Socially Situated Science for Authentic Inquiry Learning ($S^3$AIL)

Assessment Plan

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(A) Final Learning Problem

Today, many approaches to the teaching of science have stressed memorizing and parroting the “content” of science, such as established scientific theories. As a result, for many topics taught in schools and colleges, there is evidence showing that students are often unable to meaningfully apply the knowledge they acquire in school. There seems to be a fundamental disconnect between school science and the practice of science in the “real world”. There is not enough emphasis on students experiencing the process of scientific inquiry, real data collection (as opposed to performing cook-book style science experiments), and engaging in scientific discourse and analysis on data collected.

(B) Assessment Framework & Research Questions

S^3AIL is a web-based application designed to juxtapose scientific inquiry with discourse, aimed at providing an environment for students to engage in authentic data collection, and to scaffold discourse and analysis of that data. The assessment framework is designed to evaluate attitudes, skills, knowledge, usability of the product and socio-collaborative learning (ASK-US). Research questions for assessment are as follows:

1. Attitudes
   Throughout the activity, student attitudes toward science will be assessed. Are they excited about science? Have student attitudes toward science changed?

2. Skills
   How proficient are students at collecting and analyzing data?

3. Knowledge
   Have they learned anything about the topic they are studying? Have they met the learning objectives? Do they understand the scientific process?

4. Usability of web-based application
How easy is it to use the devices and integrate the data onto the application? How useful are the technology components to achieve their goals? Through this testing we will evaluate the effectiveness of our system and make refinements as necessary.

(5) Socio-Collaborative learning

How well are the student groups interacting? Is there synergy in the group? How actively do individuals contribute to attainment of group goals?

(C) Procedure and Measures

User testing will be conducted with a group of high school science students during the summer. If possible, S3AIL will also be tested with a group of high school science teachers. Using S3AIL, we will present a problem for them to investigate. Students will go out into the field with the data collection devices, gather data, discuss and analyze the data on S3AIL. In light of the time constraints and limited access to students, we are not using a randomized control group to evaluate S3AIL’s effectiveness, but rather we will be evaluating based on a pre- and post-test model. Evaluations will be administered to students before and after the project based on attitudes, skills, and knowledge. Group interactions and dynamics will also be observed on the social network to track socio-collaborative learning. With the group of teachers, the features and functionalities of S3AIL will be introduced to them. If possible, they will also be invited to join the activities with the students. A post-activity survey and focus group discussion will then be conducted with them.

(D) Analysis Method

This assessment framework will be targeted at two units of analyses: (i) the student as an individual, as aligned to the goals of developing scientific attitudes, skills and knowledge; and (ii) the project groups, as aligned to the social dimensions of the proposed solution. Analysis of data
will be performed with intent to determine how effective this science-learning environment is on student learning. The data will also be triangulated with data collected from the teachers.

(E) Learning Points from Preliminary User Testing that Influenced Design of Assessment Plan

Preliminary user testing (Show-and-Tell) was conducted on some adults and one elementary school student by describing the use of a low-fidelity prototype created using Powerpoint. This yielded the following observations and learning points:

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<tr>
<th>Learning Points &amp; Observations</th>
<th>Influence on Design of Assessment Plan</th>
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<td>S³AIL was designed to support teachers implementing inquiry-based learning in a school setting (as opposed to being an informal web-based application for students’ independent use). The users did not fully grasp this context, and therefore did not understand the design considerations for the prototype.</td>
<td>Assessment should be conducted in the context of an actual inquiry-based learning activity. Potential users should experience the whole cycle of inquiry, and use S³AIL in that process, rather than just to be taken through a description of the activity.</td>
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<td>The low fidelity prototype was designed with explicit reference to a design framework that parallels the inquiry-based learning process, called THINK (Trigger, Harness, Investigate, Network, Know). Much of the process required complementary teacher involvement. Some of the issues raised by the users were more related to the learning process, rather than on the prototype itself, and we found ourselves having to explain the process rather than the prototype.</td>
<td>In response to this observation, which was consistent across a number of users, we will design S³AIL to foreground certain aspects of the THINK framework (specifically Investigate and Network), which are directly addressed by S³AIL, and to move the other aspects into the background. This would focus users on these relevant aspects of the application. Assessment can then be also directed in a similar manner.</td>
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