CoReflect
Digital support for Inquiry, Collaboration, and Reflection on Socio-Scientific Debates

Specialized Authoring Tool as Boundary Object

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SEVENTH FRAMEWORK PROGRAMME
Science in Society

BACKGROUND

Learning Goals
•Recognize that they can participate in health care decisions
•Recognize that can make evidence-based health care decisions
•Develop competence in using systematic decision making models
•Develop graph interpretation skills
•Develop skills in "meta analysis" of disparate graphs for answering individual questions [see Poster Thursday Afternoon]

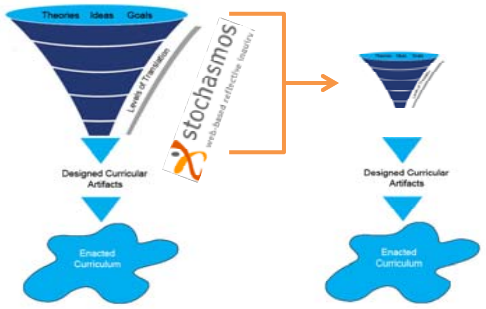
Problem scenario
Students are asked to advise a person who is contemplating among 4 pharmacological alternatives for smoking cessation: Drug A, Drug B, Patch and Gum. Students need to draw on results of clinical trials to decide which drug is best in terms of effectiveness, side effects, and fit to individual history and lifestyle.

Mixed Expertise Design Group: BGU LWG

The Ben Gurion University (BGU) team consists of some individuals who have prior experience in developing computer-based learning environments and some who do not. We are:

•a postdoctoral researcher with expertise in science and science teaching;
•a lecturer at a teachers' college who is also a high school science teacher;
•a high school science teacher; and
•a university educational researcher.

EXPERIENCES WITH STOCHASMOS



Consequences of Using a Specialized Authoring Tool

- Reducing the time involved in processes of translation (e.g., Schwab, 1973) from theory and ideas to implementation.
- Enabling pedagogical experts to focus on pedagogical considerations, and not be hampered by trying to translate their pedagogical thinking into technological ideation and visualization.
- Enabling more detailed consideration of support for the extended duration of the inquiry process, rather than just framing the overall task.
- Enabling co-design work among those with and without prior technological design work. Immediate focus on specific pedagogical issues.

EXAMPLES

Minimizing Translation & Facilitating Mixed Expertise Co-Design

The design discussions used the language of the STOCHASMOS tools and interface features to discuss the problem structure, student activities and supports (e.g., the "role tab", or "the template"). Thus, the translation from pedagogy to interface preceded and guided the design considerations.

Often the team would envision ambitious analysis on the part of the student, followed by a wave of strong concern over students' ability to contend with these tasks. This, in turn, was followed by consideration of what forms of scaffolding and guidance were needed. Our considerations were framed in terms of Stochasmos' objects, mainly "hints" and "templates."

When the team did not frame their suggestions in terms of a hint or a template, the main developer would respond with a question of how the suggestion could be implemented as a hint or template. So, the features of STOCHASMOS acted as a translational device translating pedagogy into interaction with computational media.

Detailed Consideration of Support for Extended Inquiry Processes

One of the teachers in the design team compared her experiences with Stochasmos to her prior experiences designing inquiry activities in her classroom. One aspect that she thought was unique to her work with Stochasmos was that it encouraged and enabled her to think concretely about what the students would be doing throughout the inquiry process.

Typically, she reported, most of the design work was focused on the "launching of the inquiry" – framing topic selection, setting up expectations, or setting up the mode of inquiry. Instruction and support that had to do with helping students as they were already engaged in the inquiry process was mostly an impromptu "on-the-go" endeavor.

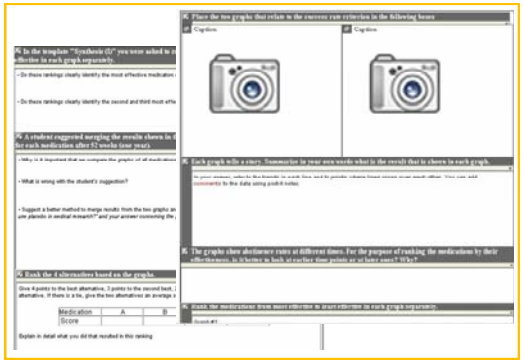
In contrast, in Stochasmos, because the entire inquiry process is encapsulated in the software environment it pushed her to consider the process of the inquiry and what difficulties students might encounter, and also helped her to visualize this in a concrete way, which in turn helped her to envision difficulties and relevant facilitation.

Teacher Impromptu Actions Feed into Subsequent Design

In a pilot enactment, we found that students had many difficulties, especially in reading graphs. The teacher realized for example that they did not have a good understanding of the role and meaning of placebo, and so she stopped the inquiry activity and led an impromptu lesson on placebo. This then became the basis for a non computer-based pre-activity that we added.

One of the central areas of difficulty was in interpreting graphs. We drew on the advice and prompting questions that the teacher provided to add a set of hints to the redesigned environment.

We also created a new set of templates that broke down the conceptual pieces involved in synthesizing multiple graphs.



EDUCATIVE IMPLICATIONS

Fuzzy and Plural Conceptions of Inquiry

One of the challenges in broad dissemination and high fidelity adoption and enactment of inquiry-based science learning is a deep understanding of the nature and intent of inquiry-based learning.

In-service and pre-service teachers maintain a variety of views about the essence and goals of inquiry-based learning, and an emphasis on process, engagement and personal development seems to overshadow issues of disciplinary practices and epistemological commitments (Gordon, Levin-Rozalis, Kainan, & Bar-On, 2003; Lotter, Harwood, & Bonner, 2007; Patrick & Pintrich, 2001; Windschitl, 2002).

These views affect the way they frame activities, and the choices that they make in allocating time, priorities and attention (Pajares, 1992; Richardson, 1996).

Thus, one of the ways in which we can facilitate broader high-fidelity adoption is by cultivating more consistent and particular views of inquiry among in-service and pre-service teachers.

Aligning Inquiry Views thru Design with Authoring Tools

It seems that engaging teachers in the design of inquiry-based learning environments using specialized authoring tools such as Stochasmos may be a promising approach.

Design in and of itself is a process that requires the translating of abstract theories and principles into tangible objects and processes. So designing inquiry activities requires one to confront or their implicit ideas about inquiry.

In addition, using a specialized authoring tool demands a certain degree of alignment with a particular conception of inquiry. Thus, this can be an opportunity to confront any discrepancies between individual views and those encapsulated by the authoring tool.

If this design is carried out in the context of mixed-expertise groups with participants who are experienced or inexperienced with inquiry, then once such discrepancies surface, they can be negotiated and more aligned views might be achieved.

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