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Precision streamlining of a school-based attention training program: a strategy for balancing feasibility and potency

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Introduction: Balancing potency and feasibility is essential for implementing digital technologies in school settings, where time and attention are limited. We introduce *precision streamlining*—a novel intervention design strategy that reduces overall duration while preserving effectiveness through targeted personalization. Instead of delivering all content to all students, this approach uses personalization to reduce the total material delivered—focusing only on what is most impactful for each individual.
Methods: We applied this strategy to an existing attention training program for adolescents, reducing its length by 45%. We then tested the streamlined version across 13 public high schools.
Results: In Study 1, the shortened intervention produced significant improvements in emotional regulation, growth mindset about attention, self-efficacy, and classroom focus. Study 2 replicated these findings in a larger and more diverse sample. Study 3 entailed a direct comparison of students who either received the original, longer version or the shortened version (N = 1715). While the original intervention produced stronger effects on self-efficacy and emotional regulation, the shortened version still yielded significant gains across all four outcomes.
Discussion: These findings support precision streamlining as a promising design strategy. They also demonstrate that a brief attention training program can offer meaningful benefits for student learning and well-being—while remaining feasible to implement in time-constrained school settings.

KEYWORDS
attention, feasibility, intervention design, personalization, precision education

1 Introduction

A key challenge in designing scalable educational programs is identifying an intervention length that is both potent and feasible. This tension is especially pronounced in school settings, where instructional time is limited and interventions often require active teacher facilitation. While feasibility may favor shorter formats, longer interventions are frequently associated with stronger outcomes—particularly for interventions aimed at producing lasting behavior change (Farrington and Ttofi, 2009; Sammallahti et al., 2023). Increased session frequency, contact hours, and opportunities for repeated practice can enhance an intervention's potency (Gearing et al., 2013). Moreover, participants who are exposed to a greater proportion of an intervention tend to exhibit larger gains (Hansen et al., 2002; Humphrey and Panayiotou, 2022).

However, the relationship between intervention length and outcomes is not always linear. Across domains such as nutrition, mindfulness, and psychological therapy, meta-analyses have shown that short, medium, and long interventions can yield comparable effects (Haughland et al., 2020; Klingbeil et al., 2017; Racey et al., 2016; Strohmaier, 2020; Weisz et al., 2017). In some cases, shorter interventions have even produced greater benefits—particularly when longer lengths lead to disengagement or diminished implementation fidelity (Lyubomirsky et al., 2005; Schueller and Parks, 2012; Strohmaier et al., 2021).

The risks of long interventions are especially pronounced in schools, where time is scarce and teacher bandwidth is limited. Interventions that are too demanding may generate resistance among students or undermine teacher enthusiasm—leading the intervention to be poorly implemented or abandoned altogether (Wolf, 1978; Klingner et al., 1999; Forman et al., 2009; Evers et al., 2002). These concerns may be especially relevant for curriculum-agnostic, Tier-1 prevention programs. When educators perceive little alignment with their curriculum, they may be less willing to tolerate longer formats. This could unfold even if educators recognize the long-term value of early intervention (Dawson et al., 2004).

Taken together, these findings highlight a persistent challenge in intervention design: increasing an intervention's length can boost outcomes, but longer programs are harder to implement, more likely to be abandoned, and—beyond a certain point—often no more effective than shorter alternatives. Several educational models attempt to navigate this trade-off between intervention length and feasibility. Curriculum compacting allows students who demonstrate mastery to skip content they already know (Reis and Renzulli, 1992), while mastery-based and competency-based approaches let learners advance once they meet predefined performance criteria (Bloom, 1968; Sturgis et al., 2011). These models can increase efficiency, but they depend on having reliable, practical assessments for every targeted skill—something many interventions lack. In settings where such mastery data are unavailable or difficult to collect, how can interventions require less instructional time without sacrificing core learning goals?

We introduce precision streamlining as one possible solution. This strategy draws on two related paradigms. First, precision medicine enhances therapeutic impact by tailoring treatment to individual characteristics—delivering only the components most likely to help while omitting others (Collins and Varmus, 2015; Kosorok and Laber, 2019). Second, a growing movement in education—often referred to as precision education—applies this logic to learning. It argues that instruction should be adapted to deliver the right lesson to the right learner at the right time, minimizing wasted effort and time (Cook et al., 2018). Precision streamlining brings these principles to bear on the challenge of intervention length. This strategy maintains exposure to all core concepts while reducing the amount of required practice by tailoring which exercises each student completes. Practice is personalized based on learners' needs and preferences, which focuses their time and attention on the activities most likely to help. By trimming overall practice time while preserving conceptual breadth, precision streamlining offers a practical way to shorten interventions without undermining their impact—making it easier to implement effective programs within the limited time available in real classrooms.

Precision streamlining may be especially useful for interventions built around repeated practice. Many intensive programs aim to strengthen key skills by offering multiple exercises or examples that reinforce the same underlying principles. For example, an anti-bullying intervention might contain two key lessons and 12 scenario-based activities. To utilize the strategy of precision streamlining, the intervention designers could collapse the scenario-based activities so that

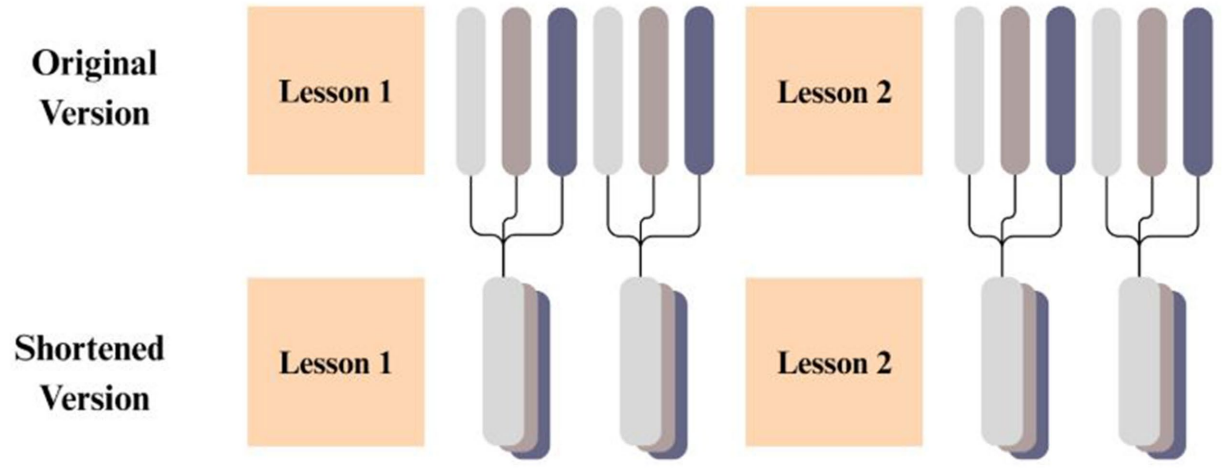

FIGURE 1
Illustrative example of precision streamlining.

each student completes only four, each time choosing the most personally relevant scenario from a list of three (Figure 1).

Precision streamlining may also enhance engagement by allowing students to focus on content that feels most meaningful to them—an effect well supported by research on autonomy and personalization (Reber et al., 2018). Despite its potential, this strategy has received little formal attention and has not been systematically evaluated in school-based settings.

To examine the potential of precision streamlining, we applied this design strategy to Finding Focus, a digital intervention developed to help high school students strengthen their attentional control and emotion regulation. These skills are central to academic success and emotional well-being, but they are rarely taught explicitly in schools. Therefore, Finding Focus takes a Tier-1, preventative approach to equip all students at a school with these skills before more severe performance and mental health issues emerge. National survey data identify student inattention as the top factor negatively impacting both learning and teacher morale (National Center for Education Statistics, 2024), underscoring the need for scalable programs that address the challenge of student inattention directly.

Although Finding Focus has demonstrated efficacy across multiple studies—improving students' classroom focus, emotion regulation, growth mindset about attention, and self-efficacy for training it (Mrazek et al., 2019b; Mrazek et al., 2020; Mrazek et al., 2022)—its length has hindered broader adoption. The original version included four core conceptual lessons alongside a large number of attention training exercises. In the streamlined version, students received the full set of conceptual lessons but completed fewer exercises overall, choosing their preferred type for each one. This shift allowed the intervention to be shortened by 45% while preserving its breadth and enhancing personalization.

The present research evaluates whether precision streamlining can improve the feasibility of an intervention without unduly sacrificing the magnitude and breadth of outcomes. We evaluated the streamlined version of Finding Focus in three stages. First, Study 1 provides an initial test of the shortened Finding Focus program in authentic classroom conditions, focused on feasibility and pre/post changes in the four key outcomes. Second, Study 2 serves as a planned replication that evaluates whether the same pattern of feasibility and outcomes generalizes across a larger and more diverse set of schools, teachers, and course contexts. Third, Study 3 integrates the new data on the shortened-version from Studies 1–2 with previously published evaluations of the original full-length program to directly compare the two versions and quantify the trade-offs. Together, these studies evaluate whether precision streamlining can preserve the impact of an evidence-based intervention while improving how easily it can be implemented in real-world school settings.

2 Study 1

2.1 Methods

2.1.1 Research design

Study 1 used a single-group pre/post-test design. Participants completed surveys immediately before and after completing the Finding Focus intervention. The study was approved by the Human Subjects Committee at the host university, and formal student consent was deemed unnecessary.

2.1.2 Participants

Teachers from several schools across the country previously agreed to help with research initiatives associated with Finding Focus, and a recruitment email was sent to these teachers. A total of six teachers across five schools opted-in to participate in the study. Four schools were located in California and one in Washington. The schools' free and reduced lunch rates ranged from 16% to 83% (M = 45.6%, SD = 26.0%). The teachers primarily taught Health, though one taught an AVID (Advancement via Individual Determination) course. Participating teachers implemented the surveys and the intervention with students across their various class periods. Classrooms were given a donation equivalent to $3/student for participating.

A total of 454 students completed the pre-test survey, and 428 students completed the post-test survey. The two surveys were linked using Student ID. In some cases, surveys could not be linked across time points due to school absences on the days the surveys were administered or typos in Student ID. Linked data from pre-test and post-test were available for 395 students. 129 of these students failed at least one of the quality checks embedded into the surveys; however, all effects remained significant when excluding those who failed the quality check, so results are reported for the full sample.

Of the 395 students, the sample consisted of 314 freshmen (79%), 9 sophomores (2%), 35 juniors (9%), and 30 seniors (8%). Students' ages ranged from 13 to 20 (M = 14.8, SD = 1.2). There were 200 male (51%), 171 female (43%), 9 nonbinary students (2%), and 8 who preferred not to say (2%). The number of students identifying with specific races and/or ethnicities was as follows: White/Caucasian—99 (25%); Hispanic/Latino—136 (34%); Af-rican American/Black––16 (4%); Asian—77 (20%); Mix of two or more races—38 (10%); American Indian / Alaskan Native—2 (<1%); Native Hawaiian or Other Pacific Is-lander—4 (1%). 7 students (2%) selected "Other," and 9 students (2%) selected "Prefer not to say." Seven students (2%) did not complete the demographics portion of the survey.

2.1.3 Intervention

Students completed an in-class digital program called Finding Focus, designed to strengthen attention and emotional regulation. The intervention was accessed through a web browser or mobile app and included brief lessons and exercises with high-quality videos, short texts, and interactive reflection questions. Previous research evaluated the original, full-length version of the program. In the current study, we tested a shortened version created through precision streamlining. Below, we first describe the original, longer version and then detail how it was revised.

Original version: the original version of Finding Focus included 132 min of content delivered over 22 days, consisting of four lessons and 21 brief exercises. The learning goals were to: (i) cultivate appreciation for the value of attention, (ii) convey that attention is a trainable skill, (iii) promote healthier ways of relating to thoughts and emotions, and (iv) teach five cognitive skills—anchoring, focusing, releasing, re-focusing, and re-evaluating. Anchoring involves making a deliberate decision about where to place attention. Focusing is directing attention to that anchor. Releasing refers to letting go of

distractions by withdrawing attention. Re-focusing means returning attention to a more worthwhile anchor. Re-evaluating involves replacing a counterproductive interpretation with one that feels true and constructive.

To help students practice these skills, the intervention also included 21 brief exercises designed to reinforce anchoring, focusing, and releasing. Each exercise guided students to direct their attention toward a specific aspect of experience, such as the sensations of breathing or the sounds of music. Students were encouraged to deliberately anchor their attention on the chosen aspect, sustain their focus, and release distracting thoughts and perceptions. These exercises provided repeated practice of the core cognitive skills in varied contexts. Some exercises allowed for limited personalization—for example, selecting a preferred music genre. However, all students completed the full set of 21 exercises, resulting in a relatively high level of practice across the intervention.

Shortened version: to reduce the overall length of the intervention while preserving its core components, the research and design team applied precision streamlining. The shortened version included 73 min of content delivered over 10 days. It retained four lessons but condensed the practice exercises. Instead of completing all 21 exercises, students completed just six. The first three exercises introduced different types of activities. For exercises 4 through 6, students choose their preferred activity type from a set of three options. This approach allowed students to engage with a smaller number of exercises that were more personally relevant.

2.1.4 Measures

Lesson and exercise completion were automatically tracked by the digital platform. In addition, four self-report measures from prior evaluations of Finding Focus were administered in randomized order.

Mindsets about focus: The Mindsets about Focus Scale (Mrazek et al., 2019b; Mrazek et al., 2020) includes two three-item subscales: one assessing growth mindset (e.g., My ability to focus is a skill that can get much better with practice), and one assessing self-efficacy (e.g., I know exactly what to do to increase my ability to focus).

Emotion regulation: The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA) is an age-adapted version of the ERQ for individuals aged 10–18 (Gullone and Taffe, 2012). Given ambiguity about whether expressive suppression is a healthy strategy, only the six-item cognitive reappraisal subscale was used (e.g., "I control my feelings about things by changing the way I think about them").

Classroom focus: following Mrazek et al. (2020, 2022), students were asked to report their actual focus using a single item: "On average across all your classes, how often do you keep your undivided attention focused on class?" A second question asked about their ideal focus: "This next question is NOT about what other people think you should do. It's about what you believe is best for yourself. On average across all your classes, how often would you ideally keep your undivided attention focused on class?" Both were rated from 0% to 100% of the time. As in previous studies, students with higher ideal focus than actual focus at pre-test constitute the subset of students with room to grow and were assessed as the *a priori* subset of interest for this measure.

2.1.5 Analytic approach

Hierarchical linear models were used to assess changes over time, accounting for the nesting of time within student, and student within teacher. Each model included time as the sole predictor and incorporated random intercepts for both student and teacher. Standardized mean difference effect sizes were calculated by dividing the time coefficient by the raw standard deviation of the corresponding pre-test score.

2.1.6 Hypotheses

Previous research on the original, full-length version of Finding Focus demonstrated improvements in growth mindset about attention, self-efficacy for training focus, classroom focus, and emotional regulation (Mrazek et al., 2019b; Mrazek et al., 2020; Mrazek et al., 2022). Based on these findings, we hypothesized that the shortened version—developed using precision streamlining—would yield significant gains from pre-test to post-test on all four outcomes. Given the reduced length, it was an open question whether the effects would match the strength of those observed in prior studies, but we expected the direction of change to remain consistent. Building upon prior research, analyses of classroom focus were hypothesized to include the subset of students who reported at baseline that their actual focus was lower than their ideal. All measures, anonymized data files, and syntax files are publicly available at: https://doi.org/10.17605/OSF.IO/ETFM6.

2.2 Results

Students completed an average of 94% of lessons (Lessons 1–4: 97%, 95%, 93%, and 90%) and 90% of exercises (Exercises 1–6: 94%,

TABLE 1 Study 1 means, standard deviations, and HLM results.

Measure	Pre-test M (SD)	Post-test M (SD)	β	SE	t	p	SMD
Growth mindset (1–6 scale)	4.7 (0.8)	4.8 (0.9)	0.10	0.04	2.23	0.03	0.12
Self-efficacy (1–6 scale)	4.0 (1.0)	4.4 (0.9)	0.45	0.05	8.28	<0.001	0.47
Emotion regulation (1–6 scale)	4.1 (0.8)	4.2 (0.8)	0.10	0.00	2.51	0.01	0.13
Classroom focus (0%–100%)	63.5 (22.1)	66.9 (21.4)	3.29	1.20	2.74	0.007	0.15

SE, standard error; SMD, standardized mean difference effect size; $N = 395$. For the classroom focus outcome, analyses included only the 215 students who reported that their actual focus was lower than their ideal focus at pre-test.

93%, 92%, 91%, 88%, and 82%). Students also showed significant improvements from pre-test to post-test in (i) growth mindset about their ability to focus, (ii) self-efficacy in knowing how to improve their focus, and (iii) emotion regulation (Table 1). Among the *a priori* subset of students (54%) who reported a gap between their ideal and actual focus at pre-test, average classroom focus significiantly rose from 63.5% to 66.9%.

2.3 Discussion

Study 1 provides initial evidence for the usefulness of precision streamlining given the feasibility and efficacy of the shortened version of Finding Focus. On average, students completed over 90% of the intervention—suggesting that precision streamlining made the intervention highly feasible to deliver in classroom settings. Despite being 45% shorter than the original, the revised intervention elicited significant improvements in students' growth mindset about attention, self-efficacy for training it, emotion regulation emotion regulation, and classroom focus for students with lower-than-ideal levels at pre-test. A standardized mean difference effect size of 0.20 is often considered a large effect in real-world education settings, and brief interventions often have effect sizes of 0.10 s.d. or lower (Yeager et al., 2019). Therefore, the gains observed in Study 1 not only exceed the benchmark for brief-format programs but also represent educationally meaningful improvements.

To replicate the findings in a broader context—Study 2 evaluated the shortened intervention in a larger and more diverse sample.

3 Study 2

3.1 Methods

The research design and procedure were identical to those of Study 1, providing a replication. Study 2 was designed to address one limitation (singular) inherent to Study 1 and to strengthen the evidence base for the shortened version before moving on to a more rigorous comparative assessment. Because implementation realities vary substantially across schools, we sought to evaluate generalizability across a broader range of geographic regions, school demographics, and course contexts. In this way, Study 2 functions not simply as a larger replication of Study 1, but as a generalizability test of whether the feasibility and outcome patterns observed in the initial implementation persists across heterogeneous real-world settings.

3.1.1 Participants

A total of 10 teachers across nine schools participated. Schools were located in New York, South Dakota, California, and Washington. The schools' free and reduced lunch rates ranged from 2% to 83% (M = 35.5%, SD = 26.5%). The teachers taught a range of subjects including Health, English, Computer Science, Physical Education, and Entrepreneurship. 796 students completed the pre-test survey, and 702 students completed the post-test survey. Linked data from pre-test and post-test were available for 674 students. 133 students failed at least one of the quality checks embedded into the surveys; however, all effects remained significant when excluding those who failed the quality check, so results are reported for the full sample.

Of the 674 students, this sample consisted of 494 freshmen (73%), 74 sophomores (11%), 87 juniors (13%), and 18 seniors (3%). Students' ages ranged from 13 to 19 (M = 14.5, SD = 0.9). There were 335 male (50%), 308 female (46%), and 6 nonbinary participants (1%), with 24 students preferring not to say (4%). The number of students identifying with specific races and/or ethnicities was as follows: White/Caucasian—185 (27%); Hispanic/Latino—154 (23%); African American/Black––16 (2%); Asian—191 (28%); Mix of two or more races—66 (10%); American Indian/Alaskan Native—1 (<1%); Native Hawaiian or Other Pacific Islander—5 (1%). 25 students (4%) selected "Other," and 30 students (4%) selected "Prefer not to say." There was one student who did not complete the demographics portion of the survey.

3.2 Results

Students completed an average of 96% of lessons (Lessons 1–4: 96%, 98%, 97%, and 93%) and 92% of exercises (Exercises 1–6: 96%, 95%, 94%, 92%, 90%, and 84%). Students also showed significant improvements from pre-test to post-test in (i) growth mindset about their ability to focus, (ii) self-efficacy in knowing how to train their focus, and (iii) emotion regulation (Table 2). Among the *a priori* subset of students (60%) who reported a gap between their ideal and actual focus at pre-test, average classroom focus increased significantly from pre- to post-test.

3.3 Discussion

Study 2 replicated and extended the findings from Study 1. As in the initial study, the shortened intervention demonstrated high completion rates and produced significant improvements in growth mindset, self-efficacy, emotion regulation, and classroom focus among the a priori subset of students who initially reported focusing less than they ideally would. These findings provide encouraging evidence for the shortened intervention's feasibility

TABLE 2 Study 2 means, standard deviations, and HLM results.

Measure	Pre-test M (SD)	Post-test M (SD)	β	SE	t	p	SMD
Growth mindset (1–6 scale)	4.8 (0.8)	5.0 (0.8)	0.24	0.03	7.16	0.001	0.29
Self-efficacy (1–6 scale)	3.9 (1.1)	4.4 (1.0)	0.58	0.05	12.62	<0.001	0.55
Emotion regulation (1–6 scale)	4.0 (0.9)	4.3 (0.9)	0.26	0.03	7.81	<0.001	0.29
Classroom focus (0%–100%)	68.8 (20.0)	73.2 (19.3)	4.44	0.86	5.18	<0.001	0.22

SE, standard error; SMD, standardized mean difference effect size; $N = 674$. For the classroom focus outcome, analyses included only the 404 students who reported that their actual focus was lower than their ideal focus at pre-test.

and effectiveness across a broader range of schools and course contexts.

At the same time, the single-group pre/post design used in both Studies 1 and 2 limits the strength of causal claims. Without a direct comparison to the original version, it remains unclear whether the streamlined design successfully preserved its core impact while improving feasibility. Study 3 addresses this critical question directly. By comparing outcomes across a large combined sample of students who received either the original or shortened version of Finding Focus, Study 3 offers a more rigorous test of whether precision streamlining can maintain the intervention's effectiveness despite a 45% reduction in length.

4 Study 3

4.1 Methods

4.1.1 Research design

Study 3 combined all data from Studies 1 and 2 with previously published data on the original version of Finding Focus, enabling a direct comparison between the original and shortened interventions. This study employed a two-group pre/post-test design, with condition defined by intervention length (original vs. shortened). Each dataset included a pre-test survey administered immediately prior to beginning the program and a post-test survey administered immediately after completion. All outcomes included in Study 3 were restricted to measures that used identical items and response scales across the original and shortened cohorts. No exclusion criteria were used. We utilized HLM to account for the nested structure of the data and incorporated random intercepts for both student and teacher. All methods and analyses replicated those used in Study 1, except where noted.

4.1.2 Participants

Three previously published studies evaluated the original version of Finding Focus (Mrazek et al., 2019b; Mrazek et al., 2020; Mrazek et al., 2022). For the present analysis, data from these studies were aggregated to form the "original version" condition. Data from Study 1 and Study 2 were similarly combined to form the "shortened version" condition. A total of 646 students completed the original version, and 1,069 students completed the shortened version, yielding a combined sample of 1,715 students for Study 3.

Of the 1715 students, this sample consisted of 1,246 freshmen (73%), 100 sophomores (6%), 132 juniors (8%), and 172 seniors (10%). Students' ages ranged from 13 to 20 (M = 14.7, SD = 1.1). However, age was not collected in one of the studies assessing the original version. There were 868 male (51%), 708 female (41%), 24 nonbinary students (1%), and 50 who preferred not to say (3%). Racial/ethnic identification: White/Caucasian—441 (26%); Hispanic/Latino—354 (21%); African American/Black––32 (2%); Asian—548 (32%); Mix of two or more races—137 (8%); American Indian/Alaskan Native—11 (1%); Native Hawaiian or Other Pacific Islander—12 (1%). There were 60 students (3%) who selected "Other," and 45 students (3%) selected "Prefer not to say." However, 75 students completed some, but not all, of the demographics portion of the survey. The schools' free and reduced lunch rates ranged from 2 to 83% (M = 49.5%, SD = 27.9%).

4.1.3 Analytic approach

Hierarchical linear modeling (HLM) was used to predict each outcome based on the interaction between time (pre vs. post) and condition (original vs. shortened intervention). To estimate within-condition changes over time, effect sizes were calculated by dividing the time coefficients by the raw standard deviation of the pre-test scores. To estimate between-condition differences, effect sizes were calculated by dividing the condition coefficients by the pooled standard deviation of pre-test scores across both groups.

4.2 Baseline equivalence across conditions

At baseline, students in the original and shortened intervention conditions did not significantly differ on growth mindset ($\beta = 0.10$, $t = 1.68$, $p = 0.10$), self-efficacy ($\beta = -0.01$, $t = -0.14$, $p = 0.89$), or emotion regulation ($\beta = 0.08$, $t = 1.28$, $p = 0.21$). A significant baseline difference emerged in classroom focus among the a priori subset of students who reported lower-than-ideal focus ($\beta = 4.31$, $t = 2.30$, $p = 0.02$), with higher initial focus in the shortened version group (M = 66.9, SD = 21.0) than in the original version group (M = 65.7, SD = 20.3).

4.2.1 Dosage

Completion rates were higher for the shortened intervention than the original intervention for both lessons (95% vs. 88%) and exercises (91% vs. 82%). Completion data were only available at the teacher level for the original intervention, precluding inferential statistics comparing the two conditions at the student level.

4.2.2 Growth mindset

Students showed significant gains in growth mindset after completing either the shortened intervention ($\beta = 0.19$, $p < 0.001$, SMD = 0.23) or the original intervention ($\beta = 0.20$, $p < 0.001$, SMD = 0.23) (Table 3). The difference in effectiveness between versions was not statistically significant ($\beta = 0.01$, $p = 0.80$, SMD = 0.02; see Figure 2).

4.2.3 Self-efficacy

Students showed significant gains in self-efficacy after completing either the shortened intervention ($\beta = 0.53$, $p < 0.001$, SMD = 0.52) or the original intervention ($\beta = 0.81$, $p < 0.001$, SMD = 0.76). The original intervention was significantly more effective than the shortened version in improving students' self-efficacy ($\beta = 0.28$, $p < 0.001$, SMD = 0.27).

4.2.4 Emotion regulation

Students showed significant gains in emotion regulation after completing either the shortened intervention ($\beta = 0.20$, $p < 0.001$, SMD = 0.23) or the original intervention ($\beta = 0.35$, $p < 0.001$, SMD = 0.38). However, the effect was significantly smaller in the shortened version compared to the original ($\beta = 0.15$, $p = 0.001$, SMD = 0.16).

TABLE 3 Means and standard deviations for shortened and original versions.

Measure	Shortened version		Original version	
	Pre-test	Post-test	Pre-test	Post-test
	M (SD)	M (SD)	M (SD)	M (SD)
Growth mindset (1–6 scale)	4.7 (0.8)	4.9 (0.8)	4.7 (0.9)	4.9 (0.9)
Self-efficacy (1–6 scale)	3.9 (1.0)	4.4 (1.0)	3.8 (1.0)	4.6 (1.0)
Emotion regulation (1–6 scale)	4.0 (0.9)	4.3 (0.9)	3.9 (0.9)	4.3 (1.0)
Classroom focus (0%–100%)	66.9 (20.9)	71.0 (20.2)	65.7 (20.3)	69.0 (20.6)

N = 1,715 high school students for all measures except classroom focus, for which analyses included 1,105 students.

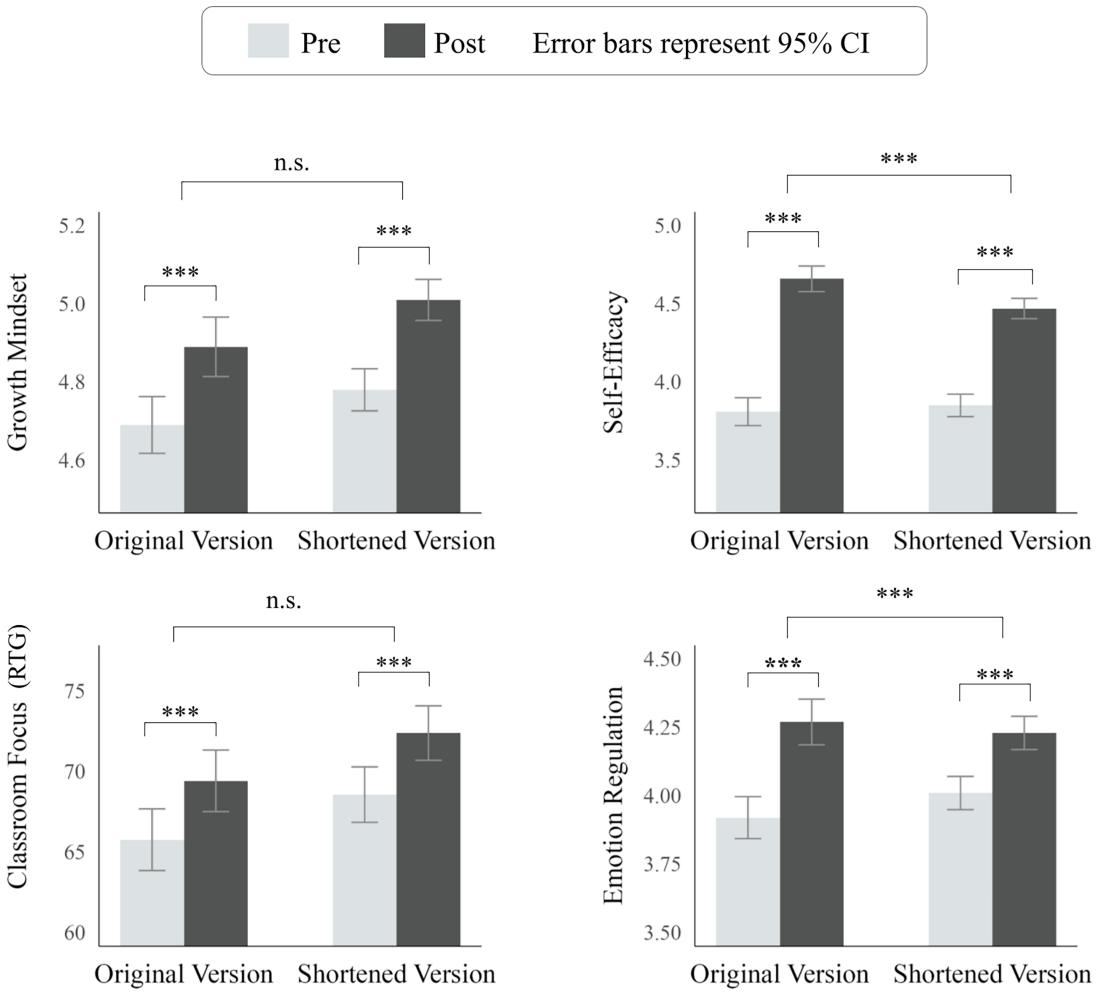

FIGURE 2
Comparisons of student improvement from the original and shortened versions. N = 1,715. For the classroom focus outcome, analyses included only the 1,105 students who reported that their actual focus was lower than their ideal focus at pre-test. ***Indicates $p < 0.001$. "N.s." indicates a non-significant difference between the original and shortened versions in the amount of improvement observed.

4.2.5 Classroom focus

Among the *a priori* groups of students who reported lower-than-ideal focus at pre-test, classroom focus significantly improved after completing either the shortened intervention ($\beta = 4.04$, $p < 0.001$, SMD = 0.19) or the original intervention ($\beta = 3.27$, $p < 0.001$, SMD = 0.16). The difference between versions was not statistically significant, indicating that reducing the program duration did not diminish the intervention's impact on classroom focus within this subset ($\beta = -0.77$, $p = 0.47$, SMD = 0.04).

4.3 Discussion

Study 3 directly compared the original and shortened versions of the intervention, providing a more rigorous test of precision streamlining. The shortened version demonstrated higher fidelity of

implementation, likely reflecting its reduced time demands. Both versions led to meaningful improvements across all four targeted outcomes. Growth mindset about attention and classroom focus showed comparable gains across versions, whereas differences between versions emerged primarily in the magnitude of effects for self-efficacy and emotion regulation.

Several features of this study shape how these findings should be interpreted. All outcomes were assessed using identical measures across studies, allowing effects to be compared directly across intervention versions without concern that differences reflect changes in measurement. In addition, by combining data across multiple prior evaluations and two new implementations, Study 3 draws on the largest and most heterogeneous sample in the present paper, spanning different schools, teachers, course contexts, and student populations. This diversity supports the generalizability of the findings. At the same time, because the comparison draws on data collected across separate studies rather than through random assignment within a single experiment, the results should be interpreted as descriptive of differences between versions rather than as definitive causal tests of equivalence.

5 General discussion

This research evaluated whether a school-based intervention could be meaningfully shortened without compromising its effectiveness. Using the Finding Focus intervention as a case study, we applied a novel design strategy—precision streamlining—to reduce the intervention's duration by 45% while preserving its core components.

Study 1 found significant improvements in students' growth mindset, self-efficacy, emotion regulation. Study 2 replicated these effects in a larger and more diverse sample emotion regulation, and classroom focus among those with less-than-ideal focus at pre-test. Study 3 directly compared the shortened version to the original, combining data from Studies 1 and 2 with previously published evaluations of the original intervention. The shortened version had higher fidelity of implementation, suggesting that reducing intervention length enhanced feasibility. Both versions significantly improved all four outcomes, with no meaningful differences in growth mindset or classroom focus. However, the original version produced significantly greater gains in self-efficacy and emotion regulation.

Notably, this pattern of findings does not map cleanly onto a simple distinction between belief change and practice-dependent skill consolidation. If cumulative practice were the primary driver of differential effects, one would expect students' actual focus to show less improvement from the shortened version of the intervention given that the ability to focus is a trainable skill that improves with practice (Mrazek et al., 2013a, 2013b). Instead, classroom focus improved to a similar degree across versions among students with room to improve. The practical implication of this pattern of findings is that precision streamlining can alter outcomes in ways that are not easily predicted by whether a construct is typically viewed as belief-based or skill-based. This underscores the need to empirically test the effects of streamlining rather than relying on intuitive assumptions about which outcomes will be most sensitive to reduced exposure.

One question raised by these findings is why the shortened intervention remained effective despite its reduced length. Several possibilities merit consideration. First, longer programs are more susceptible to fidelity decay, such that students may complete only a portion of the intended content (Jabir et al., 2024). In the present study, higher fidelity of implementation in the shortened version partially offset its reduced duration. Although students in the original condition completed more content overall, the difference in actual exposure was smaller than suggested based on program length alone.

A second possibility is that precision streamlining reduced redundancy, resulting in an experience that felt more engaging and less repetitive. By limiting repeated exposure to similar exercises and allowing students to focus on content they found most relevant, the shortened version may have sustained attention and effort more effectively across the program. Engagement is a well-established driver of impact in digital interventions (Arden-Close et al., 2015; Milward et al., 2018; Mrazek et al., 2019a; Perski et al., 2017), and higher engagement could help explain why the shortened intervention retained much of its effectiveness despite reduced duration.

A third possibility that may help explain why the shortened intervention remained effective is that the shorter format led students to perceive the program more favorably and to discuss it more positively with peers. Prior work suggests that peer norms and social endorsement can influence engagement with school-based interventions (Dörnyei and Muir, 2019; McDaniel et al., 2022). To the extent that the streamlined version was experienced as more manageable or appealing, informal peer-to-peer communication may have supported participation and effort, contributing to the intervention's overall effectiveness.

Finally, the targeted personalization embedded in the streamlined version may have enhanced students' sense of autonomy, a core driver of intrinsic motivation (Ryan and Deci, 2000). When students are given meaningful choices in how they engage with a program, they may be more likely to invest effort and internalize its value. Future studies applying precision streamlining should directly examine these potential mediators—such as engagement, peer regard, and autonomy—to better understand how streamlined interventions can maintain their impact.

Collectively, the present findings highlight the potential of a novel design strategy—precision streamlining—to resolve one of the most persistent barriers to program implementation in K-12 settings: limited classroom time. Rather than requiring designers to choose between potency and practicality, this approach offers a method for balancing both. By strategically retaining core content while collapsing and personalizing less essential elements, intervention developers may be able to scale their programs more efficiently—without sacrificing meaningful student outcomes.

Precision streamlining could be applied to other school programs facing time constraints, though the strategy is not appropriate in all cases. The approach is most likely to be effective when (i) the intervention contains meaningful redundancy in practice exercises, (ii) core concepts can be delivered efficiently, and (iii) personalization can increase engagement or relevance without undermining conceptual coverage. It may be less effective for programs whose mechanisms require cumulative exposure that cannot be compressed or selectively delivered.

More broadly, these findings speak to a persistent challenge in the translation of school-based interventions from research to practice. Many programs demonstrate efficacy under controlled conditions but show attenuated effects when implemented at scale, often due to difficulties sustaining high-quality implementation in real-world settings (Honig, 2006; Harris and Jones, 2017). Time demands, competing instructional priorities, and variability in implementation contexts can

all erode fidelity and limit impact as programs move from efficacy trials to effectiveness studies and routine use. From this perspective, precision streamlining can be understood as a design strategy aimed not only at reducing burden, but at preserving effectiveness under the conditions in which interventions are most often delivered. By explicitly accounting for implementation constraints during intervention design, approaches such as precision streamlining may help narrow the gap between demonstrated efficacy and real-world effectiveness.

Limitations & future directions: one limitation of this work is the single-group pre/post design used in Studies 1 and 2. Without a control group, it is difficult to rule out alternative explanations for the observed effects, such as student maturation, teacher influence, or changes over time unrelated to the intervention. However, these threats to internal validity are less concerning in Study 3, which directly compared the original and shortened versions of the same intervention. Because both groups received active versions of Finding Focus under similar conditions, many shared confounds would have applied equally. Moreover, the observed effects are consistent with those found in a prior randomized controlled trial of the original version (Mrazek et al., 2022), providing additional support for the intervention's efficacy.

Another limitation is the potential for selection bias, as all participating teachers opted into the study and were willing to devote class time to an optional intervention. This level of engagement may not be typical in all school settings, and it is possible that implementation fidelity would be lower with less proactive or supportive educators. At the same time, this raises an intriguing possibility: precision streamlining may be especially valuable in contexts where teacher facilitation is less robust. By making interventions easier to implement and less reliant on teacher guidance, streamlined designs could help ensure more consistent delivery even in settings with limited instructional support.

Future research should examine how program duration considerations apply to the demands placed on educators—not just students. Amid rising levels of teacher burnout and attrition (Carver-Thomas and Darling-Hammond, 2017; Marken and Agrawal, 2022; Pressley, 2021), interventions that minimize training time and reduce ongoing demands may be more scalable and sustainable. Streamlining educator-facing components—such as onboarding, delivery instructions, or required facilitation—could increase adoption while preserving or even enhancing efficacy (Swift et al., 2017). Precision streamlining offers a promising framework for this, and future work should explore how the same principles that improved student feasibility might support teacher implementation as well.

6 Conclusion

This research offers a pragmatic contribution to both intervention design and educational practice. In addition to introducing precision streamlining as a viable strategy for reducing intervention length, it demonstrates that a digital program targeting adolescents' focus and emotion regulation can produce meaningful benefits in less than 75 min of instructional time. In contexts where time is one of the most limited and contested resources, this finding opens the door to new possibilities for integrating academic, social–emotional, and mental health supports into the school day without displacing core instruction. More broadly, this work invites intervention designers to approach both existing and new programs with the goal of reducing burden without compromising impact—making it easier for effective interventions to take root in the time-pressed realities of everyday classrooms.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: https://doi.org/10.17605/OSF.IO/ETFM6.

Ethics statement

The Human Subjects Committee at the University of Texas at Austin reviewed the project, determining it qualified as program evaluation and quality improvement. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants or the participants' legal guardians/ next of kin. Student data were shared with the University of Texas at Austin under the Family Educational Rights and Privacy Act (FERPA), articles §99.31 and §99.35, which permit a local education agency (LEA) to disclose student information without the consent of parents or eligible students for the purpose of evaluating education programs and improving instruction. All data were handled in accordance with the privacy safeguards outlined in §99.35, including restrictions on data use, maintenance of confidentiality, and secure destruction of data upon completion of the evaluation.

Author contributions

AMr: Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. ATe: Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. JJ: Data curation, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing. JP: Investigation, Writing – review & editing. KZ: Formal analysis, Investigation, Methodology, Writing – review & editing. AMa: Formal analysis, Writing – review & editing. BR: Software, Writing – review & editing. ATr: Investigation, Writing – review & editing. EW: Data curation, Investigation, Writing – review & editing. YZ: Software, Writing – review & editing. TK: Software, Writing – review & editing. IW: Methodology, Writing – review & editing. JS: Funding acquisition, Writing – review & editing. MM: Conceptualization, Formal analysis, Funding acquisition, Methodology, Software, Supervision, Validation, Writing – review & editing.

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