

JSPS Foreign Researcher Post-Doctoral Fellowship: Research Proposal

Understanding of the Role of Science and Technology in Society through Online Learning Communities in Lower Secondary Education

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Understanding Science and Technology in Society: A Global Educational Problem

Science and technology continue to join our societies. As societies become more connected, the scope, nature, and impact of the Important Questions with which each grapples often become so, as well. Advances in technology are linking people and nations around the world not only through the opportunities they create, but also through the unique problems each presents. One of the most practical of the Important Questions all struggle with is this: *How do we identify and communicate to those who need them the skills and knowledge essential for successful living?* Challenging enough, it becomes more difficult when the "skills and knowledge" involve complex concepts and processes that intimidate many and seem a bit too abstract to be useful in day-to-day life. We find such a challenge today in **communicating the importance of science and technology on our societies to those who ultimately will be charged with advancing them.**

Emerging technologies are creating new economies, yet nations struggle to find (or to create) the expertise to drive them. Science blazes ahead; however, often providing fewer new answers than questions. Why? For one, too few are sifting through the sea of data our investigations are producing - and grappling with the moral, ethical, and political dilemmas the resulting technologies present. Though many interact with both the products and processes of science and technology everyday, few seem to develop any more appreciation for - or understanding of - either along the way. As advances continue, societies will need more informed citizens with interest and expertise in exploring the impact of science and technology on their daily lives. **Left unchecked, societies who fail to communicate the importance of understanding science and technology may find themselves struggling to support communities of people whose daily lives are entirely driven by technology, yet who scarcely understand it.**

Helping communities develop an understanding of 'what is worth attending to' is the primary objective of education. Creating environments where people can come together to learn, and providing people with information and experiences

that are necessary, are two fundamental goals of education that are universal. In schools and classrooms around the world, teachers spend the day making students aware of different facts and theories that provide the foundation for what those in the community believe to be important. Yet, in some of our most scientifically and technically advanced societies, students' understanding of important science and technology concepts seems precarious, at best. Particularly at the middle school / lower secondary level, students in both Japan and the U.S. show such weaknesses. What is needed is a way to increase students' (and teachers') understanding of which aspects of science and technology are worth sustained consideration, what the consequences of doing so (or not doing so) might be, and placing a relative value on the choice. Local idiosyncrasies may differentiate one community's choice of action from another, but many of the concerns - the "Important Questions" - are universal.

Proposal - Online learning community

The greatest opportunity technology presents us in education today is the ability to create communities of learners around relevant information in ways previously unavailable, thereby allowing members of that community to build mutually-beneficial relationships -- through shared interest, experience, and expertise -- that benefit the community, as well. What I propose is the development of an online "professional learning community" for middle school teachers in Japan and the United States - particularly, those with interest and expertise in helping students understand the relationship between science, technology, and the societies in which we live. Additionally, I propose the planning and initiation of an empirical investigation of the ability to advance students' interests and expertise in the areas of science and technology as they relate to our societies as demonstrated by those teachers who participate in the learning community versus those who do not.

Stage 1: Solicit teachers to participate.

I would like to work with two teams of teachers - one from Japan and one from the U.S. Ideally, each team would include a science teacher, a history teacher, a technology specialist, and a special needs teacher - and all would teach in the same school or district. Given the goals of this research project, participation will be limited to only those who teach at the middle / lower secondary level (typically, between grades 6 and 9). Participation will include:

- Active participation in an online learning environment as part of a joint Japan/U.S. educational technology initiative;
- Serving as a member of a "case study" that will be shared with other teachers;
- Traveling to Japan for three weeks in June 2002 as part of the FMF exchange program, and again in October 2002 for one week to share

- results;
- Creating an online teaching case to use within an online learning environment with students in Japan and U.S.;
 - Serving as a coach for other teachers in an online learning environment for Japanese / U.S. teachers.

For the U.S. team, I will work with the GEAR UP NC program to identify teachers willing to participate. GEAR UP NC is a state-wide program in North Carolina committed to helping middle school students prepare for college through a combination of services, including exposure to academically challenging curricula in middle school. (Note: I have a meeting scheduled for November 20, 2001 with the coordination team for the GEAR UP NC program to discuss additional support to make this connection). For the Japanese team, I will work with contacts within the U.S. Department of Education and NIME to identify a team of Japanese teachers willing to participate.

Stage 2: Engage teacher participants in an online learning community first as learners. The topic: teaching with cases about "Important Questions."

Once the teachers are identified, they will form an online learning community to learn about case-based teaching, skills for using technology to teach in their classrooms, and the concept of "Important Questions (IQs)." (Note: In this context, we refer to "Important Questions" as a way of focusing students on real-life applications of content). Participants will interact with instructional materials - and each other - via a variety of media, including the Web and videoconferencing. The goal is two-fold: (1) engage the teachers in an environment similar to the one they will be designing their cases for, and (2) introduce the teachers to the process of teaching and learning with cases. Additionally, the teachers will be learning various instructional technologies while creating some online materials (e.g., web design and publishing, digital video editing, videoconferencing, etc.).

Developing a teaching case. As the participants begin their work within the online learning community, I will begin the process of creating case studies of each of the teams. Each team will maintain a log of video, reflection statements, and other media throughout the process. These artifacts will be collected as the project proceeds, and finally constructed into an online teaching case for other teachers to gain insight into the process of teaching online, and teaching with cases about science and technology for middle school / lower secondary students.

Stage 3: Participants develop two cases for middle school / lower secondary students in the area of science and technology.

Next, the teams will create a case about a local concern that prompts Important Questions about the real-life application of science and technology in society. The goal is to present the problem in an engaging way that would compel middle school / lower secondary level students to engage in a collaborative exploration of possible actions. As such, the topic should be timely, important, interdisciplinary, and reasonably complex.

While they are developing their cases, most of the interactions between the teams of teachers will occur online. In June 2002, the U.S. team will travel to Japan for 3 weeks to work face-to-face with their Japanese counterparts. The Japanese team will travel to the U.S. for a similar amount of time - either in May 2002 or August 2002.

Stage 4: Participants teach their cases in an online learning community with their students.

In the fall semester of 2002, the two teams will introduce their cases - and the online learning community - to their students. The students will work collaboratively within the online learning community to analyze both cases, using the "Important Questions" developed by both teams as their guide. The students will work in teams and will be charged with this task: Analyze the problems represented in these cases and propose defensible actions toward solving them. The student teams will present their analyses online. The students will communicate with each other via discussion groups, chat rooms, online journaling, videoconferencing, and other technologies. Their analyses will be shared with experts in science, technology, engineering in Japan and the U.S.

Analyzing the process. As part of the research activities, I will collect and analyze the various communications between and among the students - as well as the teachers. I will analyze these data to determine if participation affects students' interests and expertise in the area of science, technology, and society.

Stage 5: Participants disseminate their work to other teachers in Japan and the U.S.

In October 2002, the teams of teachers will gather to share their work at an appropriate meeting or venue - for example, in Tokyo to the FMF exchange teachers. The teachers will present their cases, talk about their experience, and invite the new cohort of teachers to join the online learning community they have developed.

Proposed Timeline

(NOTE: Weeks highlighted in yellow would be spent based in Japan at NIME)

Jan

Solicit participants from US and Japan for project (in US, through GEAR UP NC)

Feb

Identify US team

Mar

Identify Japanese team

Apr

Boot camps on cases-based instruction and OLC environment"

May

Teams start planning "IQ-based cases"

Get Case training materials online Start planning / building OLC for US/Japan teams
Start filming US and Japanese teams Continue building OLC; continue filming teaching cases
cases
Continue building OLC; continue filming teaching cases

June

US team travels to Japan (FMF)

July

Case Development

Aug

Case Development

Sept

Cases introduced to students; students analyze/communicate in OLC

Oct

Student Presentations to communities

Continue building OLC; continue filming teaching cases	Finalize OLC; wrap-up filming teaching cases
Build teaching case and place in teacher PD OLC.	Gather data on students in OLC; gather data on teachers during use of OLC
Cases presented to new FMF cohort in Tokyo	