffolding in response to student needs (Christ & Wang, 2013; McMullen, 1999). Lockton, Weddle, and Datnow (2019) found that middle school teachers with more agency could provide more meaningful connections for their students.

Teacher agency is impacted by the context (Wallen & Tormey, 2019). Teachers rely on their knowledge of the context and past experiences to guide their decisions as they make changes (Priestley, Edwards, Priestley, & Miller, 2012; Vähäsantanen, 2015). In this way, teacher agency is particularly salient for understanding how teachers negotiated the changes brought about by the pandemic. While teacher agency has long been studied, the pandemic brought renewed attention and meaning to such research. For instance, scholars linked teacher agency to their identities during the pandemic based on insights that teachers faced many changes to their opportunity to make instructional decisions; specifically, they were more limited in making decisions about instructional practices familiar to them, while at the same time, they were confronted with many more

non-academic aspects of their students' lives in the midst of crisis (Jones & Kessler, 2020). Teachers with high agency can identify options and use knowledge and judgement in their teaching (Biesta et al., 2015). Teachers demonstrated their agency during the pandemic by making changes and working to make the new situation more feasible (Ashton, 2022). For some, the ambiguity of the situation created space for teachers to use their agency in new and meaningful ways in their work to support students more holistically (Teruya, 2023). Qualitative analysis of teacher agency during the pandemic differentiated between three forms of agency: change-seeking, stability-seeking, and responsibility-avoiding (Keum, Cho, Huh, & Kim, 2021). Indeed, research on teachers' responses to the pandemic reported how they changed their teaching approaches, sometimes to replicate their normal practice (Thumvichit, 2021).

Taking these forms of agency into the context of scaffolding, we envision that teachers might use their agency to change how they support students, recreate familiar approaches into the ERT setting, and deflect their responsibility given the overwhelming situation.

Many researchers use teacher responses to determine teacher agency, especially during the pandemic due to decreased in-person contact. Therefore, how teachers describe their experiences is a primary source of information. Biesta, Priestley, and Robinson (2017) found that teachers' word choice is an essential source of information concerning agency. In this study, we sought to understand the implementation of scaffolding in an ERT situation impacted teacher's agency, using both their responses to Likert-scaled and constructed response items.

Teacher Self-Efficacy

Self-efficacy is the perception of one's confidence to carry out particular actions (Bandura, 2001). For teachers, self-efficacy forms based on their knowledge and experiences (Bandura, 2005). Research has found that teacher self-efficacy can be impacted by student achievement (Tschannen-Moran, Hoy, & Hoy, 1998) and the context in which they teach (Friedman & Kass, 2002). Positive experiences build and reinforce self-efficacy (A. B. Bakker & Bal, 2010; R. Wood & Bandura, 1989). Dunn, Airola, Lo, and Garrison (2013) reported that teachers who were more confident collaborated with others to improve their skills. This shows that self-efficacy can be reinforced though continued experiences.

Teachers with higher self-efficacy have more job satisfaction (Collie, Shapka, & Perry, 2012) and less burnout (Weißenfels, Klopp, & Perels, 2022). Self-efficacy promotes teachers' ability to adapt in the face of change (Bandura, 1993; Dingle, Brownell, Leko, Boardman, & Haager, 2011) because they are more open to it (Bandura, 2001; Guskey, 1988), they have more endurance and flexibility, and they put forth more effort during their time as a teacher (Tschannen-Moran et al., 1998).

Teachers' self-efficacy can impact the quality of their instruction in many ways (Guskey, 1988). Higher self-efficacy is related to upholding high expectations for students (Guo et al., 2012) and providing higher-quality instruction (Holzberger et al., 2013; Zee & Koomen, 2016). When teachers have greater self-efficacy in dealing with disruptive behaviors, they are more likely to implement strategies that foster a productive learning environment (Tsouloupas, Carson, Matthews, Grawitch, & Barber, 2010; Woolfolk & Hoy, 1990). In this way, teachers' self-efficacy is critical for scaffolding. Teachers with higher self-efficacy provide students with more feedback and scaffold students when they need assistance (Gibson & Dembo, 1984). Bandura (1993) noted that teachers with high self-efficacy more often use ongoing diagnosis. This is integral to making contingent decisions about scaffolding.

There is limited research on K12 teacher self-efficacy related to online teaching in general, and online scaffolding in particular. This is partly because, prior to the pandemic, comparatively few teachers taught online; in the United States, only 8% of teachers had experience teaching online (Gudmundsdottir & Hathaway, 2020). Likewise, teacher education programs seldom prepared teachers for online learning; (Kennedy & Archambault, 2012) found only 1.3% of programs did. Research suggests that prior to the pandemic, teachers who had previously taught online had a positive mindset about teaching online (M. H. Lee & Tsai, 2010). Teachers who participated in an online course or professional development increased their self-efficacy for teaching online (Chai, Koh, & Tsai, 2010; He, 2014; Robinia & Anderson, 2010; Wright, 2010). The change to emergency remote teaching in response to the pandemic was, therefore, a new experience for most teachers and not one they were prepared for. Teachers' self-efficacy during this shift was impacted by their lack of familiarity with teaching online, the change in environment, and students' decreased academic outcomes (Ma, Chutiyami, Zhang, & Nicoll, 2021). The pandemic restrictions provided an opportunity to study online learning in a unique situation to compare teachers' perceptions of scaffolding in the classroom to being in a remote setting.

Method

To investigate teachers' perceptions of scaffolding, we used a mixed methods survey approach to comprehensively answer the research questions (Creswell, 2014). More specifically, we used a concurrent embedded design, collecting quantitative and qualitative data simultaneously (Greene, Carcelli, & Graham, 1989; Wisdom & Creswell, 2013). Qualitative data was embedded to provide more descriptive and broader perspectives on teachers' use of scaffolds (Creswell, 2014). This information supports the quantitative data and provides another layer to characterize trends in teachers' reported use of scaffolds.

Survey

We used a survey because it is a data collection method familiar to the target population, and more importantly, at the time of data collection, COVID-19 restrictions were in place. In a review of studies during COVID, 83% of the studies during this time used online surveys (Bond, Bedenlier, Marín, & Händel, 2021). Trust and Whalen (2020) used an online test with mainly quantitative and one qualitative question. Their findings supported that teachers were not prepared to move to an emergency online setting. Similarly, Kraft, Simon, and Lyon (2021) asked teachers to reflect on experiences before and during the pandemic to assess the change in teacher working conditions.

We developed a survey to measure three constructs that impact scaffolding: agency, self-efficacy, and contingent processes (Table 4.1) (Dominguez & Svihla, 2024). The survey was designed and developed using commonly accepted guidelines (Dillman et al., 2014). After an exploratory factor analysis, six factors were retained. They were: frequency of supports provided during ERT (α=.92) versus in-person (α =.86); self-efficacy during ERT (α =.92) versus in-person (α =.89); and agency during ERT (α =.91) versus in-person (α =.75). The current study reports on the retained factors, as well as on eight constructed response questions, to answer the research questions.

Table 4.1. Examples of survey questions linked to study constructs

Factor and definition	Prompt	Format
NA	Thinking about [your teaching in-person before 2020 / your online/remote teaching], provide a couple of specific examples of how you	Constructed response

	decided WHEN to provide students with support.	
Frequency of supports provided. Implementing hard and soft scaffolds based on demonstrated needs specific to student, task, and level of ability.	While [teaching in-person before 2020 / online/remote teaching], which supports did you use to help students learn?	5-point scale from Almost always to Almost never
Teacher agency. Making decisions about instruction, including how and when to use scaffolding, constrained by the disciplinary content, grade level, curricular standards, assessment environment, and school context.	While [teaching in-person before 2020 / online/remote teaching], how much control did you have in WHEN to support students?	5-point scale from *Total control* to *No control*
Scaffolding self-efficacy. Perceiving one's confidence to carry out scaffolding within specific teaching contexts.	While [teaching in-person before 2020 / online/remote teaching], how confident were you in WHEN to provide students with support?	10-point scale, from *Not at all confident* to *Very confident*

Participants and Data Collection

We recruited participants using snowball sampling (Naderifar, Goli, & Ghaljaie, 2017), starting with personal emails and posts on Facebook. We collected responses using an online survey over a six-month period in 2021 (N = 105). Demographic information (Table 4.2) was collected at the end of the survey.

Table 4.2. Demographic Characteristics

Survey Respondents		N	%
Type of School	Public	73	70.2
	Charter	24	23.1
	Private	7	6.7
Grade Level Taught	Elementary	36	34.6
	Middle School	27	26
	High School	41	39.4
Location of School	Rural	38	36.5
	Suburban	32	30.8
	Urban	34	32.7
Years Taught	0-1 year	0*	0*
	2-5 years	12	11.5
	6-10 years	15	14.4
	11-15 years	23	22.1
	16-20 years	19	18.3
	21+ years	35	33.7
Subjects Taught	Language Arts	44	20.4
	Math	58	26.9
	Science	41	19
	History	32	14.8
	Electives & Foreign Language	23	10.6
	Special Education	18	8.3
Gender	Man	26	25.5
	Woman	74	72.5
	Other or not reported	4	3.8

*Teachers had to have a minimum of two years of experience for the survey

Statistical Data Analysis

We analyzed the quantitative data using IBM SPSS Statistics (Version 28.0.0.0). We created six variables representing the constructs previously described (Dominguez & Svihla, 2024) by averaging the individual responses, thus resulting in continuous data. First, we calculated descriptive statistics for these constructs as well as demographic information. We conducted 2-tailed paired-samples t-tests to compare the ERT versus in-person versions. We calculated a Bonferroni correction when conducting multiple t-tests to avoid an increased Type I error. Then we used OLS regression modeling, treating providing supports online as an outcome and using the other factors and demographics as predictors.

Qualitative Data Analysis

Initially, we read through the open-ended responses individually to become familiar with the data. We then used a first-cycle approach called process coding (Saldaña, 2009), which results in gerunds describing actions—in our case, verbs that capture how teachers described the actions of scaffolding. For second-cycle coding, we grouped the initial process codes into categories using pattern coding (Saldaña, 2009). Using this approach, the first author developed codes for teacher actions—collecting (data, tests, exit tickets, work), observing teacher actions (walking, listening, and monitoring), and identifying student behaviors (struggling, off-task, hesitating, not working, avoiding, shutting down, engaging), asking students questions, and limiting students' online actions (accessing online, involving parent, distracting environment, time restrictions). She also developed codes of student actions—initiating (requesting, asking for help, asking questions) and responding (answering questions). To enhance the

credibility and trustworthiness of this process, the second author reviewed a subset of data independently, and we met to discuss and resolve any discrepancies, of which there were few.

While there were some apparent differences between teachers' accounts of the actions of scaffolding in-person versus online (e.g., far fewer teachers referenced observing in online settings as a means to decide when to scaffold, compared to in-person setting; teachers seldom described limiting students' online actions while in-person), and while this approach provided a way into the data, it did not help illuminate the vivid and affective ways teachers characterized their confidence and agency over scaffolding as a responsive process. As noted in other forms of qualitative analysis, focusing on frequencies of codes can sometimes obscure the aims of understanding the experiences participants share through such data (Hammer & Berland, 2014; Schegloff, 1993). Yet, this approach supported and led directly into our final interpretive process, which involved repeatedly organizing responses by similarities in the quantitative factors (in-person and ERT self-efficacy, agency, and supports provided) then characterizing themes within these groups. The first author selected a set of quotes from these to represent the diversity of perspectives shared. The second author provided peer scrutiny (Lincoln & Guba, 1985; Shenton, 2004), reviewing both the set of quotes and data from which they were selected and, in a few cases, removing redundant quotes. To enhance the trustworthiness and credibility of our analysis, we provide quotes without correction and with our interpretative chain clearly noted (Golden-Biddle & Locke, 2006; Gopaldas, 2016), making our interpretations available for others to evaluate.

Results

Statistical Data Results

First, we describe our sample, providing descriptive statistics. During ERT, almost all teachers reported having to change to teaching online (96.1%). High school and middle school teachers reported being impacted the longest (6-12 months), with 87% and 85%, respectively, whereas only 65.7% of elementary school teachers reported being impacted for 6-12 months. respectively, whereas only 65.7% of elementary school teachers reported being impacted for 6-12 months.

Although there was no significant difference between grade levels, elementary teachers reported lower use of technology while in-person and higher use during ERT. While online 85.4% of elementary teachers and 73.5% of high school teachers reported using synchronous meeting technology. Asynchronous meeting technology was reportedly used by 63.4% of elementary teachers and 47.1% of high school teachers.

Using a paired-samples t-test comparing in-person and ERT conditions, we found significant differences between support provided, self-efficacy in supporting students, and agency over providing supports (Table 4.3). The difference in supports provided was a medium to large effect, while the differences for self-efficacy and agency were large effects (Cohen, 1992). These results suggest that the modality impacted how teachers implemented scaffolding and that teachers had more agency and self-efficacy in the traditional in-person setting. With the move to emergency remote teaching caused by the COVID-19 restrictions, teachers' self-efficacy and agency over scaffolding significantly decreased.

Table 4.3. T-test Results Comparing In-Person to During ERT

	In-person		ERT					
	M	SD	M	SD	*t*	*df*	*p**	Cohen's *d*
Supports provided (scale 1-5)	4.64	0.42	4.22	0.79	-5.82	103	<.001	.734
Self-efficacy in supporting students (scale 1-10)	9.05	0.92	6.37	1.89	-14.22	104	<.001	1.938
Agency in providing supports (scale 1-5)	4.40	0.53	3.09	0.95	-12.62	103	<.001	1.059

*two-tailed; Using a Bonferroni correction of .05/3 = .0167, all of these values remain significant

Using regression modeling, we treated the factor Support Online as an outcome (dependent variable). We modeled it in a sequence of models using the other factors and demographics. In general, across models, higher scores on face-to-face support and online agency predicted higher scores during ERT. We report a parsimonious model, which explained significant variance in scores for providing support online, $F(3, 99) = 13.50$, $p < .001$. In this model, higher scores on providing support face-to-face predicted higher scores online (Table 4.4). Those who reported higher self-efficacy in person tended to report lower scores for supporting students online. Those who reported greater agency online also reported high scores for supporting students online.

Table 4.4. Regression model of providing support online

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	β	*t*	*p*
(Constant)	0.83	0.93		0.90	0.37
In-person scaffolding	0.90	0.17	0.46	5.25	<.001
In-person self-efficacy	-0.18	0.08	-0.20	-2.30	0.02
Agency during ERT	0.26	0.07	0.32	3.71	<.001

Qualitative Data Results

We analyzed teachers' responses to open-ended questions to support and describe the quantitative results. Teachers' responses provided information about their perceptions of and experiences with scaffolding, both in-person and during ERT. Based on their descriptions and examples, we developed themes and related these to study constructs—self-efficacy and agency—and sought similarities and differences by modality (in-person versus ERT). We first share themes and examples that characterize teachers' self-efficacy and agency related to in-person teaching: scaffolding based on observation, scaffolding based on task and student, and ways the physical classroom environment afforded options for scaffolding. We then contrasted these with themes and examples that characterize teachers' self-efficacy and agency related to ERT, which includes barriers to making observations, changes to the learning environment, and adapting scaffolding approaches.

In-Person Modality

Teachers described many in-person methods of scaffolding student learning, including small group, one-on-one, and reteaching. Many teachers explained scaffolding

as including reviewing instructional materials, supplementing information and materials, and providing manipulatives.

Scaffolding Based on Observation

When considering in-person teaching, teachers most often described *how* they decided to provide scaffolds, emphasizing the importance of observations that provided information about a student's learning needs (Table 4.5, Theme 1). Many teachers commented that they made such observations while walking around the room, looking over shoulders, and listening to students talking to each other. They described looking at students' faces, observing students' body language, and watching students' interactions with work or peers to understand who needed assistance.

All of these quotes, and in common with many from the survey, employ past tense modal verbs ("would," "could"), which situate such observations as habitual practice, and one in line with research on scaffolding—ongoing diagnosis. Teachers position observations as a practice over which they held a great deal of agency, and because of its ubiquitousness, teachers had opportunities to develop self-efficacy. Almost all respondents reported using observations in-person. Both the positioning of observation as habitual practice and teachers' descriptions of observation as "constant" foreground that teachers relied heavily on observations as part of ongoing diagnosis. The teachers overwhelmingly situated scaffolding as depending on their ability to observe and recognize a learning need, to "judge" the situation through their experience, and understand the level of scaffolding to provide. As such, most teachers' comments suggest both agency and self-efficacy regarding observations.

Table 4.5. In-person Modality

Theme #	Sample quotes
Theme 1. Scaffolding based on observation	"I'd circle the room and make constant observations in class that would lead to supports, along with reviewing completed work." (urban public middle school math teacher with 2-5 years of experience) "In person, I was able to hover and move around the room into student personal space, as needed. It's a highly nuanced skill. I have to monitor who is doing well on-task, who is just goofing off not suing *[sic]* time wisely, who is afraid to share their ideas with others in a small group, who has shut down entirely because they are overwhelmed and directionless, who just needs a nudge in the right direction, who needs to back up a lesson or two for reminders about what they already know to re-establish a foundation to build on... There are SO many conditions for which I am constantly monitoring. I'm listening to many conversations at the same time. Talking to one student or group, while keeping my ears open to others & keeping the eyes in the back of my head open. A seasoned teacher knows how to juggle, prioritize, and respond as needed with a variety of tools/tricks." (suburban private high school science teacher, 11-15 years of experience)
Theme 2. Scaffolding based on task and student	"Before I provided support I would use questioning to see to what extend [*sic*] the child understood what we were working on. Only after the student struggled would I begin giving them hint or providing them additional help or resources." (suburban private elementary school teacher, 6-10 years of experience) "If I had planned an extra practice or a set of scaffolded questions that led to a point I was trying to make, I would jump ahead and forego the whole set of questions if my students reached the point early. Also, if they completed work without looking at their graphic organizers I would have them try assignments without them and then continue in this way if they were

	successfully [*sic*] on their own." (urban middle language arts teacher at charter school, 21+ years of experience)
Theme 3. Classroom environment afforded options in how to scaffold	"…I would check in frequently during class time, do 1:1 support for 1-2 minutes as needed, pull a small group to back of room to review steps, reteach vocabulary, or clarify specific concepts." (urban charter elementary math teacher with 11-15 years experience) "Typically in math, I would teach a new skill, go through a few examples all together with the class, and then have the class try a few problems on their own before sending them off to work independently. During independent time, I would invite students who wanted some more support to join me in a small group to begin the independent work together. As students demonstrated understanding, typically by solving a problem independently from me or the group, I would dismiss them from the group. Other students who I knew needed some additional reinforcement to feel comfortable with the concept would complete a few problems for me with me watching and then I'd tell them they were ready to try on their own." (suburban public elementary teacher with 2-5 years of experience) "I might sit next to [students] and actually talk them through the example or I might ask them to [come] in during lunch." (urban public high school math teacher, with 6-10 years of experience)

Scaffolding Based on Task and Student

When describing scaffolding in-person, teachers explained how they used their observations to provide scaffolds responsively based on specific student needs on a given task at a specific time. These quotes (Table 4.5, Theme 2) demonstrated that teachers used information from students to make decisions and adapt scaffolds based on specific student needs—in other words, embodying the concept of responsiveness. The quotes

position the teachers as having agency and self-efficacy over this responsive work, as they used singular first-person pronouns as the subject, denoted this work as habitual by using past tense modal verbs, and offered specific examples over which they had agency. Overall, these teachers explained how they used the information from observations to provide students with support, a process they had agency over within their classrooms to positively impact student learning. They had opportunities to make decisions and make choices in response to students' needs in different ways. Teachers described how they created and adapted scaffolds to increase student learning and, through habitual practice, based adaptations on their experience and expertise. In this way, teachers' self-efficacy was demonstrated in their knowledge of effective interactions with students.

Classroom Environment Afforded Options in How to Scaffold

Many teachers described flexibly configuring the physical classroom environment as part of scaffolding. These configurations included whole-class, small groups, and one-on-one work, and teachers characterized this as dynamic. The practice of shifting students around in a room, such as one-on-one or small group, was a commonly mentioned use of the classroom environment that aided teachers in providing the level of support or independence students needed for a given task.

These quotes (Table 4.5, Theme 3) highlight how much teachers depend on their ability to quickly reconfigure to provide tailored scaffolding; in turn, this dynamic use of the classroom environment is evidence of teachers' agency over scaffolding, which depends on their ability to flexibly adapt the space and make decisions based on their knowledge of students' needs. Again, we note teachers' common use of the modal past tense, situating the practice of dynamic reconfiguring as a habitual practice.

In addition to reconfiguring students, teachers also referenced simply sitting with them. This example of a dynamic reconfiguration is simple to accomplish in a physical classroom environment and familiar to teachers. We draw attention to the teacher's use of "actually" (Table 6, Theme 3, 3rd quote), a discourse marker that linguists have determined is used to make a contrast or contradiction when it appears in the middle of a written clause (Oh, 2000). Although not explicitly stated as a comparison between the modalities addressed in the survey, we interpret this teacher's "actually" as drawing a comparison between what they felt was possible in the classroom environment and when it felt difficult or missing during ERT.

Online/Remote Modality

When asked to describe their experiences teaching online under emergency remote conditions, teachers made several distinctions about their experiences during the pandemic restrictions, including how these impacted their ability to implement scaffolds and how the change impacted their agency and self-efficacy. Teachers reported encountering barriers to diagnosing students' scaffolding needs due to barriers to making observations, and although some reported workarounds, they also reported flaws with their approaches. Next, teachers explained administrative decisions that impacted their capacity to provide scaffolding, primarily because some decisions limited teachers' time with students or permitted absences. Complicating this, teachers noted numerous challenges in homes that impacted students' abilities to attend. As a result, teachers tended to offer uniform scaffolding to all students, regardless of need, or described not providing scaffolding for certain tasks. A few teachers detailed their efforts to scaffold

with technology, and while they reported some success, they also acknowledged some limitations.

Barriers to Making Observations and Otherwise Diagnosing Students' Scaffolding Needs

Teachers described observation as a fundamental difference between their typical practice and ERT. Specifically, teachers explained they were unable to gain information from observations and that some workarounds did not provide the information they needed.

Barriers to Making Observations In-The-Moment. For many teachers, the kind of constant, habitual observations they depended on to make responsive scaffolding decisions did not transfer to working online with students. These comments (Table – 4.6, Theme 4), in alignment with many, highlight a common barrier and difficulty teachers encountered: students did not turn their cameras on, and many did not use their microphones. In this way, we notice less agency and lower self-efficacy in teachers' responses compared to their accounts of teaching in-person. In some instances, they mitigated their agency through negated modal verbs ("couldn't") and by placing the situation as the actor, attributing agency to it ("it was extremely hard"). In contrast to their comments about in-person, they did not use past tense modal verbs to situate their work as habitual, and their comments overwhelmingly mention the difficulty encountered, suggesting low self-efficacy. Fundamentally, teachers' comments reflect that they were unsure what students were doing when they weren't observed; teachers wanted to help, but without observations, they didn't know if students needed help or how to alter and scaffold information for students without seeing the student.

Table 4.6. Barriers to Making Observations and Otherwise Diagnosing Students' Scaffolding Needs

Theme #	Sample quotes
Theme 4. Barriers to Making Observations in the Moment	"I realized how dependent I was on being in physical proximity to a student and felt robbed of that in a sea of zoom faces and the increased cognitive load." (suburban charter middle school special education teacher with 11-15 years of experience) "For me it was extremely hard to gauge [whether they needed assistance] due to the fact that, I could not see students most of the time because cameras were off or connectivity was bad." (rural special education high school teacher with 6-10 years experience) "While teaching on-line, it was much more difficult to see how the students were reacting to specific procedures or projects. They didn't want to share with the other students and hardly ever turned their cameras on." (rural public high school elective teacher with 16-20 years of experience) "We couldn't get students to turn on their microphone, let alone camera. Half the time, the kids weren't even there." (suburban public high school core teacher with 16-20 years of experience)
Theme 5. Workarounds for Diagnosing that Didn't Work.	"I started asking questions of one students and calling them out one at a time, but it was not always reflective of their ability. Sometimes they had siblings in the room preventing them from turning their microphone on or they had delays or were literally doing something else and did not hear their name called." (public urban high school math teacher with 6-10 years of experience) "Because students did not typically turn on their cameras, I had to try on written and oral products to assess student needs. This meant that I could intervene less frequently 'in the moment.'….I had to use additional data beyond non-verbal cues to assess student progress, which often happened

	after the lesson presentation. This can take its toll given the amount of time to could pass between content delivery and assessment." (suburban public high school history teacher 11-15 years of experience) "There was too much delay, and I don't know if I'd catch a student in the midst of a struggle they could push through or if they'd already given up - essentially having lost the motivation to push through to a solution." (suburban private high school science teacher 11-15 years of experience) "Parents helped kids a lot more so it was tough to see where students truly were in their learning…because parents helped them, some of that data was skewed." (suburban public elementary teacher with 11-15 years of experience) "Very difficult because often I was seeing parent work not student work" (urban public elementary teacher 16-20 years of experience)

Workarounds for Diagnosing that Didn't Work. Many teachers explained workarounds they attempted in lieu of observations (Table 4.6, Theme 5), but they also recounted failures in gaining the insight needed to make responsive scaffolding decisions. These first three quotes raise the issue of responsiveness; when their workarounds did not provide timely information, they did not know if the student had maintained or resolved confusion. Teachers' focus on the impact of time delays reflects a principal component in scaffolding and, therefore, suggests high self-efficacy in their capacity to recognize the importance of this responsiveness.

In addition, many teachers expressed low confidence that the information provided by their workarounds was reliable for scaffolding decisions, in turn reducing teachers' agency over scaffolding decisions. When discussing why the information gained

through their workarounds might not reflect students' needs, many teachers mentioned parents. While students were remote, they became more reliant on parents or siblings for help. It is reasonable and expected for parents to help students with homework, even before the pandemic, but during it was almost a necessity. Some elementary teachers commented that parents' help could mask students' strengths or weaknesses, making it more difficult for the teacher to know when to scaffold and limiting their ability to scaffold based on the students' actual needs. Teachers need to know what students are capable of to understand how much help the student needs.

Changes to the Learning Environment

With the shift to ERT, the learning environment changed dramatically. In discussing this, teachers described administrative changes and complications in the home environment that limited scaffolding opportunities.

Administrative Decisions Limited Scaffolding Opportunities. Teachers shared examples of their administration making decisions about how instruction would occur while remote, articulating how these choices constrained scaffolding (Table 4.7, Theme 6). Given that many teachers wished to rely on observations to guide their scaffolding decisions, it is not surprising that teachers mentioned policies that limited their capacity to do this. Such policies related to time, attendance, and access to online tools.

Some logistical decisions related to scheduling were made by administrations aiming to balance many needs, including providing IT support with limited staff, providing professional development for teachers, and limited bandwidth. For many districts, this resulted in decreased time for synchronous class meetings, which limited teachers' time to support student learning. Quotes like these highlight how administrative decisions narrowed teachers' agency by limiting their time.

The second quote (Table 4.7, Theme 6) also highlights an issue many teachers raised as impacting their capacity to provide adequate scaffolding: policies that made absences more permissible. While such policies are understandable in context—students may have been absent due to their own or a family member's illness, dealing with the death of a family member, or simply due to connectivity issues—many teachers explained how these policies constrained their opportunities to scaffold. Thus, some teachers perceived that their districts limited their agency through policies that permitted absences. Similarly, before the pandemic, students were required to be in their classroom the entire time, but during remote instruction, policies allowed students to miss parts of class, which may have been interpreted as giving the students a choice to attend class, thereby lowering teachers' agency.

As noted previously, many schools did not require students to have their cameras on, a policy likely intended to address concerns about privacy and bandwidth. Teachers shared how this policy, along with time limitations, impacted their ability to provide scaffolding. For instance, one teacher used a verb of obligation, ("require," Table 4.7, Theme 6, 6th quote) and placed the district as the actor to mitigate their agency over scaffolding students. While she then claimed "total control" beyond those constraints, her other comments suggest that, like almost all respondents, she experienced similar challenges in gathering the information needed for making responsive scaffolding decisions. Finally, a few teachers commented on issues related to technology. Decisions to adopt or block tools limited teachers' agency. In the case of blocking tools teachers used before the pandemic, suggested they did not have the professional capacity to evaluate a tool.

Table 4.7. Changes to the Learning Environment

Theme #	Sample quotes
Theme 6. Administrative Decisions Limited Scaffolding Opportunities	"We only had a half hour per subject. Not much support was possible." (rural elementary core teacher with 21+ years of experience) "the fact that our time was limited, and because some students had attendance issues that created a lot of holes in their learning. I did not feel I was able to adequately provide the support that students needed." (public rural elementary teacher with 21+ years of experience) "Students had the ability to walk away from instruction. Students that chose not to come to school for an entire year were still advanced due to social promotion." (public elementary teacher with 11-15 years of experience) "students seemed not to care as much to learn. When we first went online, teachers were told to pass all students. Once they knew that, it became more difficult to engage students." (rural public high school math teacher with 21+ years of experience) "Students did not have their cameras on because the district didn't require that, which played a negative role in how we could work together. The district also limited how much instruction I gave and the workload for students. I had total control within those parameters." (suburban public high school history teacher with 11-15 years of experience) "District used poor judgement. Blocked items and apps that made online fun. Blocked items we could use in person when all items were online. [...] Students could attend last 2 min. of class and be marked present." (suburban public middle school science teacher with 21+ years of experience)

Theme 7. Complications in the Home Limited Opportunities for Scaffolding	"Being online is difficult to gauge a students understanding, especially when they are distracted by social media, video games, etc." (rural public high school math teacher with 21+ years of experience) "Students had low attendance and missing assignments due to home complications so there was no way to gauge when students needed scaffolding due to academic complications vs home complications." (rural public high school special education teacher with 6-10 years of experience) "I often felt limited regarding how much support to give because there were too many other factors affecting my children in their homes that were beyond my control and that my supports weren't enough to remedy." (urban public middle school math teacher with 2-5 years of experience) "They get distracted at things at home, also. Therefore, it was tough to gauge. I tried to still base my approach on the data I was receiving. As aforementioned, parents helped their kids on assignments so it was often tough to truly gauge." (suburban public elementary teacher with 11-15 years of experience)

Complications in the Home Limited Opportunities for Scaffolding. The home environment came with its own set of difficulties, including siblings, noise, and a range of complications and distractions—difficulties getting online, staying in class, muting to not disturb others—and teachers across all grade levels raised these issues (Table 4.7, Theme 7). The complicated experience of attending school during the pandemic compromised teachers' ability to observe and diagnose, limiting scaffolding. Specifically, complications in the home reduced teachers' agency related to scaffolding. Teachers' comments display ownership ("I felt") over their feelings of being limited, and they

mitigated their agency by placing the situation as the actor and subject of sentences. These comments synthesize the impact of removing teachers' primary source of information—observations—for making responsible scaffolding decisions and reducing their time with students to support their learning. Traditionally, teachers have agency over their learning environment and the configuration of students within it. Teachers experienced this as a loss during the pandemic due to less agency over the online learning environment, as well as less access to students as a result of policies and complications in the home environment.

Adapting Scaffolding Approaches

Amidst these issues, many teachers persisted in scaffolding. A common approach teachers shared was to apply scaffolding strategies uniformly. In addition, some teachers shared ways they adapted their scaffolding approaches using technology.

Scaffolding Uniformly. In lieu of trustworthy information needed for diagnosis and responsive support, several teachers resorted to providing scaffolds uniformly (Table 4.8, theme 8). Their descriptions of scaffolding suggest that responsiveness to the individual and situation was unmet and that scaffolding depended primarily on pre-planned interventions. Indeed, most of these scaffolding strategies primarily focus on hard scaffolds—scaffolds that can be planned in advance. In these comments, teachers displayed mitigated agency, placing the situation as the actor and subject and attributing cause to the conditions ("time and logistics"). While in the first comment, the teacher then displayed high agency over her scaffolding choice, others maintained a low agency stance by distancing themselves from the choice ("ended up") or by using verbs that express obligation ("required to").

Table 4.8. Adapting Scaffolding Approaches

Theme #	Sample quotes
Theme 8. Scaffolding uniformly	"Online was tricky to individualize since it was more difficult to organize an online class into small groups and ensure attendance. I decided to scaffold and support the entire class based on most missed questions." (urban charter middle school language arts teacher with 11-15 years of experience) "Honestly, a lot of this was based on time and logistics. Depending on how many students needed support, I often ended up going through the entire activity along with students in order to just support everyone..." (suburban public elementary teacher with 21+ years of experience) "I had a hard time telling if what I did was helping but I was required to be uniform with assessments so the supports usually disappeared for those." (urban public school math teacher with 2-5 years of experience) "regardless of ability, modifications and adaptations were made for ALL students." (urban public middle school science teacher with 21+ years of experience) "I resorted to digital projects for production. This worked well but was restrictive. It was extremely [sic] difficult to meet with students [sic] while they were creating projects to provide valuable feedback. Differentiation occurred if built into presentation. It was difficult to do for the individual." (private urban high school special education teacher with 11-15 years of experience)
Theme 9. Adaptions to Scaffolding	"1. I used PearDeck presentations to check for understanding about every 10 minutes. If more than a couple students revealed a misconception or if several students did not respond at all, I would stop to re-engage the class and increase participation. 2. I used a questioning strategy of think-write-spin-share. I would ask a question verbally and also post it on the screen in

	writing, ask students to write down their answer on paper at home, then display a spinner wheel with everyone's name on it. I would spin the wheel and call on the person it landed on. If the person did not answer or know the answer, I would call on one more person and then back to the original person." (rural high school science teacher with 11-15 years of experience) "This was SO hard! […] I had students work in small groups in Google Meet breakout rooms, but then I could only hear the discussion in one 'room' at a time. I had to rotate through rooms. I learned how to give the impression that I was listening all the time, even when I wasn't. I had to trick the students into thinking they were being listened to, so that they would stay on task. But I couldn't always catch conversations steering in the wrong direction, or help prod the student who wasn't contributing. Some students shared with me that they shared more frequently on this platform - they felt it leveled the playing field - they were less scared or embarrassed to share ideas. I also used Google Jamboard to have students express themselves visually in real time. I used NearPod for lecture and real-time responses, either written, visual depictions, or quick multiple choice checks. I could tell who was participating in real time. I had students use as app to submit quick recorded videos of them speaking in lieu of some responses. It just took more time and more creativity to try to get the same assessments accomplished, but it was never on the same level as it was prior to being online." (suburban private high school science teacher with 11-15 years of experience) "During the remote learning, I usually used Jamboard in my lessons so I could assign a slide to each of my students and witnessed how they answer the activities I gave them. It allowed me to see who was working on ta particular activity. So, just like during face to face instruction, I could tell if they struggle in a particular equation or a given item if they provided the incorrect answer. Our district back then also gave us access to Go Guardian app which allows us to see our students faces screen and background (It's

	like looking at them in a mirror) whether they are working on their own or have someone [coaching] them from behind or if they were focused on the activities. Using the app I can see if my student was doing the activity himself." (urban charter elementary teacher with 16-20 years of experience)

Adaptions to Scaffolding. Although most responses demonstrated what did not work, a handful of teachers described successful scaffolding adaptations. Specifically, they described adapting their typical scaffolding practices while using online programs (Table 4.8, theme 9). The types of programs they had access to influenced which practices they adopted. For instance, in the second quote (Table 4.8, theme 9), the teacher's "hard" and creative adaptations, especially her use of Jamboard and real-time responses, provided her with information for making responsive scaffolding decisions. Although she maintained that it was not on par with in-person, she recognized that some students were more willing to participate in that environment. In this, she was one of the few to share an affordance of the online environment.

The third quote described how the teacher adapted her scaffolding using computer applications in ways that allowed her to gain information for making responsive scaffolding decisions. This was the only teacher who reported controlling the ability to see students and their work in real time, rather than students being able to turn off their cameras. This teacher also expressed having increased agency by being able to see and know what the student was working on and with whom. These quotes show how specific applications allowed teachers to adapt previous strategies, such as seeing students work in real-time and attending to multiple groups in a single class, thereby increasing the responsiveness of their scaffolding.

In these quotes, we notice higher agency and self-efficacy. First, some of the teachers use modal past tense ("would"; "could") or adverbs denoting frequency ("usually"), situating the practice as habitual and perhaps similar enough with their conceptions of scaffolding to be part of their regular practice. In the second quote, by a science teacher, we notice shifting agency and self-efficacy displays across the different strategies and technologies, suggesting the teacher made scaffolding choices but lacked adequate experience with the technology and situation to predict some of the issues, which in turn the teacher positioned as the actor, mitigating her agency. Likewise, she used modal verbs of obligation ("had to") to describe the changes she made, rather than owning her insights and actions. Yet, in describing her use of other software to gain real-time information about student understanding, she displayed high agency, placing herself as the actor. Likewise, in the third quote, we notice a mix of high agency and mitigated agency, depending on the software. In this case, the teacher attributed specific functions to the software and its capabilities, suggesting higher self-efficacy in that she provided specific ways different technologies met her aims.

Altered Demands

We would be remiss not to discuss the toll of efforts teachers put forward to adapt scaffolding in the ERT conditions (Table 4.9, theme 10). The change in demands created new and additional work for teachers, such as contacting families when schoolwork wasn't completed. Teachers described developing intervention blocks (planned differentiated instruction periods for specific students), being available for office hours, and offering additional lower-level work. Teachers expressed frustration and diminished drive to persist with scaffolding adaptations as they themselves were struggling. They reported that working online was very taxing and stressful for them. These teachers'

awareness and ability to report their perceptions and understandings provide insight into the effect felt by teachers who were also dealing with the stress and changes due to the pandemic.

Table 4.9. Altered Demands

Theme #	Sample quotes
Theme 10. Altered Demands	"Every day! I emailed parents every single day if their kids did not complete their work by the end of the duty day." (suburban public high school core curriculum teacher with 16-20 years of experience) "I was thrown a lot of procedures and ideas during online teaching. Those of which I tried to be a team player and do but it became very hard to keep learning new things and be a good teacher. I felt so overwhelmed. I only wish my admin. did not require so many new different strategies and understood that we are doing are best. Due to the government and my admin. during covid, I feel under-appreciated and overworked. Scaffolding is important but I believe my admin. and district created so many more ideas and strategies to worry about instead of scaffolding." (rural public middle school science teacher with 11-15 years experience)

Discussion

The first research question addressed teachers' perceptions of self-efficacy and agency in using scaffolds while comparing in-person to ERT A paired t-test found significant differences between in-person and the ERT modalities in all three constructs: support provided, teacher self-efficacy in implementing scaffolds, and teacher agency in providing scaffolds. This has also been found in several other research studies, specifically regarding teachers' move from in-person to ERT. A decrease in teacher self-efficacy has been reported in several studies, specific to the

change in modality due to the pandemic (Kast, Lindner, Gutschik, & Schwab, 2021; Kraft et al., 2021; Sokal, Trudel, & Babb, 2020).

In this study, we found that teachers with higher self-efficacy teaching in person tended to have lower scores when implementing scaffolds online. This may reflect that teachers' use of strategies in the classroom are specific to the situation, and many such strategies did not transfer directly in an online setting (J. J. Chen & Adams, 2023). While in-person, teachers of all grade levels reported similar self-efficacy; likewise, all grade levels reported a decrease after moving to ERT. Teachers' agency has also been found to be negatively impacted during the pandemic (L. E. Kim, Oxley, & Asbury, 2022; MacIntyre, Gregersen, & Mercer, 2020). We found that teachers who reported greater agency while online felt they were more able to support students in that modality. However, other identified factors while teaching online contributed to the decrease in support and scaffolding teachers could provide (Demirkol, 2022; Leech, Gullett, Cummings, & Haug, 2022).

The second research question addressed understanding the impact the change in modality had on teacher-implemented scaffolding. The open-ended questions helped to create a picture from the teachers' perspectives, providing clarity and insight about their Likert responses on the survey (Biesta et al., 2017; Narayanan & Ordynans, 2022). Due to circumstances created by COVID restrictions, the sudden move to remote teaching created an opportunity to study teacher agency and self-efficacy related to scaffolding. Priestley et al., (2012) inferred that teacher agency is impacted by teachers' ability to act in a specific time. Although teachers had experience and knowledge with scaffolding, the change to teaching in an online/remote context was new and, therefore, challenging.

Changes to Environment

Teachers described in-person scaffolding as relying heavily on observation and interaction (walking around the room) and control of the environment (arranging seating, small group) for ongoing diagnosis and application of responsive scaffolds based on what the student needed for the task in the moment. This aligns with research showing that teachers' experiences in the classroom influence their scaffolding decisions (Priestley et al., 2012; Vähäsantanen, 2015). While online, teachers struggled to understand student needs due to the alterations in their observations and the learning environment. Teachers' abilities were hindered by students not turning on cameras or microphones, some did asynchronous teaching, and others struggled due to technology difficulties. These changes to modality impacted teachers' ability to know when and how to provide instruction and scaffolding to students (Christ & Wang, 2013; Toom et al., 2015; Wallen & Tormey, 2019). Research on agency emphasizes that it is not free will, but rather, structurally constrained (Sewell, 1992). The pandemic-related changes structurally altered teachers' agency, reducing their opportunity to observe and to act, thereby reducing the scaffolding practices that normally positively impact student learning.

These changes impacted teachers' ability to perceive students' attempts. This disconnect led to decreased teacher agency as they didn't have the information needed to make changes to their scaffolding. Teachers rely on observations to determine participation and engagement (Schnitzler, Holzberger, & Seidel, 2021; Urhahne & Wijnia, 2021) and to inform responsive support (Puntambekar & Hübscher, 2005). The lack of observation of students impacted the teachers' perceptions of student effort and

made them more reliant on students' ability to request what they needed. Therefore, lack of teacher observations drastically impeded implementing scaffolds.

Many teachers reported encountering difficulties tied to reduced agency due to the ERT environment. Not only could they not control things in their students' environment that impacted their learning, but many also felt they couldn't help their students. Several teachers expressed frustration about decreased student success, which can in turn negatively impact teacher self-efficacy (Tschannen-Moran et al., 1998). Our results are similar to findings with nursing faculty who moved online during the pandemic; they reported that their self-efficacy was reduced in response to low student engagement (Culp-Roche et al., 2021). Although almost all teachers started with high self-efficacy and agency, in the unfamiliar context of ERT their scaffolding seemed to fall to the wayside.

Adaptions

The changes during the pandemic were not foreseen or planned for; therefore, it was a unique time to view teachers' ability to adapt. Without ongoing diagnosis and observational information, teachers needed to adjust to the change in modality. We found that some teachers were creative in adapting their instruction during emergency remote teaching. Teachers who made adaptations to instruction and scaffolding described how they implemented different online applications, programs, and alternative student response methods. Such teachers also demonstrated higher agency and self-efficacy, in alignment with research showing that self-efficacy enhances teachers' ability to adapt (Bandura, 1993; Dingle et al., 2011). Research also shows that teachers demonstrated agency by adapting their approaches during the pandemic to reproduce what they were familiar with (Ashton, 2022; Thumvichit, 2021).

Hinderances

Although some teachers demonstrated creativity and adapted their teaching, others struggled. Administrative decisions limited teachers' agency and impacted the structure of learning. Changes like these—decreasing class time, not requiring attendance, and deciding not to fail students—can affect quality instruction (Holzberger et al., 2013; Zee & Koomen, 2016) and high student expectations (Guo et al., 2012). Such decisions and repercussions decreased teachers' agency and self-efficacy. Most teachers did not have experience teaching online prior to the pandemic (Ma et al., 2021); this was in line with this study as only 14.6% reported having "a lot" of experience teaching online prior to the pandemic. Self-efficacy can be increased through training and experience (Dolighan & Owen, 2021; Gabriele & Joram, 2007; Nunn, Jantz, & Butikofer, 2009; Putman, 2012). However, agency is needed to generalize those skills in the classroom (Kauppinen et al., 2020; Molla & Nolan, 2020). Due to the sudden change in modality, teachers did not have adequate experience or training to transition to online easily, even when they had high self-efficacy and years of experience teaching. This drastically impacted teachers' ability to implement scaffolding during emergency remote instruction. Further, in contrast to typical definitions of scaffolding, where scaffolds are unique, individual, and based on the task at a specific time (Palincsar, 1998; Stone, 1998b; D. Wood et al., 1976), during the pandemic, teachers reported providing scaffolding to all students regardless of their need. Additionally, the lack of information available for contingent processes like ongoing diagnosis impeded responsive scaffolding and the possibility of fading (Daniel et al., 2016).

Additionally, teachers reported having increased expectations placed on them through an increased workload, decreased time to teach, learning to teach online, transferring lessons to online, and dealing with technology issues for them and their students. Shaari (2020) found that

for teachers to change routines, they need time and support, which were not applicable due to the immediacy of the pandemic restrictions. While not asked directly, a few teachers mentioned feeling overwhelmed and overworked during the pandemic, likely an underestimate of how many experienced these feelings. This is an important concern as teacher well-being, despite having high self-efficacy, can negatively impact their work (Dunn et al., 2013). Teruya (2023) described teachers as being martyrs in their profession for students.

Implications and limitations

The complexity of scaffolding during online learning should not be viewed solely as information derived from during the pandemic, as this emergency remote learning was not an ideal or common situation. However, schools have resource limitations; thus, knowing where the most extensive needs are can prepare us to make resource investments that can have more impact. Technology and apps that provide real time information, visualization, and/or interaction with students should be considered to provide teachers with information to help them support student learning. Making online classes more interactive was reported to have increased engagement and learning, this could include written as well as verbal responses, small group discussions, sharing screens/whiteboards or documents, or learning games in teams.

Given the particular historical context of the study, our results might not generalize to other situations. For instance, future studies of planned shifts to online teaching might have different outcomes, particularly if adequate technology supports, thoughtful policies, and effective professional development are in place.

Another implication of our results relates to the nature of technologies and pedagogy that might be the focus of future professional development. Given that some teachers identified affordances of software that provided real-time insight into student

progress while expanding student participation, professional development could focus on such technologies. Similarly, future studies could investigate additional ways to support observations and the contingent processes that form the basis of teachers' scaffolding decisions.

Our results also highlight the impact that administrative decisions can have on teacher agency. Several teachers described policies that can be understood in the pandemic context, like limiting class meeting times and not requiring students to turn cameras on. Yet, such decisions constrained teacher agency in ways that significantly impacted their ability to gather foundational information necessary for scaffolding. Further, our results showing that teachers who had agency did use it to scaffold their students also highlight the contextual nature of agency. More specifically, teachers reported in-person agency was not predictive of their scaffolding in ERT, yet their agency in ERT was. Such results help clarify the situated nature of agency, and suggest that in developing policies and professional development, it is beneficial to design with teacher agency in mind.

In the analysis of teacher responses, a theme of teacher observation, or lack of, because apparent. The lack of observations was detrimental to teacher ongoing diagnosis and thereby the ability to scaffold. This was interesting as it provided information to help explain a gap in our understanding of ongoing diagnosis in scaffolding. As many studies do not specifically address this area of scaffolding, it had previously been identified as a gap in the research base ((Paper 1)). However, the analysis here demonstrates that it is indeed an embedded skill that is reliant on teachers observation.

While these results have shed some light on the experiences of teachers scaffolding at a particular time, our study comes with limitations. First, our results are correlational in nature, though our mixed methods approach helps illustrate the identified trends. Second, we collected data shortly after many teachers had returned to their classrooms. While the experiences of the pandemic may have made teachers more aware of their scaffolding practices, with some teachers back in their classrooms, the experiences may have been somewhat less fresh in their minds. However, we recognized the challenges in timing data collection, and decided it was more ethical to not burden teachers at the height of the switch to ERT. Third, and relatedly, while we collected data using a single survey to reduce the burden on teachers, we undoubtedly missed information that might have been gained through other methods, such as interviews. Fourth, many of the teachers were from the same state, New Mexico, which may have shaped their responses in ways that reflect that context. Future studies can draw from a national sample to address this limitation.

Conclusion

In this study we sought to investigate teachers' perceptions of self-efficacy and agency and their reported use of scaffolds by modality (in-person versus ERT), as well as the ways in which teachers' descriptions of their use of scaffolds changed by modality (in-person versus online). We used a survey to measure teachers' agency and self-efficacy to understand teachers' experiences scaffolding in an emergency remote teaching situation. Teachers shared changes they experienced in the rapid shift to online instruction in response to the pandemic, including differences in their use of technologies, changes to instructional time, and new responsibilities. Teachers reported significantly higher self-

efficacy, agency, and use of scaffolding prior to the pandemic. Using regression, we modeled variance in teachers' reports of providing scaffolding online. Teachers who reported providing more support prior to the pandemic carried this into their work online. However, higher reported self-efficacy in person predicted lower scores for supporting students online. Promisingly, teachers who reported having more agency online also reported high scores for supporting students online.

By analyzing teachers' written descriptions of the experiences, we identified themes as follows: While in person, teachers expressed their self-efficacy and agency related to scaffolding based on making observations and tailored to tasks and students, leveraging the physical classroom environment in the process. In contrast, teachers reported barriers to making observations and changes to the learning environment that impeded their scaffolding practice. Some teachers detailed adapting their scaffolding approaches.

References

Appanah, T. M., & Hoffman, N. (2014). Using scaffolded self-editing to improve the writing of signing adolescent deaf students. *American Annals of the Deaf*, *159*(3), 269–283. https://doi.org/10.1353/aad.2014.0024

Applebee, A. N., & Langer, J. A. (1983). Instructional Scaffolding: Reading and writing as natural language activities. *Language Arts*, *60*(2), 168–175. Retrieved from http://www.jstor.com/stable/41961447

Arriendell, W. A., & van der Ende, J. (1985). An empirical test of the utility of the observations-to-variable ratio in factor and components analysis. *Applied Psychological Measurement*, *9*(2), 165–178.

https://doi.org/https://doi.org/10.1177/0146621685009002

Ashton, K. (2022). Language teacher agency in emergency online teaching. *System*, *105*(April 2021), 102713. https://doi.org/10.1016/j.system.2021.102713

Athanases, S. Z., & de Oliveira, L. C. (2014). Scaffolding versus routine support for Latina/o youth in an urban school: Tensions in building toward disciplinary literacy. *Journal of Literacy Research*, *46*(2), 263–299. https://doi.org/10.1177/1086296X14535328

Awadelkarim, A. A. (2021). An analysis and insight into the effectiveness of scaffolding: EFL instructors'/teachers' perceptions and attitudes. *Journal of Language and Linguistic Studies*, *17*(2), 828–841. https://doi.org/10.52462/jlls.58

Azevedo, R., Cromley, J. G., Fielding, I., Moos, D. C., & Greene, J. A. (2005). Adaptive human scaffolding facilitates adolescents' self-regulated learning with hypermedia. *Instructional Science*, *33*, 381–412. https://doi.org/10.1007/s11251-005-1273-8

Bakker, A. B., & Bal, P. M. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology*, *83*(1), 189–206. https://doi.org/10.1348/096317909X402596

Bakker, A., Smit, J., & Wegerif, R. (2015). Scaffolding and dialogic teaching in mathematics education: Introduction and review. *ZDM - Mathematics Education*, *47*(7), 1047–1065. https://doi.org/10.1007/s11858-015-0738-8

Bandura, A. (1993). Perceived self-efficacy in cognitive develop and functioning. *Educational Psychologist*, *28*(2), 117–148. https://doi.org/https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of*

Psychology, *52*, 1–26. https://doi.org/https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2005). The evolution of social cognitive theory. In K. G. Smith & M. A. Hitt (Eds.), *Great Minds in Management* (pp. 9–35). Oxford University Press. https://doi.org/https://doi.org/10.1093/oso/9780199276813.003.0002

Bandura, A. (2006). Guide for constructing self-efficacy scales. In *Self-Efficacy Beliefs of Adolescents* (pp. 307–337). Information Age Publishing.

Banse, H. W., Palacios, N. A., Merritt, E. G., & Rimm-Kaufman, S. E. (2017). Scaffolding English language learners' mathematical talk in the context of calendar math. *Journal of Educational Research*, *110*(2), 199–208. https://doi.org/10.1080/00220671.2015.1075187

Bartlett, M. S. (1950). Periodogram analysis and continuous spectra. *Biometrika*, *37*(1/2), 1–16. Retrieved from https://www.jstor.org/stable/2332141

Beavers, A. S., Lounsbury, J. W., Richards, J. K., Huck, S. W., Skolits, G. J., & Esquivel, S. L. (2013). Practical considerations for using exploratory factor analysis in educational research. *Practical Assessment, Research and Evaluation*, *18*(6), 1–13. https://doi.org/10.7275/qv2q-rk76

Belland, B. R. (2016). *Instructional Scaffolding in STEM Education*. *Instructional Scaffolding in STEM Education*. Springer International Publishing. https://doi.org/10.1007/978-3-319-02565-0

Belland, B. R., Gu, J., Armbrust, S., & Cook, B. (2015). Scaffolding argumentation about water quality: A mixed-method study in a rural middle school. *Educational Technology Research and Development*, *63*(3), 325–353. https://doi.org/10.1007/s11423-015-9373-x

Belland, B. R., Kim, C. M., & Hannafin, M. J. (2013). A framework for designing scaffolds that improve motivation and cognition. *Educational Psychologist*, *48*(4), 243–270. https://doi.org/10.1080/00461520.2013.838920

Belland, B. R., Walker, A. E., & Kim, N. J. (2017). A Bayesian network meta-analysis to synthesize the influence of contexts of scaffolding use on cognitive outcomes in STEM education. *Review of Educational Research*, *87*(6), 1042–1081. https://doi.org/10.3102/0034654317723009

Belland, B. R., Walker, A. E., Kim, N. J., & Lefler, M. (2017). Synthesizing results from empirical research on computer-based scaffolding in STEM education: A meta-analysis. *Review of Educational Research*, *87*(2), 309–344. https://doi.org/10.3102/0034654316670999

Berenji, S., Saeidi, M., & Ghafoori, N. (2020). The effect of problem-based learning with hard scaffolds on Iranian EFL learners' reading comprehension. *Journal of Language and Translation*, *10*(2), 121–133.

Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. *Teachers and Teaching: Theory and Practice*, *21*(6), 624–640. https://doi.org/10.1080/13540602.2015.1044325

Biesta, G., Priestley, M., & Robinson, S. (2017). Talking about education: exploring the significance of teachers' talk for teacher agency. *Journal of Curriculum Studies*, *49*(1), 38–54. https://doi.org/10.1080/00220272.2016.1205143

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00282-x

Brunton, G., Harden, A., Oakley, A., & Brunton, G. (2007). Evidence for policy and practice information and co-ordinating centre. In *Evidence in Education Linking Research and Policy*. Organisation for Economic Co-Operation and Development.

Buck, G. A., & Trauth-Nare, A. E. (2009). Preparing teachers to make the formative assessment process integral to science teaching and learning. *Journal of Science Teacher Education*, *20*(5), 475–494. https://doi.org/10.1007/s10972-009-9142-y

Bujang, M. A., Ghani, P. A., Soelar, S. A., & Zulkifli, N. A. (2012). Sample size guideline for exploratory factor analysis when using small sample: Taking into considerations of different measurement scales. In *ICSSBE 2012 - Proceedings, 2012 International Conference on Statistics in Science, Business and Engineering: "Empowering Decision Making with Statistical Sciences"* (pp. 447–451). IEEE. https://doi.org/10.1109/ICSSBE.2012.6396605

Burgess, T. (2012). How does teacher knowledge in statistics impact on teacher listening? In J. Dindyal, L. P. Cheng, & S. F. Ng (Eds.), *Mathematics education: Expanding horizons. Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia* (pp. 146–153). Singapore.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology and Society*, *13*(4), 63–73.

Chen, J. J., & Adams, C. B. (2023). Drawing from and expanding their toolboxes: Preschool teachers' traditional strategies, unconventional opportunities, and novel challenges in scaffolding young children's social and emotional learning during remote instruction amidst COVID-19. *Early Childhood Education Journal*, *51*(5), 925–937. https://doi.org/10.1007/s10643-022-01359-6

Chen, W., Rovegno, I., Cone, S. L., & Cone, T. P. (2012). An accomplished teacher's use of scaffolding during a second-grade unit on designing games. *Research Quarterly for Exercise and Sport*, *83*(2), 221–234. https://doi.org/10.1080/02701367.2012.10599853

Chernikova, O., Heitzmann, N., Fink, M. C., Timothy, V., Seidel, T., & Fischer, F. (2020). Facilitating diagnostic competences in higher education — A meta-analysis in medical and teacher education. *Educational Psychology Review*, *32*, 157–196. Retrieved from https://doi.org/10.1007/s10648-019-09492

Cho, M. H., & Cho, Y. J. (2016). Online instructors' use of scaffolding strategies to promote interactions: A scale development study. *International Review of Research in Open and Distance Learning*, *17*(6), 108–120. https://doi.org/10.19173/irrodl.v17i6.2816

Cho, M. K., & Kim, M. K. (2020). Investigating elementary students' problem solving and teacher scaffolding in solving an Ill-structured problem. *International Journal of Education in Mathematics, Science and Technology*, *8*(4), 274–289. https://doi.org/10.46328/IJEMST.V8I4.1148

Choo, S. S. Y., Rotgans, J. I., Yew, E. H. J., & Schmidt, H. G. (2011). Effect of worksheet scaffolds on student learning in problem-based learning. *Advances in*

Health Sciences Education, *16*(4), 517–528. https://doi.org/10.1007/s10459-011-9288-1

Christ, T., & Wang, X. C. (2013). Exploring a community of practice model for professional development to address challenges to classroom practices in early childhood. *Journal of Early Childhood Teacher Education*, *34*(4), 350–373. https://doi.org/10.1080/10901027.2013.845630

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. Retrieved from http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf

Collie, R. J., Shapka, J. D., & Perry, N. E. (2012). School climate and social-emotional learning: Predicting teacher stress, job satisfaction, and teaching efficacy. *Journal of Educational Psychology*, *104*(4), 1189–1204. https://doi.org/10.1037/a0029356

Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics*. *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. https://doi.org/10.4324/9781315044408-14

Cooper, K. S., Kintz, T., & Miness, A. (2016). Reflectiveness, adaptivity, and support: How teacher agency promotes student engagement. *American Journal of Education*, *123*(1), 109–136. https://doi.org/10.1086/688168

Copp, S. B., Cabell, S. Q., & Invernizzi, M. A. (2019). Kindergarten teachers' use of writing scaffolds to support children's developing orthographic knowledge. *Literacy Research and Instruction*, *58*(3), 164–183. https://doi.org/10.1080/19388071.2019.1617374

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis:

Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation*, *10*(7). https://doi.org/10.7275/jyj1-4868

Creswell, J. W. (2014). *Research design: Qualitiative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications. https://doi.org/10.5539/elt.v12n5p40

Culp-Roche, A., Hardin-Fanning, F., Tartavoulle, T., Hampton, D., Hensley, A., Wilson, J. L., & Wiggins, A. T. (2021). Perception of online teacher self-efficacy: A multi-state study of nursing faculty pivoting courses during COVID 19. *Nurse Education Today*, *106*(July), 1–5. https://doi.org/10.1016/j.nedt.2021.105064

Daniel, S. M., Martin-Beltrán, M., Peercy, M. M., & Silverman, R. (2016). Moving beyond yes or no: Shifting from over-scaffolding to contingent scaffolding in literacy instruction with emergent bilingual students. *TESOL Journal*, *7*(2), 393–420. https://doi.org/10.1002/tesj.213

Danielson, C. (2008). *The Handbook for Enhancing Professional Practice: Using the Framework for Teaching in Your School*. ASCD.

de Oliveira, L. C., & Athanases, S. Z. (2017). A Framework to reenvision instructional scaffolding for linguistically diverse learners. *Journal of Adolescent and Adult Literacy*, *61*(2), 123–129. https://doi.org/10.1002/jaal.663

Delen, I., & Krajcik, J. (2018). Synergy and Students' Explanations: Exploring the Role of Generic and Content-Specific Scaffolds. *International Journal of Science and Mathematics Education*, *16*(1), 1–21. https://doi.org/10.1007/s10763-016-9767-1

Demirkol, T. (2022). Challenges of providing learners with scaffolding during synchronous online EFL teaching. *Journal of Theoretical Educational Science*, *15*(2), 287–306. https://doi.org/10.30831/akukeg.994322

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley & Sons, Inc. https://doi.org/10.1002/chp.20083

Dingle, M. P., Brownell, M. T., Leko, M. M., Boardman, A. G., & Haager, D. (2011). Developing effective special education reading teachers: The influence of professional development, context, and individual qualities. *Learning Disability Quarterly*, *34*(1), 87–103. https://doi.org/10.1177/073194871103400106

Dolighan, T., & Owen, M. (2021). Teacher efficacy for online teaching during the COVID-19 pandemic. *Brock Education Journal*, *30*(1), 95. https://doi.org/10.26522/brocked.v30i1.851

Dominguez, S., & Svihla, V. (2023). A review of teacher implemented scaffolding in K-12. *Social Sciences and Humanities Open*, *8*(1), 100613. https://doi.org/10.1016/j.ssaho.2023.100613

Dominguez, S., & Svihla, V. (2024). Development of the survey of teacher-implemented scaffolding. *International Journal of Research in Education and Science*, *10*(1), 138–160. https://doi.org/10.46328/ijres.3335

Doo, M. Y., Bonk, C., & Heo, H. (2020). A meta-analysis of scaffolding effects in online learning in higher education. *The International Review of Research in Open and Distributed Learning*, *21*(3), 60–80. https://doi.org/10.19173/irrodl.v21i3.4638

Dove, A., & Hollenbrands, K. (2014). Teachers' scaffolding of students' learning of geometry while using a dynamic geometry program. *International Journal of Mathematical Education in Science and Technology*, *45*(5), 668–681. https://doi.org/10.1080/0020739X.2013.868540

Dunn, K. E., Airola, D. T., Lo, W. J., & Garrison, M. (2013). Becoming data driven: The influence of teachers sense of efficacy on concerns related to data-driven decision making. *Journal of Experimental Education*, *81*(2), 222–241. https://doi.org/10.1080/00220973.2012.699899

EBSCO Connect. (2019). What is the apply equivalent subjects expander? Retrieved from https://connect.ebsco.com/s/article/What-is-the-Apply-Equivalent-Subjects-expander?language=en_US

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962–1023. https://doi.org/10.1086/231294

Fabrigar, L. R., Wegener, D. T., Maccallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272–299. https://doi.org/https://doi/10.1037/1082-989X.4.3.272

Finch, W. H. (2013). Exploratory factor analysis. *Handbook of Quantitative Methods for Educational Research*, 167–186. https://doi.org/10.1007/978-94-6209-404-8

Flick, L. B. (2000). Cognitive scaffolding that fosters scientific inquiry in middle level science. *Journal of Science Teacher Education*, *11*(2), 109–129. https://doi.org/10.1023/A

Frederick, M. L., Courtney, S., & Caniglia, J. (2014). With a little help from my friends: Scaffolding techniques in problem solving. *Investigations in Mathematics Learning*, *7*(2), 21–32. https://doi.org/10.1080/24727466.2014.11790340

Freer, P. K. (2009). Focus on scaffolding language and sequential units during choral instruction. *Update: Applications of Research in Music Education*, *28*(1), 33–40. https://doi.org/10.1177/8755123309344327

Friedman, I. A., & Kass, E. (2002). Teacher self-efficacy: A classroom-organization conceptualization. *Teaching and Teacher Education*, *18*(6), 675–686. https://doi.org/10.1016/S0742-051X(02)00027-6

Fu, G., & Clarke, A. (2021). The development and impact of teachers' collective agency during Covid-19: insights from online classrooms in Canada and China. *Educational Review*, *74*(3), 1–21. https://doi.org/10.1080/00131911.2021.1997921

Fullerton, S. K., McCrea-Andrews, H., & Robson, K. (2015). Using a scaffolded multi-component intervention to support the reading and writing development of English learners. *I.E.: Inquiry in Education*, *7*(1). Retrieved from https://files.eric.ed.gov/fulltext/EJ1171670.pdf

Gabriele, A. J., & Joram, E. (2007). Teachers' reflections on their reform-based teaching in mathematics: Implications for the development of teacher self-efficacy. *Action in Teacher Education*, *29*(3), 60–74. https://doi.org/10.1080/01626620.2007.10463461

Ge, X., Law, V., & Huang, K. (2012). Diagnosis, supporting, and fading: A scaffolding design framework for adaptive e-learning systems. In *Interactivity in E-Learning: Case Studies and Frameworks* (pp. 116–142). IGI Global. https://doi.org/https://doi.org/10.4018/978-1-61350-441-3.ch006

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569–582. https://doi.org/10.1037/0022-0663.76.4.569

Golden-Biddle, K., & Locke, K. (2006). *Composing qualitative research* (2nd ed.). Sage Publications. https://doi.org/10.4135/9781412983709

González, G., & DeJarnette, A. F. (2015). Teachers' and students' negotiation moves

when teachers Scaffold group work. *Cognition and Instruction*, *33*(1), 1–45. https://doi.org/10.1080/07370008.2014.987058

Gopaldas, A. (2016). A front-to-back guide to writing a qualitative research article. *Qualitative Market Research*, *19*(1), 115–121. https://doi.org/10.1108/QMR-08-2015-0074

Greene, J. C., Carcelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, *11*(3), 255–274. https://doi.org/10.3102/01623737011003255

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin*, *103*(2), 265–275. https://doi.org/10.1037/0033-2909.103.2.265

Gudmundsdottir, G. B., & Hathaway, D. M. (2020). "We always make it work": Teachers' agency in the time of crisis. *Journal of Technology and Teacher Education*, *28*(2), 239–250. Retrieved from https://www.learntechlib.org/p/216242/

Guo, Y., Connor, C. M. D., Yang, Y., Roehrig, A. D., & Morrison, F. J. (2012). The effects of teacher qualification, teacher self-efficacy, and classroom practices on fifth graders' literacy outcomes. *Elementary School Journal*, *113*(1), 3–24. https://doi.org/10.1086/665816

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching & Teacher Education*, *4*(1), 63–69. https://doi.org/10.1016/0742-051x(88)90025-x

Hammer, D., & Berland, L. K. (2014). Confusing claims for data: A critique of common practices for presenting qualitative research on learning. *Journal of the Learning*

Sciences, *23*(1), 37–46. https://doi.org/10.1080/10508406.2013.802652

Hammond, J., & Gibbons, P. (2005). *What is scaffolding? Teachers' Voices 8: Explicitly Supporting Reading and Writing in the Classroom*. Retrieved from http://www.ameprc.mq.edu.au/docs/research_reports/teachers_voices/Teachers_voices_8.pdf#page=15

Hausfather, S. J. (1996). Vygotsky and schooling: Creating a social context for learning. *Action in Teacher Education*, *18*(2), 1–10. https://doi.org/10.1080/01626620.1996.10462828

He, Y. (2014). Universal design for learning in an online teacher education course: Enhancing learners' confidence to teach online. *MERLOT Journal of Online Learning and Teaching*, *10*(2), 283–298. Retrieved from https://jolt.merlot.org/vol10no2/he_0614.pdf

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause*, 1–12. Retrieved from http://hdl.handle.net/10919/104648

Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Perron, J. M., & Mumford, A. K. R. (2005). The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. *Educational and Psychological Measurement*, *65*(2), 202–226. https://doi.org/10.1177/0013164404267287

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, *105*(3), 774–786. https://doi.org/10.1037/a0032198

Howe, C. (2013). Scaffolding in context: Peer interaction and abstract learning. *Learning,*

Culture and Social Interaction, *2*(1), 3–10. https://doi.org/10.1016/j.lcsi.2012.12.005

Jadallah, M., Anderson, R. C., Nguyen-Jahiel, K., Miller, B. W., Kim, I. H., Kuo, L. J., … Wu, X. (2011). Influence of a teacher's scaffolding moves during child-led small-group discussions. *American Educational Research Journal*, *48*(1), 194–230. https://doi.org/10.3102/0002831210371498

Johnson, E. (2021). Contingency in context: A study of exemplary reading teachers' use of planned scaffolds in secondary English classes with emergent bilinguals. *Reading and Writing Quarterly*, *37*(3), 260–278. https://doi.org/10.1080/10573569.2020.1776654

Johnson, E. M. (2019). Choosing and using interactional scaffolds: How teachers' moment-to-moment supports can generate and sustain emergent bilinguals' engagement with challenging English texts. *Research in the Teaching of English*, *53*(3), 245–269. https://doi.org/10.58680/rte201930036

Jones, A. L., & Kessler, M. A. (2020). Teachers' emotion and identity work during a pandemic. *Frontiers in Education*, *5*. https://doi.org/10.3389/feduc.2020.583775

Jung, K. G. (2019). Learning to scaffold science academic language: Lessons from an instructional coaching partnership. *Research in Science Education*, *49*(4), 1013–1024. https://doi.org/10.1007/s11165-019-9851-y

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575

Kang, H., Thompson, J., & Windschitl, M. (2014). Creating opportunities for students to show what they know: The role of scaffolding in assessment tasks. *Science*

Education, *98*(4), 674–704. https://doi.org/10.1002/sce.21123

Kast, J., Lindner, K. T., Gutschik, A., & Schwab, S. (2021). Austrian teachers' attitudes and self-efficacy beliefs regarding at-risk students during home learning due to COVID-19. *European Journal of Special Needs Education*, *36*(1), 114–126. https://doi.org/10.1080/08856257.2021.1872849

Kauppinen, M., Kainulainen, J., Hökkä, P., & Vähäsantanen, K. (2020). Professional agency and its features in supporting teachers' learning during an in-service education programme. *European Journal of Teacher Education*, *43*(3), 384–404. https://doi.org/10.1080/02619768.2020.1746264

Kayi-Aydar, H. (2013). Scaffolding language learning in an academic ESL classroom. *ELT Journal*, *67*(3), 324–335. https://doi.org/10.1093/elt/cct016

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education*, *63*(3), 185–200. https://doi.org/10.1177/0022487111433651

Keum, S., Cho, Y. H., Huh, S. Y., & Kim, M. (2021). Types and influence factors of teacher agency in online classes during the COVID-19 pandemic. *Journal of Educational Technology*, *37*(2), 161–190. https://doi.org/10.17232/kset.37.2.161

Kim, L. E., Oxley, L., & Asbury, K. (2022). "My brain feels like a browser with 100 tabs open": A longitudinal study of teachers' mental health and well-being during the COVID-19 pandemic. *British Journal of Educational Psychology*, *92*(1), 299–318. https://doi.org/10.1111/bjep.12450

Kim, M. C., & Hannafin, M. J. (2011). Scaffolding 6th graders' problem solving in technology-enhanced science classrooms: A qualitative case study. *Instructional*

Science, *39*(3), 255–282. https://doi.org/10.1007/s11251-010-9127-4

Kim, Y. (2010). Scaffolding through questions in upper elementary ELL learning. *Literacy Teaching and Learning*, *15*, 109–136. Retrieved from https://files.eric.ed.gov/fulltext/EJ910116.pdf

Kohnen, A. M., & Whitacre, M. P. (2017). What makes professional development coherent? Uncovering teacher perspectives on a science literacy project. *Action in Teacher Education*, *39*(4), 414–431. https://doi.org/10.1080/01626620.2017.1336130

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2021). Sustaining a sense of success: The protective role of teacher working conditions during the COVID-19 pandemic. *Journal of Research on Educational Effectiveness*, *14*(4), 727–769. https://doi.org/10.1080/19345747.2021.1938314

Lajoie, S. P. (2005). Extending the scaffolding metaphor. *Instructional Science*, *33*, 541–557. https://doi.org/10.1007/s11251-005-1279-2

Learning Sciences International. (2013). *Developing a Passion for Professional Teaching: The Marzano Teaching Evaluation Manual*. Retrieved from https://www.learningsciences.com/wp/wp-content/uploads/2018/05/The-Marzano-Teacher-Evaluation-Model.pdf

Lee, M. H., & Tsai, C. C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science*, *38*(1), 1–21. https://doi.org/10.1007/s11251-008-9075-4

Lee, P. A., & Schmitt, M. C. (2014). Teacher language scaffolds the development of

independent strategic reading activities and metacognitive awareness in emergent readers. *Reading Psychology*, *35*(1), 32–57. https://doi.org/10.1080/02702711.2012.674477

Leech, N. L., Gullett, S., Cummings, M. H., & Haug, C. A. (2022). The challenges of remote K–12 education during the COVID-19 pandemic: Differences by grade level. *Online Learning Journal*, *26*(1), 245–267. https://doi.org/10.24059/olj.v26i1.2609

Liang, L. A. (2011). Scaffolding middle school students' comprehension and response to short stories. *RMLE Online*, *34*(8), 1–16. https://doi.org/10.1080/19404476.2011.11462081

Lin, T. C., Hsu, Y. S., Lin, S. S., Changlai, M. L., Yang, K. Y., & Lai, T. L. (2012). A review of empirical evidence on scaffolding for science education. *International Journal of Science and Mathematics Education*, *10*(2), 437–455. https://doi.org/10.1007/s10763-011-9322-z

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications. https://doi.org/10.1016/0147-1767(85)90062-8

Lloret, S., Ferreres, A., & Tomás, A. H. e. I. (2017). The exploratory factor analysis of items: Guided analysis based on empirical data and software. *Anales de Psicología / Annals of Psychology*, *33*(2), 417–432. https://doi.org/10.6018/analesps.33.2.270211

Lockton, M., Weddle, H., & Datnow, A. (2019). When data don't drive: Teacher agency in data use efforts in low-performing schools. *School Effectiveness and School Improvement*, *0*(0), 1–23. https://doi.org/10.1080/09243453.2019.1647442

Lutz, S. L., Guthrie, J. T., & Davis, M. H. (2006). Scaffolding for engagement in elementary school reading instruction. *Journal of Educational Research*, *100*(1), 3–

20. https://doi.org/10.3200/JOER.100.1.3-20

Ma, K., Chutiyami, M., Zhang, Y., & Nicoll, S. (2021). Online teaching self-efficacy during COVID-19: Changes, its associated factors and moderators. *Education and Information Technologies*, *26*(6), 6675–6697. https://doi.org/10.1007/s10639-021-10486-3

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, *4*(1), 84–99. https://doi.org/10.1037/1082-989X.4.1.84

MacIntyre, P. D., Gregersen, T., & Mercer, S. (2020). Language teachers' coping strategies during the Covid-19 conversion to online teaching: Correlations with stress, wellbeing and negative emotions. *System*, *94*, 1–13. https://doi.org/10.1016/j.system.2020.102352

Maloch, B. (2004). On the road to literature discussion groups: Teacher scaffolding during preparatory experiences. *Reading Research and Instruction*, *44*(2), 1–20. https://doi.org/10.1080/19388070409558424

Marshall, J. C., Smart, J., & Alston, D. M. (2016). Development and validation of Teacher Intentionality of Practice Scale (TIPS): A measure to evaluate and scaffold teacher effectiveness. *Teaching and Teacher Education*, *59*, 159–168. https://doi.org/10.1016/j.tate.2016.05.007

Martin, N. D., Dornfeld Tissenbaum, C., Gnesdilow, D., & Puntambekar, S. (2019). Fading distributed scaffolds: the importance of complementarity between teacher and material scaffolds. *Instructional Science*, *47*(1), 69–98. https://doi.org/10.1007/s11251-018-9474-0

McMullen, M. B. (1999). Characteristics of teachers who talk the DAP talk and walk the DAP walk. *Journal of Research in Childhood Education*, *13*(2), 216–230. https://doi.org/10.1080/02568549909594742

McNeil, L. (2012). Using talk to scaffold referential questions for English language learners. *Teaching and Teacher Education*, *28*(3), 396–404. https://doi.org/10.1016/j.tate.2011.11.005

McNeill, K. L., & Krajcik, J. (2009). Synergy between teacher practices and curricular scaffolds to support students in using domain-specific and domain-general knowledge in writing arguments to explain phenomena. *Journal of the Learning Sciences*, *18*(3), 416–460. https://doi.org/10.1080/10508400903013488

McNeill, K. L., Lizotte, D. J., Krajcik, J. S., & Marx, R. W. (2006). Supporting students' construction of scientific explanations by fading scaffolds in instructional materials. *The Journal of the Learning Sciences*, *15*(2), 153–191. https://doi.org/10.1207/s15327809jls1502

McNiff, J., & Aicher, T. J. (2017). Understanding the challenges and opportunities associated with online learning: A scaffolding theory approach. *Sport Management Education Journal*, *11*(1), 13–23. https://doi.org/10.1123/smej.2016-0007

Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal*, *30*(3), 359–377. https://doi.org/10.1080/0141192041000168968 9

Micceri, T. (1989). The unicorn, the normal curve, and other improbable creatures. *Psychological Bulletin*, *105*(1), 156–166. https://doi.org/10.1037/0033-2909.105.1.156

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … PRISMA-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (prisma-p) 2015 statement. *Systematic Reviews*, *4*(1), 1–9.

Mojarrabi Tabrizi, H., Behnam, B., Saeidi, M., & Lu, X. (2019). The effect of soft vs. hard scaffolding on reading comprehension skill of EFL learners in different experimental conditions. *Cogent Education*, *6*(1), 1–13. https://doi.org/10.1080/2331186X.2019.1631562

Molla, T., & Nolan, A. (2020). Teacher agency and professional practice. *Teachers and Teaching: Theory and Practice*, *26*(1), 67–87. https://doi.org/10.1080/13540602.2020.1740196

Murphy, N., & Messer, D. (2000). Differential benefits from scaffolding and children working alone. *Educational Psychology*, *20*(1), 17–31. https://doi.org/10.1080/014434100110353

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, *14*(3). https://doi.org/10.5812/sdme.67670

Narayanan, M., & Ordynans, J. G. (2022). Meaning making and self-efficacy: Teacher reflections through COVID-19. *Teacher Educator*, *57*(1), 26–44. https://doi.org/10.1080/08878730.2021.1990455

National Center for Education Statistics. (n.d.). Characteristics of public school teachers. Retrieved from https://nces.ed.gov/programs/coe/indicator/clr

Nunn, G. D., Jantz, P. B., & Butikofer, C. (2009). Concurrent validity between teacher efficacy and perceptions of response to intervention outcomes. *Journal of*

Instructional Psychology, *36*(3), 215–218. Retrieved from https://eric.ed.gov/?id=EJ952271

O'Connor, R. E., Sanchez, V. M., Jones, B. T., Suchlit, L., Youkhanna, V., Beach, K. D., & Widaman, K. (2021). Systematic CHAAOS: Teaching Vocabulary in English/Language Arts Special Education Classes in Middle School. *Journal of Learning Disabilities*, *54*(3), 187–202. https://doi.org/10.1177/0022219420922839

Oh, S. Y. (2000). Actually and in fact in American English: A data-based analysis. *English Language and Linguistics*, *4*(2), 243–268. https://doi.org/10.1017/S1360674300000241

Palincsar, A. S. (1998). Keeping the metaphor of scaffolding fresh - A response to C. Addison Stone's "The metaphor of scaffolding: Its utility for the field of learning disabilities." *Journal of Learning Disabilities*, *31*(4), 370–373. https://doi.org/10.1177/002221949803100406

Pata, K., Lehtinen, E., & Sarapuu, T. (2006). Inter-relations of tutor's and peers' scaffolding and decision-making discourse acts. *Instructional Science*, *34*(4), 313–341. https://doi.org/10.1007/s11251-005-3406-5

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *Journal of the Learning Sciences*, *13*(3), 423–451. https://doi.org/10.1207/s15327809jls1303

Peregoy, S. F., & Boyle, O. F. (1999). Multiple embedded scaffolds: Support for English speakers in a two-way Spanish immersion kindergarten. *Bilingual Research Journal*, *23*(2–3), 135–146. https://doi.org/10.1080/15235882.1999.10668683

Pratt, M. W., & Savoy-Levine, K. M. (1998). Contingent tutoring of long-division skills

in fourth and fifth graders: Experimental tests of some hypotheses about scaffolding. *Journal of Applied Developmental Psychology*, *19*(2), 287–304. https://doi.org/10.1016/S0193-3973(99)80041-0

Priestley, M., Edwards, R., Priestley, A., & Miller, K. (2012). Teacher agency in curriculum making: Agents of change and spaces for manoeuvre. *Curriculum Inquiry*, *42*(2), 191–214. https://doi.org/10.1111/j.1467-873X.2012.00588.x

Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational Psychologist*, *40*(1), 1–12. https://doi.org/10.1207/s15326985ep4001

Putman, S. M. (2012). Investigating teacher efficacy: Comparing preservice and inservice teachers with different levels of experience. *Action in Teacher Education*, *34*(1), 26–40. https://doi.org/10.1080/01626620.2012.642285

Reigosa, C., & Jiménez-Aleixandre, M. P. (2007). Scaffolded problem-solving in the physics and chemistry laboratory: Difficulties hindering students' assumption of responsibility. *International Journal of Science Education*, *29*(3), 307–329. https://doi.org/10.1080/09500690600702454

Reynolds, D. (2017). Interactional scaffolding for reading comprehension. *Literacy Research: Theory, Method, and Practice*, *66*(1), 135–156. https://doi.org/10.1177/2381336917718820

Robinia, K. A., & Anderson, M. L. (2010). Online teaching efficacy of nurse faculty. *Journal of Professional Nursing*, *26*(3), 168–175. https://doi.org/10.1016/j.profnurs.2010.02.006

Rodgers, E. (2017). Scaffolding Word Solving While Reading: New Research Insights.

Reading Teacher, *70*(5), 525–532. https://doi.org/10.1002/trtr.1548

Rodgers, E., D'Agostino, J. V., Harmey, S. J., Kelly, R. H., & Brownfield, K. (2016). Examining the Nature of Scaffolding in an Early Literacy Intervention. *Reading Research Quarterly*, *51*(3), 345–360. https://doi.org/10.1002/rrq.142

Rodgers, E. M. (2004). Interactions that scaffold reading performance. *Journal of Literacy Research*, *36*(4), 501–532. https://doi.org/10.1207/s15548430jlr3604_4

Russell, D. W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in Personality and Social Psychology Bulletin. *Personality and Social Psychology Bulletin*, *28*(12), 1629–1646. https://doi.org/10.1177/014616702237645

Saldaña, J. (2009). *The Coding Manual for Qualitative Researchers*. SAGE Publications.

Samuels, P. (2016). Advice on exploratory factor analysis. *Centre for Academic Success, Birmingham City University*, (June), 2. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77–96. https://doi.org/10.1007/BF02505026

Schegloff, E. A. (1993). Reflections on quantification in the study of conversation. *Research on Language and Social Interaction*, *26*(1), 99–128. https://doi.org/10.1207/s15327973rlsi2601_5

Schnitzler, K., Holzberger, D., & Seidel, T. (2021). All better than being disengaged: Student engagement patterns and their relations to academic self-concept and achievement. *European Journal of Psychology of Education*, *36*(3), 627–652. https://doi.org/10.1007/s10212-020-00500-6

Schultz, R. (2012). A critical examination of the teaching methodologies pertaining to distance learning In geographic education: Andragogy in an adult online certificate program. *Review of International Geographical Education Online*, *2*(1), 45–60. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Schultz, R. B., & DeMers, M. N. (2020). Transitioning from emergency remote learning to deep online learning experiences in geography education. *Journal of Geography*, *119*(5), 142–146. https://doi.org/10.1080/00221341.2020.1813791

Schumacker, R. E. (2015). *Learning Statistics Using R*. SAGE Publications Inc. https://doi.org/10.4135/9781506300160

Sewell, W. H. J. (1992). A theory of structure : Duality, agency, and transformation. *American Journal of Sociology*, *98*(1), 1–29. https://doi.org/10.1086/229967

Shaari, I. (2020). Lateral networks of teachers in a centralised education system: Structures, processes, and development of teacher agency. *Asia Pacific Journal of Education*, *40*(4), 516–532. https://doi.org/10.1080/02188791.2020.1838879

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63–75. https://doi.org/10.3233/EFI-2004-22201

Shin, S., Brush, T. A., & Glazewski, K. D. (2020). Examining the hard, peer, and teacher scaffolding framework in inquiry-based technology-enhanced learning environments: impact on academic achievement and group performance. *Educational Technology Research and Development*, (0123456789). https://doi.org/10.1007/s11423-020-09763-8

Shin, S., Brush, T. A., Glazewski, K. D., Shin, S., Brush, T. A., & Glazewski, K. D.

(2017). Designing and implementing web-based scaffolding tools for technology-enhanced socioscientific inquiry. *International Forum of Educational Technology & Society*, *20*(1), 1–12. Retrieved from https://www.ds.unipi.gr/et&s/journals/20_1/1.pdf

Sims, R., Dobbs, G., & Hand, T. (2002). Enhancing quality in online learning: Scaffolding planning and design through proactive evaluation. *Distance Education*, *23*(2), 135–148. https://doi.org/10.1080/0158791022000009169

Slavin, R. E. (2015). Cooperative learning in elementary schools. *Education 3-13*, *43*(1), 5–14. https://doi.org/10.1080/03004279.2015.963370

Sokal, L., Trudel, L. E., & Babb, J. (2020). Canadian teachers' attitudes toward change, efficacy, and burnout during the COVID-19 pandemic. *International Journal of Educational Research Open*, *1*, 100016. https://doi.org/10.1016/j.ijedro.2020.100016

Songer, N. B., Shah, A. M., & Fick, S. (2013). Characterizing teachers' verbal scaffolds to guide elementary students' creation of scientific explanations. *School Science and Mathematics*, *113*(7), 321–332. https://doi.org/10.1111/ssm.12036

Stone, C. A. (1998a). Should we salvage the scaffolding metaphor? *Journal of Learning Disabilities*, *31*(4), 409–413. https://doi.org/10.1177/002221949803100411

Stone, C. A. (1998b). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal of Learning Disabilities*, *31*(4), 344–364. https://doi.org/10.1177/002221949803100404

Streiner, D. L. (2003). *A guide for the statistically perplexed: Selected readings for clinical researchers*. Canadian Psychiatric Association.

https://doi.org/10.1177/070674379403900303

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Allyn and Bacon.

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, *28*(1063519), 1–25. https://doi.org/10.25304/rlt.v28.2319

Teruya, J. (2023). Pedagogy in a pandemic: Responsibilisation and agency in the (re)making of teachers. *Pedagogy, Culture and Society*, *31*(1), 185–201. https://doi.org/10.1080/14681366.2021.1898044

Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge University Press. https://doi.org/10.1017/cbo9781139173698

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*, 1–10. https://doi.org/10.1186/1471-2288-8-45

Thumvichit, A. (2021). English language teaching in times of crisis: Teacher agency in response to the pandemic-forced online education. *Teaching English with Technology*, *21*(2), 14–37. Retrieved from https://eric.ed.gov/?id=EJ1293795

Toom, A., Pyhältö, K., & Rust, F. O. (2015). Teachers professional agency in contradictory times. *Teachers and Teaching: Theory and Practice*, *21*(6), 615–623. https://doi.org/10.1080/13540602.2015.1044334

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 189–199. Retrieved from https://eric.ed.gov/?id=EJ1257153

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202–248. https://doi.org/10.3102/00346543068002202

Tsouloupas, C. N., Carson, R. L., Matthews, R., Grawitch, M. J., & Barber, L. K. (2010). Exploring the association between teachers' perceived student misbehaviour and emotional exhaustion: The importance of teacher efficacy beliefs and emotion regulation. *Educational Psychology*, *30*(2), 173–189. https://doi.org/10.1080/01443410903494460

Turner, J. C., Cox, K. E., DiCintio, M., Meyer, D. K., Logan, C., & Thomas, C. T. (1998). Creating contexts for involvement in mathematics. *Journal of Educational Psychology*, *90*(4), 730–745. https://doi.org/10.1037/0022-0663.90.4.730

Urhahne, D., & Wijnia, L. (2021). A review on the accuracy of teacher judgments. *Educational Research Review*, *32*, 100374. https://doi.org/10.1016/j.edurev.2020.100374

Vähäsantanen, K. (2015). Professional agency in the stream of change: Understanding educational change and teachers' professional identities. *Teaching and Teacher Education*, *47*, 1–12. https://doi.org/10.1016/j.tate.2014.11.006

van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296.

https://doi.org/10.1007/s10648-010-9127-6

Velicer, W. F., & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. *Psychological Methods*, *3*(2), 231–251. https://doi.org/10.1037/1082-989X.3.2.231

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* (M. Cole, Ed.). Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Wallen, M., & Tormey, R. (2019). Developing teacher agency through dialogue. *Teaching and Teacher Education*, *82*, 129–139. https://doi.org/10.1016/j.tate.2019.03.014

Walsh, D., & Downe, S. (2005). Meta-synthesis method for qualitative research: A literature review. *Journal of Advanced Nursing*, *50*(2), 204–211. https://doi.org/10.1111/j.1365-2648.2005.03380.x

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Weißenfels, M., Klopp, E., & Perels, F. (2022). Changes in teacher burnout and self-efficacy during the COVID-19 pandemic: Interrelations and e-learning variables related to change. *Frontiers in Education*, *6*, 1–9. https://doi.org/10.3389/feduc.2021.736992

Wisdom, J., & Creswell, J. W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*. Rockville, MS: Agency for Healthcare Research and Quality. Retrieved from www.ahrq.gov

Wollman-Bonilla, J. E., & Werchadlo, B. (1999). Teacher and peer roles in scaffolding first graders' responses to literature. *Reading Teacher*, *52*(6), 598–608. Retrieved from https://www.jstor.org/stable/20202133

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, *17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, *14*(3), 361–384. https://doi.org/10.5465/amr.1989.4279067

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, *82*(1), 81–91. https://doi.org/10.1037/0022-0663.82.1.81

Worthen, B. (2021). *Teacher decision-making in guided reading*. University of Kentucky. Retrieved from uknowledge.uky.edu/edc_etds/35/

Wright, J. M. (2010). Effect of quality matters™ training on faculty's online self-efficacy. *Annual Distance Learning Administration Conference*. Retrieved from http://ksuweb.kennesaw.edu/~jwright/QMTraining_FacultySelf-efficacy_Wright.pdf

Wu, H.-L., & Pedersen, S. (2011). Integrating computer- and teacher-based scaffolds in science inquiry. *Computers & Education*, *57*(4), 2352–2363. https://doi.org/10.1016/j.compedu.2011.05.011

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94. https://doi.org/10.20982/tqmp.09.2.p079

Young, V. M., & Kim, D. H. (2010). Using assesments for instructional improvement. *Education Policy Analysis Archives*, *18*(19), 1–38.

Zangori, L., Forbes, C. T., & Schwarz, C. V. (2015). Exploring the effect of embedded scaffolding within curricular tasks on third-grade students' model-based explanations about hydrologic cycling. *Science and Education*, *24*(7–8), 957–981. https://doi.org/10.1007/s11191-015-9771-9

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being. *Review of Educational Research*, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

Chapter 5 - Conclusion

Introduction

Scaffolding is an essential aspect of teaching. Due to the COVID-19 pandemic, scaffolding was considerably altered due to the move to online. Most teachers were unprepared for this unexpected move to emergency remote teaching (Gudmundsdottir & Hathaway, 2020; Kennedy & Archambault, 2012). My first paper, a literature review, provided a foundation on teacher-implemented scaffolding. My second paper reported on the development of a survey about teacher-implemented scaffolds before and during this time. My third paper analyzed and described teachers' perspectives.

Summary of Results

Scaffolding is a widely used term; however, few studies have focused on the role of the teacher in scaffolding. In the first paper, I reported a literature review looking at scaffolding through the mode used and the contingent processes in which teachers implemented scaffolding. Findings revealed trends in teacher-implemented scaffolding in that it is most often studied at the elementary grade level, usually in language arts, and that soft scaffolding was reported significantly more often than hard scaffolds. Unsurprisingly, responsive scaffolding was most often reported as it is the most easily observed of the three contingent processes.

Taking these findings, in the second paper, I designed and developed a survey of teacher-implemented scaffolding. Based on an EFA, 32 items were retained in six factors: 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. These included all three constructs in both modalities - online and in-person; demonstrating a distinct difference between the

scaffolding constructs while incorporating teacher agency and self-efficacy to incorporate and strengthen the information about teacher perspectives on implementing scaffolds.

Finally, in the third paper, which reported analysis of survey data, I found that teachers reported high agency and self-efficacy while in-person and a significant decrease due to the sudden move to online learning during the pandemic. Based on regression modeling, teachers who reported greater self-efficacy in-person were predicted to have lower scores for scaffolding online, whereas those who reported greater agency while online reported more ability to scaffold online.

Implications and Limitations

These findings provide new information about how teacher-implemented scaffolding is impacted by teacher agency and self-efficacy. Additionally, due to the pandemic, I was also able to compare these constructs with the change of modality due to the emergency remote teaching.

Scaffolding needs all three contingent processes – ongoing diagnosis, responsive support, and fading. Unfortunately, we did not find evidence of ongoing diagnosis in the literature review. This may be because it is a more covert process and, without teacher insight, may be missed in observation. Responsive support was most often reported, as it is the action of scaffolding performed by the teacher during implementation; therefore, it is the most overt process in scaffolding. Fading information may be limited as it is tied to both ongoing diagnosis and changes to responsive scaffolding that may not be reported as often as it is occurring due to the taking place over time. Fading may also be reported as lumped in with responsive scaffolding without teachers' perspectives being included.

Contingent processes were impacted explicitly due to the change to online learning. Many teachers reported that without observations, it was more difficult to know

what to scaffold, which has been found to affect students more than how much help they receive (E. Rodgers et al., 2016). Although both the quality and quantity of scaffolds were decreased while online, both were reported to be directly impacted by teachers struggling to know how to help students without being able to observe their needs. This would imply that they lost a primary source of information to make ongoing diagnosis and decide how to provide responsive scaffolds. This may not have been as obvious without the change in environment and was very impactful to both teachers and students in their learning.

It may not be easy to distinguish each process, but these contingent processes are the basis for decision-making in teacher-implemented scaffolding. Teachers' ongoing diagnosis of students' needs on particular tasks is central to providing the temporary support needed at that time, and reducing supports as applicable for learning (Stone, 1998a; D. Wood et al., 1976). Further investigations into the processes can extend our understanding but should include teachers' perspectives and rationales for their actions in-the-moment to provide more information. This was a small study that included self-reported survey data, limiting the information obtained. Researchers may need to encourage teachers to describe and explain how they move through all of the contingent processes to better understand teacher-implemented scaffolding.

The mode of scaffolding also appeared to be consistent throughout our findings. Soft scaffolds were most often reported in the literature review. This was consistent with responses in our survey, despite research stating that the combination of hard and soft scaffolds can be helpful during instruction (Saye & Brush, 2002). This finding may be due to the nature of hard scaffolds, as planned support, and therefore not always

recognized as or reported as scaffolding. The view of scaffolding may need to broaden to include aspects in a classroom that develop over time and happen in-the-moment. I would encourage researchers to be more explicit in reporting scaffolding and teachers to acknowledge and recognize the skill and effort they put into teaching their students.

Although limiting this study to K12 in-service teachers within the United States constrained the findings, I was able to compare grade-level differences. For instance, although elementary teachers spent the least amount of time being online, they reported more of an impact due to this change. This may be due to how instruction is provided at this level, using more hands-on instruction, cooperative learning, and in a more social setting (J. J. Chen & Adams, 2023; Lutz et al., 2006; Slavin, 2015). Additionally, the younger grades are learning foundational skills and establishing learning skills (Vygotsky, 1978). Therefore, professional development for teacher-implemented scaffolding may need to differ by grade level to provide more specific needs.

Another limitation of this study is that results were based on self-reported information from teachers, which may have impacted the accuracy and the amount of information provided. However, teachers reported their agency and self-efficacy as being high and similar across grade levels taught while in-person, which was expected. These levels changed significantly with the move to online. Although scaffolding needs did not change, how they were provided and the environment in which they were implemented were altered with the modification of modality. Teachers' knowledge and experience are valuable but not directly transferable to online, supporting these constructs' contextual nature. Professional development and experience can help improve skills and establish policies.

As this study took place and reported findings from a time during a pandemic, the results may not generalize. However, they can provide insight and understanding into the constructs. Studied. This information can be helpful in planning for intentional online situations and learning more about teachers' perspectives in implementing scaffolds.

References

Appanah, T. M., & Hoffman, N. (2014). Using scaffolded self-editing to improve the writing of signing adolescent deaf students. *American Annals of the Deaf*, *159*(3), 269–283. https://doi.org/10.1353/aad.2014.0024

Applebee, A. N., & Langer, J. A. (1983). Instructional Scaffolding: Reading and writing as natural language activities. *Language Arts*, *60*(2), 168–175. Retrieved from http://www.jstor.com/stable/41961447

Arriendell, W. A., & van der Ende, J. (1985). An empirical test of the utility of the observations-to-variable ratio in factor and components analysis. *Applied Psychological Measurement*, *9*(2), 165–178. https://doi.org/https://doi.org/10.1177/0146621685009002

Ashton, K. (2022). Language teacher agency in emergency online teaching. *System*, *105*(April 2021), 102713. https://doi.org/10.1016/j.system.2021.102713

Athanases, S. Z., & de Oliveira, L. C. (2014). Scaffolding versus routine support for Latina/o youth in an urban school: Tensions in building toward disciplinary literacy. *Journal of Literacy Research*, *46*(2), 263–299. https://doi.org/10.1177/1086296X14535328

Awadelkarim, A. A. (2021). An analysis and insight into the effectiveness of scaffolding: EFL instructors'/teachers' perceptions and attitudes. *Journal of Language and Linguistic Studies*, *17*(2), 828–841. https://doi.org/10.52462/jlls.58

Azevedo, R., Cromley, J. G., Fielding, I., Moos, D. C., & Greene, J. A. (2005). Adaptive human scaffolding facilitates adolescents' self-regulated learning with hypermedia. *Instructional Science*, *33*, 381–412. https://doi.org/10.1007/s11251-005-1273-8

Bakker, A. B., & Bal, P. M. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology*, *83*(1), 189–206. https://doi.org/10.1348/096317909X402596

Bakker, A., Smit, J., & Wegerif, R. (2015). Scaffolding and dialogic teaching in mathematics education: Introduction and review. *ZDM - Mathematics Education*, *47*(7), 1047–1065. https://doi.org/10.1007/s11858-015-0738-8

Bandura, A. (1993). Perceived self-efficacy in cognitive develop and functioning. *Educational Psychologist*, *28*(2), 117–148. https://doi.org/https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, *52*, 1–26. https://doi.org/https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2005). The evolution of social cognitive theory. In K. G. Smith & M. A. Hitt (Eds.), *Great Minds in Management* (pp. 9–35). Oxford University Press. https://doi.org/https://doi.org/10.1093/oso/9780199276813.003.0002

Bandura, A. (2006). Guide for constructing self-efficacy scales. In *Self-Efficacy Beliefs of Adolescents* (pp. 307–337). Information Age Publishing.

Banse, H. W., Palacios, N. A., Merritt, E. G., & Rimm-Kaufman, S. E. (2017). Scaffolding English language learners' mathematical talk in the context of calendar math. *Journal of Educational Research*, *110*(2), 199–208. https://doi.org/10.1080/00220671.2015.1075187

Bartlett, M. S. (1950). Periodogram analysis and continuous spectra. *Biometrika*, *37*(1/2), 1–16. Retrieved from https://www.jstor.org/stable/2332141

Beavers, A. S., Lounsbury, J. W., Richards, J. K., Huck, S. W., Skolits, G. J., & Esquivel, S. L. (2013). Practical considerations for using exploratory factor analysis in educational research. *Practical Assessment, Research and Evaluation*, *18*(6), 1–13. https://doi.org/10.7275/qv2q-rk76

Belland, B. R. (2016). *Instructional Scaffolding in STEM Education*. *Instructional Scaffolding in STEM Education*. Springer International Publishing. https://doi.org/10.1007/978-3-319-02565-0

Belland, B. R., Gu, J., Armbrust, S., & Cook, B. (2015). Scaffolding argumentation about water quality: A mixed-method study in a rural middle school. *Educational Technology Research and Development*, *63*(3), 325–353. https://doi.org/10.1007/s11423-015-9373-x

Belland, B. R., Kim, C. M., & Hannafin, M. J. (2013). A framework for designing scaffolds that improve motivation and cognition. *Educational Psychologist*, *48*(4), 243–270. https://doi.org/10.1080/00461520.2013.838920

Belland, B. R., Walker, A. E., & Kim, N. J. (2017). A Bayesian network meta-analysis to synthesize the influence of contexts of scaffolding use on cognitive outcomes in STEM education. *Review of Educational Research*, *87*(6), 1042–1081. https://doi.org/10.3102/0034654317723009

Belland, B. R., Walker, A. E., Kim, N. J., & Lefler, M. (2017). Synthesizing results from empirical research on computer-based scaffolding in STEM education: A meta-analysis. *Review of Educational Research*, *87*(2), 309–344.

https://doi.org/10.3102/0034654316670999

Berenji, S., Saeidi, M., & Ghafoori, N. (2020). The effect of problem-based learning with hard scaffolds on Iranian EFL learners' reading comprehension. *Journal of Language and Translation*, *10*(2), 121–133.

Biesta, G., Priestley, M., & Robinson, S. (2015). The role of beliefs in teacher agency. *Teachers and Teaching: Theory and Practice*, *21*(6), 624–640. https://doi.org/10.1080/13540602.2015.1044325

Biesta, G., Priestley, M., & Robinson, S. (2017). Talking about education: exploring the significance of teachers' talk for teacher agency. *Journal of Curriculum Studies*, *49*(1), 38–54. https://doi.org/10.1080/00220272.2016.1205143

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00282-x

Brunton, G., Harden, A., Oakley, A., & Brunton, G. (2007). Evidence for policy and practice information and co-ordinating centre. In *Evidence in Education Linking Research and Policy*. Organisation for Economic Co-Operation and Development.

Buck, G. A., & Trauth-Nare, A. E. (2009). Preparing teachers to make the formative assessment process integral to science teaching and learning. *Journal of Science Teacher Education*, *20*(5), 475–494. https://doi.org/10.1007/s10972-009-9142-y

Bujang, M. A., Ghani, P. A., Soelar, S. A., & Zulkifli, N. A. (2012). Sample size guideline for exploratory factor analysis when using small sample: Taking into considerations of different measurement scales. In *ICSSBE 2012 - Proceedings, 2012 International Conference on Statistics in Science, Business and Engineering: "Empowering Decision Making with Statistical Sciences"* (pp. 447–451). IEEE. https://doi.org/10.1109/ICSSBE.2012.6396605

Burgess, T. (2012). How does teacher knowledge in statistics impact on teacher listening? In J. Dindyal, L. P. Cheng, & S. F. Ng (Eds.), *Mathematics education: Expanding horizons. Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia* (pp. 146–153). Singapore.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology and Society*, *13*(4), 63–73.

Chen, J. J., & Adams, C. B. (2023). Drawing from and expanding their toolboxes: Preschool teachers' traditional strategies, unconventional opportunities, and novel challenges in scaffolding young children's social and emotional learning during remote instruction amidst COVID-19. *Early Childhood Education Journal*, *51*(5), 925–937. https://doi.org/10.1007/s10643-022-01359-6

Chen, W., Rovegno, I., Cone, S. L., & Cone, T. P. (2012). An accomplished teacher's use of scaffolding during a second-grade unit on designing games. *Research Quarterly for Exercise and Sport*, *83*(2), 221–234. https://doi.org/10.1080/02701367.2012.10599853

Chernikova, O., Heitzmann, N., Fink, M. C., Timothy, V., Seidel, T., & Fischer, F.

(2020). Facilitating diagnostic competences in higher education — A meta-analysis in medical and teacher education. *Educational Psychology Review*, *32*, 157–196. Retrieved from https://doi.org/10.1007/s10648-019-09492

Cho, M. H., & Cho, Y. J. (2016). Online instructors' use of scaffolding strategies to promote interactions: A scale development study. *International Review of Research in Open and Distance Learning*, *17*(6), 108–120. https://doi.org/10.19173/irrodl.v17i6.2816

Cho, M. K., & Kim, M. K. (2020). Investigating elementary students' problem solving and teacher scaffolding in solving an Ill-structured problem. *International Journal of Education in Mathematics, Science and Technology*, *8*(4), 274–289. https://doi.org/10.46328/IJEMST.V8I4.1148

Choo, S. S. Y., Rotgans, J. I., Yew, E. H. J., & Schmidt, H. G. (2011). Effect of worksheet scaffolds on student learning in problem-based learning. *Advances in Health Sciences Education*, *16*(4), 517–528. https://doi.org/10.1007/s10459-011-9288-1

Christ, T., & Wang, X. C. (2013). Exploring a community of practice model for professional development to address challenges to classroom practices in early childhood. *Journal of Early Childhood Teacher Education*, *34*(4), 350–373. https://doi.org/10.1080/10901027.2013.845630

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. Retrieved from http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf

Collie, R. J., Shapka, J. D., & Perry, N. E. (2012). School climate and social-emotional learning: Predicting teacher stress, job satisfaction, and teaching efficacy. *Journal of*

Educational Psychology, *104*(4), 1189–1204. https://doi.org/10.1037/a0029356

Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics*. *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*. https://doi.org/10.4324/9781315044408-14

Cooper, K. S., Kintz, T., & Miness, A. (2016). Reflectiveness, adaptivity, and support: How teacher agency promotes student engagement. *American Journal of Education*, *123*(1), 109–136. https://doi.org/10.1086/688168

Copp, S. B., Cabell, S. Q., & Invernizzi, M. A. (2019). Kindergarten teachers' use of writing scaffolds to support children's developing orthographic knowledge. *Literacy Research and Instruction*, *58*(3), 164–183. https://doi.org/10.1080/19388071.2019.1617374

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation*, *10*(7). https://doi.org/10.7275/jyj1-4868

Creswell, J. W. (2014). *Research design: Qualitiative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications. https://doi.org/10.5539/elt.v12n5p40

Culp-Roche, A., Hardin-Fanning, F., Tartavoulle, T., Hampton, D., Hensley, A., Wilson, J. L., & Wiggins, A. T. (2021). Perception of online teacher self-efficacy: A multi-state study of nursing faculty pivoting courses during COVID 19. *Nurse Education Today*, *106*(July), 1–5. https://doi.org/10.1016/j.nedt.2021.105064

Daniel, S. M., Martin-Beltrán, M., Peercy, M. M., & Silverman, R. (2016). Moving beyond yes or no: Shifting from over-scaffolding to contingent scaffolding in

literacy instruction with emergent bilingual students. *TESOL Journal*, *7*(2), 393–420. https://doi.org/10.1002/tesj.213

Danielson, C. (2008). *The Handbook for Enhancing Professional Practice: Using the Framework for Teaching in Your School*. ASCD.

de Oliveira, L. C., & Athanases, S. Z. (2017). A Framework to reenvision instructional scaffolding for linguistically diverse learners. *Journal of Adolescent and Adult Literacy*, *61*(2), 123–129. https://doi.org/10.1002/jaal.663

Delen, I., & Krajcik, J. (2018). Synergy and Students' Explanations: Exploring the Role of Generic and Content-Specific Scaffolds. *International Journal of Science and Mathematics Education*, *16*(1), 1–21. https://doi.org/10.1007/s10763-016-9767-1

Demirkol, T. (2022). Challenges of providing learners with scaffolding during synchronous online EFL teaching. *Journal of Theoretical Educational Science*, *15*(2), 287–306. https://doi.org/10.30831/akukeg.994322

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley & Sons, Inc. https://doi.org/10.1002/chp.20083

Dingle, M. P., Brownell, M. T., Leko, M. M., Boardman, A. G., & Haager, D. (2011). Developing effective special education reading teachers: The influence of professional development, context, and individual qualities. *Learning Disability Quarterly*, *34*(1), 87–103. https://doi.org/10.1177/073194871103400106

Dolighan, T., & Owen, M. (2021). Teacher efficacy for online teaching during the COVID-19 pandemic. *Brock Education Journal*, *30*(1), 95. https://doi.org/10.26522/brocked.v30i1.851

Dominguez, S., & Svihla, V. (2023). A review of teacher implemented scaffolding in K-12. *Social Sciences and Humanities Open*, *8*(1), 100613. https://doi.org/10.1016/j.ssaho.2023.100613

Dominguez, S., & Svihla, V. (2024). Development of the survey of teacher-implemented scaffolding. *International Journal of Research in Education and Science*, *10*(1), 138–160. https://doi.org/10.46328/ijres.3335

Doo, M. Y., Bonk, C., & Heo, H. (2020). A meta-analysis of scaffolding effects in online learning in higher education. *The International Review of Research in Open and Distributed Learning*, *21*(3), 60–80. https://doi.org/10.19173/irrodl.v21i3.4638

Dove, A., & Hollenbrands, K. (2014). Teachers' scaffolding of students' learning of geometry while using a dynamic geometry program. *International Journal of Mathematical Education in Science and Technology*, *45*(5), 668–681. https://doi.org/10.1080/0020739X.2013.868540

Dunn, K. E., Airola, D. T., Lo, W. J., & Garrison, M. (2013). Becoming data driven: The influence of teachers sense of efficacy on concerns related to data-driven decision making. *Journal of Experimental Education*, *81*(2), 222–241. https://doi.org/10.1080/00220973.2012.699899

EBSCO Connect. (2019). What is the apply equivalent subjects expander? Retrieved from https://connect.ebsco.com/s/article/What-is-the-Apply-Equivalent-Subjects-expander?language=en_US

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962–1023. https://doi.org/10.1086/231294

Fabrigar, L. R., Wegener, D. T., Maccallum, R. C., & Strahan, E. J. (1999). Evaluating

the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272–299. https://doi.org/https://doi/10.1037/1082-989X.4.3.272

Finch, W. H. (2013). Exploratory factor analysis. *Handbook of Quantitative Methods for Educational Research*, 167–186. https://doi.org/10.1007/978-94-6209-404-8

Flick, L. B. (2000). Cognitive scaffolding that fosters scientific inquiry in middle level science. *Journal of Science Teacher Education*, *11*(2), 109–129. https://doi.org/10.1023/A

Frederick, M. L., Courtney, S., & Caniglia, J. (2014). With a little help from my friends: Scaffolding techniques in problem solving. *Investigations in Mathematics Learning*, *7*(2), 21–32. https://doi.org/10.1080/24727466.2014.11790340

Freer, P. K. (2009). Focus on scaffolding language and sequential units during choral instruction. *Update: Applications of Research in Music Education*, *28*(1), 33–40. https://doi.org/10.1177/8755123309344327

Friedman, I. A., & Kass, E. (2002). Teacher self-efficacy: A classroom-organization conceptualization. *Teaching and Teacher Education*, *18*(6), 675–686. https://doi.org/10.1016/S0742-051X(02)00027-6

Fu, G., & Clarke, A. (2021). The development and impact of teachers' collective agency during Covid-19: insights from online classrooms in Canada and China. *Educational Review*, *74*(3), 1–21. https://doi.org/10.1080/00131911.2021.1997921

Fullerton, S. K., McCrea-Andrews, H., & Robson, K. (2015). Using a scaffolded multi-component intervention to support the reading and writing development of English learners. *I.E.: Inquiry in Education*, *7*(1). Retrieved from https://files.eric.ed.gov/fulltext/EJ1171670.pdf

Gabriele, A. J., & Joram, E. (2007). Teachers' reflections on their reform-based teaching in mathematics: Implications for the development of teacher self-efficacy. *Action in Teacher Education*, *29*(3), 60–74. https://doi.org/10.1080/01626620.2007.10463461

Ge, X., Law, V., & Huang, K. (2012). Diagnosis, supporting, and fading: A scaffolding design framework for adaptive e-learning systems. In *Interactivity in E-Learning: Case Studies and Frameworks* (pp. 116–142). IGI Global. https://doi.org/https://doi.org/10.4018/978-1-61350-441-3.ch006

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569–582. https://doi.org/10.1037/0022-0663.76.4.569

Golden-Biddle, K., & Locke, K. (2006). *Composing qualitative research* (2nd ed.). Sage Publications. https://doi.org/10.4135/9781412983709

González, G., & DeJarnette, A. F. (2015). Teachers' and students' negotiation moves when teachers Scaffold group work. *Cognition and Instruction*, *33*(1), 1–45. https://doi.org/10.1080/07370008.2014.987058

Gopaldas, A. (2016). A front-to-back guide to writing a qualitative research article. *Qualitative Market Research*, *19*(1), 115–121. https://doi.org/10.1108/QMR-08-2015-0074

Greene, J. C., Carcelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, *11*(3), 255–274. https://doi.org/10.3102/01623737011003255

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin*, *103*(2), 265–275.

https://doi.org/10.1037/0033-2909.103.2.265

Gudmundsdottir, G. B., & Hathaway, D. M. (2020). “We always make it work”: Teachers’ agency in the time of crisis. *Journal of Technology and Teacher Education*, *28*(2), 239–250. Retrieved from https://www.learntechlib.org/p/216242/

Guo, Y., Connor, C. M. D., Yang, Y., Roehrig, A. D., & Morrison, F. J. (2012). The effects of teacher qualification, teacher self-efficacy, and classroom practices on fifth graders’ literacy outcomes. *Elementary School Journal*, *113*(1), 3–24. https://doi.org/10.1086/665816

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching & Teacher Education*, *4*(1), 63–69. https://doi.org/10.1016/0742-051x(88)90025-x

Hammer, D., & Berland, L. K. (2014). Confusing claims for data: A critique of common practices for presenting qualitative research on learning. *Journal of the Learning Sciences*, *23*(1), 37–46. https://doi.org/10.1080/10508406.2013.802652

Hammond, J., & Gibbons, P. (2005). *What is scaffolding? Teachers’ Voices 8: Explicitly Supporting Reading and Writing in the Classroom*. Retrieved from http://www.ameprc.mq.edu.au/docs/research_reports/teachers_voices/Teachers_voices_8.pdf#page=15

Hausfather, S. J. (1996). Vygotsky and schooling: Creating a social context for learning. *Action in Teacher Education*, *18*(2), 1–10. https://doi.org/10.1080/01626620.1996.10462828

He, Y. (2014). Universal design for learning in an online teacher education course: Enhancing learners’ confidence to teach online. *MERLOT Journal of Online*

Learning and Teaching, *10*(2), 283–298. Retrieved from https://jolt.merlot.org/vol10no2/he_0614.pdf

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause*, 1–12. Retrieved from http://hdl.handle.net/10919/104648

Hogarty, K. Y., Hines, C. V., Kromrey, J. D., Perron, J. M., & Mumford, A. K. R. (2005). The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. *Educational and Psychological Measurement*, *65*(2), 202–226. https://doi.org/10.1177/0013164404267287

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, *105*(3), 774–786. https://doi.org/10.1037/a0032198

Howe, C. (2013). Scaffolding in context: Peer interaction and abstract learning. *Learning, Culture and Social Interaction*, *2*(1), 3–10. https://doi.org/10.1016/j.lcsi.2012.12.005

Jadallah, M., Anderson, R. C., Nguyen-Jahiel, K., Miller, B. W., Kim, I. H., Kuo, L. J., … Wu, X. (2011). Influence of a teacher's scaffolding moves during child-led small-group discussions. *American Educational Research Journal*, *48*(1), 194–230. https://doi.org/10.3102/0002831210371498

Johnson, E. (2021). Contingency in context: A study of exemplary reading teachers' use of planned scaffolds in secondary English classes with emergent bilinguals. *Reading and Writing Quarterly*, *37*(3), 260–278. https://doi.org/10.1080/10573569.2020.1776654

Johnson, E. M. (2019). Choosing and using interactional scaffolds: How teachers' moment-to-moment supports can generate and sustain emergent bilinguals' engagement with challenging English texts. *Research in the Teaching of English*, *53*(3), 245–269. https://doi.org/10.58680/rte201930036

Jones, A. L., & Kessler, M. A. (2020). Teachers' emotion and identity work during a pandemic. *Frontiers in Education*, *5*. https://doi.org/10.3389/feduc.2020.583775

Jung, K. G. (2019). Learning to scaffold science academic language: Lessons from an instructional coaching partnership. *Research in Science Education*, *49*(4), 1013–1024. https://doi.org/10.1007/s11165-019-9851-y

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575

Kang, H., Thompson, J., & Windschitl, M. (2014). Creating opportunities for students to show what they know: The role of scaffolding in assessment tasks. *Science Education*, *98*(4), 674–704. https://doi.org/10.1002/sce.21123

Kast, J., Lindner, K. T., Gutschik, A., & Schwab, S. (2021). Austrian teachers' attitudes and self-efficacy beliefs regarding at-risk students during home learning due to COVID-19. *European Journal of Special Needs Education*, *36*(1), 114–126. https://doi.org/10.1080/08856257.2021.1872849

Kauppinen, M., Kainulainen, J., Hökkä, P., & Vähäsantanen, K. (2020). Professional agency and its features in supporting teachers' learning during an in-service education programme. *European Journal of Teacher Education*, *43*(3), 384–404. https://doi.org/10.1080/02619768.2020.1746264

Kayi-Aydar, H. (2013). Scaffolding language learning in an academic ESL classroom.

ELT Journal, *67*(3), 324–335. https://doi.org/10.1093/elt/cct016

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education*, *63*(3), 185–200. https://doi.org/10.1177/0022487111433651

Keum, S., Cho, Y. H., Huh, S. Y., & Kim, M. (2021). Types and influence factors of teacher agency in online classes during the COVID-19 pandemic. *Journal of Educational Technology*, *37*(2), 161–190. https://doi.org/10.17232/kset.37.2.161

Kim, L. E., Oxley, L., & Asbury, K. (2022). "My brain feels like a browser with 100 tabs open": A longitudinal study of teachers' mental health and well-being during the COVID-19 pandemic. *British Journal of Educational Psychology*, *92*(1), 299–318. https://doi.org/10.1111/bjep.12450

Kim, M. C., & Hannafin, M. J. (2011). Scaffolding 6th graders' problem solving in technology-enhanced science classrooms: A qualitative case study. *Instructional Science*, *39*(3), 255–282. https://doi.org/10.1007/s11251-010-9127-4

Kim, Y. (2010). Scaffolding through questions in upper elementary ELL learning. *Literacy Teaching and Learning*, *15*, 109–136. Retrieved from https://files.eric.ed.gov/fulltext/EJ910116.pdf

Kohnen, A. M., & Whitacre, M. P. (2017). What makes professional development coherent? Uncovering teacher perspectives on a science literacy project. *Action in Teacher Education*, *39*(4), 414–431. https://doi.org/10.1080/01626620.2017.1336130

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2021). Sustaining a sense of success: The protective role of teacher working conditions during the COVID-19 pandemic.

Journal of Research on Educational Effectiveness, *14*(4), 727–769. https://doi.org/10.1080/19345747.2021.1938314

Lajoie, S. P. (2005). Extending the scaffolding metaphor. *Instructional Science*, *33*, 541–557. https://doi.org/10.1007/s11251-005-1279-2

Learning Sciences International. (2013). *Developing a Passion for Professional Teaching: The Marzano Teaching Evaluation Manual*. Retrieved from https://www.learningsciences.com/wp/wp-content/uploads/2018/05/The-Marzano-Teacher-Evaluation-Model.pdf

Lee, M. H., & Tsai, C. C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science*, *38*(1), 1–21. https://doi.org/10.1007/s11251-008-9075-4

Lee, P. A., & Schmitt, M. C. (2014). Teacher language scaffolds the development of independent strategic reading activities and metacognitive awareness in emergent readers. *Reading Psychology*, *35*(1), 32–57. https://doi.org/10.1080/02702711.2012.674477

Leech, N. L., Gullett, S., Cummings, M. H., & Haug, C. A. (2022). The challenges of remote K–12 education during the COVID-19 pandemic: Differences by grade level. *Online Learning Journal*, *26*(1), 245–267. https://doi.org/10.24059/olj.v26i1.2609

Liang, L. A. (2011). Scaffolding middle school students' comprehension and response to short stories. *RMLE Online*, *34*(8), 1–16. https://doi.org/10.1080/19404476.2011.11462081

Lin, T. C., Hsu, Y. S., Lin, S. S., Changlai, M. L., Yang, K. Y., & Lai, T. L. (2012). A

review of empirical evidence on scaffolding for science education. *International Journal of Science and Mathematics Education*, *10*(2), 437–455. https://doi.org/10.1007/s10763-011-9322-z

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications. https://doi.org/10.1016/0147-1767(85)90062-8

Lloret, S., Ferreres, A., & Tomás, A. H. e. I. (2017). The exploratory factor analysis of items: Guided analysis based on empirical data and software. *Anales de Psicología / Annals of Psychology*, *33*(2), 417–432. https://doi.org/10.6018/analesps.33.2.270211

Lockton, M., Weddle, H., & Datnow, A. (2019). When data don't drive: Teacher agency in data use efforts in low-performing schools. *School Effectiveness and School Improvement*, *0*(0), 1–23. https://doi.org/10.1080/09243453.2019.1647442

Lutz, S. L., Guthrie, J. T., & Davis, M. H. (2006). Scaffolding for engagement in elementary school reading instruction. *Journal of Educational Research*, *100*(1), 3–20. https://doi.org/10.3200/JOER.100.1.3-20

Ma, K., Chutiyami, M., Zhang, Y., & Nicoll, S. (2021). Online teaching self-efficacy during COVID-19: Changes, its associated factors and moderators. *Education and Information Technologies*, *26*(6), 6675–6697. https://doi.org/10.1007/s10639-021-10486-3

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, *4*(1), 84–99. https://doi.org/10.1037/1082-989X.4.1.84

MacIntyre, P. D., Gregersen, T., & Mercer, S. (2020). Language teachers' coping strategies during the Covid-19 conversion to online teaching: Correlations with

stress, wellbeing and negative emotions. *System*, *94*, 1–13. https://doi.org/10.1016/j.system.2020.102352

Maloch, B. (2004). On the road to literature discussion groups: Teacher scaffolding during preparatory experiences. *Reading Research and Instruction*, *44*(2), 1–20. https://doi.org/10.1080/19388070409558424

Marshall, J. C., Smart, J., & Alston, D. M. (2016). Development and validation of Teacher Intentionality of Practice Scale (TIPS): A measure to evaluate and scaffold teacher effectiveness. *Teaching and Teacher Education*, *59*, 159–168. https://doi.org/10.1016/j.tate.2016.05.007

Martin, N. D., Dornfeld Tissenbaum, C., Gnesdilow, D., & Puntambekar, S. (2019). Fading distributed scaffolds: the importance of complementarity between teacher and material scaffolds. *Instructional Science*, *47*(1), 69–98. https://doi.org/10.1007/s11251-018-9474-0

McMullen, M. B. (1999). Characteristics of teachers who talk the DAP talk and walk the DAP walk. *Journal of Research in Childhood Education*, *13*(2), 216–230. https://doi.org/10.1080/02568549909594742

McNeil, L. (2012). Using talk to scaffold referential questions for English language learners. *Teaching and Teacher Education*, *28*(3), 396–404. https://doi.org/10.1016/j.tate.2011.11.005

McNeill, K. L., & Krajcik, J. (2009). Synergy between teacher practices and curricular scaffolds to support students in using domain-specific and domain-general knowledge in writing arguments to explain phenomena. *Journal of the Learning Sciences*, *18*(3), 416–460. https://doi.org/10.1080/10508400903013488

McNeill, K. L., Lizotte, D. J., Krajcik, J. S., & Marx, R. W. (2006). Supporting students' construction of scientific explanations by fading scaffolds in instructional materials. *The Journal of the Learning Sciences*, *15*(2), 153–191. https://doi.org/10.1207/s15327809jls1502

McNiff, J., & Aicher, T. J. (2017). Understanding the challenges and opportunities associated with online learning: A scaffolding theory approach. *Sport Management Education Journal*, *11*(1), 13–23. https://doi.org/10.1123/smej.2016-0007

Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal*, *30*(3), 359–377. https://doi.org/10.1080/0141192041000168968 9

Micceri, T. (1989). The unicorn, the normal curve, and other improbable creatures. *Psychological Bulletin*, *105*(1), 156–166. https://doi.org/10.1037/0033-2909.105.1.156

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … PRISMA-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (prisma-p) 2015 statement. *Systematic Reviews*, *4*(1), 1–9.

Mojarrabi Tabrizi, H., Behnam, B., Saeidi, M., & Lu, X. (2019). The effect of soft vs. hard scaffolding on reading comprehension skill of EFL learners in different experimental conditions. *Cogent Education*, *6*(1), 1–13. https://doi.org/10.1080/2331186X.2019.1631562

Molla, T., & Nolan, A. (2020). Teacher agency and professional practice. *Teachers and Teaching: Theory and Practice*, *26*(1), 67–87. https://doi.org/10.1080/13540602.2020.1740196

Murphy, N., & Messer, D. (2000). Differential benefits from scaffolding and children working alone. *Educational Psychology*, *20*(1), 17–31. https://doi.org/10.1080/014434100110353

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, *14*(3). https://doi.org/10.5812/sdme.67670

Narayanan, M., & Ordynans, J. G. (2022). Meaning making and self-efficacy: Teacher reflections through COVID-19. *Teacher Educator*, *57*(1), 26–44. https://doi.org/10.1080/08878730.2021.1990455

National Center for Education Statistics. (n.d.). Characteristics of public school teachers. Retrieved from https://nces.ed.gov/programs/coe/indicator/clr

Nunn, G. D., Jantz, P. B., & Butikofer, C. (2009). Concurrent validity between teacher efficacy and perceptions of response to intervention outcomes. *Journal of Instructional Psychology*, *36*(3), 215–218. Retrieved from https://eric.ed.gov/?id=EJ952271

O'Connor, R. E., Sanchez, V. M., Jones, B. T., Suchlit, L., Youkhanna, V., Beach, K. D., & Widaman, K. (2021). Systematic CHAAOS: Teaching Vocabulary in English/Language Arts Special Education Classes in Middle School. *Journal of Learning Disabilities*, *54*(3), 187–202. https://doi.org/10.1177/0022219420922839

Oh, S. Y. (2000). Actually and in fact in American English: A data-based analysis. *English Language and Linguistics*, *4*(2), 243–268. https://doi.org/10.1017/S1360674300000241

Palincsar, A. S. (1998). Keeping the metaphor of scaffolding fresh - A response to C.

Addison Stone's "The metaphor of scaffolding: Its utility for the field of learning disabilities." *Journal of Learning Disabilities*, *31*(4), 370–373. https://doi.org/10.1177/002221949803100406

Pata, K., Lehtinen, E., & Sarapuu, T. (2006). Inter-relations of tutor's and peers' scaffolding and decision-making discourse acts. *Instructional Science*, *34*(4), 313–341. https://doi.org/10.1007/s11251-005-3406-5

Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *Journal of the Learning Sciences*, *13*(3), 423–451. https://doi.org/10.1207/s15327809jls1303

Peregoy, S. F., & Boyle, O. F. (1999). Multiple embedded scaffolds: Support for English speakers in a two-way Spanish immersion kindergarten. *Bilingual Research Journal*, *23*(2–3), 135–146. https://doi.org/10.1080/15235882.1999.10668683

Pratt, M. W., & Savoy-Levine, K. M. (1998). Contingent tutoring of long-division skills in fourth and fifth graders: Experimental tests of some hypotheses about scaffolding. *Journal of Applied Developmental Psychology*, *19*(2), 287–304. https://doi.org/10.1016/S0193-3973(99)80041-0

Priestley, M., Edwards, R., Priestley, A., & Miller, K. (2012). Teacher agency in curriculum making: Agents of change and spaces for manoeuvre. *Curriculum Inquiry*, *42*(2), 191–214. https://doi.org/10.1111/j.1467-873X.2012.00588.x

Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational Psychologist*, *40*(1), 1–12. https://doi.org/10.1207/s15326985ep4001

Putman, S. M. (2012). Investigating teacher efficacy: Comparing preservice and inservice

teachers with different levels of experience. *Action in Teacher Education*, *34*(1), 26–40. https://doi.org/10.1080/01626620.2012.642285

Reigosa, C., & Jiménez-Aleixandre, M. P. (2007). Scaffolded problem-solving in the physics and chemistry laboratory: Difficulties hindering students' assumption of responsibility. *International Journal of Science Education*, *29*(3), 307–329. https://doi.org/10.1080/09500690600702454

Reynolds, D. (2017). Interactional scaffolding for reading comprehension. *Literacy Research: Theory, Method, and Practice*, *66*(1), 135–156. https://doi.org/10.1177/2381336917718820

Robinia, K. A., & Anderson, M. L. (2010). Online teaching efficacy of nurse faculty. *Journal of Professional Nursing*, *26*(3), 168–175. https://doi.org/10.1016/j.profnurs.2010.02.006

Rodgers, E. (2017). Scaffolding Word Solving While Reading: New Research Insights. *Reading Teacher*, *70*(5), 525–532. https://doi.org/10.1002/trtr.1548

Rodgers, E., D'Agostino, J. V., Harmey, S. J., Kelly, R. H., & Brownfield, K. (2016). Examining the Nature of Scaffolding in an Early Literacy Intervention. *Reading Research Quarterly*, *51*(3), 345–360. https://doi.org/10.1002/rrq.142

Rodgers, E. M. (2004). Interactions that scaffold reading performance. *Journal of Literacy Research*, *36*(4), 501–532. https://doi.org/10.1207/s15548430jlr3604_4

Russell, D. W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in Personality and Social Psychology Bulletin. *Personality and Social Psychology Bulletin*, *28*(12), 1629–1646. https://doi.org/10.1177/014616702237645

Saldaña, J. (2009). *The Coding Manual for Qualitative Researchers*. SAGE Publications.

Samuels, P. (2016). Advice on exploratory factor analysis. *Centre for Academic Success, Birmingham City University*, (June), 2. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77–96. https://doi.org/10.1007/BF02505026

Schegloff, E. A. (1993). Reflections on quantification in the study of conversation. *Research on Language and Social Interaction*, *26*(1), 99–128. https://doi.org/10.1207/s15327973rlsi2601_5

Schnitzler, K., Holzberger, D., & Seidel, T. (2021). All better than being disengaged: Student engagement patterns and their relations to academic self-concept and achievement. *European Journal of Psychology of Education*, *36*(3), 627–652. https://doi.org/10.1007/s10212-020-00500-6

Schultz, R. (2012). A critical examination of the teaching methodologies pertaining to distance learning In geographic education: Andragogy in an adult online certificate program. *Review of International Geographical Education Online*, *2*(1), 45–60. Retrieved from https://dergipark.org.tr/en/pub/rigeo/issue/11186/133636

Schultz, R. B., & DeMers, M. N. (2020). Transitioning from emergency remote learning to deep online learning experiences in geography education. *Journal of Geography*, *119*(5), 142–146. https://doi.org/10.1080/00221341.2020.1813791

Schumacker, R. E. (2015). *Learning Statistics Using R*. SAGE Publications Inc. https://doi.org/10.4135/9781506300160

Sewell, W. H. J. (1992). A theory of structure : Duality, agency, and transformation.

American Journal of Sociology, *98*(1), 1–29. https://doi.org/10.1086/229967

Shaari, I. (2020). Lateral networks of teachers in a centralised education system: Structures, processes, and development of teacher agency. *Asia Pacific Journal of Education*, *40*(4), 516–532. https://doi.org/10.1080/02188791.2020.1838879

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63–75. https://doi.org/10.3233/EFI-2004-22201

Shin, S., Brush, T. A., & Glazewski, K. D. (2020). Examining the hard, peer, and teacher scaffolding framework in inquiry-based technology-enhanced learning environments: impact on academic achievement and group performance. *Educational Technology Research and Development*, (0123456789). https://doi.org/10.1007/s11423-020-09763-8

Shin, S., Brush, T. A., Glazewski, K. D., Shin, S., Brush, T. A., & Glazewski, K. D. (2017). Designing and implementing web-based scaffolding tools for technology-enhanced socioscientific inquiry. *International Forum of Educational Technology & Society*, *20*(1), 1–12. Retrieved from https://www.ds.unipi.gr/et&s/journals/20_1/1.pdf

Sims, R., Dobbs, G., & Hand, T. (2002). Enhancing quality in online learning: Scaffolding planning and design through proactive evaluation. *Distance Education*, *23*(2), 135–148. https://doi.org/10.1080/0158791022000009169

Slavin, R. E. (2015). Cooperative learning in elementary schools. *Education 3-13*, *43*(1), 5–14. https://doi.org/10.1080/03004279.2015.963370

Sokal, L., Trudel, L. E., & Babb, J. (2020). Canadian teachers' attitudes toward change,

efficacy, and burnout during the COVID-19 pandemic. *International Journal of Educational Research Open*, *1*, 100016. https://doi.org/10.1016/j.ijedro.2020.100016

Songer, N. B., Shah, A. M., & Fick, S. (2013). Characterizing teachers' verbal scaffolds to guide elementary students' creation of scientific explanations. *School Science and Mathematics*, *113*(7), 321–332. https://doi.org/10.1111/ssm.12036

Stone, C. A. (1998a). Should we salvage the scaffolding metaphor? *Journal of Learning Disabilities*, *31*(4), 409–413. https://doi.org/10.1177/002221949803100411

Stone, C. A. (1998b). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal of Learning Disabilities*, *31*(4), 344–364. https://doi.org/10.1177/002221949803100404

Streiner, D. L. (2003). *A guide for the statistically perplexed: Selected readings for clinical researchers*. Canadian Psychiatric Association. https://doi.org/10.1177/070674379403900303

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Allyn and Bacon.

Tanis, C. J. (2020). The seven principles of online learning: Feedback from faculty and alumni on its importance for teaching and learning. *Research in Learning Technology*, *28*(1063519), 1–25. https://doi.org/10.25304/rlt.v28.2319

Teruya, J. (2023). Pedagogy in a pandemic: Responsibilisation and agency in the (re)making of teachers. *Pedagogy, Culture and Society*, *31*(1), 185–201. https://doi.org/10.1080/14681366.2021.1898044

Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge University Press.

https://doi.org/10.1017/cbo9781139173698

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, *8*, 1–10. https://doi.org/10.1186/1471-2288-8-45

Thumvichit, A. (2021). English language teaching in times of crisis: Teacher agency in response to the pandemic-forced online education. *Teaching English with Technology*, *21*(2), 14–37. Retrieved from https://eric.ed.gov/?id=EJ1293795

Toom, A., Pyhältö, K., & Rust, F. O. (2015). Teachers professional agency in contradictory times. *Teachers and Teaching: Theory and Practice*, *21*(6), 615–623. https://doi.org/10.1080/13540602.2015.1044334

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, *14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Trust, T., & Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education*, *28*(2), 189–199. Retrieved from https://eric.ed.gov/?id=EJ1257153

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202–248. https://doi.org/10.3102/00346543068002202

Tsouloupas, C. N., Carson, R. L., Matthews, R., Grawitch, M. J., & Barber, L. K. (2010). Exploring the association between teachers' perceived student misbehaviour and emotional exhaustion: The importance of teacher efficacy beliefs and emotion

regulation. *Educational Psychology*, *30*(2), 173–189. https://doi.org/10.1080/01443410903494460

Turner, J. C., Cox, K. E., DiCintio, M., Meyer, D. K., Logan, C., & Thomas, C. T. (1998). Creating contexts for involvement in mathematics. *Journal of Educational Psychology*, *90*(4), 730–745. https://doi.org/10.1037/0022-0663.90.4.730

Urhahne, D., & Wijnia, L. (2021). A review on the accuracy of teacher judgments. *Educational Research Review*, *32*, 100374. https://doi.org/10.1016/j.edurev.2020.100374

Vähäsantanen, K. (2015). Professional agency in the stream of change: Understanding educational change and teachers' professional identities. *Teaching and Teacher Education*, *47*, 1–12. https://doi.org/10.1016/j.tate.2014.11.006

van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296. https://doi.org/10.1007/s10648-010-9127-6

Velicer, W. F., & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. *Psychological Methods*, *3*(2), 231–251. https://doi.org/10.1037/1082-989X.3.2.231

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* (M. Cole, Ed.). Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Wallen, M., & Tormey, R. (2019). Developing teacher agency through dialogue. *Teaching and Teacher Education*, *82*, 129–139. https://doi.org/10.1016/j.tate.2019.03.014

Walsh, D., & Downe, S. (2005). Meta-synthesis method for qualitative research: A literature review. *Journal of Advanced Nursing*, *50*(2), 204–211. https://doi.org/10.1111/j.1365-2648.2005.03380.x

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Weißenfels, M., Klopp, E., & Perels, F. (2022). Changes in teacher burnout and self-efficacy during the COVID-19 pandemic: Interrelations and e-learning variables related to change. *Frontiers in Education*, *6*, 1–9. https://doi.org/10.3389/feduc.2021.736992

Wisdom, J., & Creswell, J. W. (2013). *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*. Rockville, MS: Agency for Healthcare Research and Quality. Retrieved from www.ahrq.gov

Wollman-Bonilla, J. E., & Werchadlo, B. (1999). Teacher and peer roles in scaffolding first graders' responses to literature. *Reading Teacher*, *52*(6), 598–608. Retrieved from https://www.jstor.org/stable/20202133

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, *17*(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Wood, R., & Bandura, A. (1989). Social cognitive theory of organizational management. *Academy of Management Review*, *14*(3), 361–384. https://doi.org/10.5465/amr.1989.4279067

Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and

beliefs about control. *Journal of Educational Psychology*, *82*(1), 81–91. https://doi.org/10.1037/0022-0663.82.1.81

Worthen, B. (2021). *Teacher decision-making in guided reading*. University of Kentucky. Retrieved from uknowledge.uky.edu/edc_etds/35/

Wright, J. M. (2010). Effect of quality matters™ training on faculty's online self-efficacy. *Annual Distance Learning Administration Conference*. Retrieved from http://ksuweb.kennesaw.edu/~jwright/QMTraining_FacultySelf-efficacy_Wright.pdf

Wu, H.-L., & Pedersen, S. (2011). Integrating computer- and teacher-based scaffolds in science inquiry. *Computers & Education*, *57*(4), 2352–2363. https://doi.org/10.1016/j.compedu.2011.05.011

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94. https://doi.org/10.20982/tqmp.09.2.p079

Young, V. M., & Kim, D. H. (2010). Using assesments for instructional improvement. *Education Policy Analysis Archives*, *18*(19), 1–38.

Zangori, L., Forbes, C. T., & Schwarz, C. V. (2015). Exploring the effect of embedded scaffolding within curricular tasks on third-grade students' model-based explanations about hydrologic cycling. *Science and Education*, *24*(7–8), 957–981. https://doi.org/10.1007/s11191-015-9771-9

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being. *Review of Educational Research*, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801

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], which SUPPORTS did you use to help students learn?

Examples provided (10): Materials to be completed (worksheets, graphic organizers, etc.); Supportive materials (cheat sheets, word banks, etc.); Informative materials (rubrics, static written information -such as on the board); Modeling or demonstrating; Rewording, explaining in a different way; Multiple repetitions and examples; Prompts, questioning; Guidance, hints; Feedback; Break down task into smaller steps

- Almost always
- Frequently
- Occasionally
- Seldomly
- Almost never

[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