Using Conversational AI to Teach Growth Mindset Skills to Youths in India: Protocol for a Randomized Controlled Trial

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Abstract

This study aims to test whether a brief digital intervention using conversational AI can improve mental health outcomes among school-aged youth (grades 6-8) in India, where most young people with mental health issues do not receive treatment. The intervention teaches "growth mindset", the belief that our skills and abilities can improve with effort, via a 45-minute interactive conversation with an AI chatbot (spread across two class periods). A randomized controlled trial with approximately 430 students at a private, English-medium school in Bangalore will evaluate whether interacting with the chatbot can reduce symptoms of anxiety and depression while enhancing growth mindset beliefs. Half the students will receive the full intervention at baseline, while the other half (control group) will complete a usual school assignment; after 7 weeks, the control group will receive a shortened (15-minute) version of the growth mindset intervention. Participants will complete 10-minute surveys at baseline, 3 weeks, and 7 weeks, after which all students will receive a printed booklet with all the information from the chatbot. This study represents one of the first randomized controlled trials evaluating conversational AI as a brief digital intervention for youth mental health.

About this document

With the intent of documenting the pre-registered protocol as transparently as possible, this document follows the structure of the SPIRIT 2025 guidelines for reporting protocols of randomized controlled trials (Hróbjartsson et al., 2025). Appendices provide additional details on study procedures, informed consent forms, and survey measures.

Administrative information

1. Title and structured summary

1a. Title

Using Conversational AI to Teach Growth Mindset Skills to Youths in India: Protocol for a Randomized Controlled Trial

1b. Structured summary

Primary Registry and Trial Identifying Number	OSF: https://osf.io/gxhsd/
Secondary Identifying Numbers	ClinicalTrials.gov: Registration forthcoming
Source(s) of Monetary or Material Support	William F. Milton Fund Generative AI Track
Primary Sponsor	Harvard University
Contact for Public Queries	John R. Weisz (john_weisz@harvard.edu)
Contact for Scientific Queries	John R. Weisz (john_weisz@harvard.edu)
Public Title	Using Conversational AI to Teach Growth Mindset Skills to Youths in India
Scientific title	Using Conversational AI to Teach Growth Mindset Skills to Youths in India: Protocol for a Randomized Controlled Trial
Countries of Recruitment	India
Health Condition(s) or Problem(s) Studied	Youth mental health; anxiety; depression
Intervention(s)	Growth mindset training via 45-minute interaction with conversational AI
Key Inclusion and Exclusion Criteria	Inclusion Criteria: - Youth in grades 6-8 at our partner school - Youth assents to participate and a parent/guardian provides passive consent (does not opt-out of participation) Exclusion Criteria: - N/A
Study Type	Interventional
Date of First Enrollment (planned)	Nov 3, 2025
Sample Size	430
Primary outcome(s)	Change in Behavior and Feelings Survey - Internalizing Subscale (full sample; baseline, 3 weeks, 7 weeks). Trajectories of self-reported symptoms of anxiety and depression from the 6-item (each item rated on a 0-4 scale, with higher ratings indicating more symptoms) Internalizing Subscale of the Behavior and Feelings Survey. Total scores range from 0 to 24, with higher scores indicating more symptoms (BFS; Weisz et al., 2020). Student Perceived Program Acceptability and Helpfulness (intervention group, post-intervention). Assessed via the Program Feedback Scale (Schleider et al., 2019).
Key Secondary outcome(s)	Change in Behavior and Feelings Survey - Internalizing Subscale (**elevated subsample**; baseline, 3 weeks, 7 weeks). Trajectories of self-reported symptoms of anxiety and depression from the 6-item (each item rated on a 0-4

	scale, with higher ratings indicating more symptoms) Internalizing Subscale of the Behavior and Feelings Survey. Total scores range from 0 to 24, with higher scores indicating more symptoms (BFS; Weisz et al., 2020). Change in Growth Mindset Beliefs (full sample and elevated subsample; baseline, 3 weeks, 7 weeks). Assessed via the Growth Mindset Scale (Sigmundsson & Haga, 2024), adapted to a Grade 6 reading level. Growth mindset reflections (intervention group; 3 weeks, 7 weeks). Assessed with three brief questions to check recall and use of growth mindset as well as intent to apply it in the future: - What do you remember about growth mindset from the session we did a few weeks ago? - Have you used growth mindset for anything at school or home in the past few weeks? If so, please describe how you used it. - How would you most like to use growth mindset in the days ahead?
Ethics Review	Status: Approved Approval date (original submission): 9/19/2025 Approval date (updated submission): 10/10/2025 Protocol number: IRB25-0827 Contact: Harvard University-Area Committee on the Use of Human Subjects Smith Campus Center, Suite 645 1350 Massachusetts Ave Cambridge, MA 02138
Individual Trial Participant Data sharing statement	To respect concerns shared by our school partner regarding privacy of student data, individual participant data will not be shared with outside researchers.

2. Protocol version

Version 1.0 (November 1, 2025)

3. Roles and responsibilities

3a. Names, affiliations, and roles of protocol contributors

[Refer to page 1 for contributor names and affiliations.]

WT, JSS, SHYT and JRW conceived of the study and developed the initial protocol, with input from SM and JS. WT developed the intervention, with feedback from all other authors. JSS developed the statistical analysis plan, with feedback from WT, SHYT and JRW. Project administration and supervision were provided by WT, JSS and JRW. Funding was acquired by WT, JSS, SHYT, JS and

JRW. The original draft was written by WT, JSS and JRW. All authors contributed to the refinement of the final study protocol.

3b. Name and contact information for the trial sponsor

Sponsor:
Office of Research Administration
Faculty of Arts and Sciences
Harvard University
University Hall, 1st Floor
Cambridge, MA 02138
research@fas.harvard.edu

3c. Role of trial sponsor and funders in design, conduct, analysis, and reporting of trial

The study is funded by the William F. Milton Fund, Generative AI Track at Harvard University. The study is sponsored by Harvard University. The sponsor and funders had no influence over the design, conduct, analysis and reporting of the trial.

3d. Composition, roles, and responsibilities of the coordinating site, steering committee, endpoint adjudication committee, data management team, and others overseeing the trial, if applicable

N/A

Open science

4. Trial registration

This trial is registered on OSF (https://osf.io/gxhsd/) and will be registered on ClinicalTrials.gov.

5. Protocol and statistical analysis plan

The protocol and statistical analysis plan are specified in this document as well as in trial registries:

- OSF: https://osf.io/gxhsd/
- ClinicalTrials.gov: Registration forthcoming

6. Data sharing

To respect concerns shared by our school partner regarding privacy of student data, individual participant data will not be shared with outside researchers.

7. Funding and conflicts of interest

7a. Sources of funding and other support

The study is funded by the William F. Milton Fund, Generative AI Track at Harvard University.

7b. Financial and other conflicts of interest

There are no conflicts of interest reported by the authors.

8. Dissemination policy

We will post trial results in ClinicalTrials.gov and disseminate them via peer-reviewed publications.

Introduction

9. Background and rationale

9a. Scientific background and rationale

Globally, 300 million youths have a diagnosable mental disorder (Wang et al., 2023) and more reside in India than any other country (Hossain & Purohit, 2019). Yet, in India, where our study is based, most youths affected by mental health issues do not receive treatment (UNICEF, 2021). Symptoms are especially prevalent during high school, when many students show signs of depression (Kamath et al., 2021) and anxiety (Jayashree et al., 2018). Given myriad challenges in accessing mental healthcare, some have turned to conversational AIs such as ChatGPT and Claude for personalized support (Song et al., 2024; Maples et al., 2024). However, there are few rigorous tests of whether such tools can improve mental health.

We aim to bridge this gap by combining conversational AI with evidence-based intervention for youth mental health (Cwinn et al., 2022)—specifically, a growth mindset intervention, which promotes the belief that abilities are not innate but can be improved with effort (Dweck, 2006; Jiang et al., 2023). It is well known that growth mindset interventions can improve academic performance. In addition, our group and others have shown that brief, computer-guided growth mindset training can reduce symptoms of anxiety and depression that sustain 3-9 months post-intervention (Schleider & Weisz, 2018; Schleider et al., 2019; Osborn et al., 2020; Schleider et al., 2022), and not only in the U.S. (Osborn et al., 2020). However, until now, these interventions have been delivered via static, standardized websites that few people use (Project YES, 2021).

Recently, we have developed a growth mindset intervention that is embedded within a conversational AI. The system delivers a 45-minute interactive lesson on growth mindset. Similar to prior interventions, the content includes modules on understanding growth mindset, its basis in neuroplasticity, and roleplaying scenarios. Each module includes interactive discussions with the AI (e.g., “in your words, what is a growth mindset?”, “in the above scenario, how could a growth mindset apply?”)

The specific aim of our study is to test whether our brief, AI-enabled growth mindset intervention offers measurable benefits for school-aged youth in India. We will conduct a randomized controlled trial with about 430 students (grades 6-8) to measure whether the AI-enabled training leads to changes in growth mindset beliefs and skills as well as symptoms of anxiety and depression, relative to a control group that receives a shortened intervention after 7 weeks. We will administer brief, 10-minute questionnaires to all participants at baseline, 3 weeks, and 7 weeks. At the conclusion of the trial, all students will receive a printed booklet with content from the full

intervention. Our study will take place in an English-medium private school in Bangalore, India, which serves a diversity of students.

Our growth mindset intervention may also benefit academic performance, and our partner school, at its discretion, may be able to integrate it into part of their standard curriculum following the completion of the study. However, our specific research question is whether the chatbot interaction yields measurable improvements in youth mental health. Given the preponderance of AI chatbots aiming to address various aspects of mental health, such measurement is as important as it is rare. This study will contribute to the growing evidence base on how technology can inform and support youth mental health.

9b. Explanation for choice of comparator

Guided by discussions with the partner school, the control group will undertake alternate classroom activities assigned by the teacher (i.e., treatment as usual) during the intervention periods. The exact activity assigned to the control group will be recorded and reported. The control group will also receive a shortened version of the intervention after 7 weeks. At 7 weeks, all students will receive a printed booklet containing the full content of the intervention.

10. Objectives

The primary objective is to assess the effect of a brief, AI-guided growth mindset training on anxiety and depressive symptoms in youth in India, compared to usual classroom activities, from baseline to 3- and 7-weeks post-intervention. Key secondary objectives include assessing the acceptability of the intervention, assessing the effects on growth mindset beliefs and understanding patterns of engagement with the AI chatbot.

Methods: Patient and public involvement, trial design

11. Patient and public involvement

Inputs from the school partner were vital in developing and refining the intervention content. Critical feedback on the chatbot was provided across three one-hour sessions: (i) by three school teachers, (ii) by two fifth-grade students, and (iii) by a recent 12th grade graduate and a parent of that graduate (all linked to the partner school). These sessions also helped to generate some of the role-playing scenarios that are featured in the chatbot.

12. Trial design

We will conduct a parallel group randomized controlled trial with simple individual randomization (1:1) of participants to control and intervention groups. During the intervention, the control group will engage in quiet classroom activities assigned by the teacher. After 7 weeks, the control group will receive a shortened version of the intervention (while the intervention group engages in alternate classroom activities).

Methods: Participants, interventions, and outcomes

13. Trial setting

The trial will take place in our partner school (a single site). The school is a private school in urban Bangalore and conducts classes in English. It caters to students from diverse backgrounds from Grade 1 to Grade 12.

14. Eligibility criteria

14a. Eligibility criteria for participants

Inclusion criteria:

(i) Youth in grades 6-8 at our partner school.
(ii) Youth assents to participate and a parent/guardian provides passive consent (does not opt-out of participation)

Exclusion criteria:

- N/A

14b. If applicable, eligibility criteria for sites and for individuals who will deliver the interventions)

N/A

15. Intervention and comparator

15a. Intervention and comparator

Participants will interact with an AI chatbot for approximately 45 minutes (split across two class periods). The tutorial has a structured script and pauses at section boundaries to allow for brief interactions. It also contains culturally grounded comics and illustrations with role-playing scenarios to engage with students.

Example interactions with the AI chatbot, including open-source code needed to reproduce it, will be made available at https://github.com/bthies/growth-mindset-chatbot

The comparator (alternate classroom activities) will be assigned by the teacher. The specific activities that students engage in will be noted and reported with the results of the trial.

15b. Criteria for discontinuing or modifying allocated intervention/comparator for a trial participant

We have extensively tested the chatbot with thousands of AI-generated and human-generated inputs, including malicious ones, to test its safety and appropriateness in a variety of situations. Given such testing, in combination with the already stringent guardrails of OpenAI GPT-4.1, we feel confident that the content of the bot's responses will be appropriate for a school setting. Nonetheless, we will monitor chat logs after each day of the intervention to ensure that all responses from the bot are appropriate. In the unlikely event of inappropriate responses, we will either tighten the guardrails in advance of the next day's session, or we will pause the study until such changes can be made.

15c. Strategies to improve adherence to intervention/comparator protocols, if applicable, and any procedures for monitoring adherence

To help facilitate the study, a researcher will be available over a video call during study-related class periods, and a local assistant will be physically present to help troubleshoot any technical issues. A script is also prepared for the school teacher to read at the beginning of the study (see Appendix D).

15d. Concomitant care that is permitted or prohibited during the trial

N/A

16. Outcomes

Primary Outcomes:

Change in Behavior and Feelings Survey - Internalizing Subscale (full sample; baseline, 3 weeks, 7 weeks). Trajectories of self-reported symptoms of anxiety and depression from the 6-item (each item rated on a 0-4 scale, with higher ratings indicating more symptoms) Internalizing Subscale of the Behavior and Feelings Survey. Total scores range from 0 to 24, with higher scores indicating more symptoms (BFS; Weisz et al., 2020).

Student Perceived Program Acceptability and Helpfulness (intervention group, post-intervention) - Assessed via the Program Feedback Scale (Schleider et al., 2019). This scale consists of 7 items rated on a 1 to 5 scale, with higher scores indicating greater acceptability and helpfulness.

Secondary Outcomes:

Change in Behavior and Feelings Survey - Internalizing Subscale (**elevated subsample**; baseline, 3 weeks, 7 weeks) - Trajectories of self-reported symptoms of anxiety and depression from the 6-item (each item rated on a 0-4 scale, with higher ratings indicating more symptoms) Internalizing Subscale of the Behavior and Feelings Survey. Total scores range from 0 to 24, with higher scores indicating more symptoms (BFS; Weisz et al., 2020).

Change in Growth Mindset Beliefs (all participants; baseline, 3 weeks, 7 weeks) - Assessed via the Growth Mindset Scale (Sigmundsson & Haga, 2024), adapted to a 6th grade reading level. This scale consists of 8 items, rated on a scale from 1 (not like me at all) to 5 (very much like me).

Growth mindset reflections (intervention group; 3- and 7-week follow-up assessment): three brief questions to check recall and use of growth mindset as well as intent to apply it in the future.
- What do you remember about growth mindset from the session we did a few weeks ago?
- Have you used growth mindset for anything at school or home in the past few weeks? If so, please describe how you used it.
- How would you most like to use growth mindset in the days ahead?

Chatbot logs: The logs of all interactions with the chatbot, including timing of messages, will be recorded for analysis.

Potential Moderators:

Demographic questions: age, gender identification, sex assigned at birth, year in school.

Potential Mediator:

Growth Mindset Beliefs: We will conduct a secondary mediation analysis using structural equation modeling (SEM) to test whether change in Growth Mindset mediates the effect of the intervention on change in BFS-Internalizing.

17. Harms

Participants may feel uncomfortable answering some measures of their mental health. Participants will be told that they have the option to not respond to the questions if they feel uncomfortable or they can rescind their participation in the study. Furthermore, to protect participant responses, we will use a codebook of coded IDs (maintained and owned by the school) so that all IDs collected for research are coded. Given these precautions, we do not anticipate any significant risks associated with this study.

It is unlikely that participants will become distressed when completing this study and, given that none of the survey questions directly asks about intention to harm oneself or others, such content would not fit into the structure of the intervention or surveys. Nonetheless, if a student should describe mental health distress or an intent to harm themselves or others in the interface to the AI chatbot, the chatbot will respond with empathy and encourage them to call India's national mental health helpline (called TeleMANAS, reachable at 14416.).As described in Section 15 (Intervention and Comparator), we have extensively tested the chatbot and are confident that its responses will be appropriate for a school setting. Nonetheless, we will monitor chat logs and in the unlikely event of inappropriate responses, we will either tighten the guardrails or will pause the study.

As our school partner emphasized the importance of respecting the anonymity and confidentiality of student responses as much as possible, we do not plan for researchers or school staff to initiate any outreach to students or parents based on a student's responses to the intervention or surveys.

18. Participant timeline

Each participant engages with the study across five class periods:

- Class 1: Assent and baseline survey
- Class 2 (1 week after class 1): Intervention group receives growth mindset training; control group does typical classroom activities
- Class 3 (1 week after class 2): Intervention group receives growth mindset training; control group does typical classroom activities
- Class 4 (3 weeks after class 3): Follow-up surveys
- Class 5 (4 weeks after class 4): Follow-up surveys; control group receives shortened growth mindset training; intervention group does other classroom activities

Additional detail is provided in the table below, as well as in Appendix A (Study Procedures).

Participant timeline: Schedule of enrollment, interventions, and assessments.

	TRIAL PERIOD					
	Enrollment		Intervention		Follow-Up	
TIMEPOINT	2.5 Weeks Before Enrollment	Enrollment	1 Week After Enrollment	2 Weeks After Enrollment	3 Weeks After Intervention	7 Weeks After Intervention
ENROLLMENT:						
Parents informed about study & how to opt-out	X					
Student assent		X				
Baseline surveys		X				
Randomization		X				
INTERVENTION/ CONTROL:						
Intervention group receives growth mindset training			X	X		
Control group receives delayed and shortened intervention						X
ASSESSMENTS:						
Demographic questions		X				
Internalizing symptoms		X			X	X
Growth mindset scale		X			X	X
Program feedback (intervention group)				X		
Growth mindset reflections (intervention group)					X	X

19. Sample size

Our sample size is constrained by the number of available students in the school. We expect about 450 students to be invited to participate (150/students per grade across 3 grades). Assuming an opt-out rate of 5%, we can expect a sample size of about 430 students.

For our primary tests of intervention effects (i.e., mixed effects model examining the time [baseline, 3-week FU, 7-week FU] * condition [Intervention or Control] interaction), an a priori power analysis shows that our sample size can detect effects as small as 0.22 (using two-tailed tests with $\alpha = .05$, $\beta = 0.2$). This effect size is comparable to that detected by a prior single-session growth mindset intervention (Schleider & Weisz, 2018).

20. Recruitment

All students in grades 6-8 at our partner school will be invited to participate.

The school partner was based on strong pre-existing relationships with the research team. The decision to focus on grades 6-8 was made in consultation with the school principal, who believed that these grades would benefit from the intervention while also having flexibility in their curriculum.

Methods: Assignment of interventions

21. Randomization: Sequence generation

21a. Who will generate the random allocation sequence and the method used

The first author will perform the randomization using R.

21b. Type of randomization (simple or restricted) and details of any factors for stratification.

Simple individual randomization (1:1) of participants to intervention or control group.

22. Allocation concealment mechanism

The use of central randomization will ensure that students and teachers cannot determine trial allocation ahead of time. Allocation to the experimental or control groups will take place when class is not in session (between the day of enrollment and the start of the intervention.)

23. Implementation of randomization

As the study procedures are conducted online, assignment of participants to intervention or control groups is done electronically and not by any personnel. Hence no personnel can influence the implementation of the randomized assignment.

24. Blinding

24a. Who will be blinded after assignment to interventions (e.g., participants, care providers, outcome assessors, data analysts)

The intervention will be unblinded for teachers, students and researchers.

24b. If blinded, how blinding will be achieved and description of the similarity of interventions

N/A

24c. If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial

N/A

Methods: Data collection, management, and analysis

25. Data collection methods

25a. Plans for assessment and collection of trial data

The study will be conducted in partnership with a private school in Bangalore, India in which instruction is provided in English. Participation in the study will be under supervision across five class periods. Participants will complete all survey measures online. A lump-sum payment will be made to the school partner to provide support for students in the school.

All data will be collected in electronic form, via direct entry into Qualtrics or the chatbot from the school's computer lab.

Data to be collected are summarized in Section 16 (Outcomes) as well as Appendix E (List of Measures). The forms used for data collection are available on request from the first author.

25b. Plans to promote participant retention and complete follow-up

Because the study is conducted within a school setting during regular class hours, participant retention is expected to be very high.

26. Data management

Every effort will be made to ensure data security. Survey data will be input directly into Qualtrics. Interactions with the AI chatbot will be hosted, logged and stored on Digital Ocean servers certified under SOC 2 Type II and ISO 27001 standards. OpenAI GPT-4.1 will be used as a secure and private AI service but will not retain or store any participant data.

Students will be identified by a coded ID in the research dataset. Researchers will provide a list of coded IDs to the partner school. The school will create a table with a unique coded ID for each student's name. The table will be owned by the partner school and deleted after the last survey is administered (7 weeks after intervention).

Only researchers involved in this study will have access to the study datasets. Data may be stored on password-protected personal laptops of study staff.

The project completed a successful Data Safety and Security Review at Harvard University (Safety Submission ID: DAT25-0595).

27. Statistical methods

27a. Statistical methods used to compare groups for primary and secondary outcomes

Statistical models

All statistical analyses will be performed using R. To evaluate intervention effects, we will use a series of mixed-effects regression models implemented via the lme4 package (or comparable tools). Each model will include Time (baseline, 3-week, 7-week), Condition (intervention vs. control), and their interaction (Condition × Time) as fixed effects, with random intercepts for participants and, where feasible, classroom to account for nesting. The Condition × Time interaction will test whether outcome trajectories differ between groups over time.

If outcome distributions deviate substantially from normality, we may use generalized linear mixed-effects models with an appropriate link function (e.g., logit, log, or beta) or apply suitable transformations (e.g., rescaling data to a (0,1) interval for beta regression) to improve model fit. All models will be checked for assumptions, including residual distribution and heteroskedasticity.

We will calculate both within-subject and between-subject effect sizes for intervention effects on continuous outcomes. For mixed-effects models, standardized mean differences will be computed from estimated marginal means and pooled residual variance (e.g., using effectsize::t_to_d() or contrasts via emmeans). All effect sizes will include 95% confidence intervals and, when available, Common Language (CL) effect sizes to facilitate interpretation.

For the mediation analysis, we will use structural equation modeling (SEM) in R (lavaan) to test whether change in Growth Mindset mediates the effect of the intervention on change in BFS-Internalizing. The primary model will specify: Intervention → Growth Mindset → BFS-Internalizing, with baseline levels of both constructs included as covariates. We will use a latent change score (LCS) mediation model or an observed (composite-score) change model. Indirect effects (a × b) will be estimated using bias-corrected bootstrap 95% confidence intervals, and standardized effects will be reported. Missing data will be addressed using Full Information Maximum Likelihood (FIML) or pooled multiple imputation, consistent with the main analysis. Because indirect effects are typically smaller than direct effects, and given the available sample size (N ≈ 430), we expect adequate power to detect small-to-moderate indirect effects but limited power for very small ones. Accordingly, this mediation analysis is secondary and exploratory, and findings will be interpreted cautiously.

Transformations

We will examine the distribution of each outcome and apply transformations or generalized linear mixed-effects models as appropriate. For example, if data are heavily right-skewed, we may rescale continuous outcomes to a (0,1) range and fit a **beta-distributed model** to better approximate the observed distribution.

Inference criteria

Two-tailed tests (alpha = .05) will be used.

27b. Definition of who will be included in each analysis and in which group

Participants enter the analysis cohort at randomization, which occurs after assent and baseline measures. Assenting students will be excluded if they do not have the opportunity to complete the baseline measures (e.g., due to interruption or absence) or if they later withdraw consent or assent and ask for their data to be excluded; all others will be included.

All planned analyses will be conducted using the full participant sample (intention-to-treat). We will also conduct subgroup analyses among students with elevated baseline internalizing symptoms—defined as scores ≥1 SD above the mean—following established norms for youth mental health measures (e.g., Youth Self-Report; Achenbach & Rescorla, 2001). These analyses will explore whether intervention effects differ when the program is used as a universal versus indicated prevention approach.

27c. How missing data will be handled in the analysis

We will address missing data using **multiple imputation** via the **mice** package in R. Prior to imputation, we will examine patterns of missingness and conduct sensitivity analyses to assess whether data appear to be **missing at random (MAR)** versus systematically missing. Imputation models will include all variables used in the main analyses and relevant auxiliary variables to support the MAR assumption.

Appropriate imputation methods will be specified by variable type (e.g., predictive mean matching for continuous variables, logistic or polytomous regression for categorical data). For bounded or highly skewed variables, we may apply transformations (e.g., logit or log) prior to imputation and back-transform results after pooling. If multilevel dependencies (e.g., students nested within classrooms) substantially affect missingness patterns, we will use multilevel imputation approaches (e.g., miceadds or mitml) to preserve the nested data structure.

The number of imputed datasets will approximately match the percentage of missing data for each outcome (rounded up to the nearest whole number, e.g., three imputations for ~2–3% missingness). Analyses will be pooled across imputations using **Rubin's rules**, providing **intent-to-treat** estimates that retain power and reduce bias relative to listwise deletion.

Effect sizes (e.g., *Cohen's d* with 95% confidence intervals) will be derived from model-based estimates using the **effectsize** or **MOTE** packages in R, based on *t*-values from treatment effects in the pooled analyses.

27d. Methods for any additional analyses (e.g., subgroup and sensitivity analyses)

1) We will conduct exploratory qualitative analyses of participants' growth mindset reflections using AI-based text analysis tools, supplemented by manual review where appropriate. In addition to categorizing responses into themes, we will code whether reflections demonstrate (a) valid understandings of growth mindset, (b) positive applications of growth mindset in real-life contexts, or (c) specific intentions to apply growth mindset principles. We will also explore whether baseline demographic variables are associated with the presence or absence of these codes.

2) We will conduct exploratory qualitative analyses of chatbot interaction logs using AI-based text analysis tools, supplemented by manual review where appropriate. Analyses may include descriptive summaries of responses (e.g., response length, number of attempts required to generate acceptable answers) and thematic analyses of key responses (e.g., categorization of advice provided in role-playing scenarios).

3) We may explore the time taken by participants to progress through each step of the chatbot, including optional examination of how baseline demographic variables are associated with those timings.

4) If many participants are unable to finish the training in the allotted time, we may perform an additional analysis with the subsample of participants who were able to finish the complete training.

5) We may explore how various baseline variables moderate the effectiveness of the intervention. For example, we may examine whether baseline demographic variables or baseline measures of internalizing symptoms moderate changes in outcome variables over time.

Methods: Monitoring

28. Data monitoring committee

28a. Composition of data monitoring committee (DMC) or an explanation of why it is not needed

There will not be a formal Data Monitoring Committee for this trial, as the study involves minimal risk to participants. Ongoing oversight will be conducted by the research team, who will monitor data quality, participant safety, and ethical compliance throughout the study.

28b. Explanation of any interim analyses and stopping guidelines

N/A

29. Trial monitoring

No formal trial monitoring is planned for this study, as it involves minimal risk to participants and is conducted at a single school site under direct supervision of the research team.

Ethics

30. Research ethics approval

This study was approved by the Harvard University-Area Committee on the Use of Human Subjects.

The original submission (ID number: IRB25-0827) was approved on 9/19/2025.

A modification was submitted to spread the intervention across two class periods, and to provide a booklet with the full intervention material at the conclusion of the study. The modification (ID number: MOD25-0827-01) was approved on 10/10/2025.

31. Protocol amendments

Any substantive protocol changes will be approved by the Harvard IRB and updated in this document and the trial registry.

32. Consent or assent

32a. Who will obtain informed consent or assent from potential trial participants or authorized proxies, and how

Parental consent procedures:
The school administration will contact at least one legal guardian of all eligible students (grades 6-8) to provide an overview of the study and explain the process of passive consent. This outreach will take place via an electronic system. We will use passive, opt-out consent in which parents/guardians have 2.5 weeks to opt out a student from the study. If a guardian opts their child out of the study, this information will be recorded and the child will not be invited to participate. The parental consent form appears in Appendix B.

Student assent procedures:
The technology teacher will read an informational "Script" to orient students to the study. A researcher will be available on a video call to answer any questions students might have. In addition, at least one local assistant (recruited by the study team) will be physically present in the class to help with the procedures.

The teacher will visit each student in the class, carrying a study roster that maps from student name to a coded ID. A preloaded webpage on each student's computer will be used to enter the student's coded ID, or to click "opt out" if a parent has already opted out for the student.

- Students whose parents have opted out will do an alternate classroom activity.
- Students who might participate will automatically be redirected to a digital assent form.
- Any students who decline to participate will do an alternate classroom activity.
- Students who agree to participate will proceed to answer baseline survey questions.

More details on these procedures, including creation and maintenance of the study roster, appear in Appendix A (Study Procedures). The student assent form and teacher's script appear in Appendices C and D, respectively.

32b. Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable

N/A

33. Confidentiality

As described in Section 26 (Data Management), student names will not be collected or stored as part of the research dataset. Instead, students will be identified by a coded ID. Researchers will provide a list of coded IDs to the partner school. The mapping from student name to coded ID will

be owned by the partner school and deleted after the last survey is administered (7 weeks after intervention).

To respect concerns shared by our school partner regarding privacy of student data, individual participant data will not be shared with outside researchers. The script for the school teacher (Appendix D) and student assent form (Appendix E) convey that the research team will analyze student responses to the chatbot and other questions but not share those answers with anyone else.

34. Ancillary and post-trial care

No ancillary or post-trial care is planned, as the study involves a brief, low-risk educational activity.

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Appendix A: Study Procedures

Advance Preparation: Parental Consent and Roster

Roster: The school will create and maintain a "study roster" for students. The roster will contain three columns: student name, coded ID, and whether the student has opted out of the study (or has been opted out by their parent/guardian) for any reason. Researchers will provide the school with a set of valid coded IDs (4 digits each) and the school will assign them to students. To protect the identity of participants, the mapping from student name to coded ID will be owned by the school and will be deleted when the study concludes.

Parental consent: The school principal will contact at least one legal guardian of all eligible students (grades 6-8) to provide an overview of the study and explain the process of passive consent. This outreach will take place via an electronic system. We will use passive, opt-out consent in which parents/guardians have 2.5 weeks to opt out a student from the study. If a guardian opts their child out of the study, this information will be recorded in the study roster and the child will not be invited to participate.

Class 1: Student Assent and Baseline Measures

During the period scheduled for technology class, all students will report to the school computer lab as per usual. Each student will access a personal, Internet-connected computer.

The technology teacher will read an informational "Script" to orient students to the study. A researcher will be available on a video call to answer any questions students might have. In addition, at least one local assistant (recruited by the study team) will be physically present in the class to help with the procedures.

The teacher will visit each student in the class, carrying the study roster. A preloaded webpage on each student's computer will be used to enter the student's coded ID, or to click "opt out" if a parent has already opted out for the student.

- Students whose parents have opted out will do an alternate classroom activity.
- Students who might participate will automatically be redirected to a digital assent form.
- Any students who decline to participate will do an alternate classroom activity.
- Students who agree to participate will proceed to answer brief survey questions (Demographics, Behavior and Feelings Survey – Internalizing Subscale, Growth Mindset Scale)

The process above might not require the full class period. Any students who finish early will do an alternative activity assigned by the teacher.

After class, researchers will randomly assign assenting students to control and intervention groups. They will create a table that maps each student's coded ID to one of three cases: control, intervention, or opt out. This information will be provided to the school to merge with the study roster.

Classes 2 and 3: Growth Mindset Training for Intervention Group
In the next two scheduled periods of technology class, students will be divided into two groups. Students in the intervention group will sit on one side of the computer lab, while students in the control group (and any students who have opted out) will sit on the other side.

Students in the intervention group will do the training program by interacting with an AI chatbot. On the second day of the intervention, following the intervention (or if time runs out, during the last 5 minutes of the class period), students will complete a brief survey to provide program feedback.

Students in the control group (and anyone who opted out) will complete an alternate activity identified by the technology teacher (e.g., a learning activity on the computer). This activity will not take the form of a graded assignment but will be an additional enrichment activity.

Class 4: Follow-up Survey
Three weeks after the training, all participants will be asked to complete a brief follow-up survey (approximately 10 minutes). This activity will occur at the beginning of a normal technology class. As before, the teacher will assist students in entering their coded IDs. Students who have opted out will do an alternate activity.

Class 5: Follow-up Survey and Growth Mindset Training for Control Group
Seven weeks after the training, all participants will be asked to complete a brief follow-up survey (approximately 10 minutes). This activity will occur at the beginning of a normal technology class. As before, the teacher will assist students in entering their coded IDs. Students who have opted out will do an alternate activity.

After the survey, the control group will complete a shortened (15 minute) version of the growth mindset training while the intervention group and opted-out students will do an alternate activity.

Following this class, a printed booklet with all the content from the full version of the training will be provided to all students in grades 6-8.

Appendix B: Parental Consent Form

Note: This form will be provided in electronic format so that parents can submit it remotely.

Growth Mindset Study at [School Name]: Information Sheet and Opt-Out Form

Study Title: Using Conversational AI to Teach Growth Mindset Skills to Youths in India
Researcher: Dr. John Weisz

Key Information

Here is a short summary of a study being done at [school name]. This is to help you decide whether you would like your child to have an opportunity to participate.

Why is my child being invited to take part in a research study?
We have invited your child to take part in a research study because your child is a student in one of the eligible grades at [school name], our partner for this project.

What should I know about participating in a research study?
Participation is completely voluntary. You and your child can decide whether to take part. You can also agree to take part and later change your mind. Your/your child's refusal to participate will not result in any consequences or any loss of benefits that you and your child are otherwise entitled to receive. You and your child can ask all the questions you want before you decide.

Why is this research being done?
In partnership with a team of researchers at Harvard University, [school name] is providing a brief online program for students as part of the school curriculum. The program uses an artificial intelligence (AI) chatbot, similar to ChatGPT, to teach skills that can help children learn, grow, and pursue challenges, something known as a "growth mindset." Students will be randomly assigned to two groups. One group will do a longer version of the activity in two upcoming class periods (around one hour in total). The other group will do a shorter version of the same activity (about 15 minutes) in about 2 months. After the activities are finished, all students will get a printed booklet. The booklet will explain the lessons from the full activity, so everyone learns the same things. The research will help us evaluate the effectiveness of this program in helping students.

How long will the research last and what will my child need to do? How long will the research last?
The project will last about two months. During class time, students will receive a digital program about growth mindset, lasting either for 60 minutes or 15 minutes. Your child will also be invited to answer survey questions on the first day of the study, and approximately 1 month and 2 months later. Your child will be provided with a short (about 10 minutes) online survey at each of these times. Answers to these survey questions will help us learn how helpful the online activity is, and how long the benefits may last.

What will my child need to do?
During class, students who choose to participate in this program will complete a brief interaction

with an AI chatbot: either about 60 minutes immediately or 15 minutes in about two months. That is, after answering some brief online questions on the first day of the study (~10 minutes), students will be randomly (50% chance) assigned to complete the activity immediately or in two months. This will allow us to learn for which students the digital program is most helpful.

Your child will also be invited to answer questions on the first day of the study, and at approximately 1 month and 2 months after starting the study. Your child will be provided with a short (about 10 minutes) online survey at each of these times. Answers to these survey questions will help us learn how helpful the online activity is, and how long the benefits may last.

At the end of the study, all students will receive a printed booklet that contains the full content from the chatbot. This way, all students can learn the same material.

Is there any way being in this study could be bad for my child?
Some students may feel uncomfortable answering questions about their feelings and well-being. However, students will have the option to not respond to the questions if they feel uncomfortable doing so, and they can stop their participation in the study at any time by letting the school coordinator or researchers know, or by exiting the web browser.

As in any research study, risks to participant privacy can emerge in the event of a data breach. However, we will not collect student names or contact information as part of the digital program or survey questions. We will also restrict access to datasets by using password protections and storing all data on secure servers. Given these precautions, we do not anticipate any significant risks associated with this study.

Will being in this study help my child in any way?
We cannot promise any benefits from your child's participation in this research. However, possible benefits to your child may include that they enjoy their assigned activity and that they learn skills for learning, growing and taking on new challenges. Also, what we learn from this study may help other children in the future.

What happens if I do not want my child to be in this research?
Participation in research is completely voluntary. You/your child can decide that your child will participate, not participate, or discontinue participation at any time without penalty or loss of benefits to which your child is otherwise entitled. If you or your child chooses to discontinue participation at any time, any data that has been collected from your child up to that point will be deleted if you request it.

Instead of being in this research study, your child's choices may include completing a typical class activity chosen by the school during the time in which other students are participating in the research study.

We hope that this project will help students to think positively about new challenges and be resilient to any setbacks as they pursue their academic and personal goals. Please do not hesitate

to reach out to the Harvard University research team, Bill Thies <bthies@fas.harvard.edu> and John Weisz <john_weisz@harvard.edu>, with any questions you may have.

What do I need to do?

If you would like your child to be given the opportunity to participate in this study, no further action is required. You can exit this page now.

If you DO NOT want your child to be given the opportunity to participate in this study, please select 'I do not want my child to participate' and click Submit.

- ◯ I do NOT want my child to participate in the study

Submit

Appendix C: Student Assent Form

Note: This form will be provided in electronic format. Students will submit it from the computer lab.

Assent to Participate in a Research Study

1. We are scientists at Harvard University. We are asking you to participate in a research study.

2. If you participate in the study, you will complete an online activity. The activity will use an artificial intelligence (AI) chatbot to teach you skills for learning, growing, and pursuing challenges. Half of the students in your class will be randomly assigned (50% chance) to complete the activity over the next two computer classes. The other half will do a shorter version of the same activity (about 15 minutes) in about 2 months. After the activities are finished, all students will get a printed booklet. The booklet will explain the lessons from the full activity, so everyone learns the same things.

3. You will also be asked to answer some questions online today that will take about 10 minutes.

4. We will also invite you to answer online questions again after about 1 month and 2 months. Each set of questions will take about 10 minutes to complete. You can say no to these questions and still participate in the study.

5. If you participate in the study, we will not record your name at any time. Your responses to the chatbot and other questions will be analyzed by our research team. They will not be shared with anyone else.

6. We don't think it's likely that participating in the study will be bad for you in any way. Some questions will ask you about your emotions and how you're feeling, but if you don't want to answer those questions, you don't have to. You can stop being part of the study anytime by telling your teacher or the person running the study (Mr. Bill Thies). You can also stop participating by closing the web browser. Sometimes, in studies like this, there's a chance that someone sees the private information that you tell us if there's a problem with the computer. However, we're doing things to keep that from happening. For example, we're putting passwords on the computer files, and keeping all the data safe on special computers.

7. If you participate in the study, you will learn new skills that we think may help you. You can also help us help other students like you by answering our questions.

8. If you do not want to participate in the study, you can say no. You can say no at any time, and that is okay. No one will be mad if you say no.

9. You can ask [teacher's name] if you have any questions about how to complete the program or if you have technical problems. If you do not understand what it means to participate in the study or if you have questions about the content of the activity or other parts of the study, you can talk to Mr. Bill Thies from the study team. You can also contact the research supervisor by sending email to Dr. Weisz (john_weisz@harvard.edu).

10. If you click “Yes, I would like to participate,” this means that you have read this message, you understand it, and you will be asked to answer our questions and complete an online activity either in the next two class periods or in two months.

Please choose one:

☐ I would like to participate in the study
☐ I would NOT like to participate in the study

Submit

Appendix D: Script for School Teacher

Note: The technology teacher will read this aloud at the start of the study.

Scientists from Psychology Department at Harvard University are inviting you to complete a short online activity that they hope you will find interesting and helpful. The activity will use an artificial intelligence (AI) chatbot to teach you skills for learning, growing, and pursuing challenges. I (your teacher) am helping these researchers to carry out their work by telling you about this study and by helping you to get set up to participate. This research study is optional--it is not a required assignment, and it is not graded. There are a few things the researchers want us to tell you:

What if I don't want to complete this activity?
You do not have to complete this activity. It is your choice. If you do not want to complete the activity you will [*insert alternative activity chosen by the teacher]*.

What will happen if I complete this activity?
If you want to complete the activity, I will show you how to open it on your computer. It starts on a webpage with some questions for you to answer today. The questions will take about ten minutes, and you will get them today and two other times this year. For the main activity, the class will be divided into two groups:

- Group 1 will do the activity in the next two computer classes (around one hour in total).
- Group 2 will do a shorter version of the same activity (about 15 minutes) in about 2 months.

After the activities are finished, all students will get a printed booklet. The booklet will explain the lessons from the full activity, so everyone learns the same things.

Who made these activities?
These activities were made by scientists at Harvard University.

Who will see my answers?
This study is led by a scientist named Dr. Weisz. Dr. Weisz and his team may see your answers, but they will not know your name. No one else will know your answers. No one at school, no one in your family, and no other students will see your answers.

What if I say yes now but want to stop participating in this study later?
You can stop participating in this study at any time by just letting me know that you would like to stop. If you stop participating, we will offer alternate activities during any remaining study periods, and the researchers would offer to delete any data already collected from you.

I (your teacher) and the researchers are fine with whatever you decide. We just want you to do

what you would like to do.

You can ask me if you have any questions about how to complete the program or if you have technical problems. If you do not understand what it means to participate in this study or if you have questions about the content of the activity or other parts of the study, you can talk to Mr. Bill Thies from the study team. You can also contact the research supervisor by sending an email to Dr. Weisz (john_weisz@harvard.edu).

Appendix E: List of Measures

- **Demographics (all participants; Baseline/0 Weeks)**
  - How old are you?
  - What grade are you in?
  - What gender do you identify as?
    - (i) Girl, (ii) boy, (iii) I don't identify as just a boy or girl, (iv) Prefer not to say
    - If (iii), optional follow-up: Would you like to tell us more about your gender?
  - What sex were you assigned at birth (e.g., on your birth certificate)?
    - Female, male, prefer not to say, not sure

- **Behavior and Feelings Survey — Internalizing Subscale (all participants; 0 weeks, 3 weeks, and 7 weeks):** brief assessment of anxiety and depression symptoms over the past week.

How much have you had each of the following problems during the past week?

	0 = not a problem	1	2	3	4 = a very big problem
1. I feel sad	○	○	○	○	○
2. I feel bad about myself, or don't like myself	○	○	○	○	○
3. I feel depressed or down	○	○	○	○	○
4. I feel nervous or afraid	○	○	○	○	○
5. I worry about bad things happening	○	○	○	○	○
6. I think sad or scary thoughts over and over again	○	○	○	○	○

- **Program Feedback (immediately post-training):** elicits feedback from the child about the digital program (Schleider et al., 2019).

Please read each statement and select how much you agree or disagree.

	Really Disagree	Disagree	Neutral	Agree	Really Agree
1. I enjoyed the activity	○	○	○	○	○
2. I understood the activity.	○	○	○	○	○
3. The activity was easy to use.	○	○	○	○	○
4. I tried my hardest during the activity.	○	○	○	○	○
5. I think the activity would be helpful to other kids my age.	○	○	○	○	○
6. I would recommend this activity to a friend going through a hard time.	○	○	○	○	○
7. I agree with the activity's message.	○	○	○	○	○

- **Growth Mindset Scale (all participants, all timepoints):** a standard scale to assess growth mindset beliefs (Sigmundsson & Haga, 2024), adapted to lower reading level.

Please read each statement and choose the option that describes you best.

	1 = Not like me at all	2 = Not much like me	3 = Somewhat like me	4 = Mostly like me	5 = Very much like me
1. I know that with effort I can improve my skills and knowledge.	○	○	○	○	○
2. I can control the kind of person I become.	○	○	○	○	○
3. I can change my skills and knowledge through practice.	○	○	○	○	○
4. I like to take on challenges and try new things.	○	○	○	○	○
5. I try to learn as much as I can.	○	○	○	○	○
6. Effort makes me stronger.	○	○	○	○	○
7. I am willing to put in extra time to get better at things I'm learning.	○	○	○	○	○
8. I believe in my skills and what I can achieve.	○	○	○	○	○

- **Growth mindset reflections (intervention group, 3-week and 7-week follow-up assessment):** three brief questions to check their recall and use of growth mindset as well as their intent to apply it in the future.

  1. What do you remember about growth mindset from the session we did previously?
  2. Have you used growth mindset for anything at school or home in the past month or so? If so, please describe how you used it.
  3. How would you most like to use growth mindset in the days ahead?

- **Logs of chatbot interactions (all participants):** Logs of conversation with the chatbot, including the timing of messages, will be securely stored and analyzed.