

Examples of Projects

There are lots of opportunities in science education that will help you develop skills and knowledge in teaching as well as help build upon what we know about teaching and learning in science education. Following are some examples of topics. The examples are questions you can consider to help focus your research. These topics and questions are not required; they are meant only to provide some ideas and possibilities. These topics could be explored in many different age groups and classrooms.

Students Interests, Motivations & Perceptions

There is a great interest in identifying how students think about science and in increasing students' interest in pursuing science. Projects that involve these components might include comparing different groups of students, examining the impact of a teaching strategy on these components, or examining the impact of a curriculum on these components.

Questions around these examinations might be:

- How do students in AP courses compare to students in general education courses in terms of perceptions of scientists?
- Do students in an astronomy course have more positive attitudes about science than other science courses?
- Do classroom visits by scientists improve students' perceptions of science or their interest in pursuing science careers?
- How do boys perceive their opportunities in science compared to girls?

Students Learning

There are many ideas about what impacts the way students learn. Some studies have examined learning as a factor of cognitive development and some have examined it from the perspective of conceptual change. Examples of questions that might be asked related to these studies is:

- How is the development of spatial reasoning related to the understanding of astronomy concepts?
- Do students with stronger argumentation skills learn science concepts more effectively?
- Do students with stronger creativity have more success in thinking scientifically?
- Do students that are successful in science (by grade) have a stronger understanding for the nature of science than students that aren't as successful?

Learning Environments

There are many studies that are interested in how the learning environment impacts learning. These studies examine how learning environments can be changed and they examine whether some learning environments are more effective for specific groups.

- What impact does data in the classroom have on students' conceptual understanding?
- Does integration of math and science impact students' learning?
- How do small groups develop students' interests in science?
- How does the gender of a science teacher impact the student learning and interests?
- Do smaller teacher-student ratios improve the learning opportunities than larger teacher-student ratios?
- Do girls experience more success in learning when placed in homogenous classrooms or in heterogeneous classrooms?

Teaching Strategies

Some studies are interested in what the teacher does to help the students learn. These studies are examining effective teaching strategies. Examples of questions like these might be:

- How effective is the use of a planetarium in developing spatial reasoning?
- What impact does modeling have on students' misconceptions?
- How does argumentation impact the learning environment?
- How does mentoring influence students' interests in science?
- What role does peer review have in developing understanding of concepts?
- How does concept drawing or cartooning develop skills in science argumentation?

Curriculum Impact

There are many companies and individuals that write curriculum to help teachers provide content in their classrooms. These are tested before the writing and they are field tested throughout the writing to identify how effective the curriculum is on various learning objectives. Often, people that write the curriculum will believe that if teachers have a good curriculum to work with, the learning will be effective. There are many different approaches that are included in the curriculum that is written for teachers. These are a few that are currently discussed in the educational literature:

- How does the use of urban myths improve the understanding of scientific processes?
- Does PBL (Problem-based or Project-based learning) improve students' skills in scientific argumentation?
- Does the use of colorization improve creativity in science?
- Does instruction in spatial reasoning impact learning in astronomy?
- Do science fair projects help students learn about the nature of science?

Assessments

Identifying what students know, and what students think is foundational in the field of education. Like all science, the measuring tools to identify progress, change and identification of content or knowledge are important in supporting our ideas and theories. In education, the measuring tools are assessments. In order to know that the assessments are valid and reliable we test them. We explore the ability of the assessment to be accurate and to provide the kind of information that can answer the questions that we are asking. As teachers in the classrooms, we use multiple assessments. As researchers in science education we examine those assessments and then provide information to teachers so that they can confidently use those assessments. Following are some of the questions that are currently examined surrounding assessments in science education.

- Do reflections help improve student learning?
- What impact does science notebooking have on student learning?
- Are concept maps a valid means of measuring student knowledge?
- In a mixed exam (ie: short answer, multiple choice, and mix and match) does the order of the format impact student responses?
- Can a constructed response format provide the same information from students as a structured interview?
- Do girls have higher success on short answer exams than boys?