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Planned Change: Drivers of High Implementation for a Pedagogical Self-Regulated Learning Intervention

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Resourcefulness and adaptability are essential to success in the modern economy; the motivation, metacognition, and cognitive skills required for self-regulated learning (SRL) have never been more important. Unfortunately, teacher-led SRL interventions rarely survive implementation, and teachers' general practices rarely reflect their intention to promote SRL. After discussing the shortcomings of virtual or modularized SRL education, this study explores the drivers of a human-led, communal, pedagogical approach. Data was collected over 3 months and three timepoints from 81 kindergarten to Grade 8 teachers who were genuinely dissatisfied by their status quo practices, ready for change, and largely eager to implement the novel teaching approach presented to them. Building on established theories of planned change implementation, this research shows a minimal effect of teachers' approval of the intervention on implementation. Rather, specific drivers to the implementation of complex, communal pedagogical interventions included the support of high-status supervisors and peers, while identified constraints to implementation included fears regarding management of student behavior.

Keywords: self-regulated learning, implement, enablers and barriers, theory of planned change, metacognition, activated learning

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INTRODUCTION

Self-regulated learning (SRL) is the metacognitive cycle through which an individual monitors challenges, plans and executes strategic responses, and reflects upon the success of their problem solving approach (Pintrich, 2000; Winne and Perry, 2010). Though individual SRL grows from the seed of a learner's unique cognitive qualities, goals, and emotions (Efklides, 2011; National Institutes of Health, 2015), it blossoms through interpersonal interactions (Jarvenoja et al., 2015) and requires teaching that is explicit and frequent to take root across multiple contexts (Dignath et al., 2008b). Thus, self-regulated learning (SRL) is optimized by teachers who offer choice, share control, promote student self- and peer-evaluation, encourage student strategy creation, and focus on process rather than product (Perry et al., 2002).

Recent guidance from the Center for Curriculum Redesign suggests that teachers should focus as much on skills for self-regulated learning (SRL) as on foundational knowledge such as mathematics, literacy, and science (Bialik and Fadel, 2015). Not only is SRL consistently demonstrated by the highest achievers and found to be the most important predictor of learning performance in school (Zimmerman and Martinez-Pons, 1986, 1998; Purdie and Hattie, 1996; Pintrich, 2000; Nota et al., 2004; Schraw et al., 2006; Zimmerman, 2008), it is increasingly considered a survival skill for children who will graduate into the complex and rapidly changing twenty first century context (Wang et al., 1990; Veenman, 2008). Self-regulated learning skills explain over half of all variation in school performance (Visu-Petra et al., 2011) and predict academic functioning

beyond indexes of language or intellectual ability (Espy et al., 2004; Duckworth and Seligman, 2005; Blair and Razza, 2007). In addition, specific dysfunction to the skills associated with SRL, such as organization, attention, or working memory, is common among learners with a wide range of disabilities and disadvantages. Weak executive functions are often observed in individuals with acquired cognitive impairment (Gioia and Isquith, 2004), attention deficit hyperactivity disorder and autism (Ozonoff and Jensen, 1999), fetal alcohol spectrum disorder (Fryer et al., 2007), and learning disabilities (Elliott, 2003; Stein and Krishnan, 2007). Environmentally, these challenges are further exacerbated by over-exposure to screens, lack of exercise, improper sleep or nutrition, sickness (Swing et al., 2010), low socio-economic status, and high levels of familial stress (Southern Education Foundation, 2015).

Though the development of SRL skills is essential, teachers' ability to establish them is highly inconsistent and generally low (Spruce and Bol, 2015). Hundreds of interventions (de Boer et al., 2012) and programs (e.g., see Butler et al., 2016) have been developed to encourage and support SRL, though a consistent impact on classroom practice has not been observed (Kistner et al., 2010; Dignath-van Ewijk et al., 2013; Spruce and Bol, 2015). While virtual, modular, or curricular approaches that can be dropped into classrooms in self-contained formats may be the simplest to implement, *pedagogical* SRL interventions, relying on fundamental change to a teacher's beliefs and behaviors (e.g., Pressley and Gaskins, 2006) may be the most powerful. Research highlights the inter-relationship between teacher affect (Efklides, 2017; Tzohar-Rozen and Kramarski, 2017), teacher-student relationship (Randi, 2017), teacher responsiveness, and the effectiveness of SRL. Others suggest that expanding the practice of learning regulation from "self" to "communal" is a necessary shift for citizens bound for a holistic and integrated world (Schechter, 2017) and may significantly increase the strategic resources available to individuals (Perry et al., 2017). While challenging to establish, human-led pedagogical SRL has advantages that should not be replaced by computer programs or self-contained curriculums. Thus, a complex, social, pedagogical form of SRL teaching (SRT) is particularly important to the goals of public education and also particularly vulnerable to implementation failure.

A review of literature reveals a wide range of factors that drive and constrain the adoption and continued use of new instructional approaches. While the existing scholarship provides general guidance for optimizing implementation, the complex change demanded by pedagogical SRT interventions poses unique challenges. Using qualitative and quantitative data gathered from 81 teachers over three timepoints during the implementation of pedagogical SRT, this paper will contribute specificity to knowledge regarding the factors driving and constraining the implementation of SRT.

The State of Classroom Implementation of SRL Pedagogy

Across service settings, a significant discrepancy exists between practices that have been shown to work and the practices that are actually implemented (Flay et al., 2005; Weisz et al., 2006). In classrooms, *teaching practices that target self-regulated learning* (SRT) are particularly scarce. Even the most well-trained educators do not engage students in formal SRT as often as they say they'd like to (Spruce and Bol, 2015) because, as currently enacted, it is perceived to require constant individual attention, compete with curricular demands, and require an unattainable number of strategy ideas (Winne, 2010). While hundreds of interventions (de Boer et al., 2012) and programs (e.g., see Butler et al., 2016) have been developed to encourage and support SRL, this work has failed to make a cohesive impact on classroom practice (Kistner et al., 2010; Dignath-van Ewijk et al., 2013; Spruce and Bol, 2015). Meta-analyses of self-regulated learning interventions show that researcher-directed interventions, under ideal conditions, are consistently superior to those directed by real teachers who are juggling more priorities (Hattie et al., 1996; Dignath et al., 2008a).

The small amount of SRT that has been observed is often delivered implicitly rather than explicitly (Kistner et al., 2010); students will have a chance to watch a teacher model a strategy, or receive instructions to use a strategy, but are not being prepared to evaluate problems, plan strategies, and monitor success for themselves. Not surprisingly, the teaching of self-regulated learning is often substituted with heavy discipline and reduced expectation (see review in Korpershoek et al., 2016). Regardless of approach, ∼50% of teachers across all educational levels spend more time on classroom behavior support than they think they should (Beaman et al., 2007) and report that it is their greatest challenge (Reinke et al., 2011).

In a general sense, the impact of most interventions is bottlenecked by teachers' acceptance and implementation of the proposed change (Fullan, 2007). In classrooms, where teachers balance high stress, isolation, and intensifying external control (Shahjahan, 2011), implementation gaps persist even after proper training, attentive coaching, and support (Becker et al., 2013). Despite an ever-lengthening list of essential evidence-based teaching practices (Forman et al., 2013) and increasing calls for their use (Spencer et al., 2012; Konstantopoulos, 2014), teachers continue to close their doors and apply teaching approaches that satisfy priorities of their own choosing (Allinder, 1996; Harn et al., 2013).

A Crossroads for SRL Intervention Design

Given the particular challenges associated with the implementation of teaching approaches to support self-regulated learning (SRT), it is not surprising that the state of the art has arrived at a crossroads. The stubbornly slow pace at which classroom instruction changes (Pritchett, 2013) and the proliferate high-tech options available to work around it have precipitated a whole family of SRT initiatives that rely less on teachers. On the face of it, this makes perfect sense. If, indeed, teachers and their pedagogy are so immutable and SRL is such an urgent need, SRL interventions should certainly be delivered via the path of least resistance. Accordingly, many programs designed for classrooms are completely self-enclosed and *modular*, dropped in via computer or through an external interventionist (e.g., Zhang et al., 2014). *Curricular*

interventions, meanwhile, are not so different, involving teachers only as technicians who follow lesson-by-lesson scripted teaching programs (e.g., Menezes et al., 2015). Compared with these, *pedagogical* interventions are considerably more involved. The rarest of all types, these are *approaches* that embed their mechanisms into the unpredictable and complex culture and authentic activities of a classroom over sustained periods of time. This type of intervention aims to make fundamental and lasting change to a teacher's beliefs so he or she can facilitate improved instructional techniques, relationships, and classroom routines (e.g., Pressley and Gaskins, 2006).

In healthcare, this contrast is referred to as "atom-based" vs. "interaction-based," where atom-based interventions are delivered entirely via a pill or capsule and interaction-based interventions rely on messy normative changes through which individuals build knowledge and skill. Scaling an interaction-based intervention often presents challenging problems arising from the unpredictable personal characteristics of and dynamics between human providers and recipients (Fixsen et al., 2017).

Why would anyone chase such a complex form of SRT? In 2017, the Teachers College Record published a specially issued "Yearbook" that explained the deep pedagogical basis of SRT, characterizing its emotional, complex, and context-dependent qualities (Efklides, 2017; Tzohar-Rozen and Kramarski, 2017). A teachers' ability to support unique approaches to problem solving, for example, may rely upon their ability to respond sensitively to student cues such as happiness, satisfaction, surprise, curiosity, confidence, and interest. Another study (Randi, 2017) demonstrated the reciprocal relationship between attentive, adaptive teachers of SRL and their students, suggesting that an embedded, pedagogical approach steadily increases the quality of SRT. This study also highlighted the role played by the physical environment of the classroom, describing the way teachers enact SRT by working sensitively with students to find "synchronicity" with unpredictable or constraining environments. In a discussion of cognitive modeling as a mode of SRT, White (2017) highlighted the myriad dynamic teacher actions that are taken to support SRL at different levels of development, and the corresponding diversity of student responses.

In his paper, *The seductive waltz with the self in self-regulated learning: Toward communal regulation of learning*, Schechter (2017) proposed that self-regulation should evolve toward a more holistic, communal, and integrated framework. He argued that citizens bound to solve problems of the twenty first century, requiring cooperation, negotiation, and teamwork, ought to be trained within similarly complex networks that expand the traditional notion of self-regulation to encompass many selves in a "group dance" of "communally regulated learning." This idea is echoed by others, who suggest that in a diverse and multicultural classroom the sharing of culturally specific thinking approaches that may be, for example, holistic, non-linear, or place-based, might significantly expand the strategic capital of the group (Perry et al., 2017). Open, supportive communities of self-regulation may also be an antidote to the experience of marginalization, which can cause social and emotional withdrawal, struggles with mental health, poor performance, the adoption of maladaptive social behaviors, and low aspirations (Dovidio et al., 2010; Elizalde-Utnick, 2010).

Taken as a whole, this work recognizes the important and interconnected role of teachers, teaching contexts, and groups of students themselves in the process of SRT. Both our conceptualization of SRL, and our interventions, must include the rich physical, social, and emotional ecology of a classroom.

While we have reconfirmed the centrality of SRT to student success and, with some urgency, its particular importance in a changing and volatile global context, we have also realized that it occupies more psychological territory than it has been convenient to focus on with research. Just as self-regulation feeds outcomes such as academic success, relationships, emotions, and affect, it also feeds *upon* those factors; what has previously been classified as "error variance" or "random perturbation" (Winne, 2017) should in fact be considered by our methods, described by our models, and addressed by our interventions. By this logic, good SRT can no longer be of the *modular,* "drag and drop" variety, whittled and reduced to its most simple, controllable, short, and easy to observe units. Similarly, it can no longer be restricted to far-removed *curricula* which, though systematically designed and highly reproducible, are not associated with learning that will stick and transfer (Brown et al., 1981; Veenman, 2007). While these may yield valid and reliable findings, those findings may bear little resemblance to the living, breathing, dynamic *pedagogy* of SRT we now know exists.

Known Enablers of the Implementation of Classroom Practices

Researchers have identified and modeled the key stages and drivers of high-fidelity implementation of evidence-based practices for a variety of service settings. The seminal frameworks established among the National Implementation Network define a 2–4 year implementation process from exploration, to installation, to initial and full implementation, as well as a set of drivers that enable fidelity and persistence among front-line users (Fixsen et al., 2005). These drivers have been subject of ongoing investigation by researchers, policy makers, administrators, and practitioners, who suggest that they emerge from three different realms: those related to organizational structure, leadership quality, and the competence of front-line users (Bertram et al., 2015). Implementation scientists agree that a unique pattern of drivers and constraints tends to emerge according to specific intervention-context combinations (Bertram et al., 2015), and that the identification of these local factors should take place during the preparatory stages of implementation and mitigated prior to the onset of front-line work (Bertram et al., 2011). Historically, teachers' implementation is thought to be most heavily influenced by the acceptability and effectiveness of an intervention, as well as their understanding of it (Reimers et al., 1987).

Trying to create a model of the most powerful mediators of implementation in a classroom setting, Lakin and Shannon (2015) evaluated the implementation of a science program. They examined the teacher-implementer's sense of its acceptability and effectiveness, as well as their level of understanding of its

components. Surprisingly, despite providing high ratings for all of these rational and conscious factors, approximately half of the participants did not implement the approach. An older model, the *Theory of Planned Behavior*, may provide the missing factor. It presumes that implementation behaviors are based on rational and systematic, if not always conscious, processing of factors across a robust, three-limbed model of drivers (Fishbein and Ajzen, 1975; Fishbein, 1980; Ajzen, 1985, 1991; Ajzen and Fishbein, 2000). It includes the *attitudes* held toward an intervention, encompassing the extent to which implementers value the behavior and expect that it will provide benefit and the *perceived behavioral control*, which refers to an implementer's sense of having adequate resources, skills, and competency necessary to execute the desired behavior. In addition, it includes the *subjective and norm-based beliefs* of implementers regarding the intervention, which encompasses the implementer's sense that the target behavior is socially desirable and that engaging in it is necessary to act in line with the expectations of high-status people or evaluators. In so doing, it incorporates a more complex spectrum of motivating factors, including ones that implementers may not be consciously aware of.

A diverse literature regarding teacher implementation has accumulated over the past 40 years, yielding drivers and constraints that can be loaded into all three of Ajzen's categories. The attitudinal factors include, firstly, a sense that the innovation is fair, reasonable, and not too intrusive (Kazdin, 1980; Reimers et al., 1987). Well-implemented approaches make sense to teachers, seem necessary (Lakin and Shannon, 2015), and seem to address issues that teachers are genuinely dissatisfied with (Allinder, 1996; Marzano et al., 2001; Harn et al., 2013). Also, thriving interventions tend to match the personality (Elliot, 2005), teaching philosophies (Durlak, 2010), and beliefs about children and special education (Jordan and Stanovich, 2003) espoused by the user.

The implementation supports that relate to teachers' perceived behavioral control most often revolve around the material and time resources available (Broughton and Hester, 1993), and the extent to which teachers understand exactly how to implement the intervention (Reimers et al., 1987). Similarly, teachers who are provided with ongoing support (McIntosh et al., 2013) that can be accessed when and to the extent required tend to remain engaged and succeed (Hagermoser Sanetti et al., 2018). In addition, Dearing (2008) found that teachers who feel free to modify and adapt an intervention tend to stick with it, which mirrors the well-known connection between a sense of competence and autonomy and motivation. Also, while the extent to which teachers were involved in choosing the intervention may relate to their beliefs about the intervention, it may also support a retroactive sense of behavioral control (Deci and Ryan, 1985, 2000).

Several known implementation moderators stimulate the subjective and norm-based value of educational best practices, through the influence of both peers and superiors (Wigfield and Tonks, 2002). This value accrues when principals are active, prominent, and involved in the adoption of new practices, and when implementers are surrounded by a high number of colleagues that genuinely buy in. As well, while the facilitation of a consistent approach through regular outcome data gathering and team meetings certainly supports a sense of behavioral control, it may also contribute to norm-based value (See review in Pinkelman et al., 2015). Finally, educational best practices that are deeply embedded in established organizational, training, and coaching systems tend to earn high investment from implementers (Fixsen et al., 2005).

As discussed above, identifying and eliminating key constraints prior to the launch of an intervention is essential. Adding urgency, McIntosh et al. (2018) discovered a make-or-break quality to the success of implementers' first attempts. While analyzing the impact of school and district-level mediators on the uptake of a positive behavioral intervention in 860 U.S. schools, they discovered that high-fidelity early implementation as well as the systematic collection of data to confirm early success emerged as most predictive of long-term implementation. A highly specific understanding of the drivers and constraints of a complex, pedagogical SRL intervention is vital to its endurance.

Objective of This Study

Practices and systems such as pedagogy may only need narrow change to be effectively transformed (Lanham et al., 2013). Even so, without certain enablers in place, the most well-designed high-yield practices may be abandoned or "washed out" by the scramble to quickly ease daily teaching challenges (Lewin and Stuart, 2003). The art of intervention design, therefore, is not to clear the deck and start from scratch but to understand the system well enough to make precise and powerful adjustments. With the guidance of knowledgeable practitioners of a pedagogical approach to SRL, a collection of known enablers for educational intervention were selected and placed in the context of Ajzen's model of planned change. Using qualitative and quantitative data gathered from 81 teacher implementers, the objective of the study was to understand which of these enablers would best predict successful implementation of planned pedagogical change.

About the Intervention: "Activated Learning"

"Activated Learning" (AL), which has also been called "EFs2theRescue Pedagogy" (Faith, 2018), is the name of an adaptive SRL teaching approach that was developed by the first author and then refined among a team of teachers to better suit classroom implementation. AL is a short, whole-class conversation about barriers to learning and strategies to be successful that takes place as needed throughout the school day. To support this core practice, in 1 day of group training plus ongoing online support, teachers learn new knowledge and skills including:

- Executive Functioning (EF) names and concepts to help understand and describe the types of challenges students might encounter during everyday classroom work;
- how to use this EF language during direct modeling of self-understanding and acceptance (e.g., "I struggle with attention, too, but I know how to manage it");
- how to use this EF language within the core 5–10 min whole-class metacognitive discourse (see below) called "the Barriers

and Strategies Protocol," conducted whenever required throughout the day as students encounter new challenges; and
- how to use this EF language to recognize and value student use of strategy when conducting process-based feedback and assessment.

The "Barriers and Strategies Protocol" operationalizes several powerful psychological mechanisms. The process in itself is a communalized form of an established goal striving practice called "mental contrasting" (MC) with "implementation intentions" (II) (Oettingen and Gollwitzer, 2010). According to traditional MCII, instructors, after specifying a learning goal, ask students to vividly imagine desired outcomes, identify barriers that may stand in the way of these outcomes (MC), and strategies that may be used to overcome the identified barriers (II). MC refers to the process of contrasting one's goal with its specific obstacles, which induces energization (Oettingen et al., 2009) and the readiness to plan strategic action (Kappes et al., 2013). MCII has been shown to boost success in goal achievement by helping individuals to get started, persist, deal more effectively with cognitive demands, and execute planned strategies with less effort (see review in Gollwitzer, 2014).

The form of MCII applied within AL, evolved for regular, communal, pedagogical use, shares many benefits with the traditional form and may add additional benefit. The traditional process of MCII is typically used on an individual basis, implemented over a long period of time, and focused on one particular goal. For example, in a study aiming to improve the grades, attendance, and behavior of fifth-grade students, groups of 4–5 students were gathered to discuss realistic goals, vividly imagine positive outcomes, and write down individual IF-THEN plans to follow over the course of several months at school (Duckworth et al., 2013). Both the traditional and communal form of MCII allow students to practice metacognitive monitoring and metacognitive control, the fundamental if-then contingency at the root of self-regulated learning (Corno, 1993; Winne, 1995, 1996, 1997). Like traditional MCII, communal MCII emphasizes student competence and autonomy, key determinants of student motivation and engagement (Deci and Ryan, 2000). Conducting MCII during regular whole-class conversation, however, aims to embed the psychological mechanisms in day-to-day pedagogy, positioning it as a habitual mode of problem solving rather than a singular, special process to be used on one focal problem. As well, communal MCII places the dynamics of metacognitive monitoring and self-determination into a social context, thus providing another key ingredient for student self-determination: relatedness and a sense of belonging (Deci and Ryan, 2000).

By using the language of executive functioning with students when conducting MCII, the aim for both teacher and students is to shift the locus of cause for the "barrier" away from innate, internal, and fixed factors like character or intelligence, toward factors that may be more controllable through the use of strategy. For example, when a teacher connects incomplete work to *task initiation,* attributions such as "naughty," "lazy," or "not smart" are avoided, and instead students, their peers, and teachers can work as a team to develop strategies to support task initiation. This type of shift improves student performance in many different academic contexts and at many levels (Dweck, 1975; Chapin and Dyck, 1976; Andrews and Debus, 1978), and makes students more generally capable (Menec et al., 1994; Hall et al., 2006; Haynes et al., 2006; Perry et al., 2010; Hamm et al., 2014).

Logistically speaking, Activated Learning has several advantages. It follows several of the key principles for effective instruction of metacognition and self-regulated learning, including building teachers' own knowledge about metacognition, embedding explicit teaching of metacognitive skills in authentic and natural tasks, the modeling of strategic thinking, the promotion of metacognitive talk in the classroom, informed training whereby students are explicitly informed of the benefits of using metacognitive skills, and the use of instruction that is prolonged across long periods of time during a school year (Veenman et al., 2006; Quigley et al., 2018). As well, facilitating MCII among groups of students makes its use more feasible for teachers; it increases the number of students impacted by each interaction and relieves teachers of sole responsibility for strategy-creation. It also taps into peer-to-peer social dynamics and emphasizes a community approach. The classroom practice of AL adapts to any teaching situation and can be used as needed: front loaded onto particularly novel or complex learning tasks, conducted midway through a task as a means of adjustment or troubleshooting, or conducted afterwards as a process of reflection. Thus, AL places the mechanisms of MCII, metacognitive monitoring, self-determination, and re-attribution into a feasible and communal classroom practice that can be conducted regularly.

METHODS

Procedure

This research was conducted as part of a 2 year collaboration between the authors and a team of teacher, principal, and superintendent stakeholders at a school board. Within a cycle of inquiry comprising ∼10 in-person engagements, this stakeholder team worked to make AL more classroom-friendly and straightforward, and prepare a full-day training program to be delivered at four locations by the team at a board-wide professional development event in April 2018. Following this PD day, data were collected over 3 months from April 1 to July 1, 2018 to follow 81 implementing teachers (not members of the stakeholder team) over three timepoints. Participation in the AL training was optional for all teachers from the school board from kindergarten through Grade 8. Admission was capped at 200, and later re-opened to admit an additional 60. Following the 4 h group training day, all participants were offered unlimited voluntary access to semi-private (two to four participants) online support in 30 min live videoconferences that could be scheduled before or after school. From this pool of 260 educators, 132 agreed to participate in the study, and 96 were retained through all three data collection timepoints. Fifteen participants were excluded because they were not classroom teachers, but rather

provided other support in school such as acting as special education consultants or principals.

The first survey collected baseline demographic data, as well as attitudinal data to characterize participant levels of stress and coping, self-efficacy, and resilience. Directly after training, a second survey probed participants' responses to the training using a Likert-scored rating scale and open-ended questions. After a 3 month implementation period, a final survey was administered to gather rating scale and written response data describing teachers' actual implementation of the nine components of the training.

Participants

The sample was composed of 81 educators from different schools at a rural school board, the demographic qualities of which closely matched the parameters of the teaching population in Canada (OECD.Stat, 2016). All of the participants worked with children, with 58% teaching in kindergarten to Grade 6, 22% teaching grades 6–8, and 20% providing special education support for different classes throughout their schools. Half of the participants had between six and 15 years of teaching experience, with an additional 35% having 16 or more years. Most participants (86%) held, at minimum, a bachelor's degree in education.

Measures and Analysis

The battery of measures was finalized based on an informal consultation with a group of ∼30 non-participating teachers from the participating school board. When provided with a summary of the literature review on typical implementation barriers for educational interventions and asked what might stop teachers' implementation of this particular approach, teachers suggested: fears of how to facilitate self-regulated learning discussions while managing the disruptive behaviors of students, concerns about how much knowledge would be needed to implement the approach, and how the approach might be perceived and accepted by teachers. Therefore, selected standardized measures included parts C and D of the Teacher Stress and Coping Scale (Forlin, 2001), Bandura Self-Efficacy Scale (1989), the Brief Resilience Scale (Smith et al., 2008), and the Behavioral Intervention Rating Scale (BIRS). Teachers were also asked to complete an implementation survey, which queried the nature and extent of their implementation.

Directly after training and then again after the 3 month implementation period, teachers were surveyed to gather short written responses regarding their opinions, feelings, and experiences as users of the approach. Of these, three questions yielded relevant responses. The first was a response collected directly after training, which addressed participants initial response to the training: *What did it leave you thinking and feeling?* The second and third, collected after the 3 month implementation period, asked participants to consider their experiences attempting to use AL: *Describe the factors in you, your context or your students that made this attempt work well OR made it more challenging,* and *What would make it easier to implement and use Activated Learning? Think as broadly as you like, and feel free to discuss factors related to the practice itself, the context of school or classroom, your own personal qualities or capacities, or other factors.* The qualitative responses to these questions were analyzed using the process suggested by Mutch (2013) of "Browse, highlight, code, group and label, develop themes or categories, check for consistency and resonance, select examples, report findings" (p. 124).

Inferential statistics were used to determine correlations between various study variables and the extent of implementation, both among the group of implementers as a whole and among the highest and lowest tertiles of implementation. Descriptive statistics were used to align this sample of participating teachers demographically to the broader population, and also to reflect upon the actual, natural levels of the particular forms of adaptation and coping that were discovered to be most highly correlated with implementation.

TABLE 1 | Mean, median, standard deviation, and range of study variables.

	M (Med)	*SD*	Minimum	Maximum
Teacher Professional Stress and Coping	2.61	0.52	1.00	3.63
Teacher Personal Stress and Coping	2.61	0.67	1.14	4.00
Teacher Instructional Self-Efficacy	3.81	0.56	2.44	5.00
Teacher Disciplinary Self-Efficacy (Ability to Influence Rule-Following)	(4)	0.89	1.00	5.00
Teacher Disciplinary Self-Efficacy (Ability to Control of Disruptive Behavior)	(1)	0.64	1.00	3.00
Teacher Resilience	3.40	0.77	1.00	5.00
Rating of Intervention	4.46	0.38	3.50	5.00
Extent of Implementation	2.65	0.74	1.25	4.75

RESULTS

The Level of Implementation

Descriptive analyses were conducted to determine central tendency, standard deviation, and range for the study variables (**Table 1**), and also to assess their normality. Neither logarithmic nor square root transformations corrected the considerable negative skew (−13.19) present in the teacher's rating of the intervention. This skew, and the median score of 4.6/5 on this scale, suggested that Activated Learning was widely seen as a potentially effective, acceptable, and feasible classroom approach.

The mean rate of implementation of Activated Learning was derived by averaging that of eight unique components that each had considerably different means (not including online support). **Figure 1** depicts these differing rates across three different intensities, "very little," "some," and "quite a bit/a great deal," omitting only "not at all" responses. While 98% of all participants reported having used at least one of the components of Activated Learning, the most prevalent individual components were collaborating with colleagues (89%), talking with students about their (teachers') own EF strengths and weaknesses (86%), and teaching students about EFs (84%). The use of the barriers and strategies protocol, which requires the largest pedagogical shift and represents direct self-regulated learning practice, was used by 73% of teachers, though 24% of those reported using

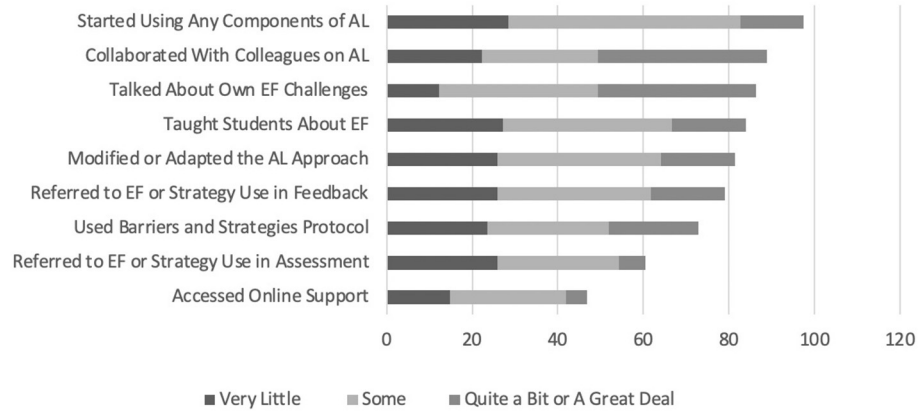

FIGURE 1 | Percent implementation across all participants.

it "very little." Similarly, the integration of EF strategies in daily feedback and assessment required pedagogical change and were reported by 79% and 61% of participants, respectively. Live online videoconference support was freely available to all participating teachers and was accessed at least once by almost half of the participants (47%).

When providing written detail about the extent of their use, 20 teachers (25%) described a substantial shift in their daily pedagogical approach, explaining "I use it alongside other teaching approaches so student voices can be heard" (Participant 74), some "[asking] students what strategy would work for them in almost every activity that [they] did" (Participant 50) or "when they run into challenges" (Participant 30). Others described using the pedagogical approach for specific purposes, including the launch of projects (9 participants), for small groups of target students (9 participants), and in community circle (4 participants). For 10 participants, the training simply yielded change to the content of their discussions with students, helping them to address "accountability" (Participant 50) or "reframe questions" (Participant 59). Teachers' mean rate of overall implementation (2.65/5) was typical compared to those reported for similar professional development initiatives (Garet et al., 2001), wherein overall reported rates of implementation characterize minor to moderate changes.

Supports to Implementation: Attitudes Toward Intervention

Directly after training, many participants provided short answer responses reflecting the enabling qualities of *attitude* thought, within Ajzen's model, to be most influential to the implementation of planned change. Positive attitudes were expressed by 86%, and 53% of these positive responders commented that they were eager to get started with newly learned practices in the classroom. These responses often mentioned the intervention "making sense" (Participants 10, 18, 66, 67, and 81) and 13 participants described the feeling that AL captured something they had already been working toward or thinking about. Participant 46 explained, "I have been talking about this for years." Participant 12 expressed a sentiment shared by four others (Participants 13, 19, 60, 61, and 36), explaining that while learning strategy support was a component of her teaching approach, the emphasis on direct teaching within AL "would be [the] next step of improvement." Participant 19 left feeling "excited" to have found a new way to "directly teach students about the learning skills." Six teachers described feeling empowered, either themselves or on behalf of their students (Participants 9, 28, 43, 67, 68, and 72). The implementers with these high positive expectations of value and benefit, however, were not as consistently high in implementation as previous application of Ajzen's model would suggest. Of responders expressing these positive attitudes only 37% went on to occupy the top tertile of implementation, with another 19% at the bottom, and an additional 44% somewhere in the middle. Using all qualitative data gathered to sort participants into generally positive, equivocal, and negative attitude-types revealed a similar ratio of positive (76, 66%), equivocal (21, 34%), and outright negative (3, 7%) among top and bottom tertile implementers; implementers with the most positive attitudes were distributed similarly in the top and bottom tertiles. Further supporting a weak connection between implementer attitude and implementation, there was no correlation found in quantitative analysis between participants' behavioral intervention ratings (BIRS) and their level of implementation.

Supports to Implementation: Subjective and Norm-Based Beliefs

The socially desirability and relevance of the intervention, particularly with respect to high status others, had a considerable impact on implementation. Data from the Teacher Stress and Coping Scale (TSCS) revealed correlation between socially connected forms of coping and implementation. Pearson correlations revealed one strategy with weak significant associations with five different implementation factors: "discussing situations with principals." This coping mechanism was correlated with the use of any component of AL [$r(81) = 0.30$, $p < 0.0$], incorporating Activated Learning into feedback

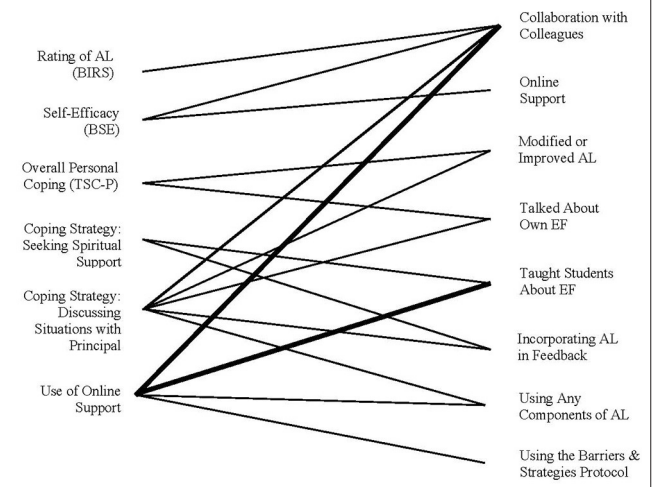

FIGURE 2 | Teacher qualities and coping strategies correlated with implementation factors. Solid lines represent positive correlations between $r(81) = 0.22$ and 0.36, $p < 0.05$. Heavier lines represent positive correlations between $r(81) = 0.45$ and 0.52, $p < 0.05$. BIRS is the Behavioral Intervention Rating Scale (Elliott and Von Brock Treuting, 1991). The BSE is Bandura Self-Efficacy Survey (1989). TSC-P is the Teacher Stress and Coping Scale (Forlin, 2001), measures of personal coping.

[$r(81) = 0.23$, $p < 0.05$], talking about one's own EFs with students [$r(81) = 0.27$, $p < 0.05$], having modified, adapted, or improved the Activated Learning approaches [$r(81) = 0.22$, $p < 0.05$], and having conferred, collaborated, or otherwise shared ideas about Activated Learning with colleagues [$r(81) = 0.30$, $p < 0.01$]. Creating two groups to include the top and bottom tertile of total implementation scores revealed that only 30% of all low implementers felt that talking with a principal was quite or extremely helpful when trying to cope with the demands of diverse learning needs in a mainstream classroom, while 67% of the high implementers felt this way. These differences were significant ($X^2 = 12.32$, $df = 3$, $p < 0.01$).

Online support took the form of *group* discussion and coaching among colleagues, so it reaffirmed the social and normative value of the intervention. Participation in this type of online support was significantly correlated to implementation of four implementation variables. It related to having started using any component of AL [$r(81) = 0.36$, $p < 0.01$], collaborating with colleagues [$r(81) = 0.52$, $p < 0.01$], teaching students about EFs [$r(81) = 0.40$, $p < 0.01$], and using the barriers and strategies protocol [$r(81) = 0.26$, $p < 0.01$]. Despite these quantitative correlations, online support was not mentioned either positively or negatively in participants' written responses. These data can be visualized in **Figure 2**.

Though socially connected forms of coping were a support to implementation, and 36 short answer responders suggested that whole-school implementation and more collaboration among teaching partners would support implementation, participants did not rate social coping to be the most useful. Comparing how often 35 coping strategies were deemed to be either "quite" or "extremely" useful (**Figure 3**), two distinct coping types emerged. Teachers' six most useful strategies were all solo, metacognitive activities relating to reflection, planning, and adaptation. Only from the seventh most useful strategy through the 20th did teachers refer to reaching out to colleagues, teams, specialists, professionals, principals, students, and parents. Communication with principals was seen as quite or extremely useful by only 47% of all participants.

Supports to Implementation: Perceived Behavioral Control

Quantitative analyses revealed no significant relationship between the extent of special needs training, age, years of teaching, or current role of each participant and the extent to which the intervention was implemented. When asked for information to explain their level of implementation, however, the lowest implementers often provided short answers referring to a perceived lack of resources, skills, and competencies required to execute the desired behavior. In short answer responses, specific teaching skill deficits were mentioned as an impediment to implementation by six low implementing participants, including a desire for more strategy ideas (Participants 20 and 52) or a "feel[ing] that there [was] much more to learn and that there [was] a need to practice [the approach] more often and more consistently for it to be effective with … students" (Participant 2). Participant 49 described this worry clearly: "I was nervous because I could not predict what my students were going to name as barriers… so I could not prepare to help scaffold/guide the conversation about strategies." This was echoed by Participant 12, who said, "I think it is something that would take practice. I'm sure you don't get 'good' at it the first time or in the first month." Participant 54 wished for support to develop suitable assessment approaches, commenting, "I feel that tracking each student will be difficult."

Almost every teacher in the lowest tertile of implementation mentioned the obstacle of time or the feeling of being "spread too thin." Participant 28 described the way "being the 'Mother Hen' to the kids and their parents takes up "every second of [the] day and cognitive space" and leaves one feeling that, "even faced with the best of options for help and support," new learning feels like "one more thing." The age, ability, or overall readiness of students was mentioned only by teachers in the lowest tertile; almost half (40%) of teachers in this group referred to concerns about students' cognitive immaturity (don't know themselves), conduct issues (angry or dishonest), or a sense that they might not "buy in" (defiance or anger).

Those who desired more learning and preparation often wondered if students would have the developmental capacity to understand themselves as learners. Some expressed curiosity about "the stages of cognitive development" (Participant 9), wondering about the appropriate "balance of more external regulation at primary ages" (Participant 16) and how "those really hard to connect with kids, the ones who don't buy into anything" might respond (Participant 80). Others suggested that

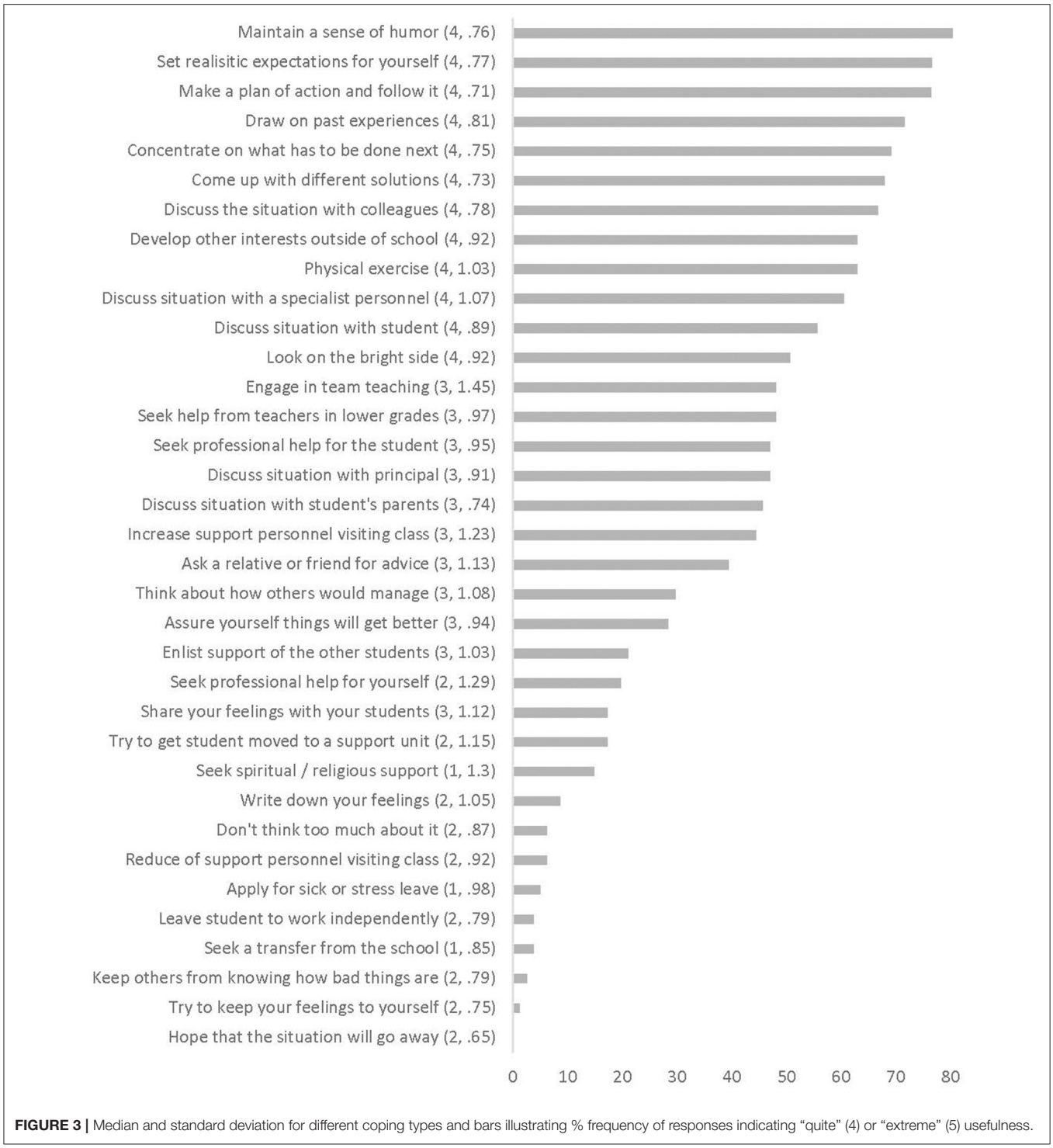

FIGURE 3 | Median and standard deviation for different coping types and bars illustrating % frequency of responses indicating "quite" (4) or "extreme" (5) usefulness.

"the students who struggle the most also did not seem as aware of their needs and [that it might be important to] actually teach them about each [executive function] so that they become more self-aware" (Participant 67). Of those who mentioned feeling "overwhelmed," several participants were concerned by the emotional vulnerability required to share strengths and challenges openly within a classroom community: "I'm an adult and very competitive with others but especially with myself. I can harness this negative feeling and turn it into something positive but I'm not so sure about my students" (Participant 11). This concern was echoed by Participants 34 and 37, who described concerns about the impact of more openness on student attention

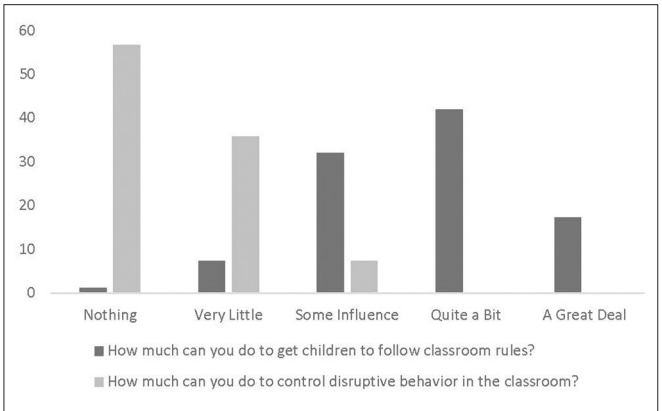

FIGURE 4 | Teacher's disciplinary self-efficacy (% frequency of response).

seeking behaviors, and the possibility that students might feel negatively "faulted" when admitting challenges.

Consider **Figure 4**, which displays declared self-efficacy for all participants. While self-efficacy for securing everyday rule-following skews toward the highest level, there is an opposite pattern with regard to controlling disruptive students. While 91% of all teachers felt that they could have some, quite a bit, or a great deal of influence over students' rule following in the classroom, only 7% reported this sense of efficacy regarding their control of disruptive behavior. A majority of teachers (57%) felt that there was absolutely nothing they could do to control students' disruptive behavior in the classroom.

DISCUSSION

The scope of these results fit within the categories proposed by the theory of planned behavior (Ajzen, 1991), and clearly characterize specific predictors above others for this pedagogical and communal SRL intervention. Data gathered directly after training revealed that while most teachers had acquired positive *attitudes* toward the intervention, those with more negative attitudes were not necessarily the lowest implementers. The *norm-based value* of the behavior change, however, had more impact on their implementation, seeming to rely on three variables: the social pressure provided by an interested principal and school staff, the execution of a whole-school implementation, and their use of online support. Variation in teachers' ability to *control and execute the planned behavior* also impacted implementation though teachers' confidence regarding the cognitive readiness, maturity, and tolerance of students in their classrooms, as well as their pre-existing self-efficacy, and their sense of available time. Regular online troubleshooting support may also have boosted their ability to execute the behavior.

Implementing in A School of Hard Knocks

Data gathered from the lowest implementers of this intervention reaffirmed that the strain of managing a diverse and needy student body contributes significantly not only to teacher stress but also to their pedagogical choices. While typical classroom teachers describe struggling to let go of enough control to attempt student-centered learning (Nariman and Chrispeels, 2016), research suggests that those who are stressed or exhausted create learning environments of markedly poor quality (Jennings and Greenberg, 2009; Klassen et al., 2012). Understandably, when overwhelmed by off-task, inattentive, or disruptive student behavior, teachers often fall into "cascades" of over-simplification in which best practices are shelved and replaced with safer lessons that are more didactic, controlled, and predictable (Yong and Yue, 2007; Klusmann et al., 2008; Muller et al., 2011). As these cascades of over-simplification deprive the classroom of work that is creative, engaging, and meaningful (Blase, 1986), students respond poorly, and the phenomenon of off-task, inattentive, or disruptive behavior intensifies. This downward spiral traces the decline of teacher self-efficacy, which reduces student engagement, classroom management, student achievement (Berman et al., 1977; Raudenbush et al., 1992; Tschannen-Moran and Woolfolk Hoy, 2001; McCormick and Ayres, 2009; Kass, 2013), student teacher relationships (Warren, 2013), and most importantly to this study, teachers' ability to provide a supportive environment (Kass, 2013) and model self-regulated learning approaches (Soodak and Podell, 1993; Bembenutty, 2006). Teachers do not simply absorb the stress of challenging students, it has a tangible impact on student learning.

The situation from an at-risk student's perspective is worth considering as well. A student who drifts off task, stalls, or becomes disorganized, for example, may seem to be acting intentionally to both teachers and peers (Elik et al., 2010), suffer a discouraging response, and internalize the idea that they are misbehaving on purpose (Brophy, 1983). The subsequent negative emotions may impact motivation, learning strategies, cognitive resources, academic achievement (Pekrun et al., 2002; Mega et al., 2014) creative problem solving (Isen et al., 1987), and positive outlook (Smith and Ellsworth, 1987), thus further suppressing SRL. Additionally, these negative emotions can result in task avoidance (Black and Wiliam, 2009; Huang, 2011) and precipitate disruptive behavior that *is* intentional (Noble, 1997). Therefore, it is likely that a paradox exists in the enactment of planned SRL teaching: those individuals who most need self-regulated learning support may be the hardest for teachers to trust with opportunities for self-control. Unfortunately, the more a student needs a self-regulated learning intervention, the harder it may be to deliver, and the more this lack of delivery may further impair SRL.

Funders and front-line practitioners rarely agree on the issue of class size. Educators often resist planned increases to class size with concerns about chaos and crowding (Stone and Alphonso, 2019) while high-profile research decries its low effect size (Hattie, 2016) and some officials suggest that managing with fewer resources may even boost students' coping and resiliency (Alphonso, 2019). The results from the present research suggest that teachers are feeling overwhelmed by the demands of coping with many diverse students, and that these feelings directly impact their ability to proceed with the implementation of new approaches. This confirms recent suggestions that class size may impact certain classroom processes and practices more than others (Blatchford et al., 2016).

Cycles of Adaptation

Ajzen's model proposes a direct relationship between intention and behavior (Fishbein and Ajzen, 1975; Fishbein, 1980). For this reason, the incongruity between teachers' high intervention ratings and declared intentions to implement and their actual levels of implementation are puzzling. Again, the correlations between implementation and both principal involvement and student behavior may provide a clue. For a population of teachers leaving training with a strong intention to implement, we may work backward and assume that on Day 1 after training, many of Azjen's predictors of successful implementation were in place. With a little nudge to get started, most of these teachers could reasonably be expected to persevere, use good judgement, problem solve and generally thrive as implementers of a new approach. Low implementation rates, therefore, may be due to what happens next. Particularly for complex and embedded interventions that act on an interactional level, might there be important shifts in the context resulting from the intervention itself that create novel and increasingly challenging cycles or waves of implementation? For example, by asking students to engage in open, whole-class discussions about their learning barriers, do teachers trigger instability (anxiety, challenging behaviors) among students that impacts their perceived ability to manage and execute the planned change? As was suggested in the teacher quotations, the classroom context may become unstable, out of routine, and worse before it gets better when changes are made to pedagogy. These early stumbles deprive teachers of the immediate positive results that would otherwise energize and reinforce their implementation (McIntosh et al., 2018).

This theory is in line with the idea that successful implementation of any intervention occurs across a sequence of steps. Within this theory, sustaining the "drivers" or core elements of support for implementation is an ongoing project. Thus, these drivers should be well-known to a variety of stakeholders including front line implementers and their supervisors, who can then gather data to understand which drivers may require fortification as they move through the process (Fixsen et al., 2017). In this way, getting a pedagogical SRL intervention to run long-term might be like starting an engine on a cold day, where an initial flood of fuel causes a roaring start and then the system chugs, struggles, and almost bottoms out before warming up and taking on its own momentum. If so, leaders hoping to make pedagogical change would need not only a static set of advice to guide teachers' initial intentions, but also the capacity to constantly evaluate and support the key enabling factors that may be shifting and changing as new routines, norms, expectations, values, and styles of relationship pick up speed.

It has been suggested that the history of American education "includes a graveyard of good ideas condemned by the pressure for fast results" (Hiebert et al., 2002, p. 13). Indeed, the full implementation of a planned change can take much longer than 1 school year, as users progress through distinct stages of first assessing needs and considering the fit of the change, then planning structural and instrumental resources needed for the change, to making first experimental attempts at delivering the planned services, to a more skillful and system-wide delivery of services that actually yields results (Rogers, 2003; Aarons et al., 2011; Meyers et al., 2012).

Deprivatization as A Protective Factor

Two coping strategies that tended to predict strongest implementation were related to collaboration and consultation, both during online support and in consultation with principals. These connections may have provided teachers with the emotional support and confidence they needed to persist with a teaching approach that may have made things a little worse before they got better. For example, during training, teachers were encouraged to "stick it out" and give challenging students a chance to trust that the community would not judge their vulnerabilities or weaknesses. If teachers did not feel as though their work was well-understood by supervisors, the risk of having made their classroom even more unstable may have been too potentially risky. This storyline has been documented in health studies, where de-adoption occurs after strong initial support from supervisors is not matched with a strong level of ongoing support (Massatti et al., 2008).

Finally, while only half of all teachers opted to use online support, it was significantly correlated with implementation of the most basic and essential program components. Providing in-service coaching over prolonged periods of time as a follow-up to professional development is known to boost implementation of professional learning (Darling-Hammond et al., 2017), and providing this support using free online videoconference technology was very practical and efficient. It allowed for small group meetings among 2–3 teachers from different schools, could be provided in 30 min bursts before and after school and didn't require additional resources to cover teacher release. Using an online scheduling app allowed videoconference appointments to be placed on a calendar and booked through the project website as an "office hours" appointment at www.activatedlearning.org. It may be important to ensure these online interactions are hosted and populated by socially relevant, "high status" colleagues. Knowing the importance of normative reinforcement, an unknown interventionist meeting one-on-one with an implementer might not be successful.

CONCLUSION

This study characterized several specific enablers and barriers to the implementation of a complex pedagogical intervention. Contrary to previous findings, teachers' attitudes toward the intervention were not the most powerful enabler of implementation. Rather, the ongoing norm-based value of the intervention as well as teachers' perceived ability to control and execute the change had the greatest impact.

From these findings, a mandate emerges for those wishing to continue the development of self-regulated learning pedagogies outside of modules, manuals, and computer programs. Firstly, any suggestion that tightening up classroom resources (through cuts and increases to class size) will make teachers and students

more resilient should be questioned. In fact, this may reduce teachers' ability to control and execute planned change.

As well, the importance of an involved principal has been reconfirmed. Principals should continue to see themselves as a direct source of social support, able to ease feelings of work overload and burnout (Maslach et al., 2001), but also as important reinforcers of the normative value of new approaches. We confirm that meaningful engagement with teachers by principals has the power to change the quality of teacher practice, and thus student experience. As such, supervision and leadership though simple presence, in the form of "popping in" to classrooms or "keeping the office door open," should be supplemented with a more structured approach. Principals should make themselves available by any means necessary, including online videoconferencing, to gather with teachers to provide substantive long-term support.

While presenting these findings to the participating school board, several practical ideas emerged. Firstly, administrators considered directly explaining Azjen's theory of planned change to implementers, describing the important role of attitudes, normative value, and perceived ability for those executing planned behavior. Secondly, the participating school board planned to produce short videos in which both teachers and students would explain their learning about implementation and the unique benefits of the approach in different settings for different individuals. Their intention was to capture messages which could later be used to support positive attitudes about the intervention, its normative value, and teachers' sense of behavioral control.

Limitations

Participants for this study were drawn from a tight-knit school board in which the buy-in of the in-house training team may have boosted normative value among the population. Also, considerable time and energy were spent fine tuning this intervention with teachers (excluding research participants) from this community prior to the study. Finally, all participants opted into training based on personal interest in the topic. These supports should be considered by teams hoping to replicate these findings.

Measures of implementation fidelity gathered general information but did not explore exact time allocations, teachers' specific adaptations, or the quality of their processes. Teachers may have drastically over or underestimated their execution of individual processes or modified-out key processes to make the approach more comfortable. This inaccuracy may explain the failure of the current research to strongly confirm previous correlations between implementation, teacher experiences, and self-efficacy (Carroll et al., 2007; Stein et al., 2008). If teacher implementation could be monitored more consistently and with greater dimension, a clearer picture might emerge. Also, the data used in this study relied upon teachers own perceptions and reporting. The results would have been more robust had other types of data been collected. For example, direct observation of teachers' classroom practices would have allowed researchers to detect more subtle or subconscious change. In addition, more research is necessary to explore the impact of teacher implementation and change on student achievement and skill development.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because Ethics were granted to use this data for the purposes of this study only. Requests to access the datasets should be directed to laurie.faith@mail.utoronto.ca.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Toronto, Research Oversight and Compliance Office. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LF conceived the presented idea, developed the theory, performed the data collection, and analyzed the data. LF and AP verified the analytical methods. All authors discussed the results and contributed to the final manuscript.

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