



View xForm - Research Review Board (RRB) Submission

New RRB Submission

Data Entry

- Submitted 02/24/2024 8:49 AM ET by McGee, Steven PhD

Amendment Summary

RRB Number	2022-1773
Study Title	Impacts of Skyline Professional Development on Teacher Practices and Student Learning
Event Type	Modification/Continuing Review defined 02/24/2024
Schools Participating	<i>No answer provided.</i>

Description of Research Activities to Date

In the last year, The Learning Partnership engaged in the two primary research activities of this RRB. At the middle school level, data collection involved observations of 13 professional learning sessions for middle school science, 7 interviews with district, network, and teacher leaders, and 8 focus groups with teachers with 28 teachers. The results have been accepted for presentation at AEPF 2024 and AERA 2024. At the high school level, data collection involved observations and video recordings of high school students engaged in 2 Skyline chemistry activities that involved computational thinking. The results were presented to the Skyline team and science department at CPS conversations with researchers session.

Preliminary Results to Date

At the middle school level, we found that Skyline PL leveraged many research-based practices; it was content-focused, involved active learning, was coherent with district goals and NGSS standards, supported teachers with the process of shifting to a new curriculum, and created space for teachers to share ideas, resources, and challenges. In focus groups, teachers articulated wanting more time for collaboration with teachers from other schools and more support with culturally responsive and equitable instruction for the science classroom. Recent observations of Co-Lab Cohort Learning Cycle 1 (Fall 2023) suggest that professional learning communities are a promising PL model to foster teacher collaboration across schools, support teachers with implementing Skyline, and build middle school teachers' capacities with culturally responsive and equitable science instruction.

At the high school level, we found that although the chemistry activities were focused on the scientific practice of modeling, the students actually engaged in many of the NGSS practices as they addressed the investigation questions, including asking questions, designing investigations, generating explanations, and developing arguments. The students engaged in a variety of problem-solving cycles as they made predictions and tested hypotheses. We hypothesize that since these students had taken the Exploring Computer Science (ECS) course, they were particularly well-prepared to engage in computational modeling inquiry. ECS likely helped them feel comfortable with computational modeling. ECS also focused on problem solving with computational tools, which also likely helped support student comfort with engaging in computational inquiry.

Type of Request

Modification

Please select continuing review if no changes have been made to your study protocol. If you plan on proposing a modification AND a continuing review, please select modification, as an approved modification will extend your approval period.

Indicate Proposed Modification Areas

Research Questions or Hypothesis
Study Methodology and/or Research Activities
Study Population
Study Timeline

After summarizing your proposed modifications on this page, please update the following pages as appropriate. Please update all aspects of your proposal to reflect your proposed modifications. Any changes made within your proposal will be displayed as tracked changes to your assigned reviewer.

Please provide an overview of the proposed modifications to your hypothesis

We have completed the CT-STEM study of HS skyline so are removing that from the protocol.

Please provide an overview of the proposed modifications to your study timeline

We are extending the Skyline middle science PD study for another year if we receive funding from NSF.

Please provide an overview of the proposed modifications to your study population

We will no longer be studying high school science students.

Please provide an overview of the proposed modifications to your study methodology and/or research activities

We will not be collecting data about high school science.

Optional Attachments - please attach any reports/publications that have been created thus far here.

No answer provided.

Pertinent CPS Documentation

Submitter

McGee, Steven PhD

Email: mcgee@lponline.net

Business: (708) 710-5963

Overview of Pertinent CPS Documentation

The RRB is composed of members representing various Central Office academic departments as well as the Law Department. The RRB meets quarterly to evaluate new proposals to conduct research. The RRB calendar and deadlines for submissions can be found on the CPS Research Website here. Decisions resulting from the research review process will be communicated to the applicant of the request as well as appropriate CPS staff in accordance with the estimated timelines outlined in the respective RRB calendar. External researchers may not begin any research activities or obtain data for research purposes without first following the procedures outlined in this policy and securing the necessary approvals.

We expect all researchers to be familiar with the guidelines and policies guiding research within the district. Please verify that you have read and acknowledged the following:

External Research Study and Data Policy

✓ I have read and understood the External Research Study and Data Policy

CPS RRB Guidelines

✓ I have read and understood the CPS RRB Guidelines

CPS Equity Framework

✓ I have read and understood the CPS Equity Framework

CPS Vision

✓ I have read and understood the CPS Vision

CPS Volunteer Policy

✓ I have read and understood the CPS Volunteer Policy, including background check requirements

Study Personnel Details

Study Title

Impacts of Skyline Professional Development on Teacher Practices and Student Learning

Does your organization participate in a Research Practice Partnership (RPP) with Chicago Public Schools?

Yes

Please select the RPP with which you are affiliated

The Learning Partnership

RPP Point of Contact

McGee, Steven PhD

Email: mcgee@lponline.net

Business: (708) 710-5963

Current Study Contacts

Name	Role
Blaushild, Naomi PhD	Project Team Member
Donaldson, Kristi Ph.D.	Primary Contact
Duck, Jennifer	Project Team Member
Duck, Kevin	Project Team Member
Fisher, Elizabeth	Project Team Member
McGee, Catherine	Project Team Member
McGee, Steven PhD	Principal Investigator
McGee-Tekula, Randi	Project Team Member
Peel, Amanda PhD	Project Team Member
Rasmussen, Andrew	District Supporter

Is the Principal Investigator a Student?

No

Is the researcher a CPS Staff Member?

No

Funding and Intervention Information

Is this project contracted by the CPS Board of Education?

No

Is a funding source associated with the proposed research?

Yes

Who is the primary funding source?

NSF

What is the amount of funding awarded?

\$2,700,000.00

Please list primary contact information of funder.

Jennifer Noll jnoll@nsf.gov

Select the option that applies to your study

My study will be occurring District-wide

Will this research require any in-person interaction or intervention activities?

Yes

Will this research require any virtual interaction or intervention activities (Google Meets, Zoom, etc.)?

Yes

Please note that Zoom is not approved for use with CPS Students. Any virtual activities will need to be conducted via Google Meets and safe@cps.edu must be invited to Google Meet. Please adjust virtual methods accordingly. For more information on permitted interactions with students and staff, please visit <https://www.cps.edu/about/policies/acceptable-use-policy/external-volunteers/>.

Please review CPS's Acceptable Use of Technology Guidance (AUP)



Questions about eligibility or appropriate use of communication channels should be directed to the school principal or CPS External Research department. Only CPS-approved communication channels may be used.

Please be aware that virtual interviews involving students may only be conducted via Google Meets. A CPS Staff member must be present for the entire duration of the interview. For more information on CPS' Acceptable Use of Technology policies, please visit <https://www.cps.edu/about/policies/acceptable-use-policy/external-volunteers/>

Please check all of the following that apply to your research protocol:

Focus Groups
Interviews

Please outline your protocol for focus group activities, describing when, where, duration, frequency, and with whom.

Focus groups for middle school science teachers will be scheduled at teachers' convenience (e.g., in the evening or immediately following a professional development session). Focus groups will last no longer than 90-minutes and will take place in-person (e.g., where PD has just taken place if space is available) or via Zoom. Teachers will be eligible to participate in focus groups if they are implementing Skyline science and have attending at least one professional development session related to Skyline (e.g., unit launch, co-lab, Network PLC, deep dive).

Does this involve video, audio, or photograph recording?

Yes

Please describe the protocol for audio/video recording

Focus groups may occur in person or via video conferencing depending on teachers' preferences. Focus groups will be audio recorded for in person interviews and video/audio recorded for Zoom interviews. The audio files will be sent to a transcription service. Originals audio files will be deleted once transcription is completed and transcripts have been cleaned.

Please describe how data will be captured and stored securely

All data will be stored on password-protected DropBox accounts managed by The Learning Partnership. Access to these accounts and folders within them are restricted to key study personnel actively involved in the cleaning or analysis of data. Originals audio files will be deleted once transcription is completed and transcripts have been cleaned. Any participant names will be replaced with pseudonyms and arbitrary ID numbers. Though a document will be generated that links names with ID numbers (to facilitate the linking of data from one year to the next), this document will be stored in a separate folder from the data within the password-protected, encrypted server. At the conclusion of the project, the focus group data will be securely deleted from The Learning Partnership servers.

Please attach all study materials corresponding to focus group procedures (i.e., consent forms, protocol, recruitment and incentive plans)

Focus Group Consent Form	Consent Forms
Focus Group Pre-Survey	Focus Group Protocols
Teacher Focus Group Protocol	Focus Group Protocols

Please outline your protocol for individual interview activities, describing when, where, duration, frequency, and with whom.

Researchers will schedule hour-long in-person or Zoom interviews with district and school leaders responsible for designing, supporting, and leading professional learning at their convenience. Interviews will cover how leaders understand and support professional learning, curriculum implementation, and instruction related to Skyline science.

Does this involve video, audio, or photograph recording?

Yes

Please describe the protocol for audio/video recording

Teacher and school/district leader interviews may occur in person or via phone or video conferencing depending on teachers' preferences. Interviews will be audio recorded for in person interviews and video recorded for Zoom interviews. The audio files will be sent to a transcription service. Originals audio files will be deleted once transcription is completed and transcripts have been cleaned.

Please describe how data will be captured and stored securely

All data will be stored on password-protected DropBox accounts managed by The Learning Partnership. Access to these accounts and folders within them are restricted to key study personnel actively involved in the cleaning or analysis of data. Original files will be deleted once transcription is completed and transcripts have been cleaned. Any participant names will be replaced with pseudonyms and arbitrary ID numbers. Though a document will be generated that links names with ID numbers (to facilitate the linking of data from one year to the next), this document will be stored in a separate folder from the data within the password-protected, encrypted server. At the conclusion of the project, the video and audio recordings will be securely deleted from The Learning Partnership servers.

Please attach all study materials corresponding to interview procedures (i.e., consent forms, protocol, recruitment and incentive plans)

MS Science_District Leader Consent Form	Consent Forms
MS Science_School Leader Consent Form	Consent Forms
MS Science_District Leader Protocol	Interview Protocols
MS Science_School Leader Protocol	Interview Protocols

Deleted Attachments: 6 (Most Recent: CT-STEM Teacher Interview on 02/24/2024 8:04 AM ET)

Will this research require the use or access of existing CPS data?

No

Will this research require the use or access of existing non-CPS data?

No

Study Details

Please select all of the following that will be participating in the study?

Teachers
Other Staff

Has this project been reviewed by an Institutional Review Board (IRB)?

Yes, and it was approved

IRB of Record Name

Northern Illinois University

IRB Protocol Number

#HS18-0135

Please attach all of your IRB documentation here (include approval/exemptions letters, IRB study protocol, etc.).

NIU IRB Amendment Approval 2023	IRB Letters
NIU IRB Continued Approval 2022	IRB Letters
NIU IRB original approval	IRB Letters
NIU IRB original	IRB Protocol

Deleted Attachments: 6 (Most Recent: Solutions IRB Updated on 02/24/2024 8:06 AM ET)

IRB of Record Primary Contact Email Address

mblaschak@niu.edu

Please select your primary area of research from the following:

STEM Education

Secondary Study Subject(s)

Equity
General Curriculum and Instruction
Professional Development
Science Curriculum
Teachers

Study Overview

Executive Summary or Abstract

Please provide a high-level overview of your study, including a summary of the motivation, design, and implications of the project.

To support the Skyline Curriculum initiative its evaluation, we propose to examine the relationships among participation in Skyline professional development (PD); changes in teacher practice; and ultimately improved student outcomes. Our subject and grade areas of focus will be middle school science and high school science. Among the planned study activities are: characterizing the structure of Skyline PD (with research-based categories of effective PD), interview Skyline staff to understand the PD and Skyline implementation process, and interview teachers implementing the curriculum to document changes in teaching practice, and ultimately, document student learning outcomes.

Research Questions and Hypothesis

Please list all research questions and hypotheses associated with this project.

Science RQ:

1. To what extent does the structure of Skyline professional development align to research-based practices?
2. To what extent does participation in Skyline professional development correlate with increases in NGSS-aligned instructional practices?

Purpose and Literature Review

Please provide an overview of the existing research and literature on this subject. What is the contextual history of this subject area and how does this research build upon the body of extant knowledge?

The goal of the Curriculum Equity Initiative is to provide equitable access to standards-aligned, high- quality and culturally responsive curriculum materials to all CPS schools, educators, and students. In support of this initiative, we will examine the relationships among participation in Skyline professional development (PD), changes in teacher practice, and ultimately improved student outcomes. We will build on Desimone and Garet's (2015) framework for effective PD, which is (1) content-focused, (2) engages teachers in active learning, (3) coherent with the school goals, teacher knowledge, the needs of students, and local policies, (4) encourages collective participation, and (5) occurs multiple times, over a sustained period.

Research Activities and Student/Staff Involvement

Please provide an overview of all primary and secondary research activities associated with this study. Please use this space to describe, as thoroughly as possible, all that will be asked of your research subjects (e.g. surveys, focus groups, observations, etc.)

RQ1: To what extent does the structure of Skyline professional development align to research-based practices?

We will examine Skyline design documents, interview Skyline designers and facilitators, and conduct observations of Skyline professional development. We will document the level of participation in both the formal Skyline professional development opportunities as well as the informal professional learning opportunities, including using attendance records from the formal workshops. Next, we will interview and/or conduct focus groups with a selection of teachers who are using Skyline and have attended district professional learning opportunities. Finally, we will conduct interviews with school and district leaders responsible for designing, leading, and supporting professional learning (e.g., Skyline leaders, content specialists, PD facilitators, school leaders, network ISLs).

2. To what extent does participation in Skyline professional development correlate with increases in NGSS-aligned instructional practices?

We will conduct teacher focus groups.

Primary Data Collection Elements

1. Skyline team member interviews (SY24-25, ongoing)
2. Skyline PD observations (SY24-25, ongoing)
4. Teacher & PLC facilitator interviews (SY23 second semester)

Secondary Data Collection Elements

1. Skyline PD design documents, collected SY22-23
2. CPS PD Participation records (Skyline and otherwise), requested for SY13-23 to understand teacher's previous PD experience and exposure
3. School Skyline level (1,2,3) for SY22-2

Research Methodology and Analytical Technique

Please provide an overview of your research methodology and specific analytical techniques that will be utilized as part of this study.

In the context of the problem-solving cycle, The Learning Partnership employs rigorous empirical methods through four modes of research: hypothesis testing, research & development, continuous improvement, and evaluation. This project falls under the evaluation phase. We will conduct analyses to examine the relationships between participation in Skyline professional development and changes in teacher instructional practices. The study will be mixed methods, with a combination of observations, interviews, and analysis of district artifacts. Analyses will be closely aligned to the research questions and to the Desimone & Garet framework for effective professional development.

Benefits and Commitment to Equity

Benefit to CPS

Which (if any) CPS vision goals does your research support?

50% of students will meet college readiness benchmarks on the SAT.

Click here to access more information on the CPS Vision Goals.

Please describe how your project supports each of the Vision Goals selected above.

Students' academic performance in science contributes to performance on the SAT. We will be evaluating the extent to which the Skyline PD contributes towards teachers implementing NGSS-aligned teaching practices which the literature suggests will contribute to increase student learning in science.

Which (if any) of the CPS core values does your research support?

Academic Excellence
Continuous Learning
Equity
Student Centered

Please describe how your project supports each of the core values selected above.

The goal of the Curriculum Equity Initiative is to provide equitable access to standards-aligned, high- quality and culturally responsive curriculum materials to all CPS schools, educators, and students. This research is in support of this initiative, to understand the relationships between Skyline PD (continuous learning), teacher instructional practices, and student outcomes (equity and academic outcomes). The Skyline science curricula use inquiry-based approaches (student-centered).

How does this project support the district broadly?

This project directly addresses Skyline research questions posed by the district. Specifically, RQ 1.2.1-7, 2.1.2-3, 2.2, 4.1.4, and 4.4.

Commitment to Equity

In what ways does this project reflect/challenge/progress the district's commitment to equity?

The goal of the Curriculum Equity Initiative is to provide equitable access to standards-aligned, high-quality and culturally responsive curriculum materials to all CPS schools, educators, and students. In support of this initiative, we will examine the relationships among participation in Skyline professional development (PD), changes in teacher practice, and ultimately improved student outcomes.

This work is informed by and aims to address research questions identified by CPS, specifically Skyline RQ 1.2.1-7, 2.1.2-3, 2.2, 4.1.4, and 4.4. We met with and received feedback from CIDL in support of this proposal and will continue to work with the office to understand the Skyline initiative, roll out, and outcomes (including co-interpretation).

Our organizational mission is to promote STEM equity and educational excellence by building school district capacity for continuous improvement to engage, inspire, and elevate students. We engage in long-term partnerships with schools, districts, and community organizations and collaboratively engage in rigorous research that informs practice and educational theory.

Our work engages in a collaborative problem-solving cycle, where practitioners (e.g., OCS, CPS, CIDL) first identify a problem, then the team (practitioners, The Learning Partnership, other university and research partners) brainstorm and prioritize hypotheses to test. We clarify the problem through data analysis and share research findings for co-interpretation with the entire team. Results are used to inform

Reflect on the district's equity framework as well as the following: As a researcher, what is my privilege / bias when it comes to this question? Am I assuming that Black and brown students will inherently perform poorly? Have I consulted those whose communities I want to research? Is the research designed with the holistic humanity of the people I am researching in mind? Do I perceive the communities I want to research as allies, or as research subjects? Am I interrogating / challenging policies and systems that may be contributing to inequities? Will this project create an undue burden on the communities I am seeking to research?

practitioner improvement strategies as well as the next steps for our collaborative research agenda as research practice partners. This cycle ensures our research is responsive to district needs and practitioners are involved in all stages of research.

Also, as an organization, we started working with We All Count's Data Equity Framework, which provides questions and resources to ask at each stage of research, from funding, to project motivation, to project design, data collection & sourcing, analysis, interpretation, and communication and distributing results. We are currently working with the first stages, specifically funding webs, where we take a critical look at the flows of data, money, and influence in each of our projects.

How are your research activities accessible to individuals with disabilities?

All students in schools that have and will adopt Skyline will be included in this research. All Skyline curricula are designed to support equitable instruction, including strategies and materials to support students with disabilities, diverse learners, and students learning English as a new language.

Are your research activities translated into languages other than English as appropriate for the community?

N/A

Please use the table below to list all District CPS Supporters and the role they will have in your study. Use the details box to describe your supporters' title and role in the district. List your primary supporter first.

Please click "save" after each line.

CPS Supporter Email Address	CPS Supporter Details
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Link to New Contact Form

User had the option to start a different form here.

How will you share your research findings with the population(s) you are studying?

The Skyline and science teams will be partners in this work, and we will work with them to 1) understand the professional development activities and Skyline supports, and 2) interpret findings. We also plan to share out findings in all-partner meetings with CPS Research, Skyline, and affiliated departments, and other Skyline researchers to aid in the overarching project of evaluating the Initiative.

Research Activities

Start Date of Recruitment

09/26/2022

End Date of Recruitment

06/13/2025

Please provide the date that you will begin primary data collection

09/26/2022

Please provide the end date of primary data collection

06/13/2025

Please provide the date that you will begin analysis

10/24/2022

Please provide the end date of analysis

09/30/2025

Please provide the approximate date that you will finalize your research report.

04/14/2024

Description of Deliverable/Final Product (i.e., academic/journal article, white paper, memo, report)

We put the April date for the next report as this is when our AERA presentation will take place. Final deliverables could include presentations, reports, blog posts, and journal articles.

Will any portion of this research, including recruitment or consent, take place during or in any way interfere with standard activities?

No

With very few exceptions, research procedures cannot be carried out during or in any way interfere with standard activities, including instruction time or professional development sessions.

Will this study involve study subject randomization or a control group?

No

Will your research employ study-subject deception or non-disclosure?

No

Will this research involve Product Testing?

No

Will this research involve collection of biological samples or biometric data?

No

Does this research involve other research procedures not described previously?

No

Is this research tied to a standard or novel curriculum, teaching or other program, staff professional development training or program, or other non-research activity or activities?

Yes

Please describe

We are studying the implementation of the Skyline curriculum and professional development program.

Has the curriculum, program, PD, etc. already been approved by the district?

Yes

Please list the contact information for internal CPS supporter.

Jonathan Ben-Isvy jiben-isvy@cps.edu

Does this study involve the use of educational technology (including survey tools, video conference platforms, and third party websites. See note for add'l details)?

Yes

Please be aware that under The Student Online Personal Protection Act, SOPPA (105 ILCS 85/), any platform students interact with must be compliant with current data security and student privacy regulations. Please note that this definition includes online survey tools such as Qualtrics. Please use the following website to check if your proposed platform is complaint with SOPPA: <https://cps.app.learnplatform.com/new/public/tools>

Please describe the use of educational technology as part of this study

Safari Montage

Is the described educational technology a CPS SOPPA operator?

Yes

Please use the following website to check if your proposed platform is complaint with SOPPA: <https://cps.app.learnplatform.com/new/public/tools>

Study Population

Will you be submitting a secondary Data Request?

No

Study Subject Inclusion Criteria

middle school science teachers in schools that have adopted Skyline. District and school leaders who are responsible for designing, facilitating, and supporting professional learning activities for Skyline.

If the research involves more than one study subject population (e.g. students, parents, teachers, staff), please individually detail the inclusion criteria for each.

Study Subject Exclusion Criteria

Teachers who do not consent to participate in the research and teachers not implementing Skyline.

If the research involves more than one study subject population, please individually detail the inclusion criteria for each

Please select all special populations that may be targeted for your study

No answer provided.

Describe the potential direct and/or indirect benefits for all detailed research procedures and populations

Teachers may not personally benefit from being in this study. We hope that what we learn will help CPS improve the quality of professional development provided to teachers in the future with positive impacts for student learning.

Describe the anticipated potential risks, however minimal, associated with the detailed research procedures and subject populations

Being in this study does not involve any risks other than what subjects would encounter in daily life. Teacher and leader participation in interviews and focus groups is voluntary and can be withdrawn at any time.

How will the identified risks for all research procedures and subject populations be minimized and/or mitigated to the greatest extent possible?

We will review consenting procedures with teachers ahead of study participation. All data will also be stored on password-protected DropBox accounts managed by The Learning Partnership. Access to these accounts and folders within them are restricted to key study personnel actively involved in the cleaning or analysis of data. Original audio recordings will be deleted once transcription is completed and cleaned. Any participant names will be replaced with pseudonyms and arbitrary ID numbers. Though a document will be generated that links names with ID numbers (to facilitate the linking of data from one year to the next), this document will be stored in a separate folder from the data within the password-protected, encrypted server. At the conclusion of the project, the interview data will be securely deleted from The Learning Partnership servers.

What procedures will you use in the event that research questions/processes produce observable stress/distress in subjects?

Though we do not anticipate stress or distress as a result of research questions or processes, if teachers become distressed, they will be instructed to stop completing the interview or focus groups, as also detailed in the consenting documents. We will also check in with district staff throughout to identify ways to reduce additional stressors or research burdens on practitioners.

Will you compensate study subjects?

Yes

Detail the proposed compensation (monetary and/or non-monetary) for each research procedure and population

Middle School Science: Teachers will be compensated with a \$25 gift card for participating in the first 1-hour interview and a \$25 gift card for participating in the second two 30-minute interviews. District/school leaders will be compensated with a \$50 Amazon gift card for participating in an interview. Teachers who participate in a 90-minute focus group (as their only research activity) will be compensated with a \$50 Amazon gift card.

Student incentives must be appropriate, equitable, and reasonable in amount. All staff incentives are limited to \$50 or less in a given year. Any amount in excess will require the secondary employment form to be completed by staff participants, or otherwise have the amount allocated to the school.

Describe when and where study subjects will be compensated and detail the mechanisms that will be in place to ensure study subject privacy when distributing compensation.

Participants will be provided a physical or digital gift card depending on their preference. All data will also be stored on password-protected DropBox accounts managed by The Learning Partnership. Access to these accounts and folders within them are restricted to key study personnel actively involved in the cleaning or analysis of data.

Describe the compensation schedule for participants that withdraw from the research or that are withdrawn from the research by the study team.

For middle school science, teachers who participate in the first interview will receive a \$25 gift card whether or not they agree to the next two interviews. Teachers will receive a second \$25 gift card at the completion of the two shorter interviews.

Study Recruitment

Outline every aspect of the recruitment process for teacher participants.

CPS (CIDL, the Skyline Team) will provide a list of teachers and schools participating in Skyline in middle-school science. We will work with the Skyline team, Science department, PD facilitators, and network staff to identify teachers who have attended some form of Skyline professional learning.

For Middle School Science: Using the Science department listserv, PD facilitators, and network staff, we will send out a recruitment email with a link to information about the study and opportunities to participate (e.g., focus group or interview).

Outline every aspect of the recruitment process for non-teacher staff participants.

For Middle School Science: We will communicate with leaders from the Skyline office, Science department, and networks via email about participating in an interview at their convenience. We will start by reaching out to leaders with whom we already have relationships and ask those individuals to relay this opportunity to others they feel would be a good fit (snowball sampling).

Please attach all recruitment materials not attached elsewhere (Optional).

No answer provided.

Please attach all consent/assent forms associated with this study not already attached elsewhere (Optional).

No answer provided.

Identify study team members who will recruit subjects.

Steven McGee

Will this research involve screening procedures

No

Compliance

FERPA

For more information on FERPA, click here.

Is any aspect of this research subject to FERPA?

Yes

Is the proposed research in compliance with FERPA?

Yes

ISSRA

For more information on ISSRA, click here.

Is any aspect of this research subject to ISSRA?

Yes

Is the proposed research in compliance with ISSRA?

Yes

PPRA

For more information on PPRA, click here.

Is any aspect of this research subject to PPRA?

No

Permission, Confidentiality, and Security

Attach a draft of the permission letter that will be sent to school Principals

No answer provided.

Please note that Principals have final authority over what happens in their schools.

How will you protect the privacy of prospective research subjects? Please detail how study subject privacy will be protected during recruitment, screening, consent, and all research procedures. Provide an accounting for all applicable research procedures and study populations.

Any data on prospective and participating subjects will be kept confidential, with access limited to key study personnel. The Learning Partnership will replace the names of the teachers with arbitrary ID numbers, and other identifying information (e.g., school names) will also be masked, by way of the deletion of that information or through the use of pseudonyms in reports and presentations.

Describe the data confidentiality or security provisions that will be in place for all research data.

All data will be stored on password-protected DropBox accounts managed by The Learning Partnership. Access to these accounts and folders within them are restricted to key study personnel actively involved in the cleaning or analysis of data. The original audio files will be deleted once transcription is completed and transcripts have been cleaned. Any participant names will be replaced with pseudonyms and arbitrary ID numbers. Though a document will be generated that links names with ID numbers (to facilitate the linking of data from one year to the next), this document will be stored in a separate folder from the data within the password-protected, encrypted server. At the conclusion of the project, the interview data will be securely deleted from The Learning Partnership servers.

How will you store participant data?

With direct identifiers
With codes

These details must be included in all applicable consent forms

List the identifiers that will be stored and explain if identifiers will be deleted at a later date

Direct identifiers will be retained to facilitate linking data across school years. Only personnel directly working on or supporting the project will have access to teacher names. The Learning Partnership will replace the names of the teachers with arbitrary ID numbers, and other identifying information (e.g., school names) will also be masked, by way of the deletion of that information or through the use of pseudonyms in reports and presentations.

Teacher identification numbers will be replaced with internal IDs for all research personnel involved in data analysis. Only the Data Manager, President, and Vice President of The Learning Partnership will have access to CPS teacher IDs. At the completion of the study, identifiers and linking documents, will be securely deleted from The Learning Partnership servers.

Describe the coding mechanism, indicate where links to codes will be stored, identify the individuals who will have access to coding keys or links, and clarify if codes will be deleted at a later date.

Teacher identification numbers will be replaced with internal IDs for all research personnel involved in data analysis. Only the Data Manager, President, and Vice President of The Learning Partnership will have access to CPS teacher IDs. At the completion of the study, identifiers and linking documents, will be securely deleted from The Learning Partnership servers.

Will you keep participants' contact information on file after the data have been collected?

Yes

How long will you store participant contact information?

Until we close out this project

Explain the purpose for which participant contact information will be retained, such as recruitment for future studies or other follow-up study completion

We will retain participant's contact information to facilitate future research recruitment activities associated with this project.

These details must be included in all applicable consent forms

Will you share individual-level data with other researchers or practitioners beyond the designated key research personnel?

No

What will you do with the data once the research has been completed (choose all that apply)?

Save data for future use or create a data bank

Please note that the district discourages storing study data for longer than three years after study completion.

Detail the purpose of the data bank or future use purposes, itemize the data points that will be included in the data bank, and explain if data will be banked with identifiers or codes. Also, explain possible timeline for data destruction.

We will retain teacher transcripts to look at long-term trends (e.g., we anticipate this project potentially extending beyond the current period of SY24-25). These data will be de-identified.

All applicable consent forms must clearly detail all future use or data banking provisions and explicit consent must be sought and documented for all future use or data banking

Attachments

Please attach all miscellaneous attachments

No answer provided.

If you are resubmitting your protocol following initial review, please attach your response letter here.

Are there any additional finalized contracts or agreements associated with this research that have not been attached elsewhere as part of this application (e.g. CPS Data Authorization Agreements)?

No

Are there any pending (i.e. not yet signed by both parties) contracts or agreements associated with this research that have not been attached elsewhere as part of this application?

Yes

Please attach any pending contract or agreement associated with this research

NSF Proposal for Skyline PD research Contract/Agreement

Acknowledgements

Acknowledgements

Please acknowledge the following:

- ✓ All parts of this submission are accurate, complete, consistent, and clear.
- ✓ I have accurately and completely described all intended human subjects research procedures and the populations with whom they will be carried out.
- ✓ I have attached all study materials, including, but not limited to, all materials that will be given to, sent to, read to, or otherwise used with all prospective study subject populations.
- ✓ This submission adhere to all CPS policies and guidance as outlined in the link below
<https://www.cps.edu/about/district-data/conduct-primary-research/>
- ✓ I have accurately identified all personnel who will be involved in this study.
- ✓ I acknowledge that any/all changes required by the CPS RRB in the course of its review of this submission will be reported to my IRB of record during the entire lifetime of this study.
- ✓ I attest that I will work with my IRB of record to address any concerns raised in the review of this submission.
- ✓ I attest that all of the research procedures detailed in this submission have been carried out with prospective IRB review and approval.
- ✓ I agree to comply with all background check and volunteer procedures required of my study, per the official CPS Volunteer Policy (link provided below):
<https://policy.cps.edu/download.aspx?ID=272>

Submission Date

11/20/2022

Load CR/Mod into IRBManager

- Submitted 02/24/2024 8:50 AM ET by System, The

CR/Mod Processing
- Submitted 02/27/2024 1:13 PM ET by Corson, Adam

CR/Mod Processing

Ready for Review

Approve

Approval Date

02/27/2024

Approval Period (in number of months)

12

Existing Background Check Level

Level I

Existing Background Check Justification

Interactions with staff, students

Does background check level need to be updated?

No

Notes for Letter

No answer provided.

RRB Meeting Date for Notification

03/05/2024

Current School Sites

No answer provided.

School Sites Chosen Within Data Entry

School Contacts for Sites Chosen

No answer provided.

Are the Supplementary Sites the same?

True

Administrative Reviewer

Corson, Adam

Email: ACorson1@cps.edu

Phone:

Load Approved Modifications

- Submitted 02/27/2024 1:14 PM ET by System, The

Determination Letter Finalization

- Submitted 02/27/2024 1:14 PM ET by Corson, Adam

Review Generated Letter and Confirm Before Sending

RRB

2022-1773

Study Title

Impacts of Skyline Professional Development on Teacher Practices and Student Learning

Principal Investigator

McGee, Steven PhD

Email: mcgee@lponline.net

Business: (708) 710-5963

Determination Letter

In some cases you may see other determination letters attached by the submitter. However, only the generated determination letter will be sent in the decision email.

Name	Type	Date	This determination letter will be automatically attached to an email being sent to the principal investigator.
RRB#2022-1773- Steven McGee, PhD 2024- 02-27.docx	Determination Letter	02/27/2024	

Please use the link below, click on the Attachments link on the left side of the page if you need to upload an edited version of the above letter.

Modification/Continuing Review defined 02/24/2024

Output Background Check Level

N/A

Additional Attachments to Decision Email

No answer provided.

Notes for Determination Email

No answer provided.

Study Site Contact Background Check Expirations

Name	Role	Background Check Expiration
Blaushild, Naomi PhD	Project Team Member	Missing
Donaldson, Kristi Ph.D.	Primary Contact	Missing
Duck, Jennifer	Project Team Member	Missing
Duck, Kevin	Project Team Member	Missing
Fisher, Elizabeth	Project Team Member	Missing
McGee, Catherine	Project Team Member	Missing
McGee, Steven PhD	Principal Investigator	Missing
McGee-Tekula, Randi	Project Team Member	Missing
Peel, Amanda PhD	Project Team Member	Missing
Rasmussen, Andrew	District Supporter	Missing

Please use the text box above to indicate the background check level required or any other pertinent information.

Level I

Background Check Level Justification

Interactions with staff, students

Other Notes in Letter

N/A

Northern Illinois University
CONSENT TO PARTICIPATE IN RESEARCH

Project Title: An Investigation of the Teacher and Organizational Level Factors that Support the Development of Student Argumentation Ability in the Context of Amplify Science

Researcher(s): Dr. Amanda Durik, Associate Professor of Psychology at Northern Illinois University, Dr. Anne Britt, Professor at Northern Illinois University & Dr. Steven McGee, President of The Learning Partnership

Introduction:

You are being asked to participate in a research study about the challenges of teaching scientific argumentation and explanation to middle school students. You were selected to participate in this study because you are implementing an inquiry-based curriculum in your science classroom.

Please read this form carefully and ask any questions you may have before deciding whether to agree to participate in the study.

Purpose:

The purpose of this study is to identify the challenges students face while building evidence-based explanations, as well as the instructional obstacles teachers may have while presenting this type of content. The study will take place during the duration of the course. The main benefit of your participation is helping researchers, educators, and the community at large understand how to include supports for building evidence-based explanations in science courses.

Procedures:

- A member of the research team will conduct a **90-minute focus group** with a small group of middle school science teachers. The timing and location of the focus group will be arranged with you at your convenience. The focus group will be audio recorded and transcribed.
- You will be asked to complete a brief survey about your background prior to participating in the focus group.
- You will receive a \$50 Amazon gift card for participating in the focus group.

At any time in the study, you may decide to withdraw from the study. If you withdraw no more information will be collected from you. When you indicate you wish to withdraw the investigator will ask if the information already collected from you can be used.

Risks/Benefits

Your participation in this study does not involve any physical or emotional risk beyond that of everyday life. You may withdraw from the study at any time and still fully participate in the project.

Taking part in this study may help scientists to better understand how to design instruction within science courses that help middle school students learn how to develop evidence-based explanations in science. You are not likely to have any direct benefit from being in this research study.

Confidentiality:

- The information we collect will be stored on encrypted computers managed by staff at The Learning Partnership, Chicago, IL. The results will be stored by your name until we have finished collecting data, at which time it will be coded with a pseudonym. Once the data has been coded with a pseudonym, we will no longer be able to withdraw your data. Only researchers on this study will have

direct access to the data. Researchers not involved in the study will have access to anonymous versions of this data upon request.

- Results of this study may be used for research, publications, and presentations at professional meetings. If your individual results are discussed, your identity will be protected by using a pseudonym rather than your name or other identifying information.

Voluntary Participation:

Participation in this study is voluntary. If you do not want to be in this study, you do not have to participate. Even if you decide to participate, you are free not to answer any question or to withdraw from participation at any time without penalty.

Contacts and Questions:

If you have any questions or problems during your time on this study, call us promptly. Dr. McGee is the primary contacts for this research study. You can call him at 708-710-5963 between 8:30 a.m. and 5:00 p.m. Monday through Friday.

If you have questions about your rights as a research participant, you may contact the Northern Illinois University Office of Research Compliance at Northern Illinois University at (815) 753-8588.

Statement of Consent:

Please indicate your willingness to participate in the research activities by placing your initials next to each component of the study. Your signature below indicates that you have read the information provided above, have had an opportunity to ask questions, and have documented your choices about permission to take part in this research. You will be given a copy of this form to keep for your records.

Study Elements

As a participant in this study, you grant permission to participate in the study by taking part in a focus group and completing a brief survey about your background.

Initial one of the following to indicate your choice about participation in the study:

_____ (initial) I agree to participate in study by being part of a focus group and completing a brief survey about my background.

_____ (initial) I do not agree to participate in study by being part of a focus group and completing a brief survey about my background.

Your Name

Your Signature

Date



Northern Illinois University

5/18/2022

Approved by NIU IRB

Void one year from above date

Teacher Focus Group Pre-Survey Questions

* 1. Background information:

Name	<input type="text"/>
School name	<input type="text"/>
District name	<input type="text"/>
Subject/grade levels taught	<input type="text"/>
Years teaching total	<input type="text"/>
Years in district	<input type="text"/>
Years in current school	<input type="text"/>
Email	<input type="text"/>

2. What is your gender identity?

- ☐ Female
- ☐ Male
- ☐ Prefer not to answer
- ☐ Other (please specify)

3. Do you identify as Hispanic or Latinx?

- ☐ Yes
- ☐ No
- ☐ Prefer not to answer

4. Which of the following categories describes your race? (Check all that apply.)

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ Prefer not to answer
- ☐ Other (please specify)

* 5. Are you a Chicago Public School teacher?

☐ Yes

☐ No

Teacher Focus Group Pre-Survey Questions

6. Network number:

7. What professional learning opportunities have you attended (at least once) related to Skyline? (Check as many as applicable)

- ☐ Summer Kick-Off
- ☐ Unit Launch/Instructional Practice Workshop
- ☐ Network-based professional learning community or workshop
- ☐ School-based Skyline Co-Lab
- ☐ Skyline training videos available on SAFARI Montage
- ☐ Self-Paced Skyline Professional Learning Resources (quarterly curriculum series, unit-specific modules)
- ☐ Other - please explain

Teacher Focus Group – CPS/Skyline Adopters

Interviewer script: *Thank you all so much for agreeing to take part in this focus group discussion about your experiences teaching middle school science and Skyline. I'm going to pose a few questions about teaching science, the Skyline curriculum, and any professional learning opportunities you have attended recently related to Skyline. This focus group is meant to be a conversation rather than going around in a circle to respond, so please feel free to add onto another person's responses as we go. If you don't have a response to a particular question, you do not have to say anything. Also, the goal of this focus group is to hear a range of teachers' opinions and experiences, not to come to a consensus. So please feel free to share a different opinion from someone else's, but please speak from your own experience when doing so.*

I am going to record and transcribe this conversation. I will de-identify the data by taking out everyone's names and any school names or colleagues' names that you mention. Please keep everyone else's responses confidential and do not repeat anything that was said in this focus group. Does anyone have any questions about the consent form or for me before we begin?

Okay, great. I am going to turn on the recording now.

I. **Introductory Questions**

1. Can you please tell me your first name, your school name, what you teach, and how long you've been teaching? *Skip if not needed*
2. I'd love to start by zooming out for a minute and hearing about your favorite thing about teaching middle school science. Please feel free to share a specific moment that stands out to you or a more general reflection about teaching middle school science.

II. **Transition**

Great, thank you so much for sharing that – it's so fun to hear about your classrooms. So, now I'm going to ask some big picture questions about your science instruction.

3. How do you think students best learn science?
4. Where do you see students struggle in science?
5. Thinking back to when you first started teaching science, how has your practice changed, if at all? What accounts for that change?
6. Describe some of the advantages of using an inquiry-based approach to teaching science.
7. Describe some of the challenges to using an inquiry-based approach (and how you've attempted to confront those challenges)

III. Key Questions

Great, thank you all so much for your participation so far. Now, I'd like to transition to talking more specifically about the [curriculum] that your district/school uses, any professional development you've participated in related to that curriculum, and the impact of that PD on your practice.

8. How long have you been using the Skyline curriculum to teach middle school science?
 - a. If new: What were you using before?
 - b. If some experience: When did the curriculum shift happen? What was that like?
9. What are some of the benefits of using Skyline?
 - a. Probe for specific successes, examples
10. What are some of the challenges of using Skyline teachers?
 - a. Probe for specific challenges, examples
11. How does the curriculum meet or not meet the needs of your particular students?
12. *If applicable*, describe how you have used the argumentation scaffolds (Investigation Steps, CER builders) in your classrooms. To what extent do you think those scaffolds have helped your students with argumentation? Your teaching of argumentation?
13. Now, I'm interested in hearing about the professional development you've experienced regarding this curriculum. What has been the most helpful to your practice? While you're describing PD, please speak to the focus of the PD, what you were doing, and with whom
 - a. Listen for/probe for features of PD: content focus, duration, coherence, collaboration, active learning,
 - b. Listen for/probe for impact on beliefs, practice
 - c. Listen for/probe for strategies for culturally responsive/equitable pedagogy
14. What have you found to be the least helpful professional development?
 - a. *If applicable*, if you haven't participated in PD, what has prevented you from attending? What might compel you to attend in the future?
15. Thinking about the rollout of Skyline overall – what do you think was successful about the rollout? What was unsuccessful?

I. Conclusion

16. Is there anything we didn't discuss today about [the curriculum], professional development, or teaching science that you would like to share?

[Stop recording].

Northern Illinois University
CONSENT TO PARTICIPATE IN RESEARCH

Project Title: Developing a Generalized Storyline that Organizes the Supports for Evidence-based Modeling of Long-Term Impacts of Disturbances

Researcher(s): Dr. Amanda Durik, Associate Professor of Psychology at Northern Illinois University, Dr. Anne Britt, Professor at Northern Illinois University & Dr. Steven McGee, President of The Learning Partnership

Introduction:

You are being asked to participate in a research study about designing curriculum units to support middle school students in developing the ability to engage in evidence-based modeling of the long-term impacts of environment disturbances. You were selected to participate in this study because you serve in an instructional leadership position in your district and are involved in professional learning related to middle school science.

Please read this form carefully and ask any questions you may have before deciding whether to agree to participate in the study.

Purpose:

The purpose of this study is to understand how teachers implement middle school science curriculum and support students in developing the ability to engage in evidence-based modeling of the long-term impacts of environment disturbances. As part of this study, you will be asked to participate in a one-hour interview. We expect that you will be in this research study for 1-2 years. The main benefit of your participation is helping researchers, educators, and the community at large understand how to include supports for evidence-based modeling in science courses.

Procedures:

- A member of the research team will conduct one or two 45-60-minute interviews about your instructional leadership and professional learning at different timepoints in the schoolyear. The timing and location of the interview will be arranged with you at your convenience. The interview(s) will be audio recorded and transcribed.
- You will receive a \$50 Amazon gift card for participating in the interview.

At any time in the study, you may decide to withdraw from the study. If you withdraw no more information will be collected from you. When you indicate you wish to withdraw the investigator will ask if the information already collected from you can be used.

Risks/Benefits

Your participation in this study does not involve any physical or emotional risk beyond that of everyday life. You may withdraw from the study at any time and still fully participate in the project.

Taking part in this study may help scientists to better understand how to design science courses that help middle school students in developing the ability to engage in evidence-based modeling of the long-term impacts of environment disturbances. You are not likely to have any direct benefit from being in this research study.

Confidentiality:

- The information we collect will be stored on encrypted computers managed by staff at The Learning Partnership, Chicago, IL. The results will be stored by your name until we have finished collecting

data, at which time it will be coded with a pseudonym. Once the data has been coded with a pseudonym, we will no longer be able to withdraw your data. Only researchers on this study will have direct access to the data. Researchers not involved in the study will have access to anonymous versions of this data upon request.

- Results of this study may be used for research, publications, and presentations at professional meetings. If your individual results are discussed, your identity will be protected by using a pseudonym rather than your name or other identifying information.

Voluntary Participation:

Participation in this study is voluntary. If you do not want to be in this study, you do not have to participate. Even if you decide to participate, you are free not to answer any question or to withdraw from participation at any time without penalty. You will still be able to fully participate in the design and implementation of the curriculum units.

Contacts and Questions:

If you have any questions or problems during your time on this study, call us promptly. Dr. McGee is the primary contacts for this research study. You can call him at 708-710-5963 between 8:30 a.m. and 5:00 p.m. Monday through Friday.

If you have questions about your rights as a research participant, you may contact the Northern Illinois University Office of Research Compliance at Northern Illinois University at (815) 753-8588.

Statement of Consent:

Please indicate your willingness to participate in the research activities by placing your initials next to each component of the study. Your signature below indicates that you have read the information provided above, have had an opportunity to ask questions, and have documented your choices about permission to take part in this research. You will be given a copy of this form to keep for your records.

Study Elements

As a participant in this study, you grant permission for a research team member to conduct a one-hour interview with you about your instructional leadership and professional learning.

Initial one of the following to indicate your choice about participation in the study:

_____ (initial) I agree to being interview.

_____ (initial) I do not agree to being interview.

Your Name

Your Signature

Date



Northern Illinois University
CONSENT TO PARTICIPATE IN RESEARCH

Project Title: Developing a Generalized Storyline that Organizes the Supports for Evidence-based Modeling of Long-Term Impacts of Disturbances

Researcher(s): Dr. Amanda Durik, Associate Professor of Psychology at Northern Illinois University, Dr. Anne Britt, Professor at Northern Illinois University & Dr. Steven McGee, President of The Learning Partnership

Introduction:

You are being asked to participate in a research study about designing curriculum units to support middle school students in developing the ability to engage in evidence-based modeling of the long-term impacts of environment disturbances. You were selected to participate in this study because you serve in a school/instructional leadership position in your district and are involved in professional learning related to middle school science.

Please read this form carefully and ask any questions you may have before deciding whether to agree to participate in the study.

Purpose:

The purpose of this study is to understand how teachers implement middle school science curriculum and support students in developing the ability to engage in evidence-based modeling of the long-term impacts of environment disturbances. As part of this study, you will be asked to participate in a one-hour interview. We expect that you will be in this research study for 1-2 years. The main benefit of your participation is helping researchers, educators, and the community at large understand how to include supports for evidence-based modeling in science courses.

Procedures:

- A member of the research team will conduct a one-hour interview with you about your instructional leadership and professional learning at different timepoints in the schoolyear. The timing and location of the interview will be arranged with you at your convenience. The interview(s) will be audio recorded and transcribed.
- You will receive a \$50 Amazon gift card for participating.

At any time in the study, you may decide to withdraw from the study. If you withdraw no more information will be collected from you. When you indicate you wish to withdraw the investigator will ask if the information already collected from you can be used.

Risks/Benefits

Your participation in this study does not involve any physical or emotional risk beyond that of everyday life. You may withdraw from the study at any time and still fully participate in the project.

Taking part in this study may help scientists to better understand how to design science courses that help middle school students in developing the ability to engage in evidence-based modeling of the long-term impacts of environment disturbances. You are not likely to have any direct benefit from being in this research study.

Confidentiality:

- The information we collect will be stored on encrypted computers managed by staff at The Learning Partnership, Chicago, IL. The results will be stored by your name until we have finished collecting

data, at which time it will be coded with a pseudonym. Once the data has been coded with a pseudonym, we will no longer be able to withdraw your data. Only researchers on this study will have direct access to the data. Researchers not involved in the study will have access to anonymous versions of this data upon request.

- Results of this study may be used for research, publications, and presentations at professional meetings. If your individual results are discussed, your identity will be protected by using a pseudonym rather than your name or other identifying information.

Voluntary Participation:

Participation in this study is voluntary. If you do not want to be in this study, you do not have to participate. Even if you decide to participate, you are free not to answer any question or to withdraw from participation at any time without penalty. You will still be able to fully participate in the design and implementation of the curriculum units.

Contacts and Questions:

If you have any questions or problems during your time on this study, call us promptly. Dr. McGee is the primary contacts for this research study. You can call him at 708-710-5963 between 8:30 a.m. and 5:00 p.m. Monday through Friday.

If you have questions about your rights as a research participant, you may contact the Northern Illinois University Office of Research Compliance at Northern Illinois University at (815) 753-8588.

Statement of Consent:

Please indicate your willingness to participate in the research activities by placing your initials next to each component of the study. Your signature below indicates that you have read the information provided above, have had an opportunity to ask questions, and have documented your choices about permission to take part in this research. You will be given a copy of this form to keep for your records.

Study Elements

As a participant in this study, you grant permission for a research team member to conduct one 60-minute interview with you about your instructional leadership and professional learning.

Initial one of the following to indicate your choice about participation in the study:

_____ (initial) I agree to being interviewed.

_____ (initial) I do not agree to being interviewed.

Your Name

Your Signature

Date



Northern Illinois University

5/18/2022

Approved by NIU IRB

Void one year from above date

District Leader Draft Protocol (CPS and General)

STAR Overall Research Question: How does professional development around the use of scaffolding tools influence teachers' beliefs and practices and students' abilities to develop evidence-based arguments in the middle school science classroom?

Skyline Eval RQ1: To what extent does the structure of Skyline professional development align to research-based practices?

District leaders include staff members who work for the district to guide/support teaching and learning (including professional development), such as: District-level employees (i.e., managers of professional learning, instructional leaders, directors of curriculum and instruction, science department head), network leaders (i.e., instructional support leaders, network chiefs).

Rationale for interviewing leaders: System leaders' sensemaking around instructional improvement and educational policies underscores how policies are enacted and messaged at the system and school-level (Huguet et al., 2021; Spillane et al., 2019, 2022). These questions are designed to capture district leaders' and PL facilitators' thought processes that go into planning PL and their perceptions of how it's going (i.e., their perceptions of teachers' receptiveness, engagement, use of new curriculum, growth, etc.). From the Desimone & Garet (2013) lens, district leaders are part of "context" shaping professional development and teachers' practice.

***Intro:** Thank you so much for taking the time to talk to me today. As part of our study of middle school science instruction and professional learning, we wanted to talk to you about how you guide professional learning in your [district/network], particularly related to the [curriculum]. Did you have any questions about the consent form? Is it okay if I record our conversation using an audio recording? Please remember that your participation in this study is completely voluntary. If at any time you would like me to stop the recording or stop the interview, please let me know. All data collected up to that point will be deleted. Any questions before we begin?*

Thank you. I'd like to start by asking you a few questions about your current role.

Part 1: Professional Background and Responsibilities

1. Can you tell me about your role and responsibilities as [title]
 - a. How long have you been in this role?
 - b. How did you come to be in this role?
 - c. What did you do before this?

Part 2: School Community and Goals

2. Tell me about the students and families that attend your district/schools in your network?
 - a. Probe for student body, demographics, neighborhood.
 - b. Probe for changes in student/family composition.

3. What's it like to work in this district/network?
 - a. Probe for professional culture?
 - b. Listen for references to norms, beliefs, rules/regulations etc. and probe as needed
4. What are your top 2 or 3 priorities this school year?
5. Does the district/network have other priorities that you are aware of?

Part 3: Instruction and Instructional Improvement

Now, I'd like to talk specifically about middle school science instruction and the curriculum that your teachers are using.

6. How do you think students best learn science [or, learn in general, if needed]?
7. Can you tell me about your district's current approach to science instruction?
 - a. [CPS only]: Is this similar to your network's approach to science instruction?
8. I'm interested to hear more about the curriculum you're using in middle school science.
 - a. How long have you been using the ____ curriculum?
 - i. *If not known, ask first, What curriculum are you using? Then follow with (a.).*
 - b. How was this curriculum chosen (to your knowledge)?
 - c. Do you believe that this curriculum serves the needs of your student body? If so, how? If not, why not?
 - d. Do you find that there are any challenges related to the curriculum?
 - e. If this is the first year of the curriculum's implementation, how is that implementation going so far?
 - i. What do you see as the biggest barriers to implementation? Biggest successes so far?
 - ii. If not the first year, can you describe what the implementation process has looked like from the beginning until now?
9. Can you describe an existing classroom that best represents your vision for science instruction in the district/network? *If you can't think of a specific classroom – what would the ideal classroom look like to you?*
 - a. How typical is the classroom you described in your network/district?
 - b. In what ways is it typical? In what ways is it atypical?
 - c. How do you feel about classrooms varying in these areas? Are there dimensions on which it is okay for classrooms to vary?
 - i. If a concern, are you doing anything to reduce the variation?

10. If I was to visit several classrooms [in your district/network], how would they compare around science instruction?
 - a. How might it be similar? How might it differ?
 - b. How do you know? Probe for evidence.
 - c. How do you learn about what happens in classrooms? Probe for evidence. What are your sources of information?
11. Are you working with anyone to reach the instructional vision that you described?
 - a. i.e., what other departments/external agencies do you work with around science instruction
12. What opportunities do teachers have to learn and develop their skills in science instruction?
 - a. How effective or useful are these opportunities?
 - b. What additional supports do teachers have in their classrooms or at the district level? (Coaching/mentoring models)
 - c. What other supports do you think teachers need?
 - d. What have your conversations with teachers been like around professional development needs?

[CPS SKYLINE ONLY]: *Now I'm interested to hear more about Skyline.*

- A. From your perspective, what was middle school science instruction like prior to Skyline? (Prior to Amplify?)
- B. *If applicable*, when did your network adopt Skyline – what was/is the current expectation of the network regarding Skyline? What does the timeline look like for Skyline implementation?
- C. What was most important to you when thinking about how to design PL opportunities around Skyline?
- D. *If applicable*, the information about PL on the district's website mentions the Carnegie Elements framework as a model for professional learning. Can you walk us through how the district decided to use that framework as a model?
 - a. Why did that one stick out?
 - b. Were any others considered?
- E. To your knowledge, what professional learning opportunities do teachers have related to Skyline? Please describe as many as you are aware of.
 - a. How do you envision teachers engaging in Skyline PL?
 - i. Probe for how often? Which sessions?
 - ii. New teachers? Experienced teachers?

- b. *If applicable:* How do you envision networks and schools using different teacher PL opportunities for Skyline?
- F. From your vantage point, what do you think are the biggest successes from the rollout of Skyline and its professional learning opportunities?
 - a. How do you know?
 - b. What are some of the challenges and areas of improvement?
- G. By the end of the year, what do you hope is true across the district when it comes to Skyline professional learning and implementation? What would indicate success to you?
- H. If teachers have questions about Skyline, whom do you recommend they talk to or what resources do you suggest?
 - a. Where should teachers go if they needed additional materials, resources related to science instruction (i.e., for investigations)
 - b. Probe for who pays for things – school budget, outside funds, PTO funds, teachers, students
- I. What have you noticed so far in terms of teacher buy-in and use of Skyline?

Part 4: Teacher Growth

So now I'd like to shift gears a bit and talk about teacher growth and how the teachers you are working with have responded to the new curriculum. As a reminder, we will de-identify all interviews but if you are giving an example about a specific teacher, you may wish to not refer to them by name.

- 13. Are there any teachers who might be more resistant to adopting [curriculum/initiative] than others? More willing to adopt **[curriculum/initiative]** than others?
- 14. Do you think that **[curriculum]** will work better for some teachers compared to others?
- 15. What do you think teachers should know or do to successfully implement **[curriculum]**?
- 16. Have you noticed any changes in teachers' beliefs or practices when it comes to science instruction since adopting **[curriculum]**?
 - a. ***What did this look like?***
 - b. ***How do you know this? (Observations? Conversations?)***

Part 5: Wrap Up

- 17. Is there anything that we didn't talk about related to instructional improvement and professional learning in middle school science that you would like to discuss?

Thank you so much! I am turning off the recording now.

Questions for School Leaders (CPS only)

School Leaders: Principals, APs/Deans if their roles are focused on instructional, other instructional leaders (e.g., instructional coaches)

Rationale for interviewing school leaders: School leaders have nearly as large an impact on student learning as teachers (Grissom et al., 2021) and mediate the relationship between policy change and teachers' practice in the ways that leaders interpret, message, and support policy implementation (Coburn, 2005; Marsh et al., 2010; Spillane et al., 2002; Woulfin & Rigby, 2017).

Intro: *Thank you so much for taking the time to talk to me today. As part of our study of middle school science instruction and professional learning, we wanted to talk to you about how you guide professional learning in your school, particularly related to the [curriculum]. Did you have any questions about the consent form? Is it okay if I record our conversation using an audio recording? Please remember that your participation in this study is completely voluntary. If at any time you would like me to stop the recording or stop the interview, please let me know. All data collected up to that point will be deleted. Any questions before we begin?*

Thank you. I'd like to start by asking you a few questions about your current role.

Part 1: Professional Background and Responsibilities

1. Can you tell me about your role and responsibilities as [title]
 - a. How long have you been in this role?
 - b. How did you come to be in this role?
 - c. What did you do before this?

Part 2: School Community and Goals

2. Tell me about the students and families that attend your school
 - a. Probe for student body, demographics, neighborhood.
 - b. Probe for changes in student/family composition.
3. What's it like to work in this school and district
 - a. Probe for professional culture?
 - b. Listen for references to norms, beliefs, rules/regulations etc. and probe as needed
4. What are your top 2 or 3 priorities this school year?
5. Does the district/network have other priorities that you are aware of?

Part 3: Instruction and Instructional Improvement

Now, I'd like to talk specifically about middle school science instruction and the curriculum that your teachers are using.

6. How do you think students best learn science [or, learn in general, if needed]?
7. Can you tell me about your school's approach to science instruction?
 - a. Is this similar to your network's/district's approach to science instruction?
8. Can you describe an existing classroom that best represents your vision for science (or general, if needed) instruction in your school? *If you can't think of a specific classroom – what would the ideal classroom look like to you?*
 - a. How typical is the classroom you described in your school?
 - b. In what ways is it typical? In what ways is it atypical?
 - c. How do you feel about classrooms varying in these areas? Are there dimensions on which it is okay for classrooms to vary?
 - i. If a concern, are you doing anything to reduce the variation?
9. If I was to visit several classrooms in your school, how would they compare around science instruction (or general, if needed)?
 - a. How might it be similar? How might it differ?
 - b. How do you know? Probe for evidence.
 - c. How do you learn about what happens in classrooms? Probe for evidence. What are your sources of information?
10. I'm interested to hear more about the curriculum you're using in middle school science.
 - a. How long have you been using the ____ curriculum?
 - b. How was this curriculum chosen (to your knowledge)?
 - c. Do you believe that this curriculum serves the needs of your student body? If so, how? If not, why not?
 - d. Do you find that there are any challenges related to the curriculum?
 - e. If this is the first year of the curriculum's implementation, how is that implementation going so far?
 - i. What do you see as the biggest barriers to implementation? Biggest successes so far?
 - ii. If not the first year, can you describe what the implementation process has looked like from the beginning until now?
11. What opportunities do teachers have to learn and develop their skills in science instruction?
 - a. How effective or useful are these opportunities?
 - b. What additional supports do teachers have in their classrooms or at the district level? (Coaching/mentoring models)
 - c. What other supports do you think teachers need?
 - d. What have your conversations with teachers been like around professional development needs?
12. What does collaboration look like at your school when it comes to science instruction?

Part 4: Skyline

Now I'm interested to hear about your decision to adopt Skyline in your school or not.

Part 4a: For Skyline adopting schools only:

13. What did you think about Skyline when you first heard about it?
14. What curriculum were you using before?
15. How did you come to a decision about adopting Skyline?
16. What are your expectations for teachers' use of Skyline?
 - a. Ex: use materials exactly as written
 - b. Can they supplement with outside materials?
17. To your knowledge, what professional learning opportunities do teachers have related to Skyline? Please describe as many as you are aware of.
 - a. How do you envision teachers engaging in Skyline PL?
 - i. Probe for how often? Which sessions?
 - ii. New teachers? Experienced teachers?
 - b. *If applicable*: How do you envision networks and schools using different teacher PL opportunities for Skyline?
18. From your vantage point, what do you think are the biggest successes from the rollout of Skyline and its professional learning opportunities?
 - a. How do you know?
 - b. What are some of the challenges and areas of improvement?
19. If teachers have questions about Skyline, whom do you recommend they talk to or what resources do you suggest?
 - a. Where should teachers go if they needed additional materials, resources related to science instruction (i.e., for investigations)
 - b. Probe for who pays for things – school budget, outside funds, PTO funds, teachers, students
20. Have you been able to access online and other necessary resources related to Skyline [Science] (e.g., science materials)?
21. Have you noticed any change in teachers' time use since adopting Skyline?

Part 4b: For leaders at non-Skyline adopting schools:

21. What did you think about Skyline when you first heard about it?
22. Why have you decided not to adopt Skyline? How do you come to that decision?

23. What would need to be true for you to consider adopting Skyline? Do anticipate adopting Skyline in the future?
24. What curriculum do you use instead? How do teachers access those materials?
25. What is the expectation for teachers' use of that curriculum?
- a. Ex: are teachers expected to teach every lesson as written? Adapt to classroom?
 - b. Use of supplemental materials?
26. What opportunities do your teachers have to access PL related to [curriculum]?
- a. Probe for expectations around their attendance
 - b. Probe for any school specific PL opportunities
27. If teachers have questions about [curriculum], whom do you recommend they talk to or what resources do you suggest?
- a. Where do you go/or where do you recommend teachers go if they needed additional materials, resources related to Science instruction (i.e., for investigations)
 - b. Probe for who pays for things – school budget, outside funds, PTO funds, teachers, students
28. Do you feel that [curriculum] meets the needs of your school's population? Why or why not?

Part 5: Teacher Buy-In and Growth

So now I'd like to shift gears a bit and talk about teacher growth and how the teachers you are working with have responded to the new curriculum. As a reminder, we will de-identify all interviews but if you are giving an example about a specific teacher, you may wish to not refer to them by name.

29. *If curriculum is new:* Are there any teachers who might be more resistant to adopting [curriculum/initiative] than others? More willing to adopt **[curriculum/initiative]** than others?
30. Do you think that **[curriculum]** will work better for some teachers compared to others?
31. What do you think teachers should know or do to successfully implement **[curriculum]**?
32. Have you noticed any changes in teachers' beliefs or practices when it comes to science instruction since adopting **[curriculum]**?
- a. ***What did this look like?***
 - b. ***How do you know this? (Observations? Conversations?)***

Part 6: Wrap Up

33. Is there anything that we didn't talk about related to instructional improvement and professional learning in middle school science that you would like to discuss?

Thank you so much! I am turning off the recording now.



NORTHERN ILLINOIS UNIVERSITY

Office of Research Compliance, Integrity & Safety

Division of Research & Innovation Partnerships

Approval Notice Protocol Amendment

12-Jan-2023
Amanda Durik
Psychology

RE: Protocol # **HS18-0135 “Collaborative research: Developing a generalized storyline that organizes the supports for evidence-based modeling of long-term impacts of disturbances (known to participants as "An investigation of the teacher and organizational level factors that support the development of student argumentation ability in the context of Amplify Science")”**

Dear Amanda Durik,

Your **Protocol Amendment** submission was reviewed and approved under **Member Review** procedures by the Institutional Review Board on **12-Jan-2023**.

Proposed changes:

- **Additional data collection; Additional consent forms**

Please note the following information about your approved research protocol:

Protocol Approval period: **18-May-2022 - 17-May-2023**

If your project will continue beyond that date, or if you intend to make modifications to the study, you will need additional approval and should contact the Office of Research Compliance, Integrity, and Safety for assistance. Annual review of the project will be necessary until you no longer retain any identifiers that could link the subjects to the data collected.

It is important for you to note that as a research investigator involved with human subjects, you are responsible for ensuring that the project has current IRB approval at all times, and for retaining any signed consent forms obtained from your subjects in a secure place for a

minimum of three years after the study is concluded. The committee also recommends that the informed consent include an acknowledgement that the subject, or the subject's representative, that he or she has received a copy of the consent form. In addition, you are required to promptly report to the IRB any injuries or other unanticipated problems involving risks to subjects or others.

Please remember to use your **protocol number** (**HS18-0135**) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the Office of Research Compliance, Integrity, and Safety at (815) 753-8588.

Please see the RIPS website for guidance on the impact of COVID-19 on research(including face-to-face data collection) <https://www.niu.edu/divresearch/covid/index.shtml>



NORTHERN ILLINOIS UNIVERSITY

Office of Research Compliance, Integrity & Safety

Division of Research & Innovation Partnerships

Approval Notice Continuing Review

16-May-2022
Amanda Durik
Psychology

RE: Protocol # **HS18-0135** “**Collaborative research: Developing a generalized storyline that organizes the supports for evidence-based modeling of long-term impacts of disturbances (known to participants as "An investigation of the teacher and organizational level factors that support the development of student argumentation ability in the context of Amplify Science")**”

Dear Amanda Durik,

Your **Continuing Review** submission was reviewed and approved under **Administrative Review** procedures by the Institutional Review Board on **16-May-2022**. Please note the following information about your approved research protocol:

Protocol Approval period: **18-May-2022 - 17-May-2023**

Please remember to use your **protocol number (HS18-0135)** on any documents or correspondence with the IRB concerning your research protocol.

If you are still recruiting subjects and have not waived the written signature of consent, I have attached a date-stamped copy of the approved consent form for your use. NIU policy requires that informed consent documents given to subjects participating in non-exempt research bear the approval stamp of the NIU IRB. This stamped document is the only consent form that may be photocopied for distribution to study participants. If your project will continue beyond that date, or if you intend to make modifications to the study, you will need additional approval and should contact the Office of Research Compliance, Integrity, and Safety for assistance. Continuing review of the project, conducted at least annually, will be necessary until you no longer retain any identifiers that could link the subjects to the data collected.

It is important for you to note that as a research investigator involved with human subjects, you are responsible for ensuring that this project has current IRB approval at all times, and for

retaining the signed consent forms obtained from your subjects in a secure place for a minimum of three years after the study is concluded. If consent to participate is being given by proxy (guardian, etc.), it is your responsibility to document the authority of that person to consent for the subject. In addition, you are required to promptly report to the IRB any injuries or other unanticipated problems involving risks to subjects and others. Please accept my best wishes for success in your research endeavors. If you have any questions or need further help, please contact the Office of Research Compliance, Integrity, and Safety at (815) 753-8588.

Please see the RIPS website for guidance on the impact of COVID-19 on research(including face-to-face data collection) <https://www.niu.edu/divresearch/covid/index.shtml>



NORTHERN ILLINOIS UNIVERSITY

Office of Research Compliance, Integrity & Safety

Division of Research & Innovation Partnerships

Approval Notice Initial Review

24-May-2018

TO: Amanda Durik
Psychology

RE: Protocol # HS18-0135 “**Collaborative research: Developing a generalized storyline that organizes the supports for evidence-based modeling of long-term impacts of disturbances**”

Your **Initial Review** submission was reviewed and approved under **Expedited** procedures by Institutional Review Board #1 on **18-May-2018**. Please note the following information about your approved research protocol:

Protocol Approval period: **18-May-2018 - 17-May-2019**

If your project will continue beyond that date, or if you intend to make modifications to the study, you will need additional approval and should contact the Office of Research Compliance and Integrity for assistance. Continuing review of the project, conducted at least annually, will be necessary until you no longer retain any identifiers that could link the subjects to the data collected. Please remember to use your **protocol number (HS18-0135)** on any documents or correspondence with the IRB concerning your research protocol.

Please note that the IRB has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Unless you have been approved for a waiver of the written signature of informed consent, this notice includes a date-stamped copy of the approved consent form for your use. NIU policy requires that informed consent documents given to subjects participating in non-exempt research bear the approval stamp of the NIU IRB. This stamped document is the only consent form that may be photocopied for distribution to study participants.

It is important for you to note that as a research investigator involved with human subjects, you are responsible for ensuring that this project has current IRB approval at all times, and for retaining the signed consent forms obtained from your subjects for a minimum of three years after the study is concluded. If consent for the study is being given by proxy (guardian, etc.), it is your responsibility to document the authority of that person to consent for the subject. Also, the committee recommends that you include an acknowledgment by the subject, or the subject's representative, that he or she has received a copy of the consent form. In addition, you are required to promptly report to the IRB any injuries or other unanticipated problems or risks to subjects and others. The IRB extends best wishes for success in your research endeavors.

FOR OFFICE USE ONLY:

IRB Protocol # _____ Date Received _____
Routed as _____ Board # _____

Application for Institutional Review of Research INVOLVING HUMAN SUBJECTS

Note: Please complete this form thoroughly keeping in mind that the primary concern is the **potential risk** (economic, ethical, legal, physical, political, psychological/emotional, social, breach of confidentiality, or other) to the participants. Provide **copies** of all materials to be used in the investigation. The Institutional Review Board (IRB) must have enough information about the transactions with the participants to evaluate the risks of participation.

Name(s) and employee ID for faculty, Z-ID for students

Amanda Durik (00129108), M. Anne Britt (00107830), & Steven McGee (The Learning Partnership)

Status: ☒ Faculty ☐ Graduate Student ☐ Undergraduate Student

Department:

Psychology

Mailing Address (if not department):

Phone: 815-753-7069

E-mail: adurik@niu.edu

Project Title:

Collaborative Research: Developing a Generalized Storyline that Organizes the Supports for Evidence-based Modeling of Long-Term Impacts of Disturbances

Proposed Data Collection Start Date:

June 25, 2018

Note: Unless the authorized departmental reviewer (e.g., chair or designee) has deemed on the screening form that IRB review is not needed, all projects must receive formal written clearance from the IRB Chair (or an IRB member designated by the Chair) **prior** to the start of data collection.

Type of Project (Check one)

☐ Departmental Research (faculty/student projects not externally funded and not indicated below)

☐ Graduate Thesis/Dissertation (IRB application should be submitted AFTER proposal defense)

Advisor/Committee Chair (& e-mail):

☐ Undergraduate Project (Senior thesis/capstone, research rookies, independent study)

Advisor/Committee Chair (& e-mail):

☒ Externally Sponsored Research

A complete copy of the grant proposal or contract must accompany this application form for IRB review to take place.

• Source of Funding:

National Science Foundation

• Title of grant proposal (if different from IRB protocol):

• Name of principal investigator on grant proposal:

Steven McGee

• Office of Sponsored Projects file number (Note: this is not the grant number):

OSP#

☐ Other

FOR OFFICE USE ONLY:

IRB Protocol # _____ Date Received _____

Routed as _____ Board # _____

Specify: _____

Part I. Purpose and Procedures:

- 1) Describe the purpose of your study and the reason(s) this study is needed. Include any necessary background information and a description of your hypothesis or your research question.

This project will focus on supporting middle school students to develop evidence-based explanations for understanding how disturbances impact processes. The project will focus on middle school environmental science disciplinary core ideas in life, Earth, and physical sciences. Complex systems are not generally taught in school, which has negative consequences for students' ability to understand what happens when complex systems are impacted by disturbances. For example, Hurricane Maria made landfall on Puerto Rico as a category 4 hurricane on September 20, 2017. There was unwarranted concern about the ability of the El Yunque (the rainforest in Puerto Rico) to recover, which reflect common misconceptions about the dynamics of forest ecosystems.

Working with teachers in order to develop materials and supports, we will test ways to foster middle school students' understanding of complex systems across three units related to ecological disturbances in El Yunque. The units will focus on life science, physical science, and Earth systems science across the years of the grant, respectively.

The first year of the project will involve the following: First, while teachers are working with scientists to the researchers to co-develop materials for modules that reflect best practices in teaching evidence-based reasoning, teachers who agree to be in the research will be observed during the design process. Next, for those teachers who agree to participate in the research while implementing the modules with students, we will collect data on the effectiveness of the modules largely by embedded assessments, but supplemented by video recording of classroom interactions, and some survey measures. Researchers will observe those teachers who agree to be in the research during the time that teachers are working with scientists to iteratively refine the modules to improve their effectiveness.

The second and third years of data collection will continue test their effectiveness more systematically. Amendments will be submitted to address year 2 and 3 research activities.

- 2) The following items will help the IRB reviewers understand the step-by-step procedures of your study:

2A) Explain the participant **eligibility** and **exclusion** criteria that will be used.

Teachers who are participating in the co-design process will be invited to participate in the research about their co-design process. All teachers who agree to participate will be included. There is no exclusion criteria. Students who are taught by teachers in the research study will be invited to participate in the research on the implementation of the curriculum modules. All students whose parents provide permission and who also assent will be included in the research. There is no exclusion criteria.

2B) Explain the **recruitment** procedures (how will participants learn about the study?). If using the snowballing technique, please explain who contacts potential participants (other participants or the researcher). *Please attach recruitment scripts, flyers, or postings.*

The co-design teachers will be invited to participate in the study during the co-design workshop. An oral script will be used (attached). For those teachers that agree to be in the study, a researcher will visit the classroom to invite students to participate by having their parents complete a permission form. The research will use a script (attached)

2C) Explain the **consent process** (verbal and/or written procedures for informing participants of the nature of the study and what they will do).

[Please attach all documents (assent, consent, parent permission) that are appropriate for each group of subjects participating in the study. Consent forms should be prepared for adult participants (age 18 or over). Assent forms should be prepared for minor subjects appropriate to their ages, and permission form(s) for parents or legally authorized representatives should also be prepared. For children too young to comprehend a simple explanation of participation, parental permission is sufficient only if the research will provide direct benefit to the subject, a member of the subject's family, or other children with the same condition as the subject.]

After hearing the recruitment scripts at the co-design workshop, teachers will complete the consent form indicating whether they agree to participate in the research. In the classroom, students will be provided with a combined parent permission/student assent form. The students will take the form home, review with one of their parents, indicate their choices, sign and return the form. The teacher will put the form in an envelope without looking. If 90% of or more of the class return the signed consent/assent form the whole class will receive a \$5 gift card.

2D) Describe the **data collection** procedures including what data will be collected, how it will be collected (include a description of any interventions to be used), the duration of participation in the study session(s), and how the session(s) will end.

All teachers will participate in the design of the course materials. If a teacher agrees to participate in the research, members of the research team will be present during the face-to-face portions of the 2-day introductory workshop and during ad hoc meetings that the design teams schedule during the 2-week design period. While the research team is present, they will be observing teacher participation in the course design teams and take field notes. Teachers will also give permission to examine the interim and final artifacts that are produced and stored on the common project server. Members of the research team will observe teachers' implementations of the curriculum modules that teachers designed and collect video recordings. The number of times a class will be observed and recorded will vary depending on the length of the unit that is developed. We anticipate video recording the implementation up to three times per week. The days on which the video recording will take place will be pre-arranged with the teachers at the teacher's convenience. A member of the research team will conduct one 60-min interview about each teacher's implementation. after teaching the unit. The timing and location of the interview will be arranged at the convenience of the teacher.

Students will complete a 10-minute survey during class about his/her attitudes towards the course. The survey will take place at the beginning of the school year and at the end of the school year. We will ask permission to receive copies of course assignments such as homework, coursework, tests, and quizzes. We will be collecting video of the teachers providing instruction. Students might appear in the video.

2E) If applicable, explain the procedures for providing **compensation**.

Participating teachers will be given a full set of bound versions of the background readings for their classrooms.

Students will complete the research activities during class time, but students' data will be used for research only if their parents permit them (and the students assent) to be part of the research. Classes will be given an incentive for returning their signed parent permission forms. Specifically, if 90% of students in a given class return their parental consent forms, each student in the whole class will be given a \$5 gift card.

2F) If applicable, explain the procedures for **debriefing** participants. *Please attach a debriefing script or sheet*

Neither teachers nor students will be debriefed.

Reminder: Attach copies of all questionnaires, surveys, interview questions, listing of all information/data to be collected, etc. It is the responsibility of the researcher to obtain any relevant permission for copyrighted materials. If the research involves an oral interview or focus group discussion that could evolve as it progresses, include a list of discussion topics and any “starter” questions for each topic that can reasonably be expected to be covered. If a *draft* of a written questionnaire or survey is attached, it should be clearly labeled as such and a final version must be submitted *before* data collection begins.

Part II: Research Participants

3) Participant demographics:

• Gender: M ☐ F ☐ Both ☒

• Estimated age(s):

Students (ages 10-15); Teachers (ages 21-65)

• Are any subjects under age 18? Yes ☒ No ☐

• **Potentially vulnerable populations** (please indicate if any of the following groups are the **target population of the study**)

- ☐ Pregnant women & fetuses
- ☐ Prisoners
- ☐ Decisionally impaired/mentally disabled
- ☐ Specific ethnic group(s) (list in box):

If any potentially “vulnerable populations” have been indicated above, please explain the necessity for using this particular group, or if specific groups are excluded from the study, please indicate the exclusion criteria used.

- Target number of participants in the **entire study** (including controls) from start to finish (keep in mind that this is just an **estimate of the total**):

90 teachers (10 for Year 1, 40 in Year 2, and 40 in Year 3)
3500 students (500 in Year 1, 1500 in Year 2, and 1500 in Year 3)

4) Please explain any outside institutional (i.e., schools, hospitals) approval you will need to obtain and how approval will be sought. Provide scripts, letters, or emails providing any information that will be used to obtain needed approvals/permission. It is the responsibility of the researcher to follow all applicable policies of any outside institution(s).

Upon approval from the NIU IRB, we will submit the protocol and consent forms to the CPS RRB. Upon approval from the RRB, we will submit the approval letter to NIU IRB.

Part III: Risk/Benefit assessment

- 5) What knowledge/benefit(s) to the field will be gained from the study?

This project aims to conduct research on the process of developing modules that improve instruction for students learning evidence-based reasoning in science. The conduct of this research in Chicago Public Schools has the additional benefit of improving teaching and learning in low performing, low income, high minority urban schools. The project has the potential to inform science teachers and curriculum designers about scaffolds that are best suited for skill growth in this area.

- 6) What direct benefit(s) are there to the participant(s) (if any) from the proposed research? *[For example, learning a new skill, psychological insight, teaching experience]* *[Please note that compensation is **NOT** considered a direct benefit.]*

The students and teachers will have the benefit of participating in the program regardless of their decision to participate in the research. There is no direct benefit for participating in the research.

- 7) Describe any potential risks (breach of confidentiality, economic, ethical, legal, physical, political, psychological/emotional, social, or other) to the subjects posed by the proposed research. (Note: Some studies may have “no reasonably foreseeable risks.”) Investigators are required to report all unexpected and/or adverse events to the IRB. Therefore, it is important that you list all reasonably anticipated risks because unanticipated adverse events may need to be reported by NIU to OHRP.

There are no foreseeable risks to teachers or students for participating in this research that exceed risks of daily life. For those teachers and students who participate in the video study, there is a risk of loss of confidentiality if there is a data breach.

- 8) Federal regulations require that researchers use procedures that minimize any risks to participants. What procedures will be used to minimize each risk and/or deal with the challenge(s) stated in “7” above?

All video will be stored in the password-protected Swivl cloud service. Only research personnel have access to the videos. \Swivl Cloud runs on Amazon EC2 Compute Cloud for the core application. Swivl Cloud uses Amazon S3 for storing video. Amazon states that they have highly secure data centers which utilize state-of-the art electronic surveillance and multi-factor access control systems, that its data centers are staffed 24x7 by trained security guards, and access is authorized strictly on a least privileged basis. More information can be found at: <https://support.swivl.com/2017/09/18/swivl-security-overview-2/>
<https://aws.amazon.com/security/>

Swivl goes to great lengths to secure all videos when they are uploaded, stored, or played. We are FERPA and COPPA compliant, have signed and fully support the Student Privacy Pledge, and invite you to read through our terms and privacy policy.
See: <https://www.swivl.com/2017/10/31/privacy-and-security-of-our-kids/>

9) If support services are required to minimize risk of harm to participants, explain what will be provided (list of services available). *[A resource list for the DeKalb area is available on the ORC website – if using this, please provide a copy with your application.]*

10) How do the potential benefits of the study *justify* the potential risks to the participants?

The anticipated risks are equivalent to those associated with daily life activities. Therefore, even modest improvements to science instructional practices will be better than not doing the research at all.

Part IV: Consent Document Variations

11) Will audio, video, or film recording be used?

Yes ☒ No ☐

If **yes**, specify the recording format to be used.

Digital video recording will be used for this study.

Please keep in mind that specific consent must be sought in the informed consent document(s) by including a **separate signature/date line giving consent** for recording. This is in addition to the signature/date line giving consent to participate in the research project.

12) Will this project require the use of consent/assent documents written in a language other than English?

Yes ☒ No ☐

Reminder: If non-English documents will be used, please have the document translator **provide documentation** (email or written) that the translation is equivalent to the English version. *[This can be done after the protocol is approved in order to minimize the number of changes needed.]*

13) Are you requesting a **waiver of a signed** informed consent document?

Yes ☐ No ☒

Please indicate the justification for requesting this waiver:

- ☐ The only record linking the subject to the research would be the signed consent document and the principal risk of the research would be breach of confidentiality.
- ☐ The research involves minimal risk to the subjects and involves no procedures for which written consent is normally required outside of the research context (e.g., online surveys).

14) Are you requesting a **waiver/alteration** of some other aspect of the informed consent document?

*[This section is relevant for studies involving **deception**.]*

Yes ☐ No ☒

14a) Please explain which aspects of informed consent will be missing or altered along with a justification for the change.

14b) Please explain how the project meets all of the following criteria:

1) The research presents no more than minimal risk of harm to the participants.

2) The waiver/alteration will not adversely affect the rights or welfare of the participants.

3) The research could not practicably be carried out without the waiver or alteration.

4) Whenever appropriate, the participants will be provided with additional pertinent information after participation.

15) Will any HIPAA protected health information be collected as part of the data? Yes ☐ No ☒

If **yes**, describe the procedures for protecting the information.

[Please provide a copy of your HIPAA disclosure form to be given to participants.]

16) Will any protected school records be collected as part of the data? Yes ☐ No ☒

If **yes**, describe the procedures for protecting the information.

Part V: Confidentiality and Anonymity

17) Will identifying information be connected to the data (even through an identification key linking identities to a pseudonym or code that is kept separate from the data)? Yes ☒ (**confidential** data) No ☐ (**anonymous** data)

18) If you answered **yes to question #17**, describe precautions to insure the privacy of the subjects, and the confidentiality of the data, both in your possession and in reports and publications.

Identifying information will be used to match students across different days of class. We will keep each student's data confidential and remove identifying information as soon as a study identification number is used to track the data across multiple time points.

Reports of this data will not include any identifying data of students, teachers, or the specific schools from which data were obtained.

The following types of data will be accumulated: a) Student demographics b) Student survey and assessment outcomes c) Teacher Interviews e) Field Notes f) Classroom Video Data from this study will be initially labeled with participant names and then converted to ID numbers. All data will be stored on file servers maintained by The Learning Partnership. The physical hardware for The Learning Partnership servers is located in a secure and robust hosting facility maintained by DropBox.com. In addition, the servers are routinely backed up to off-site locations maintained by a third party. Identifiable data is stored in an encrypted electronic format on a Dropbox server accessible only to IRB-certified Learning Partnership staff via two-step verification. Once data is coded with an arbitrary identifier it will be made accessible on DropBox to the researchers at NIU. The video servers are maintained by Swivl.com. For those students who do not grant permission to appear in the video, all precautions will be taken so that they do not appear in the videos. However, if they are captured on the video, that portion of the video will either be deleted or blurred to hide the identity of the student.

19) If you are collecting your data through an on-line survey tool, will the survey instrument collect email and/or IP addresses with the data?

No ☐ **The survey will be set so that email/IP addresses are NOT collected**

Yes ☒ **IP and/or email addresses WILL be collected with the data**

N/A ☐ **I am not using an online survey tool.**

20) How will the records (data, recordings, and consent forms) be stored? **Also** indicate how long records will be kept and how and when they will be disposed of.

[Note: Signed informed consent documents must be maintained for 3 years following completion of the study.]

Physical artifacts will be converted to digital format and stored on the DropBox server.

Physical artifacts will be destroyed. Once the different sources of data have been linked through students names, the names will be deleted and replaced with an arbitrary id number.

We will make available via the Internet all data that could not reveal the identity of individual subjects, including numerical data, codings, and summaries. Researchers will be able to access the data from the project section of The Learning Partnership's web site, from the Swivl.com site, and from folders that are marked with public access (where appropriate) or specific, limited, password protected access.

Part VI: Projects Involving Deception *[complete only if your study includes deception]*

21) Describe the deception being used. Be sure to clarify whether this is deception by **omission** (an important aspect of the study is withheld from the participants) or **commission** (the participant is misled about some aspect of the study) or both. *[Complete item 14 if aspects of consent are missing.]*

22) Why is deception a necessary and unavoidable component of the experimental design?

23) Debriefing of participants will be:

☐ Immediate (directly following the research session)

☐ Delayed

☐ Full (all aspects of deception will be revealed)

☐ Partial (some aspects of deception will remain unexplained)

a) If debriefing is delayed, why is the delay necessary, and when will it occur?

b) If debriefing is partial, why is the partial debriefing necessary? Would the participant be harmed in any way by full debriefing?

c) If debriefing is partial, will full debriefing occur later?

d) Does the presence of deception increase risk of harm to the participants?

e) Is the respondent free to withdraw his/her data after being fully debriefed?

24) Who will provide the debriefing?

Reminder: Please include a copy of your debriefing script/sheet with this application.

Part VII: Credit and Compensation

25) If participants will receive course credit for participation, please describe it below.

26) If participants will receive some other form of compensation for participation, please describe it below.

Participating teachers who complete data collection will be given a full set of bound versions of the background readings for their classrooms.

Classes will be given an incentive for returning their signed parent permission forms. Specifically, if 90% of students in a given class return their parental consent forms, each student in the whole class will be given a \$5 gift card.

27) Describe any alternative tasks that will be available for participants to earn the credit or compensation.

Part VIII: Conflict of interest

28) Do any of the researchers conducting this study have any potential conflicts of interest?

[Conflicts of interest may include financial or personal interest, or any condition in which the investigator's judgment regarding a primary interest may be biased by a secondary interest.]

Yes ☐ No ☒

29) If **yes** to the above question, please describe the nature of the conflict of interest.

Part IX: Researcher Qualifications

30) In addition to listing the investigators' names, indicate their qualifications to conduct procedures to be used in this study.

Amanda Durik, Ph.D. is a social psychologist at Northern Illinois University who has been conducting research on motivation in achievement situations for over 15 years.

Anne Britt, Ph.D. is a cognitive psychologist at Northern Illinois University who has been conducting research on argumentation for over 25 years.

Steven McGee, Ph.D. is a learning scientist and president of The Learning Partnership, an organization developed to bring educational innovation to schools. He has over 25 years of experience conducting research in educational settings.

31) State the date of completion of the **CITI Human Subjects Protection** training program(s) for the individuals listed in the question above. The required course is "**Social & Behavioral Research - Basic/Refresher, Basic Course**". The required CITI training is accessible from the ORCI website at http://www.niu.edu/orci/human_research/training/index.shtml If you have comparable training, please attach certification verifying this. *[Note: NIU policy requires that research investigators must complete appropriate training before conducting human subjects research.]*

Amanda Durik completed CITI training in June 2017
Anne Britt completed CITI training in January 2018
Steven McGee completed CITI training in January 2017.

To be completed by investigator and confirmed by advisor (if student project) and departmental reviewer.
Initials indicate all required parties ratify that application is complete:

Checklist of items required to accompany completed application form:

1. _____ Complete grant proposal/contract (for externally funded projects)
2. _____ All surveys, questionnaires, interview questions, or other instruments to be used
3. _____ Subject recruitment/introductory materials
4. _____ Informed consent documents (must select at least one):
5. _____ Consent form for adults (if participants are age 18 or over)
6. _____ Assent form for minors (if participants are under age 18)
7. _____ Parental permission form (if participants are under age 18)

Initial indicating all listed materials are attached and application is complete; INCOMPLETE APPLICATIONS WILL NOT BE PROCESSED. The investigator will be notified of deficiencies in the application via e-mail from the Office of Research Compliance and Integrity (ORCI); if no response is received by the ORCI thirty (30) days the application will be considered withdrawn.

Investigator _____ Advisor (if student project) _____ Department Chair/Designee _____

REQUIRED SIGNATURES: ALL

PROJECTS

CERTIFICATION

I certify that I have read and understand the policies and procedures for research projects that involve human subjects and that I intend to comply with Northern Illinois University Policy. Any changes in the approved protocol will be submitted to the IRB for written approval prior to those changes being put into practice unless it involves an immediate safety issue for the subject during a procedure. (In such instances, the researcher is required to promptly notify the IRB after the fact.) I also understand that all non-exempt projects require review at least annually.

Investigator(s) Signature(s) Date

Signature of Faculty Advisor Date
(Student Project Only)

Authorized Departmental Review:

☐ Project qualifies for Administrative Review.

Cite the appropriate exempt category:

☐ Project qualifies for Subcommittee Review.

Cite the appropriate expedited category:

☐ Project is referred for review by the convened IRB.

Signature of Authorized Departmental Reviewer Printed name Date

Return this form, together with necessary documentation, to the Office of Research Compliance and Integrity, Lowden Hall, 301. For information or additional assistance with the approval process, please call the office at (815) 753-8588 or access the ORCI web page at www.niu.edu/orci.

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./ DUE DATE NSF 23-596 11/08/2023		<input type="checkbox"/> Special Exception to Deadline Date Policy		FOR NSF USE ONLY NSF PROPOSAL NUMBER	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.) DRL - Discovery Research K-12					
DATE RECEIVED	NUMBER OF COPIES 1	DIVISION ASSIGNED 11090000 DRL	FUND CODE 7645	UEI (Unique Entity Identifier) DA9LBJCRS8F3	FILE LOCATION
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN) 841681934		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)	
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE LEARNING PARTNERSHIP LLC			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE 4617 WOLF RD WESTERN SPRINGS, IL 60558-1522 US		
AWARDEE ORGANIZATION CODE (IF KNOWN)					
NAME OF PRIMARY PLACE OF PERF The Learning Partnership			ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE 4617 WOLF RD WESTERN SPRINGS, IL 60558-1522 US		
IS AWARDEE ORGANIZATION (Check All That Apply)		<input checked="" type="checkbox"/> SMALL BUSINESS <input checked="" type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS	
					<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Exploring Cross-School Professional Learning Communities as Drivers of Culturally Responsive and Equitable Middle School Science Instruction					SHOW LETTER OF INTENT ID IF APPLICABLE
REQUESTED AMOUNT \$ 1,198,550	PROPOSED DURATION (1-60 MONTHS) 36 months	REQUESTED STARTING DATE 06/01/2024		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE	
THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW					
<input checked="" type="checkbox"/> TYPE OF PROPOSAL Research <input checked="" type="checkbox"/> COLLABORATIVE STATUS Collaborative from one organization <input checked="" type="checkbox"/> BEGINNING INVESTIGATOR <input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES <input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION <input type="checkbox"/> HISTORIC PLACES <input type="checkbox"/> LIVE VERTEBRATE ANIMALS IACUC App. Date _____ PHS Animal Welfare Assurance Number _____			<input checked="" type="checkbox"/> HUMAN SUBJECTS Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date pending <input type="checkbox"/> FUNDING OF INT'L BRANCH CAMPUS OF U.S. IHE <input type="checkbox"/> FUNDING OF FOREIGN ORGANIZATION OR FOREIGN INDIVIDUAL <input type="checkbox"/> INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED _____ <input type="checkbox"/> POTENTIAL LIFE SCIENCES DUAL USE RESEARCH OF CONCERN <input type="checkbox"/> OFF-CAMPUS OR OFF-SITE RESEARCH		
PI/PD DEPARTMENT		PI/PD POSTAL ADDRESS 1 South Dearborn St. 20th Floor Chicago, IL 60603 US			
PI/PD FAX NUMBER					
NAMES(TYPED)	High Degree	Yr of Degree	Telephone Number	EmailAddress	
PI/PD NAME Naomi Blaushild	PhD	2022	412-445-4289	naomiblaushild@thelearningpartnership.net	
CO-PI/PD					
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Overview

This three-year (Level II) Exploratory Project in the Teaching Strand investigates how cross-school professional learning communities (PLCs) support culturally responsive (CR) and equitable science instruction at the middle school level (grades 6-8). A decade into the adoption of the Next Generation Science Standards (NGSS), there is little evidence of widespread improvements in students' science achievement. Research shows teacher collaboration, professional learning (PL), and teacher leadership are associated with successful NGSS implementation and improved student outcomes in science. However, many teachers, particularly those who are "instructionally isolated" (the only teacher of a particular grade and/or subject area), lack authentic opportunities for content-focused collaboration within their schools. Further, some efforts to ensure that historically marginalized students have access to high-quality and CR science instruction have stagnated because teachers often struggle to connect theories of CR instruction to their classroom practice. To support middle school (MS) science teachers with delivering CR and NGSS-aligned instruction and enhance teachers' opportunities for collaboration, Chicago Public Schools (CPS) has begun developing PLCs for MS science teachers from across the district (i.e., "cross-school"). This project is grounded in an emerging research practice partnership (RPP) between The Learning Partnership (TLP) and the CPS STEM Department, which co-developed the following research questions:

1. How do cross-school PLCs impact teachers' practices and mindsets when delivering NGSS-aligned science lessons? What aspects of PLCs contribute to or inhibit these shifts?
2. How do cross-school PLCs support teacher learning of CR and equitable instruction in science?
3. How do PLC teacher leaders develop their leadership capacities and what impact does this have on their own instructional practice?

Intellectual Merit

This study has the potential to advance knowledge in several timely and intersecting research areas, including PK-12 science education, STEM teacher development, policy implementation, and CR instruction in science. Since PLCs are often studied and implemented within schools, this project could provide novel insights about how cross-school PLCs can facilitate teacher collaboration and lead to shifts in teachers' mindsets and practices. Whereas much of the research on standards-based reform focuses on Math and ELA, this project focuses on a long-standing tension between standardization (i.e., provision of a universal, standards-aligned curriculum) and teachers' responsibilities to adapt curriculum to deliver CR and equitable instruction in the science context. Understanding the structures and mechanisms within PLCs that help teachers adapt standards-aligned curriculum to meet their students' unique needs will contribute to shared knowledge around effective teacher PL, teacher collaboration, and education policy implementation in the context of NGSS and standards-based reform more broadly.

Broader Impacts

This project has the potential to make a deep local impact in CPS and broader impacts on STEM teacher PL and student outcomes. Each year, PLCs could impact up to 100 science teachers and teacher leaders, who teach approximately 6,000 MS students in CPS. Over three years, the project could reach up to 18,000 students, or over 80% of MS students in CPS. Given the district's aim to strategically recruit teachers from under-resourced schools, the project has the potential to have a greater impact on students who are underrepresented minorities in STEM fields (low-income, Black, and Latinx students). Second, the study would identify effective features of cross-school PLCs that could be replicated and/or adapted to other grade levels and content areas in CPS and other districts. The study's dissemination plan will ensure that PLC activities and teacher-created resources for CR and equitable science instruction are shared digitally with other school districts, regardless of size or urbanicity. Understanding what structures and mechanisms in cross-school PLCs best support teachers in delivering NGSS-aligned CR and equitable science instruction can enhance student learning, the development of STEM identities, and increase the diversity of the STEM workforce. Further, longer-term teacher outcomes from PLC participation, such as increased job satisfaction and retention, could strengthen school improvement efforts and school stability and increase students' access to experienced and supported science teachers.

1. IMPORTANCE

This Exploratory Project investigates how cross-school professional learning communities (PLCs) impact middle school (MS) science teachers' practices, mindsets, and capacities to deliver equitable and culturally responsive (CR) science instruction. A decade after most U.S. states adopted the Next Generation Science Standards (NGSS), there is little overall evidence of improvement or greater equity in student outcomes in science (Allensworth et al., 2023). Common learning standards (e.g., NGSS) provide broad signals about what to teach, but they have largely not been designed to assist teachers in adapting these standards to meet the unique needs of their students (Haverly et al., 2022; Milner, 2014; Peurach et al., 2019). While the NGSS outlined five key shifts in science instruction to engage students in real-world science and engineering practices, local districts are responsible for helping teachers navigate the many instructional shifts necessary to teach the NGSS (Allensworth et al., 2022). Thus, the effectiveness of the NGSS in transforming science instruction in the U.S. relies both on teachers' access to high-quality, standards-aligned curriculum and professional learning (PL) opportunities that support teachers' interpretations and uses of curricular materials (Cohen et al., 2013; Short & Hirsh, 2020). Indeed, studies of local NGSS implementation have found that districts providing opportunities for effective PL and teacher leadership experience greater improvements in both overall student achievement levels and equity (Allensworth et al., 2022; Cassata & Allensworth, 2021).

In 2019, Chicago Public Schools (CPS), the nation's fourth-largest school district, identified teachers' inequitable access to high-quality curriculum materials as one major cause of educational disparities by race and socioeconomic status in Chicago. In response, the district established the Curriculum Equity Initiative (CEI), which centers access to high-quality curriculum and teacher professional learning (PL) as one strategy for seeking racial justice and educational equity in Chicago. The core of CEI is Skyline, the district's first universal curriculum, which provides "standards-aligned, grade-level-appropriate, and culturally relevant collections of curricular materials that CPS educators across all grade levels and subjects will be able to utilize to ensure that the needs of all students are met" (Chicago Public Schools, 2023). For a district known for decentralization, localized control, socioeconomic and racial segregation, and principal autonomy (Bryk et al., 1999), Skyline represents a historic effort to make high-quality, CR instruction available to all students.

This project focuses specifically on the MS context (grades 6-8), which is a crucial time point for science education. Because many elementary schools devote little time to science (Haverly et al., 2022), MS teachers are often responsible for introducing students to scientific content, practices, and mindsets. Further, research suggests that adolescents' motivations and interests in school subjects decline during the transition from elementary to middle school (Eccles & Midgley, 1989; Rice, 2001; Wigfield et al., 1991). This has also been documented in the case of students' interests in science as a subject and potential career path (Barton, 2002; Kanter & Konstantopoulos, 2010), which highlights the importance of MS science teachers creating welcoming and engaging learning environments.

In the context of MS science, CPS adopted the *Amplify Science* curriculum as the foundation for Skyline science and added several features (e.g., "Chicago Connections") to make the curriculum more relevant to Chicago students. To support MS science teachers with Skyline implementation, The STEM Department offers various opportunities for teacher PL, including content-focused unit overviews, sessions on specialized topics (e.g., discourse or formative assessments), school-based collaborative routines (e.g., analyzing student data protocols), and, more recently, PLCs that bring teachers together from across the district to focus on instructional practice shifts. However, data collected by the PI in the 2022-2023 schoolyear – including observations of PL, interviews with PL leaders, and teacher focus groups – surfaced several barriers to MS teachers' implementation of Skyline and delivery of equitable, CR science instruction. Teachers described struggling to adapt the Skyline curriculum to meet the specific needs of their students and lacking opportunities for authentic collaboration with other teachers due to "instructional isolation" (Patrick et al., 2023) – being the sole MS science teacher in their buildings. While teachers valued district-run PL sessions for the opportunities to share challenges, ideas, and resources with other teachers, these opportunities for collaboration were often short-lived and rarely focused on developing strategies and resources for equitable and CR instruction.

Building on a PLC model piloted in Spring 2023, the CPS STEM Department will design and implement PLCs that bring together MS science teachers from across the district (i.e., “cross-school PLCs”) to collaborate and develop their practice. Cross-school, context-focused PLCs, particularly those bringing together instructionally isolated teachers, are a promising intervention to support NGSS-aligned and CR science instruction. However, much of the existing research on science teacher PLCs relies on teachers’ self-reported changes, fails to clearly describe PLC structures, lacks clarity on which aspects of PLCs lead to greatest shifts in teachers’ practices, and focuses on school-level PLCs (Dogan et al., 2016; McGee & Nutakki, 2017). Thus, it is unclear what structures and mechanisms could make cross-school PLCs effective for collaboration and MS science teacher learning. In this exploratory project, The Learning Partnership (TLP) will conduct research and provide feedback to CPS on cross-school PLCs for MS science teachers, which will be designed and facilitated by the science team.

2. GOALS

Anchored in an emerging research practice partnership (RPP) between The Learning Partnership (TLP) and the CPS STEM Department, this exploratory study investigates these questions:

1. How do cross-school PLCs impact teachers’ practices and mindsets when delivering NGSS-aligned science lessons? What aspects of PLCs contribute to or inhibit these shifts?
2. How do cross-school PLCs support teacher learning of CR and equitable instruction in science?
3. How do PLC teacher leaders develop their leadership capacities and what impact does this have on their own instructional practice?

Because the STEM Department is still in the early stages of designing and implementing cross-school PLCs, an exploratory study is the most appropriate project type for this research. By helping to identify the mechanisms and structures within the PLC models that best support teachers’ implementation of NGSS-aligned curriculum and practices, mindset shifts, collaboration, and teacher learning around CR and equitable instruction in science, this study could help CPS refine and scale up the PLC model and lay the groundwork for an Implementation and Improvement study focused on student outcomes.

3. THEORETICAL AND EMPIRICAL RATIONALE

A. NGSS Implementation and Implications for MS Science Teacher PL

In 2013, NGSS outlined five key shifts for science education, including three-dimensional learning, coherent learning progressions, engaging students with real-world phenomena and design solutions, integration of science and engineering practices, and explicit connections to math and literacy (National Research Council, 2012). The NGSS position students as agents of their own learning and teachers as guiding and supporting learning among students with diverse backgrounds, motivations, and interests – in other words, providing opportunities for rigorous, real-world, and *equitable* science instruction (Haverly et al., 2022). Shifting from traditional science instruction (i.e., teacher-centered, science as a set of contextualized facts), the NGSS require teachers to deepen both their science content knowledge and subject-specific teaching practices, rethink how they motivate science lessons, and develop classroom environments that support student sensemaking, questioning, and discussion (Dogan et al., 2016; Reiser et al., 2021; Thompson et al., 2019).

PL is a crucial lever for enacting educational change, especially standards-aligned instruction; however, not all PLs lead to improvements in teacher practice and student learning (Stornaiuolo et al., 2023). Effective PL fosters changes in teachers’ knowledge, skills, beliefs, attitudes, and ultimately, teachers’ practice (Darling-Hammond et al., 2017; Desimone & Garet, 2015). PL that is sustained, interactive, collaborative, content focused, coherent with district goals and educational policies helps teachers learn and refine how they use instructional resources to meet their students’ needs (Stornaiuolo et al., 2023). Research on teacher PL emphasizes the importance of teachers having opportunities for collaboration, feedback, coaching, and reflection, and that PL is more impactful when grounded in instructional materials that teachers are currently using (Darling-Hammond et al., 2017; Desimone, 2009; Short & Hirsh, 2020). In the context of science reform, teachers’ abilities to implement new standards

rest, in part, on the amount of time they have to plan and reflect on curriculum implementation among colleagues (Allen & Heredia, 2021). The more rigorous demands of the NGSS necessitate that teacher PL is embedded in subject matter, connected to teachers' practice, and collaborative (Reiser, 2013). In-depth studies across multiple states and Chicago on Common Core-Math and NGSS found that PL was critical to teachers' implementation of new standards, but the quality and structure of PL mattered. Teachers had more buy-in and success with implementing the NGSS when there was a balance of guidance and flexibility around curriculum implementation, a focus on changing practice, guidance around using resources, and collaboration with knowledgeable colleagues (Allensworth et al., 2022, 2023).

B. Professional Learning Communities and Teacher Leadership in Science

PLCs are defined as a group of teachers committed to a common vision of instructional improvement working collaboratively around problems of practice; PLC activities center student learning, include student work analysis, and support teachers with identifying specific goals for improvement and evaluating their progress toward their goals (Dogan et al., 2016; Thompson et al., 2019). Research suggests that PLCs for science teachers can positively impact teachers' content knowledge, pedagogical content knowledge, and self-efficacy (Dogan et al., 2016) and help teachers implement standards-aligned curriculum (Wang et al., 2023). PLCs provide opportunities for teachers to share ideas and experiences to improve their implementation of a new policy or curriculum (Desimone & Hill, 2017).

Because sustained opportunities for teacher collaboration have been recognized as critical to effective PL and NGSS implementation (Allensworth et al., 2023; Reiser, 2013; Stornaiuolo et al., 2023), PLCs have become a “cornerstone of systemic reform efforts supporting science teachers' learning and heralded as a vehicle for collaboration among science teachers with the ultimate goal to improve student achievement” (Dogan et al., 2016, pp. 2–3). PLCs can involve or develop **teacher leaders**, who are also critical to the success of NGSS implementation. Teacher leaders are educators who positively influence their peers, have a strong sense of purpose, extend their impact beyond their classrooms, take instructional risks, engage in reflective practice, and help cultivate a positive school environment (Trabona et al., 2019). Given the rigorous demands of the NGSS, teacher leaders can play a unique role in supporting colleagues, advocating for change, supporting teacher collaboration, and taking on leadership roles within PLCs (Allensworth et al., 2023; Cassata & Allensworth, 2021; Trabona et al., 2019).

Although PLCs can enhance teacher collaboration and instruction, they are often organized at the school-level and thus unavailable to teachers at smaller schools who lack grade-level or content-area colleagues. Such “instructionally isolated” teachers are the only individuals teaching their specific subjects at their schools or within their districts (Patrick et al., 2023). Although instructional isolation is more common in small, rural districts and among specialized subjects (e.g., music or computer science), it is a common setup in CPS PK-8 schools to have one teacher for all three grades of MS science (or, in some cases, MS science and math). Indeed, a study of a PL program for CPS MS science teachers found that teachers who participated in PD described positive shifts in their practice; however, high rates of teacher turnover, the small size of neighborhood schools, and underfunding undermined the potential impact of the program district-wide (McGee & Nutakki, 2017). Since teacher collaboration is key to NGSS implementation and instructional practice shifts (Allensworth et al., 2022), instructionally isolated MS science teachers may struggle to deliver high-quality, NGSS-aligned instruction. While establishing cross-school PLCs that involve teachers across the district is a promising intervention, research on science teacher PLCs typically relies on teachers' self-reported changes, fails to clearly describe PLC structures, lacks clarity on which aspects of PLCs lead to teachers' practice shifts, and focuses on school-level PLCs (Dogan et al., 2016; McGee & Nutakki, 2017). Thus, we know less about the mechanisms that could make cross-school PLCs effective for MS science teacher learning.

C. Culturally Responsive and Equitable Science Instruction

CPS' Skyline initiative is rooted in the goals of increasing students' access to equitable and CR learning opportunities. Students from historically marginalized backgrounds benefit academically and socioemotionally when their educational environments reflect, affirms, and validate their cultural and

linguistic assets, community values, interests, and lived experiences (Gay, 2002; Ladson-Billings, 1995; Villegas & Lucas, 2022). While some scholars distinguish between culturally *relevant* pedagogy (Ladson-Billings, 1995) and culturally *responsive* teaching (Gay, 2002), we use the term culturally *responsive* or CR instruction throughout this proposal, unless quoting another source (e.g., CPS). CR instruction includes five essential elements: 1) developing a knowledge base about cultural diversity; 2) including ethnic and culturally diversity content in the curriculum; 3) demonstrating caring and building learning communities; 4) communicating with ethnically diverse students; 5) responding to ethnic diversity in the delivery of instruction (Gay, 2002). CR teaching leverages “the cultural characteristics, experiences, and perspectives of ethnically diverse students as conduits for teaching them more effectively” (Gay, 2002, p. 106). CR teachers create classroom environments that encourage student sensemaking, involve students in inquiry projects that have personal meaning to them, and promote conversations about topics that are relevant to students but often excluded from class discussions (Villegas & Lucas, 2002). When students feel a sense of belonging, they are more likely to contribute to class discussions and perceive their contributions as valuable (Penuel et al., 2023). Since the NGSS rely on student sensemaking and discussion (Reiser et al., 2021; Schwarz et al., 2017), teachers’ capacities to cultivate student belongingness through CR instruction is critical to student learning and interest in STEM careers.

While many of the tenets of CR instruction (Gay, 2002) are embedded in the NGSS (e.g., exploring real-world phenomena), scholars emphasize that CR science instruction also involves teachers’ helping students acquire the skills and knowledge to see themselves as change agents (Brown et al., 2019; Laughter & Adams, 2012). These aims are reflected in the vision statement established by the CPS STEM Department in the 2024 schoolyear, which states that “students leverage their ideas and lived experiences as they work towards developing an understanding of culturally relevant, real-world phenomena”; and, “through these experiences, students develop identity and take ownership over their learning, laying the foundation for the next generation of critical thinkers that are able to contribute to global innovations” (fieldnotes, September 19, 2023). However, teachers often struggle to enact CR instruction (Ladson-Billings, 2008). Research shows that teachers understand the importance of addressing the needs of traditionally underserved students but “are left to figure out how to do so in a standards-based system in which messages prevail about teaching a curriculum with fidelity and ensuring that students are passing standardized tests” (Wang et al., 2023, p. 2). STEM teachers often struggle to connect CR theory to practice, and the infusion of CR teaching in STEM lags behind other subjects (Brown et al., 2019).

Overall, research suggests that PLCs for science teachers can positively impact teachers’ content knowledge, pedagogical content knowledge, and self-efficacy (Dogan et al., 2016) and help teachers understand and implement standards-aligned materials” (Wang et al., 2023). However, few studies have explored which features of PLCs impact science teacher knowledge and practices and student learning (Dogan et al., 2016), and PLCs are often organized and studied in the single-school context. Understanding what structures and mechanisms in cross-school PLCs support teachers implement the NGSS standards and deliver CR and equitable science instruction in grades 6-8 has the potential to enhance student learning and the development of STEM identities, particularly for underrepresented minorities (URMs) in STEM fields.

D. Results from Recent Research on CPS MS Science PL

As part of the district’s broader evaluation of Skyline, TLP partnered with the Skyline office to investigate how the district designed and implemented PL opportunities for MS science teachers. Led by the PI of this project (Dr. Blaushild), data collection took place throughout the 2022-2023 school year and included observations of nine Skyline PL sessions, teacher focus groups, interviews with professional learning leaders (PLLs), and document collection. During observations, researchers took detailed fieldnotes and participated in activities and discussions with teachers. Next, we conducted eight one-hour, virtual focus groups with a total of 28 MS science teachers throughout the district about their experiences with Skyline PL and individual interviews with seven PLLs – district, network, and school-based staff members responsible for designing and/or facilitating Skyline PL. Finally, we collected documents (e.g., district PL plans) to triangulate our understanding of PL design and teachers’ experiences with Skyline

PL. Data analysis involved deductively coding (Miles et al., 2014) qualitative data for evidence of effective PL components (e.g., content focus, active learning) identified by the literature (Darling-Hammond et al., 2017; Desimone, 2009; Short & Hirsh, 2020). We then open-coded (Corbin & Strauss, 1990) teachers' descriptions of their experiences in PL and future PL needs.

We found that CPS provided teachers with content-focused PL that engaged them in active learning, was coherent with district goals and NGSS standards, supported them with the process of shifting to a new curriculum, and created space for teachers to share ideas, resources, and challenges. Throughout the year, Skyline PL evolved to include more modeling of effective practices by facilitators, specialized topics (e.g., discourse), and district or network-based professional PLCs. According to teachers, these specialized PLs and PLCs offered richer opportunities for teacher collaboration and for teachers to deepen their expertise in self-selected topics or problems of practice. Nonetheless, while equitable and CR instruction is an overarching goal of the district's Curriculum Equity Initiative, teachers described lacking PL opportunities that build their capacities in CR and equitable instruction. Teachers understood that they need to adapt the Skyline curriculum to their students but lacked concrete strategies, resources, and importantly, a professional community, to help them put their ideas into practice.

Overall, Skyline was designed to provide teachers across all grades and subject areas with a *universal* set of CR curricular materials; however, for students in a large, diverse school district to receive an education that is responsive to their specific needs, backgrounds, and lived experiences, teachers must be equipped with the capacities to *adapt* Skyline to their students. Thus, our study of Skyline PL illuminated the importance of providing MS science teachers with PL opportunities that foster authentic collaboration and focus explicitly on CR and equitable instructional strategies for science.

4. RESEARCH AND DEVELOPMENT DESIGN

A. Research Questions

1. How does participating in a cross-school PLC impact teachers' practice and mindsets when delivering NGSS-aligned science lessons? What aspects of PLCs contribute to or inhibit these shifts?
2. How does participating in a cross-school PLC support teacher learning around CR and equitable instruction in the science classroom?
3. How do PLC teacher leaders develop their leadership capacities and what impact does this have on their own instructional practice?

B. Partner District

This project builds on our partnership with CPS, the nation's fourth-largest school district.

Table 1: CPS Student Enrollment Characteristics

Demographic Categories	% of Students
<u>Race/Ethnicity</u>	
Hispanic	46.9
Black/African-American	35
White	11.1
Asian	4.5
Multi-Racial or Other Race	2.4
<u>Other Student Characteristics</u>	
Economically Disadvantaged	70.7
English Language Learners	24.7
Diverse Learners (Students with IEPs)	16.1

Note: Demographic information from cps.edu/about/stats-facts

CPS educates over 320,000 students from diverse racial, ethnic, linguistic, and socioeconomic backgrounds, as shown in Table 1. TLP has partnered with CPS on various research and PL initiatives since 2005 and is one of eight official research partners of the district's External Research Team. This

partnership involves a data sharing agreement, granting TLP access to data on MS science teachers' PL attendance, Skyline curriculum adoption information by school and subject, and other relevant administrative data. TLP has been working with the STEM Department since its adoption of the Amplify curriculum in 2018 (see: Easley et al., 2023) and district's broader evaluation of Skyline since 2022.

C. Cross-School PLCs for Middle School Science Teachers

The MS science team within the STEM Department – comprised of Science Manager Andre Botello and MS Science Specialists, Taissa Lau, Amy Brady, and Ryan Gracia – will design and support two PLC models for MS science teachers. These PLCs will be held after school, and teachers will be compensated by the district for participating. The first is the **Learning Cycle Cohort**, in which MS science from across the district will engage in a Plan-Do-Study-Act (PDSA) cycle with the support of their peers, teacher leaders, and science specialists. The PDSA cycle provides a structure for continuous improvement that involves identifying a problem of practice, crafting a plan for improvement, collecting data on process and outcomes, and using that data to make decisions on how to adjust the improvement plan (Shakman et al., 2017). Teachers in the Learning Cycle Cohort will meet 4 times per cycle. To help teachers focus on instructional practices aligned to both the NGSS and CPS' instructional vision for science, the science team has identified six "CPS Science High Leverage Instructional Practices" for teachers to select from when beginning the PDSA cycle: 1) anchoring learning in phenomena; 2) leveraging student ideas, questions, and experiences; 3) constructing evidence-based explanations; 4) standards-aligned three-dimensional instruction; 5) discourse; and 6) real world applications. The science team plans to run three Learning Cycle Cohorts each school year. The second PLC model is the year-long **MS Science Teacher Cohort**, which is designed for early-career teachers to engage in content-specific instructional learning, peer-to-peer learning/observation, and coaching cycles led by science specialists. Participants in this PLC will meet 5-6 times per year. PLCs will be led by **MS science teacher leaders** drawn from a **Master Teacher Leader Cohort (MTLC)**. The science team will recruit up to 20 teachers each year from across the district to participate in leadership training with Loyola University and take on leadership roles within the STEM Department (e.g., PLC facilitation) and/or at their schools.

D. Theory of Action

Our Theory of Action illustrates the many potential impacts of cross-school PLCs (Figure 1) and how the emerging RPP between TLP and the STEM Department can ensure continuous improvement of PLCs and their capacities to impact teachers' practices and mindsets (Figure 2).

Impact of PLCs on Teacher and Teacher Leader Outcomes

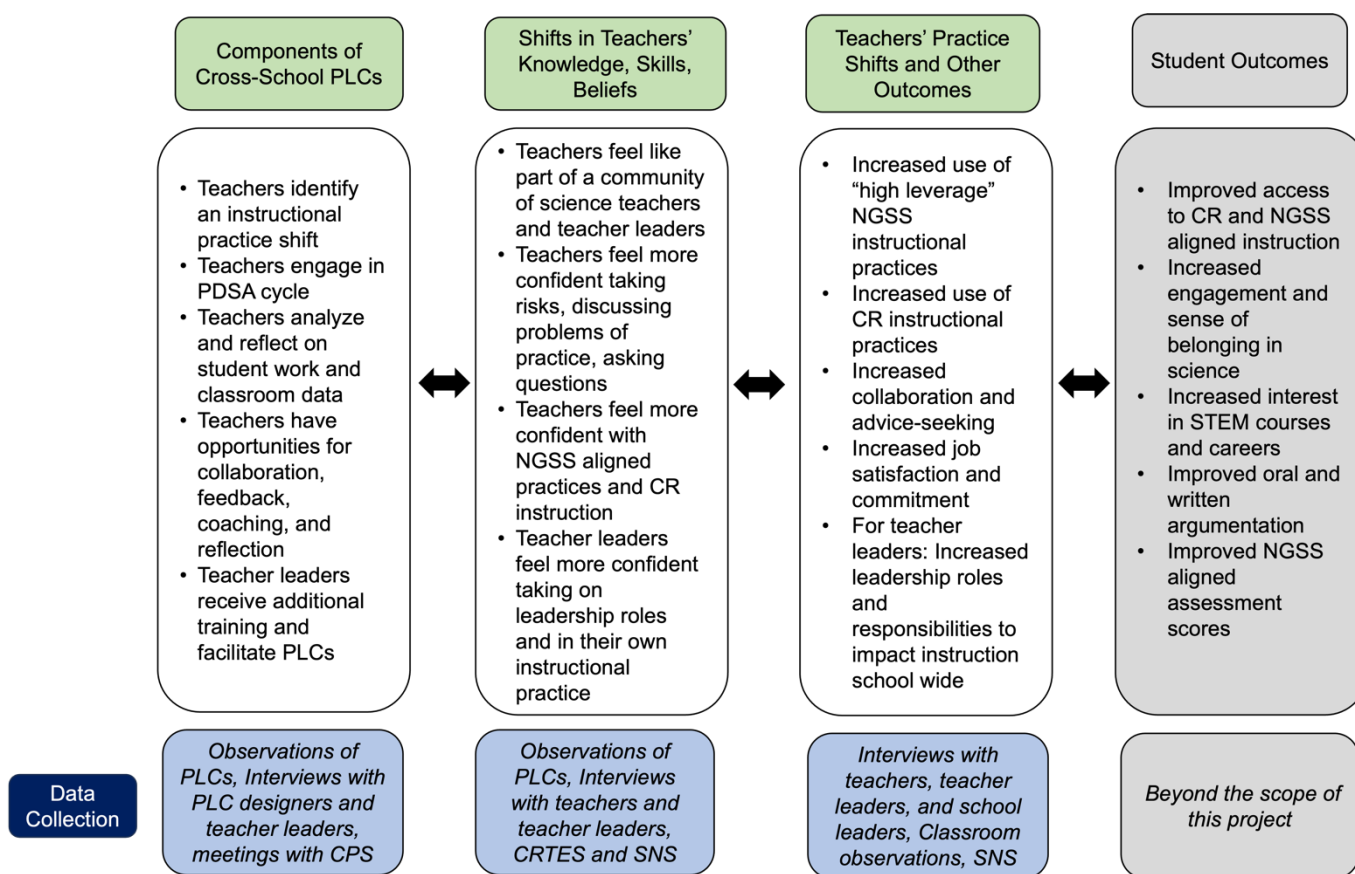
The first part of our Theory of Action illustrates the expected impacts of cross-school PLCs on MS science teachers' and teacher leaders' practices and mindsets. Figure 1 uses a common framework for analyzing PL effectiveness (Desimone, 2009; Desimone & Garet, 2015) to theorize the relationship between cross-school PLCs, shifts in teachers' and teacher leaders' mindsets and outcomes, and student outcomes, and data collection related to each component (described in detail in subsections E-G).

Consistent with recent studies of teacher PL in the context of NGSS, we hypothesize that opportunities for collaboration, feedback, coaching, and reflection among teachers, teacher leaders, and science specialists, will help teachers with NGSS implementation and instruction and increase teachers' efficacy related to NGSS instruction (Allen & Heredia, 2021; Allensworth et al., 2022; Darling-Hammond et al., 2017; Desimone & Garet, 2015; Penuel et al., 2007). During the Learning Cycle Cohort PLCs, teachers will be prompted to identify one high-leverage instructional practice to work on through a PDSA cycle. Since some of the high-leverage instructional practices curated by CPS are aligned to both the NGSS and tenets of CR instruction (e.g., leveraging student ideas, questions, and experiences), we expect that PLCs will also improve teachers' practice and efficacy related to CR instruction (Siwatu, 2007). Additionally, we anticipate that the PLCs could indirectly benefit the colleagues of PLC participants. A study of PL found that teachers who gain instructional expertise through organized PL can share their expertise with colleagues who did not attend (Penuel et al., 2012).

Further, we hypothesize that the short-term outcomes of participating in PLCs – shifts in practice, growth in advice-seeking networks, increased efficacy in CR instruction – will lead to other positive outcomes, such as increased sense of belonging, job satisfaction, and commitment, which could lead to higher teacher retention rates in the long-term (Skaalvik & Skaalvik, 2011). We anticipate similar short-term and long-term outcomes for teacher leaders for their own classroom practice with the added outcomes of increased knowledge of adult learning strategies and leadership capacities. Importantly, opportunities to take on leadership roles can also increase teachers’ commitment to teaching in urban schools (Anderson & Olsen, 2006; Blaushild, 2022; Olsen & Anderson, 2007).

Although collecting data on student learning is beyond the scope of this project, evidence suggests that high-quality teacher PL can lead to improvements in student achievement (Kraft et al., 2018; Penuel et al., 2007). If the PLCs help teachers develop their capacities and self-efficacy related to delivering equitable and CR instruction, they will be better able to create welcoming, affirming, and engaging classroom environments for students of all backgrounds, particularly underrepresented minorities in STEM (Brown & Crippen, 2016; Gay, 2013). For example, students who feel a greater sense of belonging in the science classroom are more likely to engage in classroom discussions (Penuel et al., 2023). Relatedly, increasing teacher job sense of belonging, sense of success, and job satisfaction could positively improve retention (Johnson & Birkeland, 2003; Skaalvik & Skaalvik, 2011). Higher rates of teacher retention will ensure that students are taught by more experienced teachers (Darling-Hammond et al., 2005; Lankford et al., 2002), increase school stability (Allensworth et al., 2009; Ronfeldt et al., 2013), and allow PL to focus more on deepening teachers’ expertise. Though collecting data on student outcomes is beyond the scope of this project, the anticipated impact of PLCs on student learning and other outcomes are integral to this project’s broader impacts.

Figure 1: Theory of Action linking Cross-School PLCs to Teacher and Student Outcomes

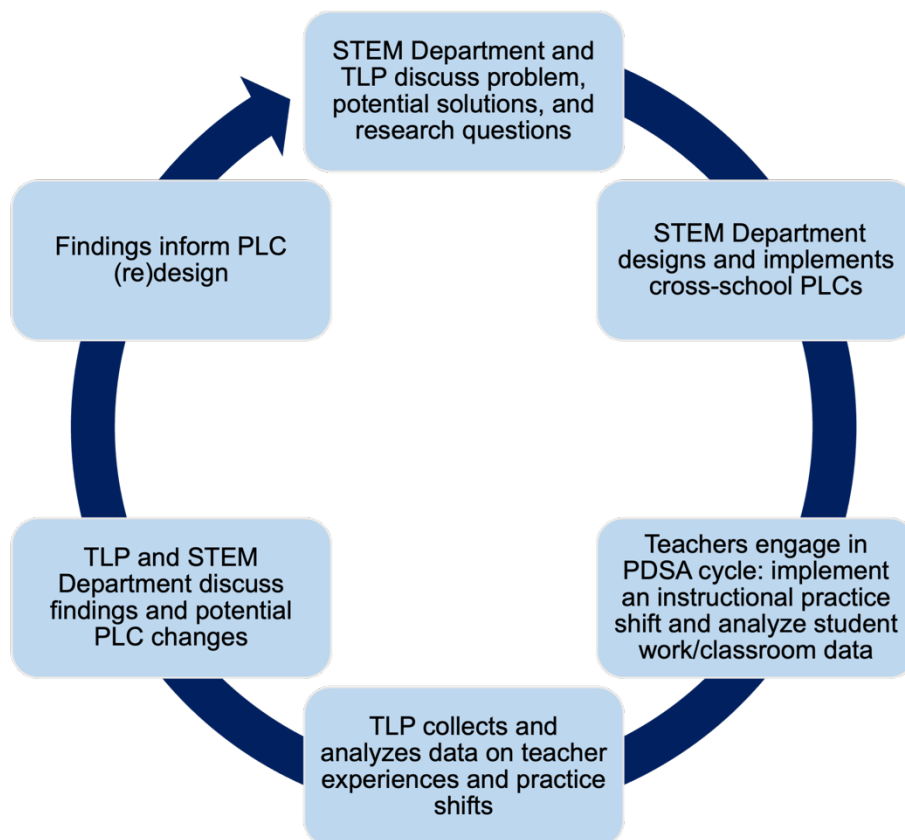


Iterative PLC Design and Feedback

The second part of our Theory of Action is illustrated in Figure 2 and shows how the “problem-solving” cycle (Lewis et al., 2022) between TLP and STEM Department will lead to continuous improvement in and learning about PLCs. RPPs are long-term collaborations “aimed at educational improvement or equitable transformation through engagement with research” that is “intentionally organized to connect diverse forms of expertise and shift power relations in the research endeavor to ensure that all partners have a say in the joint work” (Farrell et al., 2021, p. 5).

Within the RPP framework, the science team will take on the primary role of designing and implementing PLCs, and TLP will take on the primary role of conducting research on teachers’ experiences in the PLCs and how these experiences impact their practices and mindsets. TLP will provide formative and summative feedback to the science team based on ongoing data collection and analysis (detailed in E-G). TLP’s ongoing data collection and analyses of PLCs will inform the science team of what is working and where teachers are seeking more support. The iterative nature of this design and feedback cycle will ensure that the science team designs PLCs that are increasingly responsive to teachers’ needs and experiences. In Section 5, we detail how our external evaluator, Partner to Improve, will support and evaluate the RPP aspect of this project.

Figure 2: Problem-Solving Cycle to Ensure Effective and Teacher-Responsive PL



E. Study Sample

The science team anticipates that each year between 45-60 teachers will participate in the Learning Cycle Cohort, 15-20 teachers will participate in the MS Science Teacher Cohort, and 13-20 teachers will participate in the MSTC. The science team will recruit teachers from across the district, regardless of whether they are using the Skyline/Amplify curriculum. TLP will invite all PLC participants to take part in the research study. Each year, we anticipate involving approximately 35 teachers from the

Learning Cycle Cohort, 12 teachers from the MS Cohort, and 8 teacher leaders. We expect that some teachers will participate in PLCs multiple years in a row. In that case, we will conduct follow-up interviews with teachers who have participated in two or more years of PLCs to understand the longitudinal impact of the PLCs on their practice and mindsets. Given these potential sample sizes and expectation that some teachers will participate multiple times, we anticipate involving **approximately 120 teachers and 30 teacher leaders over the course of the three-year project**. We also anticipate involving around **10 non-teacher participants** (e.g., science specialists, district leaders, school leaders) each year. Overall, we anticipate interviewing 65 teachers and other staff members per year.

In the first iteration of PLCs (2022-2023), the science team used school-level data, including number of teacher vacancies and substitute assignments, to identify schools with greater need for instructional support and more intentionally recruited from those schools. The current iteration of PLCs is open to any MS science teacher in the district; however, the science team will use school-level data (e.g., teacher vacancies) to determine whether certain schools are in greater need of support and adjust their recruitment strategies accordingly. Accordingly, we expect that our sample will include teachers in schools with higher levels of teacher vacancies and substitutes; in CPS, these schools typically serve predominantly low-income students of color (Allensworth et al., 2009; Karp, 2019).

F. Data Collection Procedures and Measures

Data collection includes multiple sources of qualitative and survey data. In collaboration with the STEM Department, the project team will conduct observations of PLC meetings and classroom observations select teachers, during which researchers will take detailed fieldnotes. The project team will conduct semi-structured interviews (Weiss, 1995) with participating teachers, teacher leaders, building administrators for select teacher leaders, and members of the science team at multiple timepoints throughout the year (i.e., at the beginning and end of the school year). During meetings between TLP and the science team, the project team will take anonymized meeting notes to serve as a record of the conversation and note any changes to upcoming PLCs. Finally, the project team will collect documents where relevant, such as district PL plans, PLC agendas and materials, and lesson plans. All qualitative data – including observation field notes, interviews, focus groups, meeting notes, and documents – will be transcribed and uploaded to qualitative coding software (e.g., Dedoose) for analysis.

The project team will administer two surveys to teachers before and after they participate in a PLC. The first is the **Culturally Responsive Teaching Self-Efficacy Scale (CRTSE)**, which was designed to elicit information from preservice teachers regarding their self-efficacy related to specific CR teaching practices (Siwatu, 2007). Respondents rate their levels of confidence ranging from 0 (no confidence) to 100 (complete confidence) on 40 items related to CR teaching practices (e.g., ability to identify diverse needs of my students). The second is the **Science Network Survey (SNS)**, adapted from the validated School Staff Social Network Questionnaire (Pitts & Spillane, 2009) and previously used to study MS science teacher PL (McGee & Nutakki, 2017). The SNS focuses on teachers' formal and informal PL opportunities, self-reported changes in their teaching practices, and their advice-seeking networks. Teachers are prompted to list all individuals from whom they have sought advice and/or information about curriculum, teaching, and student learning in science. Teachers then describe each individual's role, how often they seek advice from that individual, and the type of advice or information they seek from that individual (e.g., science curricula, teaching strategies, etc.).

Additionally, we will use the **5 Essentials Survey (5E)** to understand shifts in teachers' practice, specifically related to inquiry-based instruction. The 5E survey is administered to every CPS teacher and middle and high school student each year and includes a variety of school climate topics, including the **Inquiry-based Science Instruction Scale**. The scale captures students' reports of the frequency with which they use laboratory equipment of specimens, write lab reports, generate hypotheses, use evidence/data to support an argument or hypothesis, and find information from graphs and tables (Bryk et al., 2010). Using the 5E survey results for each year of the study, we can track potential changes in school-level inquiry scores for teachers who participate in the PLCs. Even though the 5E results are reported at the school-level, many MS science teachers in CPS are the only MS science teachers in their

schools. Thus, changes in the school-level 5E score for inquiry-driven instruction reflects changes in that MS science teacher's practices, from the perspective of their students (McGee & Nutakki, 2017).

We show in Table 2 how each data collection activity aligns to our research questions, and we elaborate on these activities and their alignment to each research question below.

Table 2: Data Collection Activities Aligned to Research Questions

Data Collection Activity	RQ1	RQ2	RQ3
Observations of PLC Meetings	X	X	X
Interviews or Focus Groups with Teachers	X	X	X
Interviews with PLC Designers/Leaders	X	X	X
Notes from meetings with STEM Department	X	X	X
Culturally Responsive Teacher Self-Efficacy Scale (CRTSE)		X	
Science Network Survey (SNS)	X		X
Interviews with Teacher Leaders			X
Interviews with Teacher Leaders' administrators			X
Classroom Observations	X	X	X
Inquiry-based Science Instruction Scale (5 Essentials Survey)	X		X

RQ1: *How does participating in a district-wide PLC impact teachers' practice and mindsets when delivering NGSS-aligned science lessons? What aspects of the PLC contribute to these shifts?*

At the beginning of the PLC, researchers will administer the SNS to determine a baseline of each teachers' reported practices, informal and formal PL opportunities, and advice-seeking network. During PLC session observations, researchers will take detailed fieldnotes on PLC activities and pay particular attention to opportunities for teacher collaboration (i.e., conversations between teachers about instruction), opportunities for coaching (i.e., conversations between teachers and facilitators or science specialists about instruction), and teachers' overall engagement in PLCs. At the end of the schoolyear in which teachers participate in a PLC, the team will administer the SNS again to compare each teacher's responses to their beginning-of-year survey. Understanding teachers' advice-seeking networks (and changes within) can help researchers understand whether the PLCs led to increased collaboration across the district and help the STEM Department identify potential teacher leaders by seeing which PLCs members are often sought out by their colleagues for instructional advice. The SNS will also prompt teachers to describe shifts in their instructional practice.

At the end of the PLC, researchers will conduct in-depth, semi-structured interviews (Weiss, 1995) with teachers about their experiences in the PLCs, how they have applied their learnings from the PLC to their practice, and any shifts in their mindsets related to teaching the NGSS. Interviews will also be designed to elicit which specific aspects of the PLC model underscored shifts in teachers' practice and mindsets. In years 2 and 3 of the project, researchers will conduct follow-up interviews with select teachers who have participated in one or both PLC models for multiple years to understand their continued motivation for participating in a PLC and longer-term impacts of the PLC on their practice, sense of community, and self-efficacy. We will also conduct classroom observations of select teachers at different timepoints throughout the PLC cycle to see teachers' enactment of high-leverage instructional practices. Observations will help triangulate teacher interviews and surveys, which capture self-reported practices and practice shifts. Additionally, we will use school-level 5E survey scores related to inquiry-based instruction for participating teachers as another potential indicator of teachers' practice shifts. This section of the 5E survey could show if the school's inquiry-based instruction score increased after their MS science teacher(s) participated in a PLC (McGee & Nutakki, 2017). Finally, the project team will record notes during regular meetings with the science team and conduct individual interviews with members of the science team. These interviews will cover the design process and how the science team decided on any adjustments made to the PLCs throughout each school year.

RQ2: How does participating in a district-wide PLC support teacher learning of culturally responsive and equitable instruction in science classroom?

We will administer the CRTSE to participating teachers at the beginning and end of the PLC. This survey is designed to elicit teachers' levels of confidence with different CR teaching practices, many of which overlap with NGSS practices, and the high-leverage science instructional practices identified by the STEM Department as areas of focus within PLCs. The pre/post survey will reveal whether teachers' levels of confidence in CR instruction shift over the course of the PLC and in what direction and whether there are specific areas of CR instruction in which many science teachers feel less confident. In addition to providing useful insights about science teachers' levels of confidence with CR instructional practices and what, if any, PLC activities contribute to changes, results from the surveys could inform the STEM Department about future PL topics that teachers would benefit from.

In addition to the CRTSE surveys, semi-structured interviews will allow teachers to elaborate on their challenges related to delivering CR instruction in science, which PLC activities were most useful to their understanding and delivery of CR science instruction, and any additional supports they need. Classroom observations for select teachers will help triangulate what teachers share about their confidence with CR instructional practices and what they have learned during the PLC. Notes from meetings with the science team and interviews with PLC designers will provide helpful context about how the science team seeks to incorporate CR instruction as part of the PLC work. Observations of PLC meetings will show how teachers respond to CR-focused activities and/or if teachers discuss and collaborate around CR instructional practices on their own. Data collected in the 2022-23 schoolyear indicated that teachers were struggling to make lessons relevant to students' backgrounds, interests, and lived experiences and desired more time to collaborate with teachers around developing CR lessons and resources. Observations of PLC sessions and teacher interviews will illuminate whether the cross-school PLC model addresses this need by fostering teacher collaboration around CR science instruction.

RQ3: How do PLC teacher leaders develop their instructional leadership capacities and what impact does this have on their own instructional practice?

We will administer the same surveys (SNS and CRTSE) to teacher leaders to determine whether their practices, networks, and levels of confidence with CR instruction shift over time while leading PLCs. We will use the 5E survey inquiry-based instruction scores for teacher leaders' schools to determine whether these scores increased in the year following the teacher leaders engaged in leadership training and facilitated PLCs. We will also conduct semi-structured interviews with teacher leaders focusing on their leadership training and roles, perceived changes in their leadership capacities, perceived changes in their own instructional practice, and their additional PL needs related to science instruction and/or leadership. During observations of PLC sessions, we will pay attention to how teacher leaders interact with teachers around instructional practice shifts. Additionally, we will reach out to the school leaders who work with science teacher leaders for interviews. These interviews will focus on how school leaders perceive the influence of teacher leaders on teacher collaboration and science instruction at the school level and whether school leaders have observed shifts in teacher leaders' instructional practices. Finally, the results of the SNS taken by other teachers can show where teacher leaders land within teachers' advice-seeking networks. While we would expect that teacher leaders will be at the center of many science teachers' advice-seeking networks, it is possible that other informal leaders emerge or that some teacher leaders become more sought after than others for instructional advice.

G. Proposed Data Analysis

Data collection and analysis will be integrated so that the research team can adjust protocols in response to emergent findings (Miles & Huberman, 1994). Our analysis will rely on both deductive and inductive coding strategies (Miles et al., 2014). For the first round of coding, we will first develop a list of deductive codes derived from our theoretical and empirical framework (e.g., components of effective PL, NGSS alignment, CR teaching). For the next round, we will employ *in vivo* coding to capture participants' unique language and open coding (Corbin & Strauss, 1990) to ground our analysis in

participants' experiences and remain open to unexpected results that spark new research questions. After finalizing the codebook and assuring consistency between multiple coders (i.e., interrater reliability), the researchers will apply codes to all data using Dedoose. The team will use code co-occurrence charts, comparative matrices, and memoing (Miles et al., 2014) to explore and examine patterns in the data.

The project team will conduct descriptive analyses of the survey data to determine any shifts in teachers' self-reported practices and self-efficacy related to CR instruction and overall trends across participating teachers. For the advice-seeking section of the SNS, we will use social network analysis (SNA) (Daly, 2010) to build a model of teachers' individual advice seeking-networks for science instruction. Education researchers have used SNA to explore relationships between networks of teachers, instructional coaches, and/or school leaders on outcomes such as collegiality, advice-seeking behavior, instructional practices, and teacher retention (Baker-Doyle, 2010; Caduff et al., 2022; Coburn & Russell, 2008; Spillane et al., 2017). Our analysis of teachers' instructional advice-seeking networks can illuminate whether these networks expanded throughout the PLC (i.e., they identify more teachers from whom they can seek instructional advice) and whether some teachers and/or teacher leaders have become "hubs" for instructional advice among MS science teachers in the district. This data could shed light on how teachers build community and help the STEM Department identify future science teacher leaders.

Interviews and observations will help triangulate survey data and help us pinpoint specific practices and structures in the PLC model that contribute to these reported shifts in practice, efficacy, and advice-seeking behavior. Taken together, these analyses will help us build a model of effective cross-school PLCs to support instructionally isolated teachers with standards-aligned and CR instruction. Finally, consistent with the RPP framework (Farrell et al., 2021), a key component of our data analysis process will involve sharing and discussing preliminary themes and findings with the STEM Department and providing space for the science team to offer their interpretations and potential new research questions. These conversations will ensure that all members of the emerging RPP are involved in the data analysis process and that findings are contextualized within the district's historical and policy context.

5. MECHANISMS TO ASSESS SUCCESS OF THE PROJECT

We will use an Advisory Board and an external evaluator to assess the success of this project from two different angles. The **Evaluation Advisory Board** will provide ongoing, independent, and critical reviews of the research process. The Board's work will focus on this evaluation question: *Does the research team employ valid research methods for drawing conclusions about impact of cross-school PLCs on teachers' practice, mindsets, collaboration, and capacities to deliver culturally responsive and equitable science instruction?* The Board will monitor the data collection and analysis processes and evaluate the extent to which we are making sufficient progress toward answering our research questions. The Board will meet with the project team through videoconferencing twice per year – in the first half of the school year and at the end of the school year. Prior to each meeting, the project team will share a specific artifact or set of artifacts (e.g., data collection plans, analyses, description of emergent findings) for the Board to evaluate prior to the meeting. During the first meeting, the Board will review findings from ongoing analyses (as relevant), evaluate the research team's data collection plans for the school year, and provide critical feedback and questions to consider. During the second meeting of the school year, the Board will review and provide critical feedback on the research team's analyses and findings. These meetings will be scheduled so that the project team can revise analyses and findings according to the Board's suggestions before presenting them to CPS. We will audio record and transcribe each meeting to generate meeting minutes that summarize key points and recommendations from the Board. Following each meeting, the Board will approve the meeting minutes. At the subsequent meeting, we will summarize how we addressed the Board's recommendations from the previous meeting.

The Evaluation Advisory Board is comprised of scholars with a wealth of experience teaching in K-12 schools and conducting qualitative and quantitative research on instructional improvement, teacher collaboration, and STEM education. **Dr. Susan Kemper Patrick** is a former MS English Language Arts team and current Senior Researcher at the Learning Policy Institute. Her expertise includes teacher collaboration, educational equity, and conducting mixed-methods research, and she has extensive

experience working with school districts, state education departments, and RPPs. **Dr. Maxwell Yurkofsky** is a former elementary school teacher in Detroit who currently serves as an assistant professor in Radford University's EdD program. Dr. Yurkofsky's research focuses on using qualitative methods to investigate the organizational dynamics of how teams, schools, districts, and RPPs seek to use continuous improvement methods to advance a more ambitious and equitable vision of schooling. **Dr. Christa Haverly** is a research assistant faculty member at Northwestern University's School of Education and Social Policy and an expert in qualitative methods. Her research focuses on supporting elementary teachers in science instruction both from a practice-based approach considering students' sense-making and teachers' responsiveness, as well as from a systems-building approach considering how school systems can organize to support instructional improvements in elementary science.

While the Advisory Board will evaluate the quality of our research, **Danny Schmidt of Partner to Improve (PTI)** will serve as the external evaluator for the RPP aspect of this project. PTI is an education research and consulting group that will provide feedback and support aligned to the Five Dimensions of Effective RPPs (Henrick et al., 2017). Danny Schmidt and the PTI team provide expertise in evaluating RPPs. PTI has worked with both TLP and CPS as an evaluator on past grants. PTI will provide ongoing support for the RPP and conduct a formative and summative evaluation of the project and the RPP to (a) assess the quality of the RPP using the framework developed by Dr. Henrick that identifies five dimensions of effective RPPs (Henrick et al., 2017), and (b) provide formative feedback to the project leadership to improve the health of the RPP. PTI will evaluate the effectiveness of the RPP team in succeeding in its aims, utilizing multiple sources of data including surveys of RPP team members, RPP meeting observations, interviews with key RPP team members, and analysis of relevant project documents and research products from the grant (see Table 3).

Table 3: RPP Evaluation Questions and Data Sources

Evaluation Questions	Data Sources
EQ1: To what extent does the RPP function according to best practice (including the extent to which the RPP is grounded in trust, focused on high-quality research, primarily centered on supporting practice improvement efforts, striving for broad influence on practice and research, and ensuring equal balances of power)?	<ul style="list-style-type: none"> ▪ RPP interviews ▪ RPP surveys ▪ Meeting observations ▪ Project documents
EQ2: How do partners collaborate to sustain an effective and equitable RPP?	<ul style="list-style-type: none"> ▪ RPP interviews ▪ RPP surveys ▪ Meeting observations

The evaluation will include the following components:

- Annual interviews with and/or surveys of leadership team members to understand and assess progress towards project goals.
- Annual interviews with and/or surveys of leadership team members and participating teachers to understand and assess their experience in the partnership.
- Attendance at and facilitation of health of the RPP discussions during leadership team/RPP meetings, at a schedule agreed on by the evaluator and PI.
- Collection of project artifacts, including measurement tools, data collection and analysis plans, data collected and analyses performed by the project leadership, leadership team meeting agendas and notes, RPP meeting agendas and activities.
- Brief exit slips of RPP participants administered after each PLC meeting. The evaluation team will design and administer surveys to assess RPP participants' views on the RPP activities and meetings. To support continuous improvement, the evaluation team will share findings from surveys in brief memos shortly after the conclusion of each survey administration.
- Annual reports including findings about the quality of the RPP and its success in supporting desired outcomes and recommendations for next steps in each area.

6. Project Timeline

	PILOT (SY24)			Year 1 (SY25)			Year 2 (SY26)			Year 3 (SY27)		
	BOY	MOY	EOY	BOY	MOY	EOY	BOY	MOY	EOY	BOY	MOY	EOY
Meet with CPS STEM Department to discuss roles, PLC and research agendas, touchpoints for the upcoming year	X		X	X			X			X		
Attend PLC Planning Meetings and Document (Re)Design	X		X	X		X	X		X	X		X
Conduct Pilot Interviews and Observations		X										
Recruit Teachers (Cohort A)				X	X							
Recruit Teachers (Cohort B)							X	X				
Recruit Teacher (Cohort C)										X	X	
Conduct Interviews and Pre-Surveys with Teachers				X			X			X		
Conduct Interviews and Post-Surveys with Teachers						X			X			X
Interview Teacher Leaders			X			X			X			X
Interview PLC Designers			X			X						X
Conduct Classroom Observations					X	X		X	X		X	X
Interview Teacher Leaders' Administrators			X			X			X			X
Conduct Follow-Up Interviews and Classroom Observations with Cohort A								X			X	
Conduct Follow-Up Interviews and Classroom Observations with Cohort B											X	
Analyze interview, observation, and survey data		X	X	X	X	X	X	X	X	X	X	X
Present formative feedback to CPS					X			X			X	
Present summative feedback to CPS		X				X			X			X
Prepare artifact and meet with Evaluative Advisory Board					X	X		X	X		X	X
Prepare artifact and meet with Partner to Improve					X	X		X	X		X	X

Note. BOY indicates beginning of the school year; MOY indicates middle of the school year; EOY indicates end of the school year. Collaborative meetings and presentations with CPS are shaded in blue; data collection and analyses are shaded in green; Evaluation activities are shaded in orange.

7. EXPERTISE

The project team is uniquely qualified to pursue this work. We will work in close collaboration with **6-12 Science Manager, Andre Botello**, and **MS Science Specialists** at CPS, who will design the PLCs and supervise **teacher leaders** who facilitate the PLCs. **Andy Rasmussen** (independent consultant) will help facilitate the RPP between CPS and TLP; he has experience on the leadership team of two computer science RPPs at CPS (Chicago Alliance for Equity in Computer Science and Scratch Encore) and has helped broker efforts between CPS' External Research Team and multiple district research partners, including TLP. The **PI, Dr. Naomi Blaushild**, will take the lead on designing data collection protocols, conducting interviews and observations, administering surveys, analyzing data, and developing white papers, conference presentations, and manuscripts. Dr. Blaushild has collaborated with school districts and other stakeholders to conduct qualitative and quantitative research on policy implementation, school leadership, and teacher development and retention. She also has six years of experience teaching

elementary and middle school and leading PL in Baltimore City Public Schools. In the 2022-2023 school year, she designed and facilitated 34 hours of PL for MS science teachers on scientific argumentation in three Illinois school districts. Dr. Blaushild collaborated on a qualitative, comparative of six school systems' instructional improvement efforts, which led to multiple academic publications and presentations. She has also partnered with Teach For America (TFA) to analyze administrative data on teacher retention and to conduct a qualitative study of teacher commitment. Dr. Blaushild will be supported by the Advisory Board, a **Research Assistant** to help with qualitative data collection and analysis, a **Data Analyst** to support survey and social network analyses, and other TLP staff members to provide support with data management and research operations. The TLP executive team will mentor Dr. Blaushild in the management and implementation of the grant (see Facilities and Resources Description).

8. INTELLECTUAL MERIT

This study has the potential to advance knowledge in several timely and intersecting research areas, including PK-12 science education, in-service STEM teacher development, policy implementation, and teacher learning related to CR and equitable instruction. Since PLCs are often studied and implemented at the school level, this project could provide novel insights about how cross-school PLCs can facilitate teacher collaboration and lead to shifts in teachers' mindsets and practices. Whereas much of the research on standards-based reform focuses on math and reading, this project focuses on a long-standing tension between standardization (i.e., provision of a universal, standards-aligned curriculum) and teachers' responsibilities to adapt curriculum to deliver culturally responsive and equitable instruction in the science context. Understanding the structures and mechanisms within PLCs that help teachers adapt standards-aligned curriculum to meet their students' unique needs will contribute to shared knowledge around effective teacher PL, teacher collaboration, and education policy implementation in the context of the NGSS and standards-based reform more broadly.

9. BROADER IMPACTS

This project has the potential to make a deep local impact on MS science instruction and student outcomes in CPS and contribute more broadly to STEM teacher PL and student outcomes. Each year, PLCs could impact up to 100 science teachers and teacher leaders, and by extension, approximately 6,000 MS students in CPS. Over three years, the project could reach up to 18,000 students, or over 80% of the MS population in CPS. Given the district's aim to strategically recruit teachers from under-resourced schools, the project has the potential to have a greater impact on students who are underrepresented minorities in STEM fields (low-income, Black, and Latinx students). Second, the study would identify effective features of cross-school PLCs that could be replicated and/or adapted to other grade levels and content areas in CPS and other districts. The study's dissemination plan will ensure that PLC activities and teacher-created resources for CR and equitable science instruction are shared digitally with other school districts, regardless of size or urbanicity. Understanding what structures and mechanisms in cross-school PLCs support teachers to implement the NGSS standards and deliver CR and equitable science instruction can enhance student learning, the development of STEM identities, and increase the diversity of the STEM workforce. Further, longer-term teacher outcomes from PLC participation, such as increased job satisfaction and retention, could strengthen school improvement efforts and school stability and increase students' access to experienced and supported science teachers.

10. FUTURE WORK

This exploratory project will lay the foundation for an Implementation and Improvement project that investigates the impact of a refined PLC model and more formalized RPP between TLP and the STEM Department impacts student learning, sense of belonging in science, and interest in STEM.

11. RESULTS FROM PRIOR NSF SUPPORT

No prior support.

- Allen, C. D., & Heredia, S. (2021). Reframing Organizational Contexts from Barriers to Levers for Teacher Learning in Science Education Reform. *Journal of Science Teacher Education*, 32(2), 148–166.
- Allensworth, E., Cashdollar, S., & Cassata, A. (2022). Supporting Change in Instructional Practices to Meet the Common Core Mathematics and Next Generation Science Standards: How Are Different Supports Related to Instructional Change? *AERA Open*, 8, 23328584221088010. <https://doi.org/10.1177/23328584221088010>
- Allensworth, E., Desimone, L. M., & Marianno, L. (2023). Local success in the standards era. *Phi Delta Kappan*, 105(1), 18–23.
- Allensworth, E., Ponisciak, S., & Mazzeo, C. (2009). *The Schools Teachers Leave: Teacher Mobility in Chicago Public Schools* (pp. 1–48). University of Chicago Urban Education Institute.
- Anderson, L., & Olsen, B. (2006). Investigating Early Career Urban Teachers’ Perspectives on and Experiences in Professional Development. *Journal of Teacher Education*, 57(4), 359–377. <https://doi.org/10.1177/0022487106291565>
- Baker-Doyle, K. (2010). Beyond the Labor Market Paradigm: A Social Network Perspective on Teacher Recruitment and Retention. *Education Policy Analysis Archives*, 18, 26. <https://doi.org/10.14507/epaa.v18n26.2010>
- Barton, A. C. (2002). Urban Science Education Studies: A Commitment to Equity, Social Justice and a Sense of Place. *Studies in Science Education*, 38(1), 1–37. <https://doi.org/10.1080/03057260208560186>
- Blaushild, N. (2022). *Investigating the Dynamics of Teacher Commitment in U.S. Public Schools*. [Unpublished doctoral dissertation]. Northwestern University.
- Brown, B. A., Boda, P., Lemmi, C., & Monroe, X. (2019). Moving Culturally Relevant Pedagogy From Theory to Practice: Exploring Teachers’ Application of Culturally Relevant Education in Science and Mathematics. *Urban Education*, 54(6), 775–803. <https://doi.org/10.1177/0042085918794802>
- Brown, J. C., & Crippen, K. J. (2016). Designing for culturally responsive science education through professional development. *International Journal of Science Education*, 38(3), 470–492. <https://doi.org/10.1080/09500693.2015.1136756>
- Bryk, A. S., Hess, G. A., Mirel, J., & Wong, K. (1999). Policy Lessons from Chicago’s Experience with Decentralization. *Brookings Papers on Education Policy*, 2, 67–127.
- Bryk, A. S., Sebring, P. B., Allensworth, E., Luppescu, S., & Easton, J. Q. (2010). *Organizing schools for improvement: Lessons from Chicago*. University Of Chicago Press.
- Caduff, A., Daly, A. J., Finnigan, K. S., & Leal, C. C. (2022). The Churning of Organizational Learning: A Case Study of District and School Leaders Using Social Network Analysis. *Journal of School Leadership*, 0(0), 1–27.
- Cassata, A., & Allensworth, E. (2021). Scaling standards-aligned instruction through teacher leadership: Methods, supports, and challenges. *International Journal of STEM Education*, 8(1), 39. <https://doi.org/10.1186/s40594-021-00297-w>
- Chicago Public Schools. (2023). *Curriculum Equity Initiative*. <https://www.cps.edu/strategic-initiatives/curriculum-equity-initiative/>
- Coburn, C. E., & Russell, J. L. (2008). District Policy and Teachers’ Social Networks. *Educational Evaluation and Policy Analysis*, 30(3), 203–235. <https://doi.org/10.3102/0162373708321829>
- Cohen, D. K., Peurach, D. J., Glazer, J. L., Gates, K. E., & Goldin, S. (2013). *Improvement by design: The promise of better schools*. University Of Chicago Press.
- Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13(1), 3–21.
- Daly, A. J. (2010). Surveying the terrain ahead: Social network theory and educational change. In *Social network theory and educational change*. Harvard Education Press.
- Darling-Hammond, L., Holtzman, D. J., Gatlin, S. J., & Vasquez Heilig, J. (2005). Does Teacher Preparation Matter? Evidence about Teacher Certification, Teach for America, and Teacher

- Effectiveness. *Education Policy Analysis Archives*, 13, 42.
<https://doi.org/10.14507/epaa.v13n42.2005>
- Darling-Hammond, L., Hyler, M., & Gardner, M. (2017). *Effective Teacher Professional Development*. Learning Policy Institute. <https://doi.org/10.54300/122.311>
- Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher*, 38(3), 181–199.
<https://doi.org/10.3102/0013189X08331140>
- Desimone, L. M., & Garet, M. S. (2015). Best Practices in Teachers' Professional Development in the United States. *Psychology, Society, & Education*, 7(3), 252.
<https://doi.org/10.25115/psye.v7i3.515>
- Desimone, L. M., & Hill, K. L. (2017). Inside the Black Box: Examining Mediators and Moderators of a Middle School Science Intervention. *Educational Evaluation and Policy Analysis*, 39(3), 511–536. <https://doi.org/10.3102/0162373717697842>
- Dogan, S., Pringle, R., & Mesa, J. (2016). The impacts of professional learning communities on science teachers' knowledge, practice and student learning: A review. *Professional Development in Education*, 42(4), 569–588. <https://doi.org/10.1080/19415257.2015.1065899>
- Easley, K.M., McGee, S., McGee-Tekula, R., Britt, A., Rupp, K.E., Higgs, K. (2023). Designing Educative Tools for Scientific Argumentation: A Case Study of DBR Before and During the Pandemic. In: Spector, M.J., Lockee, B.B., Childress, M.D. (eds) Learning, Design, and Technology. Springer, Cham. https://doi.org/10.1007/978-3-319-17727-4_178-1
- Eccles, J. S., & Midgley, C. (1989). Stage-environment fit: Developmentally appropriate classrooms for young adolescents. *Research on Motivation in Education*, 3, 139–186.
- Farrell, C. C., Penuel, W. R., Coburn, C. E., Daniel, J., & Steup, L. (2021). *Research Practice Research-Practice Partnerships in Education: The State of the Field*. William T. Grant Foundation.
- Gay, G. (2002). Preparing for Culturally Responsive Teaching. *Journal of Teacher Education*, 53(2), 106–116. <https://doi.org/10.1177/0022487102053002003>
- Gay, G. (2013). Culturally Responsive Teaching Principles, Practices, and Effects. In *Handbook of Urban Education*. Routledge.
- Haverly, C., Lyle, A., Spillane, J. P., Davis, E. A., & Peurach, D. J. (2022). Leading instructional improvement in elementary science: State science coordinators' sense-making about the Next Generation Science Standards. *Journal of Research in Science Teaching*, n/a(n/a), 1–32.
<https://doi.org/10.1002/tea.21767>
- Johnson, S. M., & Birkeland, S. E. (2003). Pursuing a "Sense of Success": New Teacher Explain their Career Decisions. *American Educational Research Journal*, 40(3), 581–617.
<https://doi.org/10.3102/00028312040003581>
- Kanter, D. E., & Konstantopoulos, S. (2010). The impact of a project-based science curriculum on minority student achievement, attitudes, and careers: The effects of teacher content and pedagogical content knowledge and inquiry-based practices. *Science Education*, 94(5), 855–887.
<https://doi.org/10.1002/sce.20391>
- Karp, S. (2019). *Hundreds of Chicago schools go without teachers and subs, mostly in schools serving Black students*. WBEZ News. <https://www.wbez.org/shows/wbez-news/hundreds-of-chicago-schools-go-without-teachers-and-subs-mostly-in-schools-serving-black-students/3d22d97b-e5ee-4ff1-8722-f25c39c02c7f>
- Ladson-Billings, G. (1995). Toward a Theory of Culturally Relevant Pedagogy. *American Educational Research Journal*, 32(3), 465–491. <https://doi.org/10.3102/00028312032003465>
- Ladson-Billings, G. (2008). "Yes, but how do we do it?": Practicing culturally relevant pedagogy. In *City kids, city schools: More reports from the front row* (pp. 162–177).
- Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis. *Educational Evaluation and Policy Analysis*, 24(1), 37–62.
<https://doi.org/10.3102/01623737024001037>

- Laughter, J. C., & Adams, A. D. (2012). Culturally Relevant Science Teaching in Middle School. *Urban Education*, 47(6), 1106–1134. <https://doi.org/10.1177/0042085912454443>
- Lewis, C., Henrick, E., Friedkin, S., & McGee, S. (2022). Model Variation in Inquiry Processes. In D. J. Peurach, J. L. Russell, L. Cohen-Vogel, & W. R. Penuel, *The Foundational Handbook on Improvement Research in Education*. Lanham, MD: Rowman & Littlefield.
- McGee, S., & Nutakki, N. (2017). The Impact of Adapting a General Professional Development Framework to the Constraints of In-Service Professional Development on the Next Generation Science Standards in Urban Settings. *Journal of Urban Learning, Teaching, and Research*, 13, 73–89.
- Miles, M., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. SAGE Publications Ltd.
- Miles, M., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis* (3rd ed.). Sage Publications Ltd.
- Milner, H. R. (2014). Scripted and Narrowed Curriculum Reform in Urban Schools. *Urban Education*, 49(7), 743–749. <https://doi.org/10.1177/0042085914549685>
- Olsen, B., & Anderson, L. (2007). Courses of Action: A Qualitative Investigation Into Urban Teacher Retention and Career Development. *Urban Education*, 42(1), 5–29. <https://doi.org/10.1177/0042085906293923>
- Partner to Improve, Henrick, E., McGee, S., The Learning Partnership, Dettori, L., DePaul University, Williams, T., Chicago Public Schools, Rasmussen, A., Chicago Public Schools, Yanek, D., Chicago Public Schools, Greenberg, R., Loyola University, Reed, D., & University of Illinois Chicago. (2021). *Research-Practice Partnership Strategies to Conduct and Use Research to Inform Practice*. The Learning Partnership. <https://doi.org/10.51420/conf.2021.3>
- Patrick, S. K., Guthrie, J. E., & Fittz, L. (2023, April 18). *Exploring the professional consequences of instructional isolation: A mixed methods study*. Annual Meeting of the American Educational Research Association, Chicago.
- Penuel, W. R., Allen, A.-R., Deverel-Rico, C., Singleton, C., & Pazera, C. (2023). How Teachers' Knowledge of Curriculum Supports Partnering with Students in Their Science Learning. *Journal of Science Teacher Education*, 1–22.
- Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What Makes Professional Development Effective? Strategies That Foster Curriculum Implementation. *American Educational Research Journal*, 44(4), 921–958. <https://doi.org/10.3102/0002831207308221>
- Penuel, W., Sun, M., Frank, K., & Gallagher, H. A. (2012). Using social network analysis to study how collegial interactions can augment teacher learning from external professional development. *American Journal of Education*, 119(1), 103–136.
- Peurach, D. J., Cohen, D. K., Yurkofsky, M. M., & Spillane, J. P. (2019). From Mass Schooling to Education Systems: Changing Patterns in the Organization and Management of Instruction. *Review of Research in Education*, 43(1), 32–67. <https://doi.org/10.3102/0091732X18821131>
- Pitts, V., & Spillane, J. (2009). Using social network methods to study school leadership. *International Journal of Research & Method in Education*, 32. <https://doi.org/10.1080/17437270902946660>
- Reiser, B. J. (2013). *What Professional Development Strategies Are Needed for Successful Implementation of the Next Generation Science Standards?* (pp. 1–23). K-12 Center at ETS.
- Reiser, B. J., Novak, M., McGill, T. A. W., & Penuel, W. R. (2021). Storyline Units: An Instructional Model to Support Coherence from the Students' Perspective. *Journal of Science Teacher Education*, 32(7), 805–829. <https://doi.org/10.1080/1046560X.2021.1884784>
- Rice, J. K. (2001). Explaining the Negative Impact of the Transition From Middle to High School on Student Performance in Mathematics and Science. *Educational Administration Quarterly*, 37(3), 372–400.
- Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How Teacher Turnover Harms Student Achievement. *American Educational Research Journal*, 50(1), 4–36. <https://doi.org/10.3102/0002831212463813>

- Schwarz, C. V., Passmore, C., & Reiser, B. J. (2017). *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices*. NSTA Press.
- Shakman, K., Bailey, J., & Breslow, N. (2017). *A Primer for Continuous Improvement in Schools and Districts* (pp. 1–17). Education Development Center.
https://www.edc.org/sites/default/files/uploads/primer_for_continuous_improvement.pdf
- Short, J., & Hirsh, S. (2020). *The Elements: Transforming Teaching through Curriculum-Based Professional Learning* (pp. 1–64) [Challenge Paper]. Carnegie Corporation of New York.
<https://www.carnegie.org/our-work/article/elements-transforming-teaching-through-curriculum-based-professional-learning/>
- Siwatu, K. O. (2007). Preservice teachers' culturally responsive teaching self-efficacy and outcome expectancy beliefs. *Teaching and Teacher Education*, 23(7), 1086–1101.
<https://doi.org/10.1016/j.tate.2006.07.011>
- Skaalvik, E. M., & Skaalvik, S. (2011). Teacher job satisfaction and motivation to leave the teaching profession: Relations with school context, feeling of belonging, and emotional exhaustion. *Teaching and Teacher Education*, 27(6), 1029–1038. <https://doi.org/10.1016/j.tate.2011.04.001>
- Spillane, J. P., Shirrell, M., & Sweet, T. M. (2017). The Elephant in the Schoolhouse: The Role of Proximity in School Staff Interactions about Teaching. *Sociology of Education*, 90(2), 149–171.
<https://doi.org/10.1177/0038040717696151>
- Stornaiuolo, A., Desimone, L., & Polikoff, M. (2023). “The Good Struggle” of Flexible Specificity: Districts Balancing Specific Guidance with Autonomy to Support Standards-Based Instruction. *American Educational Research Journal*, 20(10), 1–41.
- Thompson, J., Richards, J., Shim, S.-Y., Lohwasser, K., Von Esch, K. S., Chew, C., Sjoberg, B., & Morris, A. (2019). Launching Networked PLCs: Footholds Into Creating and Improving Knowledge of Ambitious and Equitable Teaching Practices in an RPP. *AERA Open*, 5(3), 2332858419875718. <https://doi.org/10.1177/2332858419875718>
- Trabona, K., Taylor, M., Klein, E., Munakata, M., & Rahman, Z. (2019). Collaborative professional learning: Cultivating science teacher leaders through vertical communities of practice. *Professional Development in Education*, 45, 1–16.
<https://doi.org/10.1080/19415257.2019.1591482>
- Villegas, A. M., & Lucas, T. (2002). Preparing culturally responsive teachers. *Journal of Teacher Education*, 53(1), 20–32.
- Wang, E. L., Schweig, J., Kaufman, J. H., Opfer, V. D., & Berglund, T. (2023). *Coherence in English Language Arts and Mathematics Instructional Systems Across the United States*. RAND Corporation. https://www.rand.org/pubs/research_reports/RRA2168-1.html
- Weiss, R. S. (1995). *Learning From Strangers: The Art and Method of Qualitative Interview Studies*. Simon and Schuster.
- Wigfield, A., Eccles, J. S., Mac Iver, D., Reuman, D. A., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology*, 27(4), 552–565.
<https://doi.org/10.1037/0012-1649.27.4.552>



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02/27/2024

Steven McGee, PhD

Dear Dr. McGee,

Thank you for your interest in conducting research in The Chicago Public Schools. The Research Review Board has reviewed your Modification proposal 02/24/2024 for research, titled: Impacts of Skyline Professional Development on Teacher Practices and Student Learning.

The Research Review Board has completed the review of your Modification proposal and has approved your request to conduct this research. Although your study is approved, school principals have final authority over activities that are allowed to take place in the school. If data collection continues beyond a year from this approval, please complete the Modification & Continuing Review Process Form through IRBManager.

Please note the following--

Background Check Level Required: Level I

Other Notes: Interactions with staff, students

Upon completion of the research study, a copy of the final report or summary of the results must be provided to the Research Review Board. The Board reserves the right to use the information in the research report or summary for planning, solicitation or grants, and staff development.

Please note that your study has been assigned Project ID #2022-1773. If you have any questions, please contact our office by email at research@cps.edu.

Sincerely,

A handwritten signature in black ink, appearing to read "Sarah Dickson".

Sarah Dickson
Co-Chair, Research Review Board