Distributed Expertise in Teaching

Working Group 3.2

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Abstract Given the rapid advances in various disciplines it is sometimes difficult for faculty who regularly teach core courses to stay up-to-date and to effectively incorporate the recent advances into a course curriculum. Sometimes faculty are required to teach courses outside of their area of expertise especially computer science. The paper discusses how distributed resources can be set up for teachers using website portals. Updated textbooks or web-based text resources are very useful as well as tutorials, exercises, suggestions for further reading, notes on learning styles and educational organisations. A special added value is a list of available experts with whom can be contacted, an electronic forum for further talk and discussion. Big questions are who will contribute to expert portals? Are teachers interested in co-operation?

1. INTRODUCTION

Given the rapid advances in various disciplines it is sometimes difficult for faculty who regularly teach core courses to stay up-to-date and to effectively incorporate the recent advances into a course curriculum. In most instances it is to be assumed that faculty expertise will not cover all topics that form the core of a course. In fact, in a number of institutions, it is typically the case that faculty are required to teach courses outside of their area of expertise. This has especially been true for a number of computer science courses where faculty often are required to teach courses outside of their area of research.

In such instances faculty tend to rely on available texts and the course is defined by the content and organisation of the text. Consequently, the success of the course is mostly dependent on the quality of the text and the ability of the instructor to effectively teach from it. Considering the time required to produce and distribute a textbook, it is not surprising that many texts are hopelessly outdated. Moreover, faculty who rely heavily on a text may be hesitant to abandon it, however old.

Modern communication and resource sharing mechanisms make possible new ways of assuring high quality education at locations where faculty expertise does not cover all topics appropriate to core courses. This professional group will explore the possibilities of distributed expertise applied in support of high quality course offerings. For example, in the case where the course is of a traditional format, local faculty with complete control over the content of the course, assignments, and expected performance will benefit from the availability of materials developed by others and from the support of experts in topic areas of the course.

2. WHAT IS DISTRIBUTED EXPERTISE?

We define distributed expertise to be a resource for teachers in a particular subject area that can be used to provide high quality education. We envision such a resource to be accessible via a web portal that provides an entry into pedagogical materials that may be of use to various teachers. While the entry point to this resource is a web site, we envision it to contain at least the following components.

- Tutorials on topics related to the subject.
- A repository of teaching materials appropriate for each topic, to include lecture notes, illustrated examples, exercises, suggestions for further reading, possible examination questions.
- Strategies for addressing learning styles, classroom formats, educational organisation.
- A list of suitable texts for each topic.
- A list of available experts who would be willing to consult on a given topic.
- A forum for continuing discussion
- A search facility for locating specific materials at the portal and beyond.
- Links to related information.

In short, a distributed expertise resource helps connect faculty with usable content, teaching methodologies, and contact with experts in the field. It is important to emphasise that providing a distributed resource may not be just a matter of providing adequate content knowledge. It is equally important to

provide guidelines for presentation and various ways to organise learning experiences in the context of a specific topic.

3. ORGANISING DISTRIBUTED EXPERTISE

Creating a distributed expertise resource should necessarily follow a thoughtful process that clearly identifies the structure of the main portal and how it incorporates the above facilities. There already exist several web sites that provide content that would fall in any of the above categories, it should be noted that the primary goal here is to provide support for teachers. Hence, such a resource would inherently differ from the now prevalent distance learning portals. We do recognise that there will be some overlaps and in some cases distributed expertise portals may very well serve the same role as distance-learning sites. However, the primary targets for delivery of distributed expertise portals will be teachers.

One could begin creating a distributed expertise portal by planning an exhaustive coverage on a particular subject. However, our experience suggests that teachers will be better served if such portals focussed on immediate needs. In researching this issue for the case of a core computer science course (Computer Organisation and Architecture), we have discovered that such a resource should begin by performing a study of the prevailing practice and identifying the burning pedagogical issues. Providing distributed expertise in support of the identified weakness should be the top priority though gradually, it would inevitably be the case that such a resource would grow to incorporate a nearly complete coverage of the field of study.

A survey of the prevailing practice also yields a lot of useful information about the subject that should be incorporated in the portal. This provides a teacher, perusing the portal, with a good sense of the state-of-the-art in addition to what may already be available. For instance, by conducting a survey of Computer Organisation and Architecture course, we were able to gather information about various texts, teaching environments, available software, lab toolkits, etc. These will naturally form an integral component of the portal.

3.1 Enlisting (distributed) experts

We recognise that the key component of the proposed portal is the availability of subject experts. Experts will be needed to provide tutorials and related content. Experts may also volunteer to be available to teachers (via e-mail or other means of communication) for assistance. Experts may

also be required to maintain parts of the course content and to keep them updated.

Experts may not be restricted to subject matter experts. We recognise that other faculty colleagues could play the role of an expert. Such colleagues may be locally available, in some instances, or accessible via electronic communication. experts.

3.2 Distributed expertise and textbooks

Most textbooks do a decent job of presenting most of the content well. By creating a distributed expertise portal, we are not necessarily discounting the usefulness and value of available texts. However, given the long production cycle of texts, it is to be expected that, in rapidly advancing fields, texts will be unable to provide an up-to-date coverage. Yet, we suggest that, in order to address this issue, authors of texts rethink of new ways of supporting their texts that could be facilitated by the creation of a distributed expertise resource.

How to get the true experts to participate? Can we ask people to give us their educational material as is and we put it on the web and make it available to others? This could provide inspiration as well as real use. But what about intellectual property rights? Within the university, faculty protect their property. How do we deal with conflicting opinions among experts; recognise minority opinions in particular? We need to list of different practices, not best practices because you cannot say what is best. There is not likely to be one way that is best in all contexts.

Is the subject topic the problem or is it how to present and organise the learning experience? When we talk of resources, we must include other dimensions besides content. Points of discussion included:

- What is distributed expertise?
- Web-based resource that reaches out to real people. Contact with experts.
- How is this organised?
- Content or teaching methods?
- Start with weak areas through maybe several experts contributing.

Before starting, what sort of educational organisation are we supporting – traditional classrooms; competence based environments; teacher as guide or coach? One guide is probably not enough; could distributed expertise can help in that sort of situation? Subject, methodology, educational organisation dimensions are all relevant.

An instructor who is not an expert will find a book or approach from someone they know; take some as given and fill in as they can. With supplemental resources that provided experiences, projects, etc. To produce useful things, someone must provide an architecture for a course. Education

is now very fractionalised. We propose a learning process not having one teacher, but *a lot of experts* connected to the students more directly. For instance in a four-campus university, all the faculty are there and are qualified, but have to deliver courses or parts of courses to various campuses. Someone locally oversees the overall course, and is responsible for assessment, but the experts write the exam questions.

3.3 Other dimensions besides content

More collaborative way of learning and teaching also must be part of our work. How to support the authors of text books? What other materials should there be to help teachers that may feel uncomfortable with the topic areas? Is the subject topic the problem or is it how to present and organise the learning experience? When we talk of resources, we must include other dimensions besides content.

The key may be in Web pages. Can we persuade different experts who have web pages to list where questions can be posted? There could be question/answer sections, and room for evolving discussion. But would this need a moderator to be sure that the questions get answers, and must there be control the number of people who have access? Would an expert be able to give enough time?

3.4 The community is the expert

Perhaps we should explore the open source model as an example. The community is the 'expert' which smoothes out the load. Can we formulate the questions well enough to use this model? Experts are responsible for maintaining their own area of expertise. An open source community is focused on some artefact. There are usually some reasonably small group of people who moderate the contributions and form groups around a very identifiable topic, with branches out of the centre for sub topics.

There are professional societies, such as IFIP, for the various parts of the discipline. They hold educational seminars as well as conferences. The people who primarily teach are not always connected to the people who do research in the topic. Workshops and tutorials are held at the research conference where the people who teach and need more content help are often not present.

There are international and national teacher support organisations, such as IFIP TC3, ACM SIGs, IEEE TCs, AAAI. Teachers need an interchange of experiences related to how to conduct classes and use learning styles in the classroom. There needs to be more communication between local teachers who are working on similar things but not talking to each other. If

local groups do not function, the bigger scale will not. Would people use distributed expertise?

4. ARE TEACHERS INTERESTED?

Who will benefit? Different teachers in different countries have a range of concerns. In Denmark and the Netherlands, teachers at high school are subject trained, but not taught teaching. Would such a resource lead to one way communication? Is there a lack of interest in new ways of doing things? Do older teachers have problems while newer ones have more requirements. In Israel, teachers in remote places may know very little about the subject and need help to get onto their feet. There is a global shortage of teachers in many fields. Trying to keep up with a changing field when teachers are already very busy is hard.

How can an open community be organised? Will 20% of the people (experts?) provide 80% of the answers?