Getting real in the classroom

Getting Real in the Classroom

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Exposing students to real-world projects will encourage them to share, learn, and improve.

The ancient Chinese philosopher Lao Tzu proclaimed: "if you tell me, I will forget; if you show me, I will remember; if you let me experience, I will learn." Often, a large gap separates software projects in industry from what can be experienced in the classroom. A typical university course runs 100 hours, while projects in real life can involve many person-years. Does this mean we can only "tell" about the real world while in the classroom? Students might appreciate having an experienced software manager visit the class to explain the latest project, but Lao Tzu would still consider such an interaction only "telling."

Students have difficulty appreciating the complexities of planning a 100-person project because they have never been involved in anything that large and thus lack a frame of reference. The same holds true for important software management topics such as change control, configuration management, or working with people across the world on an offshore project.

This dilemma can be solved. We have done so ourselves, bringing real life into the classroom through a course in software management that we have taught for the past 10 years.

European, Asian, and American students experience software management by working in virtual teams on a structured set of activities that emulate the inherent complexities of real life in a compressed time frame. The innovation lies mainly in how students operate in virtual teams that never meet face to face, as so often occurs in offshore projects today. The project's size ensures the experience's realism.

BOHKNET PROJECT

The BOHKNet (Beijing, Orlando, Hong Kong, and the Netherlands) project began in 1998 with the universities of Eindhoven and Hong Kong. Over the years, the membership list expanded to include the universities of Tilburg, Beijing, and Orlando. The number of students has ranged from 65 to 180, depending on class sizes at the various sites.

Each BOHKNet team typically consists of eight to 10 students in two to four locations. The team is assigned a software-related topic such as TV on mobile phones or open source and software patents, which students approach from different geographical perspectives. The structured process consists of several divergent and convergent activities that take place over eight weeks. The different groups produce a Web site for discussing their topics from European, American, and Asian perspectives. All the group's Web sites are integrated into an electronic book.

As Figure 1 shows, this process involves a multiyear effort in which participants use the results of previous years as input for the current year. During week 3, the teams choose from a list of topics and must define several research questions to focus their subject of study. In week 6, students must deliver a Web site that discusses their topic. Then, in week 7, they must integrate a chapter into the project's electronic book. An evaluation concludes the project. The results of the 2006 project can be found at www.bohknet.com.

The technologies used in the course include videoconferencing, e-mail, and an off-the-shelf learning-management system that supports both chat and forums. The students can freely use additional tools to create the Web site. BOHKNet classroom instructors address specific software management issues to accelerate the experiential learning, including planning, work breakdown, information overload, and knowledge management.

Planning

In the project's first weeks, instructors ask the student teams to critique a Web site from the previous year and then write a specification that includes an explanation of how they will improve it. Next, the students must plan their project in greater detail. Instructors ask them to size the project according to the number and kind of screens, estimate the effort, distribute the work, and name the risks. Students also can view a lecture on software planning available from the Web site.

Although many students have already taken courses in project management and know how to use the tools, some could be planning a real project for the first time and might, for example, need to personally face the
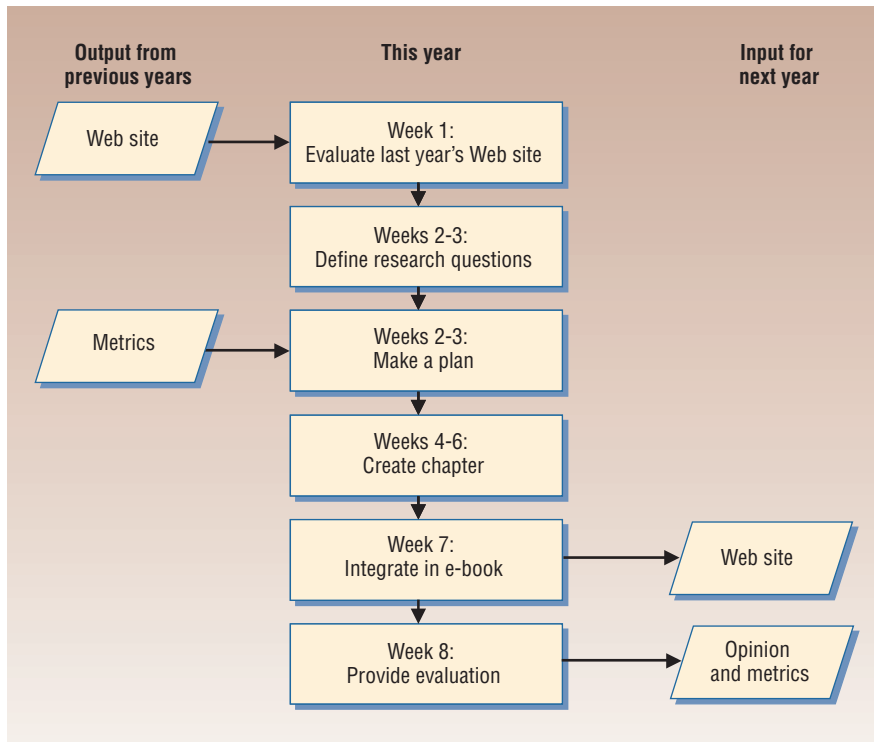
Figure 1. BOHKNet process. In this multiyear effort, participants use the results of previous years as input for the current year. The current year's final assessment and evaluation in turn provide input for the following year's project.

consequences of an overly optimistic plan. The guest speaker who later comes in to discuss a real-life project must understand the students' own project so that he or she can relate to their planning questions.

Work breakdown and integration

Many real-life problems are too complicated to be solved with one task by one person. A generalized engineering approach splits the problem, solving the smaller problems and integrating the partial solutions later. We apply this principle in the BOHKNet project, assigning a group of more than 100 students the task of writing an electronic book. This e-book is broken down into chapters and further subdivided into sections. Each section requires studying a topic from the geographical angles represented in the project—for example, Asian versus European.

This is where the breakdown stops. The students must work with their counterparts and study their topic from both angles. Later, they must integrate the sections into chapters, which they then must assemble into an e-book. Having students go through this breakdown and integration trajectory with a group of more than 100 peers distributed around the world provides them with a novel experience.

Information overload

Nowadays, developers worry less about finding information and software and more about organizing and handling it. The typical confident response from students after one week on the project proclaims, "We found information on the Internet you do not know about." They are most likely right, especially if it concerns a good example of "identity theft in Hong Kong," presented to a European teacher. This is great, because the teacher also learns.

A few weeks later, the instructor checks back and hears that "we are overwhelmed by all the new stuff we have found and have no clue how to get it into a Web site within the few weeks we have left." This is the moment when the instructor can contribute by offering theory, experience, or a process for integration.

Knowledge management

The students must handle not only content, but also the software they use to make their Web site more attractive. This often results in questions to the professor such as, "Do you have the source code for that flash animation that last year's group made?" The professor's honest answer will be, "No, but if you are lucky, the students that built it still attend the university."

In our experience, this teaches students more about the need for documentation and configuration management than hours of lecturing would. From Lao Tzu's perspective, this is the difference between telling and experiencing. The instructor can also learn an important lesson from this: He or she no longer provides the only source of knowledge, which must be disseminated verbally, supported by his or her own book and slides.

Sometimes we give a plenary lecture. More often, we find ourselves working with a student team struggling to organize masses of information. The teacher has thus moved from "the sage on the stage" to "the guide by the side."

GLOBAL VIRTUAL TEAM DYNAMICS

Working as part of a global virtual team with participants from different cultures has become a reality of contemporary software development. In the BOHKNet project, students learn firsthand how to communicate effectively and efficiently across multiple time zones, using a variety of synchronous and asynchronous multimedia technologies.

Virtual workspaces preclude the ability to walk down the hall to solve a problem or get everyone on the team in the same room at the same time. It can be difficult to coordinate activities, much less arrive at a consensus and achieve synergism expediently. Cultural differences challenge basic assumptions

of thinking, feeling, and reacting that necessitate compromise and the creation of a new approach to working together and sharing knowledge.

In the BOHKNet setting, students learn communication and tool-use skills they can take with them when they enter the professional world.

Learning environment creation and support

The classroom of yesteryear does not meet current or future needs. Creation and support of a robust and flexible learning environment has become paramount. In effect, this environment becomes a classroom without walls, seamlessly integrated into a global community. By nature, this requires an enhanced physical facility and a portfolio of communication tools with the ability to easily add more as circumstances dictate.

Fortunately, a wide range of cost-effective Internet-based tools are readily available, including VoIP, instant messaging, discussion forums, and collaborative authoring tools. These operate on mobile platforms that quickly turn a traditional classroom into a media center. Unfortunately, they are poorly integrated and can induce frustrations that, without understanding and support, inhibit team dynamics. However, such is the nature of the real world, and we can anticipate a better future. Examples of learning-environment-extension opportunities include virtual worlds and the incorporation of Internet2-based social networking.

Software management education

Much can be learned from approaches others have taken to bring realism into the classroom—the Team Software Processes by Watts Humphrey and contributions by groups of students to open source projects provide two such examples. Another possibility focuses on involving people from different disciplines, such as user interface specialists. Developments in video technology will let virtual teams feel closer while performing their tasks. We have also experimented with real customers who use the Web site and provide students with feedback. However, this has yet to achieve satisfactory results because the customers did not benefit enough from the interactions to maintain their participation.

Ultimately, education is increasingly less about creating content and more about creating an environment in which students can experience and learn. It is about improving the learning environment by adding elements of the real world. Professors provide the environment and process, and the Internet provides a source of nearly boundless content.

W e applaud the efforts of various universities to make their content freely available. Further, we consider the process and the environment equally important and would like to make the BOHKNet experience available for free. The 10 years of experience accumulated from this project have been captured in manuals, software templates, Web sites, scientific papers, and video. All are freely available for reuse on the www.bohknet.com Web site. We welcome efforts to reuse and improve it. Getting real in the software classroom benefits both students and teachers. Reuse will accelerate the improvements. There is much to be shared and learned. ■

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