

Developing the Science Comprehensive Online Learning Platform for Rural School

Dr. Brooke Moore - Fort Hays State University
Mr. Earl Legleiter - Fort Hays State University

Science Teacher Development

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Project Overview

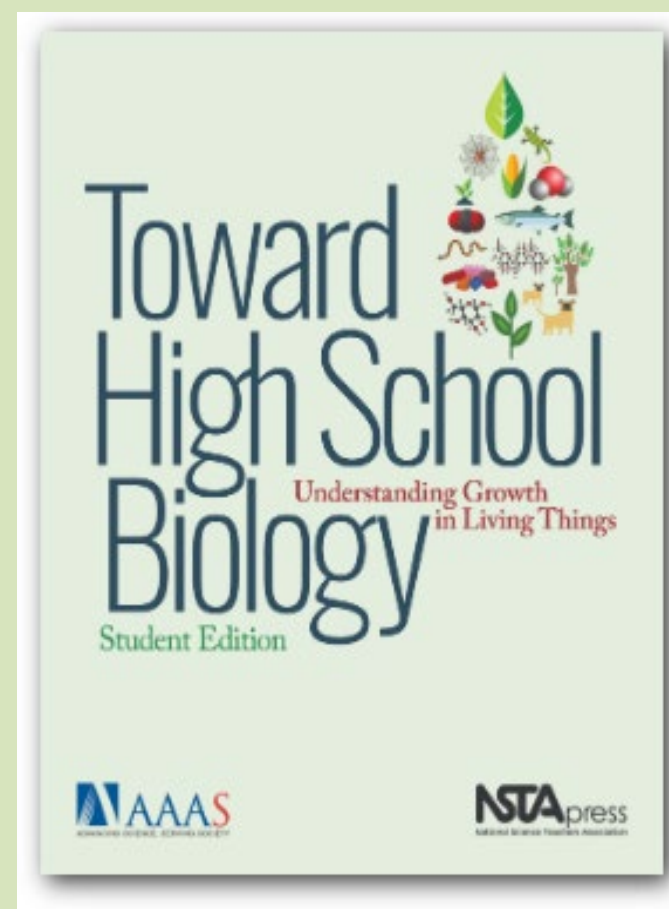
In rural, geographically dispersed school districts, access to high-quality face-to-face professional development (PD) is challenging. Recognizing the benefit of PD on teachers' use of Next Generation Science Standards (NGSS) instructional approaches, we argue the importance of designing effective, economical online PD to bring teachers across rural communities together.

Development Goal

The goal of this project was to develop and test an online PD platform, Science Comprehensive Online Learning Platform (SCOLP), against traditional face-to-face (F2F) PD to build the capacity of rural teachers to collaborate and support the successful implementation of the *Toward High School Biology* (THSB) curriculum in their own schools.

Development Activities

We worked with the curriculum designers of THSB to develop and align our two PD settings (F2F, SCOLP). SCOLP was developed using Stream LXP technology which provided rich opportunities for participants to engage both synchronously and asynchronously.



THSB Curriculum

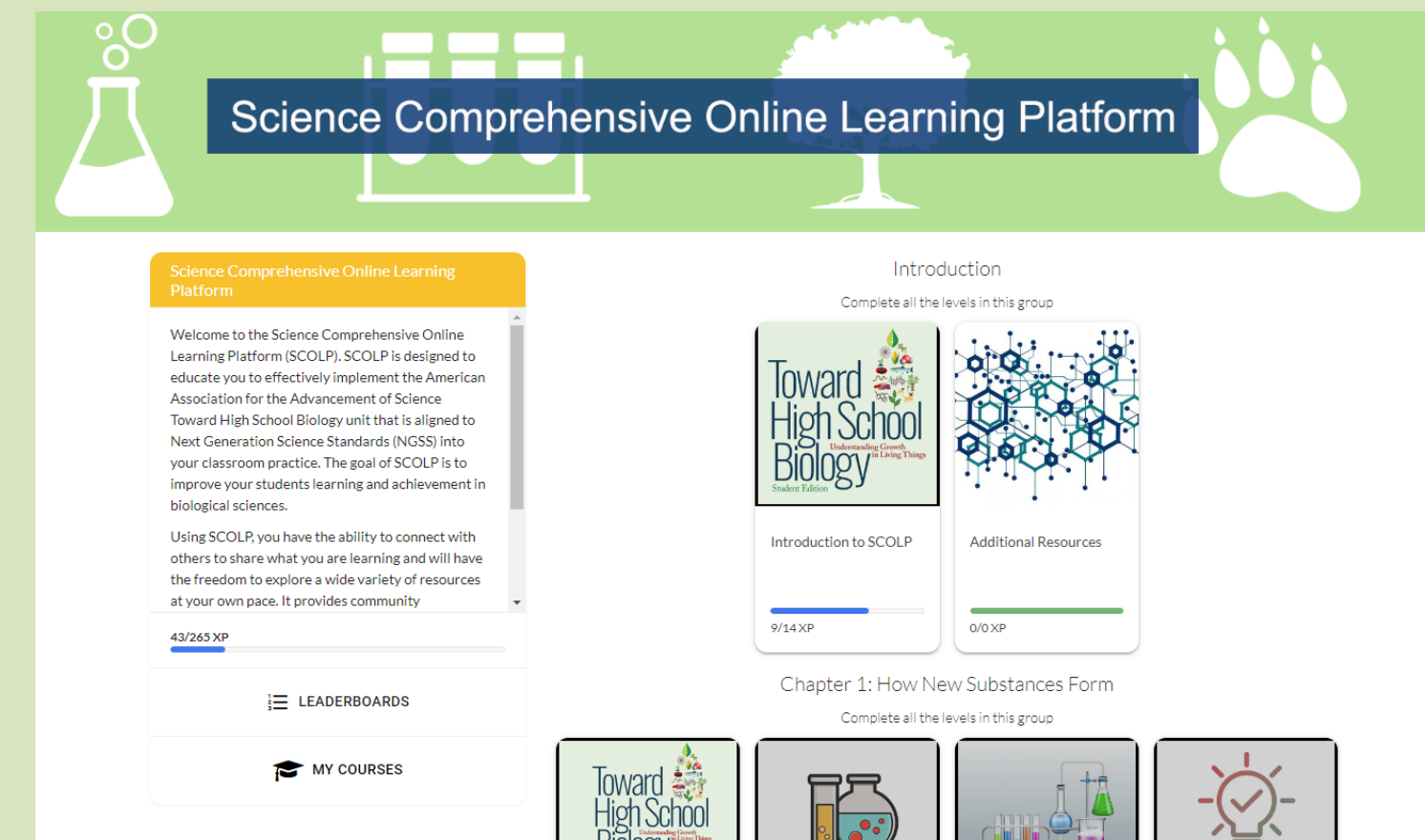


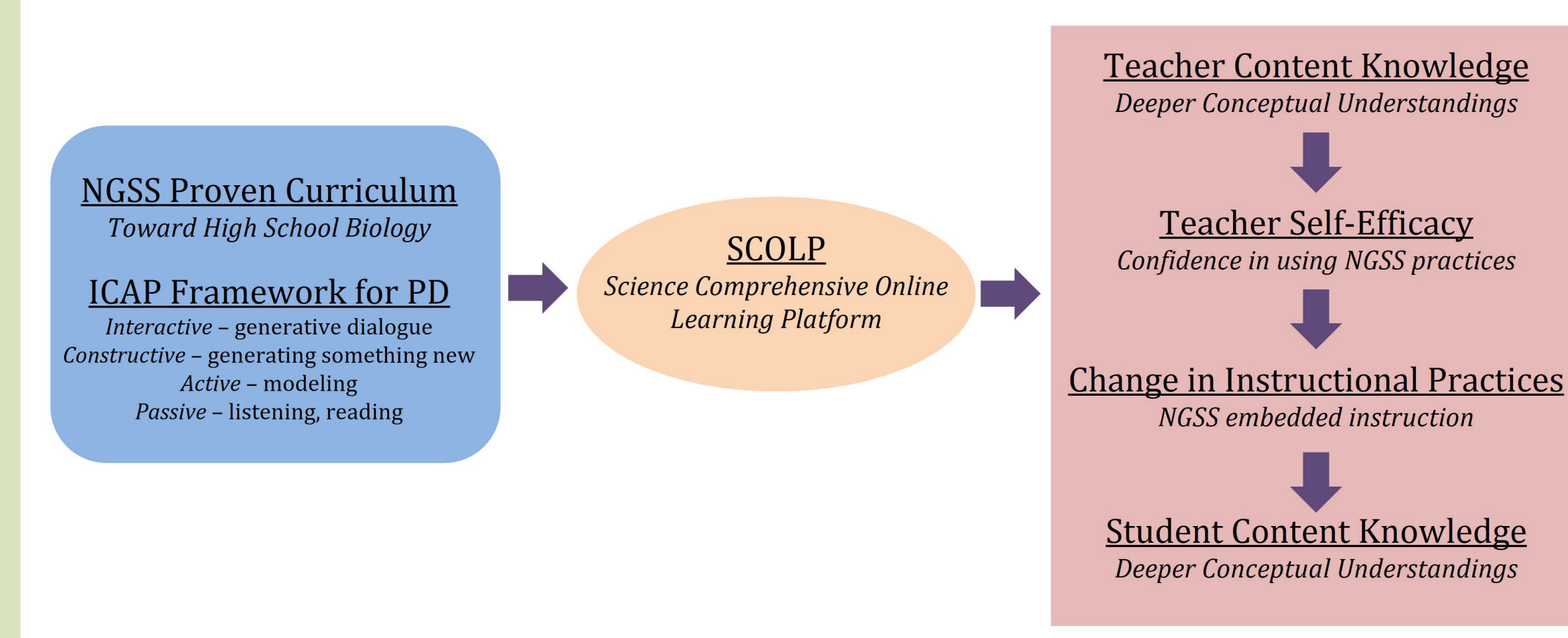
Image of SCOLP webpage

Project Context

Our project was set in rural, western Kansas where schools are geographically dispersed. All participants work in settings where they are the only middle and high school science teacher. Student demographics in our participating schools include high numbers of English learners, students from migrant families, and higher than average number of students who qualify for free/reduced lunch.



Logic Model



Study Hypothesis

Our hypothesis was that we would find overall improvement across both groups, regardless of PD setting, in teacher content knowledge and self-efficacy, which would then lead to changes in instructional practices, then leading to improvement in student content knowledge related to the THSB curriculum.

Methodology

Participants

- 27 middle school science teachers
- Randomly selected to F2F or SCOLP
- 554 students
 - 72% White/22% Hispanic
 - 85% English/13% Spanish

Research Question

- What differences exist between groups in:
 - Teacher Content Knowledge
 - Teacher Self-Efficacy
 - Change in Instruction
 - Student Content Knowledge

Measures: collected using Qualtrics

- Teacher Content Knowledge (TCK) – developed by project team to align with THSB curriculum
- Teacher Self-Efficacy Survey (TSES) – developed/validated by Portland STEM Metro
- Change in Instruction: Student Perception of Instructional Practices Survey (SPIPS) – developed/validated by Portland Stem Metro
- Student Content Knowledge (SCK) – developed by THSB curriculum team

Project Impact

Our initial findings indicate that online PD is as effective as traditional F2F PD in improving teacher instructional practices related to NGSS thus improving overall student outcomes. We argue that our findings inform the research base on rural school education, particularly the importance of finding effective and economical ways to deliver high-quality PD to rural and geographically dispersed schools.



Study Initial Findings

Teacher Content Knowledge

Within Condition	Pre-Test	Post-Test	Significance
Face-to-Face	M = 14.36 SD = 5.75	M = 15.13 SD = 6.33	0.774
SCOLP	M = 15.67 SD = 3.41	M = 16.78 SD = 4.66	0.487
Across Condition	Face-to-Face	SCOLP	Significance
Pre-Test	M = 14.36 SD = 5.75	M = 15.67 SD = 3.41	0.428
Post-Test	M = 15.13 SD = 6.33	M = 16.78 SD = 4.66	0.546

Teacher Self-Efficacy

Within Condition at Post	Face-to-Face	SCOLP
Student Engagement	M = -0.27 p = 0.45	M = -0.55 p = 0.16
Instructional Practices	M = 0.30 p = 0.37	M = -0.74 p = 0.09
NGSS	M = 0.79 p = 0.06	M = -0.28 p = 0.67
Across Condition	Post	Significance
Student Engagement	F2F M = 0.61	p = 0.053
Instructional Practices	F2F M = 1.42	p = 0.005*
NGSS	F2F M = 1.27	p = 0.012

Change in Instructional Practice

Within Condition	Pre-Test	Post-Test	Difference	Significance
F2F Student Centered	3.63	3.76	0.13	0.001
SCOLP Student Centered	3.45	3.69	0.24	0.002
F2F Relevance	3.57	3.69	0.12	0.013
SCOLP Relevance	3.13	3.38	0.25	0.014
F2F Assessment	3.97	4.02	0.06	0.188
SCOLP Assessment	3.88	3.95	0.07	0.363
Across Condition	F2F Post	SCOLP Post	Difference	Significance
Student Centered	3.76	3.69	-0.068	0.294
Relevance	3.69	3.38	-0.309	0.000
Assessment	4.02	3.95	-0.071	0.285

Student Content Knowledge

Within Condition	Pre-Test	Post-Test	Significance
Face-to-Face	M = 6.78 SD = 2.83	M = 10.32 SD = 0.35	0.000
SCOLP	M = 7.62 SD = 2.87	M = 11.00 SD = 0.53	0.000
Across Condition	Face-to-Face	SCOLP	Significance
Post-Test	M = 10.32 SD = 0.35	M = 11.00 SD = 0.53	0.290