

## STEM Grant Proposal 2023

### **Student Outcomes:**

What are your school's/group's desired changes in student behaviors associated with STEM? (you can identify up to four). For the duration of this application, these behaviors will be called focus behaviors. For more information, please see the RFP at

<https://docs.google.com/document/d/1SzqfVUTswPqoFcztPIF2VVJvUap20XTNzQcLs4ioDS0/edit?usp=sharing>

### **Focus Behavior 1**

*Student Discourse:* Davis students will engage in more productive talk around science concepts during class. Baseline data for this would be from TeachFX recordings conducted in September 2023 from the teacher classrooms that will be participating in the professional development. Through monthly professional development opportunities, teachers will be provided strategies to increase opportunities for student discourse in their classroom and implement a new strategy in a lesson each month. Teachers would use TeachFX to gather data about discourse in their classroom lessons. The goal is to have a 10% increase in student discourse or a classroom ratio of teacher talk, 30%, to student discourse, 70%, focused on science concepts by April 2024. The rationale for this focus behavior stems from *Ambitious Science Teaching* (Windschitl, Thompson, Braaten, 2018) where equitable, effective science includes teachers eliciting ideas from students and providing students with varied opportunities to reason through talk.

### **Focus Behavior 2**

*Engagement:* Davis students will engage in more relevant tasks to explain phenomena that incorporate science and engineering practices and crosscutting concepts. In order for this to happen, we would like to see an increase in the relevancy of phenomenon-based tasks that students are provided. Through professional development, teachers will be introduced to the characteristics of phenomenon from *Ambitious Science Teaching* and to the characteristics of thinking tasks from *Building Thinking Classrooms in Mathematics*. Teachers will have the opportunity to draw parallels between the two resources and use the defining characteristics to evaluate phenomena currently used for instruction and collaborate to develop more phenomena that align to the characteristics. This will also help teachers create sense-making tasks using science and engineering practices and crosscutting concepts. The goal is to create a repository of phenomenon-based, three-dimensional science tasks that will be used to develop storylines for high school science subjects.

### **How will you ensure all participating educators are aware of the identified focus behaviors being addressed with this grant?**

As part of recruitment, the focus behaviors will be identified as primary objectives of participating in the professional development of the grant. Participating teachers will also be encouraged to use the focus behaviors to develop their yearly professional goals for the district evaluation system. Teachers will have the opportunity to create or adapt lesson experiences each month based on pedagogy strategies that support the focus behaviors (student discourse and engagement).

## Educator Outcomes

For the focus behaviors identified above, identify the educator knowledge, skills, and/or attitude goals that will be addressed with STEM professional learning over the next two years to help achieve that desired behavior. These goals should include all of the components of SMART (specific, measurable, action-oriented, realistic, and time-based) goals. As you write this, be sure to consider the data you may want or need to determine which educators should participate in this PL. For an example, see the RFP at

<https://docs.google.com/document/d/1SzfVUTswPqoFcztPIF2VVJvUap20XTNzQcLs4ioDS0/edit?usp=sharing>

Year 1 Goals:

**Educator Goal 1:** Secondary science teachers will increase the percentage of average student discourse in their classroom by ten percent or have an average classroom ratio of teacher talk, 30%, to student discourse, 70%, focused on science concepts by the end of the school year.

This will be measured by data collected from TeachFX recordings of at least three 20-minute classroom segments during the month of September (collected by each teacher). Teachers will meet monthly with science teacher leaders to have a new instructional strategy modeled for them. The instructional strategies to be modeled will come from Ambitious Science Teaching and Building Thinking Classrooms in Mathematics. Approximately half of the meetings will focus on intentional teacher moves to increase student discourse in science. Teachers will identify at least one lesson to use the new strategy within the following month. Teachers will use TeachFX to gather classroom data on the implementation of the strategy and reflect on the lesson identifying what went well, what could be improved, and the effectiveness of opportunities for student discourse. Each month 3-4 educators will share data from the TeachFX recording to share successes and areas of improvement for increasing student discourse. Peer educators will have a chance to discuss and reflect on the shared data. Final data to determine a change in the percent of average student discourse in a class period will be determined in April using TeachFX to record at least three 20-minute classroom segments (collected by each teacher).

**This Educator Goal ties to the focus behavior(s):**

*Student Discourse*

**Educator Goal 2:** Secondary science teachers, over the course of a school year, will identify 3-4 phenomena to use in instruction that align with the characteristics of good phenomena as outlined by Ambitious Science Teaching.

This will be accomplished during the monthly meetings designated to focus on defining characteristics of good phenomena and developing protocols to engage students in phenomena. Teachers will identify current phenomena used for instruction and evaluate them based on the characteristics of good phenomena and use an example protocol to introduce phenomena in their classroom. Teachers will also have time to collaborate together to identify more or better aligned phenomena to use during instruction. In months where phenomenon development is the focus, a few teachers will volunteer to record class data using TeachFX or video record a sample of the phenomena implementation in class. Teachers will reflect on the process and identify successes and areas for improvement. Peer educators will have a chance to discuss and reflect on the shared data. Science Teacher Leaders will organize shared folders for phenomenon to be collected for each content area. The phenomenon will be used in year two of the grant to build storylines.

**This Educator Goal ties to the focus behavior(s):**

*Engagement*

**Educator Goal 3:** Secondary science teachers will collaborate to develop 3-4 thinking tasks to sense-make phenomena that incorporate science and engineering practices and crosscutting concepts.

This will be accomplished during the monthly meetings designated to focus on developing thinking tasks. In these sessions, teachers will be trained on the characteristics of good thinking tasks based on the book *Building Thinking Classrooms* and principles of making student thinking visible from *Ambitious Science Teaching*. Teachers will have the opportunity to develop thinking tasks that center on phenomena they have identified and intentionally incorporate science and engineering practices and crosscutting concepts. In months where task development is the focus, a few teachers will volunteer to record class data using TeachFX or video record a sample of class where the task was implemented. Teachers will reflect on the process and identify successes and areas for improvement. Peer educators will have a chance to discuss and reflect on the shared data. Science Teacher Leaders will organize shared folders for the thinking tasks to be collected for each content area. The thinking tasks will be used in conjunction with the collected phenomena to build storylines in year two of the grant,

**This Educator Goal ties to the focus behavior(s):**

*Engagement & Student Discourse*

Year 2 Goal:

**Educator Goal 4:** Teachers will work in collaborative teams to develop phenomena-based storylines that support student discourse using the three dimensions of science and share storylines on the SEEd Storylines Website.

In the first year of the grant, the goals of the planned professional development is to increase the capacity of secondary science educators to develop pieces of instruction that provide one or more of the following:

- Increased student discourse during class time,
- Introduce students to engaging, relevant scientific phenomena,
- Create thinking tasks that utilize science and engineering practices and crosscutting concepts for students to make sense of phenomena and science concepts.

At the end of year one (June 2024), teachers will be trained on three-dimensional science storyline development. During year two, teachers will take the pieces of instruction they developed in year one and build instruction around those pieces to form a storyline. The primary focus will be to develop storylines for high school science SEEd standards that will be housed on the SEEd Storylines website to be made available for teachers state-wide.

**This Educator Goal ties to the focus behavior(s):**

*Engagement & Discussion Strategies*

## Section 4: 4 Pillars

### **Content-Focused**

Effective professional learning focuses on defined goals that are tied to what an educator actually does as part of their job, including content knowledge and specific pedagogical skills and strategies.

List the data that is needed to determine which PL is needed for educators, and indicate if this data is already collected, or if it will need to be collected.

Which data will be used to determine which educators will be participating in the offered professional learning?

If some educators need/want to participate in more than one PL offering, based on the data, which one should they prioritize?

At the end of the 2022-2023 school year, secondary science educators will be sent a survey to determine their needs for district PLC trainings. Educators will have the option to rate themselves on the student-teacher talk ratio in their classroom, their use of phenomenon to engage students in science instruction, and their implementation of tasks that incorporate science and engineering practices and crosscutting concepts. This information will be used to identify specific needs and topics for the monthly professional development meetings. This information will also be used to identify potential Science Teacher Leaders that are already effectively incorporating three-dimensional science pedagogy strategies.

The primary purpose of the professional learning outlined for year one is to support a pedagogical shift in secondary science teachers, particularly high school teachers, towards the implementation of three-dimensional science strategies. The adoption of new high school SEEd standards occurred in June of 2019, and implementation of the new standards was scheduled for the 2021-2022 school year. With the onset of the pandemic, training on the new standards was limited. The new standards support a shift in science pedagogy with the incorporation of the three dimensions of science outlined by *A Framework for K-12 Science Education* (National Research Council, 2012). With any shift in pedagogy, intentional, ongoing professional development with a strong emphasis on collaboration and reflection provides the best outcome for educators to change practice and implement new strategies. The professional learning identified for year one will be available to all secondary science teachers in Davis School District to support a comprehensive shift in science instruction.

To participate in the storyline development writing teams in year two of the grant, teachers must fill out an application. Storyline Writing Teams will be determined based on the applications, participation in year one professional learning, and classroom observations.

### **Coaching**

Describe how this plan will utilize effective coaching practices to support educators implementing new strategies and content into their instruction. Ideally, coaches are used to model effective strategies and educators are given multiple opportunities to practice and implement what they are learning. Coaches are NOT to be used for evaluation purposes.

Science Teacher Leaders that effectively utilize the strategies in their own classrooms will facilitate the monthly meetings. They will model the strategies in the meetings by providing a shared learning experience or sharing recordings from their own classrooms where the strategy was implemented with students. The teacher leaders will provide their own reflections of the practice and what went well and improvements they plan to make for future implementation. Educators will have the opportunity to apply each strategy they learn into a lesson of their choice in the following month. During the subsequent meeting, educators will take turns sharing their classroom experience of implementation and engage in a lesson talk facilitated by the Science Teacher Leaders who will provide feedback and opportunities for reflection on practice.

## Collaboration

Describe how this proposal will support effective collaboration in learning communities for participating educators.

Collaboration will be essential during the monthly meetings where new strategies are introduced. As educators share examples from their classroom practice, they will engage in lesson talks with their peer educators to discuss the successes and areas of improvement in implementation. Educators will also have opportunities for collaboration to identify phenomenon and develop thinking tasks that align to their content area with educators that teach the same content. In year two, collaborative teams will be formed to focus on storyline development for each content area. Collaborative teams will have consistent updates with the Science Teacher Leaders to communicate work progress and team dynamics.

## Consistency

Educators need time to learn, practice, implement, and reflect on what they have learned. This cycle is intentional, iterative, and cumulative, requiring multiple experiences associated with the same learning goal to make long-lasting change. Proposals funded through this grant should meet monthly (through the school year, and keeping in mind school holiday breaks) to maintain this pillar. Keeping this expectation in mind, fill out the hoped for Implementation Plan using the table below. Use the example row to help determine the amount of clarity and information you should provide.

	Description of Learning Opportunities	How will this learning opportunity help meet your goals?	How will participants reflect and follow-up after learning opportunity?	Expected number of participants?
July 2023	-Recruitment for Science Teacher Leaders			
August 2023	-Two-day training and planning for Science Teacher Leaders  -Recruitment for learning opportunities.	Science Teacher Leaders will be introduced to the goals of the professional development and engage in planning for professional development sessions.	-Science Teacher Leaders will finish development and planning of professional development sessions and report to project lead.	24
September 2023	-One Hour Professional Development- Session 1: Student Discourse	Teachers will be introduced to a strategy that supports increasing student discourse opportunities in the classroom and opportunities to collaborate on ideas for the implementation of the strategy in instruction.	Pre-survey: Participating educators will be given a survey to provide information about implementation and attitudes of three-dimensional science pedagogy and student discourse.  After the meeting, participants will identify a lesson to	180

			incorporate the new strategy into and share experience in the following month during lesson talks in breakout groups.	
October 2023	-One Hour Professional Development- Session 2: Student Discourse	Teachers will be introduced to another strategy that supports increasing student discourse opportunities in the classroom and opportunities to collaborate on ideas for the implementation of the strategy in instruction.	After the meeting, participants will identify a lesson to incorporate the new strategy into and share their experience in the following month's professional development by engaging in lesson talks.	180
November 2023	-One Hour Professional Development- Session 3: Phenomenon	Teachers will be provided instruction on the characteristics of good phenomenon, scaffolds/protocols for introducing phenomenon to students, and opportunities to collaborate on ideas of phenomena that align to standards.	After the meeting, participants will either identify a phenomenon to implement in classroom instruction the next month or develop one to share with an implementation scaffold/protocol for peer feedback.	180
December 2023	-One Hour Professional Development- Session 4: Phenomenon	Teachers will have the chance to reflect on their use of phenomenon, discuss implementation and scaffolds/protocols, and have opportunities to further collaborate on ideas for phenomena that align to standards.	After the meeting, participants will either identify a phenomenon to implement in classroom instruction the next month or develop one to share with an implementation protocol for peer feedback.	180
January 2024	-One Hour Professional Development- Session 5: Thinking Tasks	Teachers will be provided instruction on the characteristics of thinking tasks and how to incorporate science and engineering practices and crosscutting concepts into tasks.	After the meeting, participants will create a thinking task to implement in classroom instruction the next month and share their experience in the following month	180

		Teachers will have opportunities to collaborate on thinking task development that align to standards.	professional development by engaging in lesson talks.	
March 2024	-One Hour Professional Development- Session 6: Thinking Tasks	Teachers will have the chance to reflect on their use of thinking tasks and will have further opportunities to collaborate on thinking task development that align to standards.	After the meeting, participants will create a thinking task to implement in classroom instruction the next month and share their experience in the following month professional development by engaging in lesson talks.	180
April 2024	-One Hour Professional Development- Session 7: Student Discourse	Teachers will be introduced to another strategy that supports increasing student discourse opportunities in the classroom and opportunities to collaborate on ideas for the implementation of the strategy in instruction.	After the meeting, participants will identify a lesson to incorporate the new strategy into and share experience in the following month during lesson talks in breakout groups.	180
May 2024	-One Hour Professional Development- Session 8: Student Discourse  -Recruitment of storyline development teams.  -One Day training and planning with Storyline Team Leads	Teachers will have the chance to reflect on implementation of student discourse strategies and determine next steps for teaching next year.  -Storyline Teacher Leads will be introduced to the goal of storyline development for year two and engage in instruction and planning for the June training of the storyline writing teams.	Participants will be given a survey to reflect on their experiences throughout the professional development, implementation of new strategies in class, and attitudes on three-dimensional science pedagogy and student discourse.	180

June 2024 (end of year 1)	Three-day training and initial storyline development.	Teachers will be trained on the components and structure of a storyline and how storylines provide increased engagement for students. Teachers will form collaborative groups to begin work on storyline development.	Collaborative teams will develop a plan for work tasks and completion. The team lead will follow up with members to determine work progress and needs, and report to the project lead periodically.	50
July 2024 (start of year 2)	Collaboration teams work on storyline development on their own time	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	Collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
August 2024	Collaboration teams work on storyline development on their own time	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	Collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
September 2024	One day, in-person storyline development	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	During the day, teams will share progress and seek input from other teams for further development. After, collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
October 2024	Collaboration teams work on storyline	Progress in storyline development to increase student	Collaborative teams continue work on storylines and check	50



	development on their own time	engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	
November 2024	One day, in-person storyline development	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	During the day, teams will share progress and seek input from other teams for further development. After, collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
December 2024	Collaboration teams work on storyline development on their own time	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	Collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
January 2025	Collaboration teams work on storyline development on their own time	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	Collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
February 2025	One day, in-person storyline development	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	During the day, teams will share progress and seek input from other teams for further development. After, collaborative teams continue work on storylines and check in with the team lead	50

			at least once a month. Team lead reports on progress and needs to project lead at least once a month.	
March 2025	Collaboration teams work on storyline development on their own time	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	Collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
April 2025	One day, in-person storyline development	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	During the day, teams will share progress and seek input from other teams for further development. After, collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
May 2025	Collaboration teams work on storyline development on their own time	Progress in storyline development to increase student engagement in science using phenomenon, thinking tasks that incorporate SEPs and CCCs, and student discourse.	Collaborative teams continue work on storylines and check in with the team lead at least once a month. Team lead reports on progress and needs to project lead at least once a month.	50
June 2025	Two days, in-person storyline development and finalization. Add storylines to SEEd Storyline website.	Teams work to finalize storylines to be added to SEEd Storylines Website.	Teachers plan implementation of storylines in their own classrooms.	50

**How does this series of learning opportunities fit into the school's long-term (3-5 year) plan? (250 word limit)**

The series of learning opportunities supports the district's long-term plan to enhance student engagement in science courses and increase teacher capacity in three-dimensional science pedagogies. The plan prioritizes the implementation of pedagogies that support wonder, sense-making, and problem solving for all science students in Davis School District. The plan also supports the development of storylines. In the long-term, a collection of robust storylines and companion assessment for each science standard in Utah's 7-12 SEEd Standards would be ideal.

The development of storylines that focus on phenomena will allow students to wonder about the natural world and provide greater opportunity for students to engage in authentic science experiences. The development of rigorous thinking tasks that incorporate science and engineering practices and crosscutting concepts further supports increased engagement through sense-making activities. Increasing student discourse around science topics in the classroom will allow students to communicate their ideas, take greater ownership in their learning, and develop skills necessary to engage in their communities and future learning.

The learning opportunities support the long-term plan to increase teacher capacity in three-dimensional science pedagogies by exposing teachers to specific strategies and protocols that support student discourse, utilize phenomenon, and incorporate rigorous thinking tasks into instruction. An emphasis on educator collaboration and reflection in each learning opportunity further supports this goal by creating a robust structure for teachers to engage in intentional planning and implementation of three-dimensional strategies.

**What are the long-term funding needs associated with this plan? (250 word limit)**

Funding beyond the two years of the grant would support continued development of storylines, classroom pilots of storylines, storyline revisions, and assessment development.

In order to have a variety of robust storylines for each standard in Utah's 7-12 SEEd standards, the work of writing teams would need to continue. Funding would be required to train additional writers for the writing teams and to support the work of the writers.

To determine the effectiveness of storylines, it would be ideal to have PLC communities pilot the curriculum. During a storyline pilot, collaboration would be specific to identifying what is effective and what needs revision in the storylines. Student work examples could also be collected to include as part of the teacher instructions associated with the storyline.

Storyline revisions would be necessary based on the feedback from curriculum pilots. Funding would be necessary for writing teams to collaborate and make the revisions.

Funding would also be required to provide the necessary professional learning and writing time for assessment development. Once written, funding would then support a process for the implementation of assessments followed by scoring and rubric calibration.

**How will the organization manage the long term (3-5 year) costs of this plan without grant funds after years 1 and 2?**

Without grant funds after years 1 and 2, the primary work of storyline development would shift to district scheduled PLC time. Secondary teachers in Davis School district are provided with a late start each Wednesday morning for PLC time. The second Wednesday of each month is designated specifically for district-led PLCs. Science Teacher Leads would continue to facilitate PLCs that evaluate the implementation of storylines, drive work on revisions, and develop new storyline ideas.

**Budget**

**Year 1**

Item	Item Cost	Quantity	Total Cost
Building Thinking Classrooms Books	\$35	200	\$7,000
Science Teacher Leaders	\$750	24	\$18,000
Discourse & Three-Dimensional Stipends (Out of class work)	\$200	150	\$30,000
Storyline Team Leaders Planning Day Substitute 1 day (10)	\$130	10	\$1,300
Storyline Stipends Out of Contract 3 days (50)	\$450	50	\$22,500
Storyline Team Leaders	\$750	10	\$7,500
TeachFX	\$333	180	\$59,940
Stipend Benefits rate (33%)	\$72,000	0.33	\$23,760
Indirect Costs (3.05%)	\$170,000	0.0305	\$5,185

TOTAL	\$175,185
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Year 2

Item	Item Cost	Quantity	Total Cost
Building Thinking Classrooms Books	\$35	150	\$5,250
Storyline Writing Substitutes 4 days (50)	\$130	200	\$26,000
Storyline Writing (Out of class work)	\$300	50	\$15,000
Storyline Stipends Out of Contract 2 days (50)	\$300	50	\$15,000
Storyline Team Leaders	\$750	10	\$7,500
SEEd Storylines Review	\$500	24	\$12,000
TeachFX	\$333	180	\$59,940
Stipend Benefits rate (33%)	\$49,500	0.33	\$16,335
Indirect Costs (3.05%)	\$157,025	0.0305	\$4,789
TOTAL			\$161,814