Ian Frank & Malcolm Field; Creating Meaningful Learning

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meta-skills	transfer	technological thinking, with no technology

We describe an implemented example of an interdisciplinary higher education curriculum design that privileges meta-skills as a common goal for all first-year classes. We then discuss how the challenge of "teaching technological thinking without technology" can allow students to reinforce appropriate competencies across a curriculum.

Short biography of lead author:

Professor Ian Frank graduated from the Department of Artificial Intelligence at Edinburgh University, where his PhD research was on computer game playing and how to automatically explain a computer's "thinking" to humans. "The understanding and explanation of the complex" is a good summary not just of his research interests in science, but also of his experience in teaching. He became a faculty of Future University-Hakodate in 2001, and has been experimenting with educational practices and workshops over several years. More information on his workshops and teaching can be found at www.koto-tsukuri.org.

Abstract:

Higher education in Japan is facing an identity crisis: on the one hand, university education is generally essential to attain employment in most white collar jobs, while on the other hand, fiscal support for higher education is being reduced.

Resource limitations are particularly evident in the public sector where national and public universities are being required to rethink their position in society, and in some cases, are being required to become semi-autonomous organizations (Monbukagakusho 1997).

This paper describes our experiences of working within the contradictions of the Japanese system, and draws concrete and general lessons for both theory and practice. First, we describe an implemented example of interdisciplinary higher education curriculum design that we have successfully introduced in our home institution. A key educational feature of the design is the privileging of meta-skills as a common goal for all first-year classes. This approach was especially important in our institution since although it is primarily a science and technology school, it also has significant components of design and communication education. For students in Japan, meta-skills do not fit easily within their learned educational experience. Students can acquire knowledge, and can demonstrate some level of comprehension of that knowledge, but they are unused to questioning, comparing, contrasting, or creating new outcomes that have been based on decisions and information gathered from alternative criteria. We describe our experience of initiating a "Center for Meta-Learning" (CML) and the challenges it faces in crossing academic paradigms, and reconciling mindsets of different cultures.

We ourselves follow Salomon and Perkins (1989: 7) in the belief that the transfer of knowledge or skills from one situation to another "is not easy and it does not happen on its own; it requires the mindful abstraction of a principle…". Especially, there is a growing worldwide body of evidence that the introduction of technology into classrooms often does not produce anticipated improvements in learning. For instance, the report by Pegg et al. (2007) on ICT learning in Australia concluded that "Most state and territory projects are yet to see the rewards of their efforts". We have been working towards addressing this issue by developing a framework that can support learners' thinking, both with and without technology, even before they actually encounter computers. In particular, we have used the notion of *koto* from Japanese philosophy to develop a series of workshops that target an understanding of how people interact with their environment. By maximally reducing the technology in our workshops, we have arrived at the original research challenge: "How can technological thinking be taught without technology?" This has led us to the ongoing formalization of technological thinking primitives, with accompanying teaching practices and workshop activities. This formalization raises the possibility of the reinforcement of technological thinking in classes other than those directly related to technology. We discuss how, through a clear and concise formalisation of what it actually means to think in a technological way, appropriate competencies can be reinforced not only in classes that use technology, but also across a curriculum.

References

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