The State of Evidence for Social and Emotional Learning:

A Contemporary Meta-Analysis of Universal School-Based SEL Interventions

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Abstract

This systematic review and meta-analysis provides an assessment of the current evidence for universal school-based (USB) social and emotional learning (SEL) interventions for students in kindergarten through 12th grade. First, we describe how significant developments in the operational definition of USB SEL and implementation science necessitate an updated review. Next, we will execute a fully replicable meta-analysis of USB SEL interventions, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards, using the most rigorous methodological practices available in educational and psychological science. Lastly, we will discuss the strengths and limitations of the current evidence and their implications for future SEL research, policy, and practice.

Keywords: social and emotional learning (SEL), universal school-based intervention, systematic review

The State of Evidence for Social and Emotional Learning: A Contemporary Meta-Analysis

of Universal School-Based SEL Interventions

Ten years ago, *Child Development* published the pivotal meta-analysis by Durlak and

colleagues (2011) examining the state of the evidence for universal school-based (USB) social

and emotional learning (SEL) interventions that was available through December 31, 2007. USB

SEL interventions support the development of intra- and inter- personal skills to promote

physical and psychological health for all students in a given school or grade. SEL includes

fostering emotional intelligence, behavior regulation, identity formation, and the skills necessary

for establishing and maintaining supportive relationships and making empathic and equitable

decisions in the best interest of the entire school community (CASEL, 2020; Cipriano et al.,

2020; Greenberg et al., 2017). Durlak et al.'s meta-analysis of 213 USB SEL programs

(involving 270,034 students in grades K-12) reported statistically significant improvements in

students' social and emotional (SE) skills (standardized mean effect size [ES], Hedge's $g = 0.57$),

attitudes toward self and others ($g = 0.23$), social behaviors ($g = 0.24$) and academic achievement

($g = 0.27$). In addition, analyses revealed significant reductions in students' conduct problems,

such as disruptive behaviors ($g = 0.22$) and students' emotional distress ($g = 0.24$).

Durlak et al.'s positive findings have been followed by substantial changes in educational

practice and policy (Dusenbury et al., 2019; Hamilton et al., 2019; Jones et al., 2017; National

Commission on Social, Emotional, and Academic Development, 2018; Organization for

Economic Cooperation and Development, 2017). At the time this manuscript was prepared,

thousands of schools within and outside the United States had implemented USB SEL programs,

with 69 countries participating in the 2021 International SEL Day (see selday.org), and more

than half of US states had at least preschool and early elementary SEL state standards (58%;

Dusenbury et al., 2019), an increase of 50% since 2011. Furthermore, federal, state, and local

funding have been increasingly available for SEL programs (CARES Act, 2020; Krachman &

LaRocca 2017; Weissberg et al., 2015). Ten years later, Durlak and colleagues' (2011) paper

remains the most frequently cited justification for investments in SEL (cited by 8,380 to date;

Google Scholar), even though the review only synthesizes studies through the end of 2007. The

present paper provides an update of the evidence available for USB SEL programs from January

1, 2008 through December 31, 2020. We begin by describing significant developments in *what*

aspects of SEL content and implementation make a difference in *which* outcomes and *who*

benefits (or not) from USB SEL interventions.

Recent and Relevant Reviews of USB SEL

The first generation of reviews and meta-analyses since the 2011 paper concentrated on

study outcomes in one or more of the six outcome areas assessed by Durlak and colleagues:

skills, attitudes, conduct problems, prosocial behavior, emotional distress, and academic

achievement. However, varying inclusion criteria and treatment effects across reviews have

contributed to differential interpretations of what constitutes an SEL program and what effects

can be expected (Supplemental Table 1). In 2012, Sklad and colleagues reviewed 75 studies

published since 1995 (based on the year that Goleman's *Emotional Intelligence* was published),

including only studies that targeted at least one SE skill as defined by the World Health

Organization in 2002, to analyze the main effect of SEL interventions. Four years later,

Wiglesworth and colleagues conducted a review of 89 studies based on an adaptation of

Denham's (2006) framework of SE competency (see Denham, 2006). The following year,

Domitrovich et al. (2017) reviewed five meta-analyses of USB SEL programs (inclusive of 300

studies, involving more than 300,000 students) and showed modest promise for promoting

positive skills and reducing behavioral risk using a two-domain framing of intrapersonal and interpersonal SE competence, similar to Denham's (2006) framing.

Furthermore, recent studies have noted that students may benefit in related areas, such as developing civic attitudes, forming identity, and improving moral or ethical reasoning. For example, Grant et al.'s (2017) systematic review of 60 evidence-based SEL programs that met requirements under ESSA (2015) between January 1, 2002 and September 22, 2016, posited SEL competencies identified under four domains: intrapersonal competencies, interpersonal competencies, civic attitudes and behaviors, and school climate and safety. That same year, Taylor et al. (2017) reviewed the follow-up effects in all studies included in Durlak et al.'s 2011 paper, identifying several additional indicators of well-being including reduced rates of school disciplinary actions, suspensions, pregnancies, or STDs, increased likelihood of graduation, employment, favorable marital history, and overall better mental health.

Concurrent to the recognition that supportive learning environments influence students' academic, personal, and social adjustment, emergent data suggest that the school or classroom climate changes positively following the administration of USB SEL programs (Berg et al., 2017a; National Commission, 2018; Wang et al., 2020). Considerable evidence regarding the dynamic interaction between positive school or classroom climate and student learning, and their personal and social development, has accumulated (Brown et al., 2010; Hamre & Pianta, 2007; Wang et al., 2020). Findings suggest that students in classrooms and schools that participate in SEL programs are more engaged, have better quality relationships with their teachers, have demonstrate increased prosociality (Brown et al., 2010; Hagelskamp et al., 2013). This has resulted in more USB SEL interventions aiming to actively improve climate to support whole student development (Berg et al., 2017a; Lawson et al., 2019; Wang et al., 2020)

The "What" of USB SEL: SEL Content for Skill Development

Despite the volume of reviews completed to date, lack of consensus remains regarding the parameters of SEL (Aspen Institute, 2019; Berg et al., 2017b; Cantor et al., 2019; Elias & Yuan, 2020; Jones et al., 2017; Immordino-Yange et al., 2019; Osher et al., 2016; Schonert-Reichll, 2019). Upwards of 136 SEL frameworks (Grant et al., 2017) comprise more than 700 SEL-related competencies (Jones et al., 2017) that could represent critical content of USB SEL interventions (Dymnicki et al., 2020; Jones et al., 2019). For example, CASEL's five SEL competencies (self-awareness, self-management, social awareness, relationship skills, and responsible decision making; see CASEL, 2020) are widely regarded as the standard (Lawson et al., 2019). Lawson et al.'s (2019) review of 14 CASEL-designated programs further differentiated these five competencies into 12 core components and 59 indicators in SEL.

Similarly, Jones and colleagues (2017) organized social and emotional skills and behaviors into three main categories: cognitive regulation, emotional processes, and social/interpersonal skills (Jones & Bouffard, 2012; Jones et al., 2017). Much like Lawson et al., Jones and colleagues (2017) also analyzed the content of 25 SEL programs to identify the SEL content they covered. The authors added two more categories, character and mindset skills, because related skills did not fit into the three primary categories. Further, Jones and colleagues categorized skills from 40 SEL-related frameworks to develop a taxonomy and nomological network to allow for clearer categorization of content that often uses similar terms to mean different things and different terms to mean similar things (EASEL, n.d.; Jones, n.d.; Jones et al., 2016). As with the coding of SEL programs, the three-category system was insufficient for some SEL related skills, which resulted in the inclusion of three additional categories: intellectual, ethical, and civic values related to aspects of character education not encompassed by the

original three-category system; perspectives sometimes associated with positive psychology and

mindfulness (e.g., optimism, gratitude, openness) that are closely related to SEL; as well as

aspects of identity formation related to self-knowledge, self-efficacy, and mindset (Elias &

Yuan, 2020; Frank, 2020; EASEL, n.d.; Shankland & Rosset, 2017; Osher et al., 2020). The

content delivered by SEL programs reflects one type of core component that could drive the

effectiveness of programs among many other core components (Dymnicki et al., 2020). Further

examination of the relations between SEL content and outcomes, taking into account these varied

conceptualizations of what constitutes SEL, would be a significant contribution to the field.

From "What" to "How": Advances in USB SEL Implementation Science

Advances in USB SEL implementation science, including evolved conceptions of SEL

competencies and how program implementation and fidelity are associated with student

outcomes, further require an update (Durlak, 2015; 2016; Jones et al., 2017; National

Commission of Social, Emotional, and Academic Development, 2018). Growing evidence

indicates implementation (i.e., how a program or set of practices is delivered), influences the

effect of SEL approaches on student outcomes (Abry et al., 2017; Durlak, 2015; 16; Rimm-

Kaufman & Hulleman, 2015). Importantly, features of implementation go beyond content

components to include program structure, such as the sequencing of content, as well as aspects of

quality, such as fidelity and dosage (Abry et al., 2015; Jones et al., 2017; Low et al., 2016).

Program Curriculum Structure. Durlak et al. (2011) found that programs that "use a

connected and coordinated set of activities...(Sequenced)," "use active forms of

learning...(Active)," "have at least one component devoted to developing personal or social

skills…(Focused)," and "target specific SEL skills rather than targeting skills or positive

development in general…(Explicit)"—agreed upon components reflected by the acronym

SAFE—were more effective than those that did not include these components (p. 410). Similar

to the SAFE components examined by Durlak et al. (2011), CASEL noted that evidence-based

SEL programs tend to include "free-standing lessons that provide explicit, step-by step

instructions...across the five core competency clusters," and focus on aspects of instruction that

pertain to the classroom, including integrating skills into academic content and support for

development of school policies and structures broadly (CASEL, 2017, p. 2). Jones et al.'s (2017)

review of 25 SEL programs identified 10 common program components that echo those of

CASEL, including integration of SEL into academic content as well as others related to focusing

on the SEL of adults and adaptability of SEL programs. Although investigation of program

features, such as whether SEL is integrated into academic content or if adult SEL is part of

programming, are now more common (Jones et al., 2017; Wanless & Domitrovich, 2015),

questions remain regarding if the number and combination of SEL content areas taught or the

sequence of skills (e.g., emotion skills preceding social skills) relate to the effectiveness of SEL

programming (Denham et al., 2003; Izard et al., 2001). The field would benefit from further

examination of these features as moderators of effects of SEL interventions.

Program Implementation. Durlak et al. (2011) found that programs that monitored

implementation (i.e., fidelity) were more effective than those that did not. Most measures of

implementation consider fidelity, or the extent to which the program was implemented as

intended (e.g., lessons were delivered, core principles were implemented) and there is growing

evidence supporting the important roles of implementation fidelity and implementation quality

(Domitrovich et al., 2019; Granger et al., 2020; Low et al., 2016; Sutherland et al., 2021). Given

the substantial growth and focus on implementation, a contemporary meta-analysis is well suited

to identify the role of monitoring other aspects of quality implementation, beyond fidelity, that

have been associated with improved outcomes, such as the dosage delivered, quality of program

delivery, or participant engagement (Low et al., 2016). Although these are common features of

implementation, whether their presence is linked to specific student outcomes remains unclear.

From "How" to "for Whom": USB SEL as a Lever for Educational Equity

Concurrent with increasing USB SEL implementation, is the recognition of SEL's role in

promoting or detracting from educational equity (Cipriano et al., 2021; Farrington, 2020; Jagers

et al., 2019). Students' experience of education and their treatment in society is one of

intersectionality (Crenshaw, 1989)—race, class, gender, ethnicity, sexuality, and disability

interact to create overlapping and interdependent systems of advantage and/or disadvantage for

students. Although USB SEL has the potential to provide all students with the skills they need to

thrive, the discourse of emotions in schools are situated within the politics and power of the

education system, wherein significant disparities in SE outcomes between students persist

(Cipriano et al., UR; Hoffman, 2017; Zembylas, 2007). Students with disabilities, those growing

up in economically disadvantaged communities, and those with experiences of trauma have more

difficulties in social relationships, recognizing and managing emotions, and awareness of

strengths and needs (Cipriano et al., 2021)—all skills explicitly targeted by most USB SEL

interventions (Grant et al., 2017; Lawson et al., 2019). And, common SEL program features,

including teaching perspective taking, responsible decision making, identity development and

affirmation, fostering a safe and inclusive school culture, and celebrating cultural differences

(Jones et al., 2017; Lawson et al., 2019) are critical for social justice (Farrington et al., 2020;

Wanless & Barnes, 2020).

Yet, significant disparities are apparent in the little evidence we have available for

students who have been historically marginalized in education (Cipriano et al., 2021; UR; Daley

& McCarthy, 2020; Rowe & Trickett, 2018; Taylor et al., 2017). Academics in the field have

scrutinized how programs suggest to and educators teach emotion and behavior regulation and

how they set expectations of emotion expression, behavior, and compliance to identify how they

may be contributing to culturally insensitive and oppressive practices, including the

disproportionate use of punitive or exclusionary discipline with students of color and others

historically marginalized (Cipriano et al., 2021; Duchesneau, 2020; Elias et al., 2019). Learners

vary in how they perceive and navigate learning experiences and can encounter significant

barriers structured by educators who have incongruous expectations or social norms about how

learning experiences and environments "should" be navigated and how learners "should" behave

within them. Identification of learner variability is critical to making the necessary cultural

adaptations to ensure that USB SEL is supportive of all learners (Castro-Olivo, 2014; Garner et

al., 2014; Gershon & Pellitteri, 2018; Jagers et al., 2019). The field must examine for whom and

under what circumstances USB SEL is effective.

The Present Study

Our primary aim is to assess if USB SEL interventions for students in grades K-12

enhance student SE competencies and related outcomes (Exhibit A: V, pp. 28–30). We

hypothesize our review will yield significant mean effects across all indicators (Hypothesis 1;

Durlak et al., 2011; Rimm-Kaufman & Hulleman., 2015; Taylor et al., 2017). To the extent data

have become available since the Durlak et al. (2011), analyses will explore the evidence for

follow-up effects originally assessed at posttest and all additional long-term indicators of well-

being identified by Taylor et al. (2017), which presented too infrequently for inclusion in their

analyses. We hypothesize significant mean effects at follow-up across all outcomes and for any

additional indicators of well-being that are collected later (Hypothesis 2; Durlak et al.; Rimm-Kaufman & Hulleman, 2015; Taylor et al.; Exhibit A: V, pp. 28–30).

Further, although the promotion of social and emotional skills is the primary feature of SEL programs to date, no meta-analysis has sought to determine which specific content or content combinations yield the best outcomes. This meta-analysis will be the first to address this question and explore if intervention effects are associated with specific skills, attitudes, and/or beliefs targeted by SEL programs, either in terms of the number of different skill domains that are targeted and/or the number of discrete skills that are targeted within any one domain (Exhibit A: IV, I16-17, pp. 24–25). We expect programs with instruction in more than one skill domain to yield significantly better effects at both posttest and follow-up than programs with instruction in only one skill domain (Hypothesis 3a; Abry et al., 2017; Durlak, 2015), and programs that include instruction with greater depth of coverage (higher number of discrete skills within domains) to yield significantly better effects at both posttest and follow-up than programs that offer instruction in fewer targeted skills within domains (Hypothesis 3b; Lawson et al., 2019).

Following Durlak et al.'s (2011) meta-analysis, we will examine if intervention effects are moderated by delivery format, inclusion of effective program features (i.e., SAFE practices), the integration of the intervention into academic instruction, or intervention dosage and sequencing. We hypothesize that: program delivery by teachers and multicomponent approaches will yield significantly higher effects than those delivered by outside school personnel or solely classroom-based approaches (Hypothesis 4a; Durlak et al, 2011; Taylor et al., 2017; Exhibit A:, IV); interventions containing all four SAFE features will yield significantly higher effects than interventions not containing all four SAFE features (Hypothesis 4b; Durlak et al., Exhibit A: IV); programs that are sequenced to teach intrapersonal skills before interpersonal skills will yield

significantly higher effects than programs not containing this sequence (Hypothesis 4c; Denham et al., 2003; Izard et al., 2001; Exhibit A: IV); programs that are integrated into academic instruction will yield significantly higher effects than those that are not integrated into academic instruction (Hypothesis 4d; Abry et al., 2015; CASEL, 2020; Newman & Dusenbury, 2015; Exhibit A: IV); and programs that are longer in duration will yield significantly higher effects than those that are shorter in duration (Hypothesis 4e; Exhibit A: IV).

Given the increasing recognition that study design features can influence study outcomes, we will explore if intervention effects are associated with indicators of study design, or the quality of implementation of the intervention. We hypothesize that studies with higher quality study designs (as evidenced by an index of study quality) will yield significantly higher effects at posttest than those with lower quality designs (Hypothesis 5; JBI, 2020; Exhibit A: I, IV, V, and VI). In addition, we hypothesize that studies with evidence of higher quality implementation (as evidenced by an index of quality implementation) will yield significantly higher mean effects than lower quality studies (Hypothesis 5b; Durlak, 2015; Exhibit A: IV).

Exploratory inquiries. If adequately powered, we will investigate if intervention effects differ significantly for different subgroups of students as a function of their age, gender, race/ethnicity, native language learner status, socioeconomic status, LGBTQIA+, or disability status (Exhibit A: III); for programs that include other program features (not included in a priori research questions and hypothesis; Exhibit A: IV); and when studies are implemented in the country where the intervention originated (Exhibit A: II). See Supplemental Table 2.

In sum, this review addresses the need for an update of the current state of evidence for USB SEL interventions among students in grades K-12. We embrace the evolution of the field of SEL by using a comprehensive and inclusive definition of USB SEL and include hypothesized

features of USB SEL implementation identified in the contemporary literature to explicate the associated evidence for USB SEL interventions on outcomes.

Method

This systematic review and meta-analysis of the evidence for USB SEL is following the contemporary PRISMA guidelines (Page et al., 2021) and adhering to a predetermined, peer-reviewed protocol to strengthen transparency through pre-registration (Nosek et al., 2012), and we will share analytic files on Open Science Framework (OSF) and the data, instructions, and code for analysis on GITHUB to support reproducibility.

Literature Search

Our research team conducted a systematic literature search with terms developed through an analysis of the controlled vocabulary terms of known key articles [blinded.edu] and through scoping searches in each database (Supplemental Table 3). Our approach used an iterative process of translating and refining the searches. To maximize sensitivity, our formal search used controlled vocabulary terms and synonymous free-text words to capture the concepts of "SEL programs" and "school." The search strategy was peer reviewed using the Peer Review of Electronic Search Strategies (PRESS) Checklist (McGowan et al., 2016).

Information Sources

We performed a comprehensive search of the APA Psycinfo (Ovid), MEDLINE (Ovid), Education Resources Information Center (ERIC), and Web of Science databases. There was no date limit, and studies published before 2008 and after December 31, 2020 were removed. In addition, we will review the reference list of included articles and hand search all journals searched by the prior reviews that do not populate in our database searches (Supplemental Table 3). We will conduct a grey literature search of unpublished and published articles in

Dissertations & Theses Global (ProQuest), and the following three repositories: the *2013 CASEL Guide: Effective Social and Emotional Learning Programs–Preschool and Elementary School Edition*, CASEL's (2015) updated list of interventions to the 2013 report, and RAND's (2017) *Social and Emotional Learning Intervention Under the Every Student Succeeds Act* report (Grant et al., 2017). We will search the American Educational Research Association (AERA) database, distribute calls for studies on the AERA SEL and Cognitive Development Society list-servs, and contact first authors of studies identified through the search as needed for additional information.

Inclusion and Exclusion Criteria

Inclusion criteria. We included published or unpublished reports of universal interventions that target one or more intrapersonal and interpersonal skills (e.g., self-management and communication skills; Exhibit A: IV, I19a and Supplemental Table 3, 4, and 5). Furthermore, each study was (a) a randomized or quasi-experimental design testing the effects of an intervention, (b) contained a control group (wait list, or attention placebo), (c) involved at least six sessions if it was a classroom-based intervention or last for at least 4 months if a whole school approach; (d) allowed for the calculation of effect sizes through data available in print or provided by authors (Exhibit A: VI); and (e) appeared in English in any country between January 1, 2008 and December 31, 2020 (including online first publications).

Exclusion criteria. Studies comparing two interventions without a control group and those in which the SEL intervention was not the primary component were excluded. We excluded studies that delivered the intervention to specific students within the classrooms or were provided as pull-out programs in which small groups of students are removed from class. We also excluded studies whose primary purpose was to promote academic achievement through

educational curricula or specific instructional strategies, as well as sex education programs and

interventions whose primary purpose was to prevent drug use, AIDS, or obesity.

Moderators

SEL Intervention Content

Discrete SEL skills are being coded individually and clustered into three dominant SEL

content frameworks. We derived the discrete skill indicators from adaptations to the EASEL

Taxonomy project (EASEL, n.d.) and integration of indicators reflecting the CASEL

Competency Areas identified by Lawson et al. (2019; Exhibit A: IV, I15a). The Two-Domain

Framework classifies discrete skills into *intrapersonal* processes, such as emotion regulation,

and *interpersonal* processes such as conflict resolution (Exhibit A: IV, I15b). For the CASEL

Competency Areas, discrete skills are classified into five content areas: *self-awareness,* which

includes skills related to identifying one's own feelings, understanding how emotions relate to

thoughts and behaviors, as well as aspects of self-knowledge and acceptance; *self-management,*

which includes skills related to coping, setting and reaching goals, and focusing one's attention;

social awareness, which includes skills related to identifying others' emotions, perspective

taking and empathy, and embracing diversity; *relationship skills,* which encompass social skills

broadly, including assertiveness; and *responsible decision-making,* which primarily reflects

problem solving skills (Lawson et al., 2019; Exhibit A: IV, I15b). The EASEL Taxonomy

includes the three domains of the Framework for Social and Emotional Learning (Jones &

Bouffard, 2012) reflecting: *cognitive regulation*, including skills related to cognition and

planning, such as attention and critical thinking skills; *emotional processes*, including activities

that focus on developing knowledge and skills related to defining emotions and their expression

and regulation, as well as empathy and perspective taking skills; and *social/interpersonal skills*

that primary focus on developing students' prosocial and cooperative behavior, including

understanding social cues and resolving conflicts (Jones & Bouffard, 2012; Jones et al., 2017).

The EASEL Taxonomy includes three supplemental categories based on theoretical SEL

frameworks and content (Jones et al., 2017; EASEL, n.d.): *values* instruction related to ethical,

performance, civic and intellectual values; activities that focus on *perspectives*, such as

optimism, gratitude, and openness; and *identity* instruction to develop self-knowledge, a sense of

purpose, self-efficacy, and self-esteem (EASEL, n.d.; Exhibit A: IV, I15c).

From the discrete codes, we will also compile the *frequency of discrete skills within*

domains (summed based on I15a) and the *number of skill domains* (1 or 2 for the Two-Domain

Framework, 1 to 5 for the CASEL competency areas, 1 to 3 for the original Framework for SEL,

and 1 to 6 for the EASEL Taxonomy) covered by a program (Exhibit A: IV, I16-I17).

Intervention Characteristics

We are coding for *primary* and *secondary change agent*s (who primarily delivered the

intervention; Exhibit A: IV, I2). We will capture dosage with the *intervention duration* (in

weeks), *average session duration* (in minutes), *number of discrete sessions,* and if the

intervention lasted for *more than one school year* (Exhibit A: IV, I11–I14). We are coding for

features of effective programs (i.e., SAFE*:* sequenced, active, focused, and explicit; Durlak et al.,

2011; Taylor et al., 2017), including the *order of intrapersonal and interpersonal skills* (no

order, intrapersonal skills precede, interpersonal skills precede; Exhibit A: IV, I18). We are

coding for the presence and nature, if applicable, of the following other program features:

classroom-based, *free-standing classroom lessons, integration of SEL into academic instruction,*

classroom activities beyond core lessons, multi-component, *efforts to improve classroom or*

school climate, family engagement and *types of family engagement*, *community engagement* and

types of community engagement, *focus on adult social and emotional competence*, *multi-phased*, *tiered,* and *adaptability to local context* (Exhibit A: IV, I19).

Quality

It is necessary to assess the validity of the studies included in the review when drawing conclusions from meta-analytic research (Higgins et al., 2011; Lester et al., 2020; Pigott & Polanin, 2020). Quality refers to three categories: study design, study quality, and study implementation quality. Study design variables include *report format* (see all formats in Exhibit A: I, G5), and an examination of risk of bias using the adapted Joanna Briggs Institute (JBI) Critical Appraisal tool (JBI, 2020) for quasi-experimental and randomized controlled trials (Exhibit A: IV, I3). Study quality includes the *control/comparison condition*, and if there *was more than one control comparison group* (Exhibit A: IV, I4), as well as *missing data handling* (e.g., problematic: deletion, regression-based single imputation, mean substitution, intent to treat analysis; appropriate [multiple imputation or full information maximum likelihood]; Rioux & Little, 2019), and if the *assumption of independence* (i.e., accounted for non-independence with students nested in classrooms or schools by using hierarchical models or by adjusting standard errors) was met (Carbonneau et al., 2013; Exhibit A: V1, R7–R8). Implementation quality includes *steps to increase effective program implementation* (e.g., pre-program training, ongoing support or training, supervisory or support meetings, detailed program manuals), *data on the level of implementation* and *level of implementation achieved* (i.e., not mentioned, satisfactory, low, moderate, high, variable), whether *aspects of implementation* were measured (e.g., fidelity, dosage, quality of delivery, student engagement) and what methods were used to assess program implementation (e.g., not examined/reported, self-report/logs, videotaped and rated, observations; Exhibit A: IV, I7–I9). Each of these domains also includes an indicator for a

combination of listed outcomes or other unlisted outcomes to be identified as they present. We will double code each indicator independently and merge codes into a composite index score for analyses (Kremer et al., 2015; Lester et al., 2020).

Sample Ecological Variables

Sample ecological variables refer to setting and participant characteristics. Setting characteristics will include the *country* where the study was conducted, the *type of community* the intervention was conducted in (urban, suburban, rural, mixed), and the *type of school* (public, private [secular or religious], charter, magnet, or other) and *average school size* of the schools the intervention was conducted in (Exhibit A: II, S2–S5). For participant characteristics, we are coding for participants' mean *age*, *age range*, *developmental level (childhood, early adolescence, adolescence)*, *SES reporting* and overall *SES level*, *percentage female*, reporting of *LGBTQIA+ identification* (i.e., sexuality-related minority status: homosexual, transgender, or related metric), *race/ethnicity reporting*, and constructs (or any risk designation) related to *disability:* IEP status, receiving special education services, diagnosis, "at-risk" (Exhibit A: III).

Dependent Variables: Intervention Effects

The proposed dependent variable categories are: (a) *skills*, (b) *attitudes/beliefs*, (c) *prosocial behaviors*, (d) *externalizing behaviors*, (e) *civic attitudes and behaviors*, (f) *peer relationships*, (g) *emotional distress*, (h) *school functioning*, (i) *disciplinary outcomes*, (j) *school climate and safety*, (k) *family relationships*, and (l) *physical health outcomes*. Each domain includes an indicator for other outcomes that will be identified as they present. See Exhibit A: V.

Data Screening

We pooled 41,002 search results in EndNote [www.endnote.com] to remove duplicates and uploaded a final set of 31,257 articles to Covidence [www.covidence.org] for screening.

Articles are being double screened: first by title and abstracts, then by full-text. Any conflicts will be resolved through discussion and consensus. To ensure reliability on study exclusion, two authors will independently review all excluded studies and resolve any conflicts by discussion.

Data Extraction

A team of twelve coders (including four undergraduates, two graduate students, and six of the authors) will review articles using the codebook (Exhibit A) to code studies (Dedoose version 8.3.47b). All studies will be double coded to estimate reliability. In addition, requests will be sent to all corresponding authors of included studies to self-code the study data from their study for a quality assurance check. To ensure coder consistency, we will conduct calibration exercises before review and weekly throughout full-text coding. Disagreements will be resolved through discussion between pairs of coders and a third coder will arbitrate when needed.

Analytic Strategy

Our index of effect will be Hedge's *g,* which will be calculated using available information from each report. If means and standard deviations are not presented, effect sizes will be calculated using other information (e.g., *F* or *t* test values) following Borenstein et al. (2009). If an effect size cannot be calculated from data in the report, we will contact authors twice for the necessary information. In the absence of available data, we will conduct analyses to assess the robustness of findings when excluding these studies from analyses versus including with imputation and report these findings descriptively to consider how missing data can inform the interpretations of findings (Kahale et al.; Pigott & Polanin).

We conducted a power analysis with a calculator (Quintana & Tiebel, 2019) based on equations from Valentine et al. (2010) using conservative values from Durlak et al. (2011) of (a) anticipated summary effect size, (b) average group sample size, and (c) number of effect sizes.

Specifically, we chose a summary effect size of 0.20, which was the lowest found by Durlak et al. (2011). We chose a value of 150 for the average group sample size which is a reasonable estimate from Durlak et al (2011). Regarding number of effect sizes, the lowest number of studies across the outcomes examined by Durlak and colleagues was $N = 3$ for academic outcomes among SEL programs delivered by non-school personnel; $N = 7$ for the SEL skills outcome among multicomponent SEL programs, and $N = 10$ for academic outcomes among SEL programs delivered by teachers. However, the remaining 21 mean effects had substantially higher sample sizes, ranging from $N = 11$ to $N = 112$. Thus, we examined power for a range of $N = 7$, $N = 10$, and $N = 12$. All three power analyses assume high heterogeneity of $I^2 = 0.75$. With these conservative assumptions, power is 0.63 for $N = 7$, 0.78 for $N = 10$, and 0.91 for $N = 15$. These estimates provide guidance on what we may find for analyses involving smaller cells. We will adjust our discussion relative to the final number of observed studies we synthesize.

We will use a random-effects model in our analyses and first inspect the distribution of effects to detect outliers more than two standard deviations beyond the tails of the distribution. We will reset the values of any detected outliers so that they lie exactly at the point of two standard deviations of the distribution so that extreme values do not unduly influence outcomes. Whenever possible, we will calculate adjusted post and follow-up effect sizes using any pre-intervention differences that occur between intervention and control groups. This procedure improves the precision of intervention effect estimates over time. To account for effect-size dependency and the hierarchical structure of our dataset (effect sizes nested within study), we will use robust variance estimation and hierarchical weights and small sample corrections in all analyses (Hedges et al., 2010; Tipton, 2015; Tipton & Pustejovsky, 2015). We will conduct sensitivity analyses by varying estimates of the mean correlation between pairs of effect sizes

within a cluster (ρ) to assess the accuracy of our robust variance estimation analyses (Tanner-Smith & Tipton, 2014). We will combine multiple reports evaluating the same cohort and intervention, but containing different outcome data at post or follow-up, into a single study for analysis. To address potential imbalance in representation of specific programs in our analytic sample (i.e., if some programs are evaluated more than others), we will include dummy codes for each program and conduct a sensitivity analysis via metaregression to determine whether the multiple replications of any specific programs are influencing the findings.

First, we will estimate the overall mean effect size, followed by metaregression models to examine whether individual study-level characteristics (i.e., moderators) significantly predict effect size magnitude. We will also investigate possible concerns with publication bias using selection modeling (Citkowicz & Vevea, 2017; Vevea & Hedges, 1995) to provide estimates of selective reporting. We will supplement the selection models by aggregating the effect sizes to the study level and by using mixed effects models and associated methods, including contour enhanced funnel plots (Peters et al., 2008), trim-and-fill analyses (Duval & Tweedie, 2000), and a metaregression model using the standard error as a predictor of the effect size (Rodgers, & Pustejovsky, 2020). Further, given evidence that average effect sizes differ based on the nature of the publication (Chow et al., 2018; Polanin et al., 2016), we will compare overall effect sizes separately for type of publication.

Lastly, we will follow the PRISMA framework and methodological guidance for research in education and psychology to report findings and reach conclusions (Page et al., 2021; Pigott & Polanin, 2020; Polanin et al., 2020). The proposed practices of data treatment will allow future researchers to build upon a comprehensive catalogue of data; thus, mitigating excess time and

effort required for rigorous reviews and analyses, and reducing researcher bias while maintaining

methodological transparency (Pigott & Polanin, 2020; Rogers & Pustejovsky, 2020).

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*Referenced in Supplemental Materials