Worked Examples for Sound Object-Oriented Pedagogy

A "killer" workshop

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Abstract

The Killer Examples workshops are highly interactive workshops, held annually at OOPSLA since 2002. The workshop goals are to bring together educators and developers to share their object-oriented expertise, and provide a forum for discussion of teaching techniques and pedagogical goals. The theme of last year's workshop was process in the pedagogy of object orientation; the theme of this year's workshop is pedagogically sound examples for object orientation: examples which are structured to support student learning.

The workshop solicits examples which can be used in the teaching of object orientation. Submitters present their examples at the workshop; participants in the workshop will critique the examples and actively engage in refining the examples in a way that they support a clear and sound pedagogy.

The workshop accepts walk-ins if space permits and walk-ins are determined to have adequate interest and background in the workshop theme to contribute positively to the discussions.

Categories and Subject Descriptors K.3.2 [*Computers and Education*]: Computer and Information Science Education—Computer Science Education

General Terms Design

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Themes and Goals

> **killer app** The application that actually makes a sustaining market for a promising but under-utilized technology.
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> First used in the mid-1980s to describe Lotus 1-2-3 once it became evident that demand for that product had been the major driver of the early business market for IBM PCs. The term was then restrospectively applied to VisiCalc, which had played a similar role in the success of the Apple II. After 1994 it became commonplace to describe the World Wide Web as the Internet's killer app. One of the standard questions asked about each new personal-computer technology as it emerges has become "what's the killer app?"
>
> The Jargon File

Since 2002 we have organized and run, with various colleagues from different institutions, the "Killer Examples" series of workshops at OOPSLA. These workshops have been well-received, and have adapted over the years in response to attendee feedback to keep interest high.

Early "Killer Examples" workshops focused on gathering examples of design pattern usage which are suitable for use in a CS curriculum, especially in beginning courses. In these workshops the focus was, to a large extent, on *what* we teach.

One piece of feedback that we have received regarding the killer examples that have come out of previous workshops is that while the examples themselves are good to have, the example themselves do not come with a roadmap for bringing them into the classroom. To begin to address this, in 2007 the focus was placed more on *how* we teach object orientation.

In this year's workshop we continue with this focus, providing a forum in which educators (from both academia and industry) can present examples they use in their teaching and learn, through the workshop activities, how to effectively

structure these examples in ways which will help maximize the learning benefits that students derive from them.

In other words, we focus the workshop's attention on more than just presenting killer examples, to but on *worked* killer examples. Worked examples are instructional devices that provide a problem together with a model solution for a learner to study. Although there is no precise definition, worked examples share certain common characteristics. As instructional devices, they include a problem statement and a procedure for solving the problem; together, these are meant to show how other similar problems might be solved. In a sense, they provide a desirable problem solving model for the learner to study and emulate. Examples typically present solutions in a step-by-step fashion. In many cases, worked examples include auxiliary representations of a given problem, such as diagrams. [vanGog+2004] There is a lot of empirical evidence that worked examples can help controlling cognitive load and thereby support effective learning. [Clark+2006]

The worked examples approach is particularly relevant to programs of instruction that seek to promote skills acquisition, a goal of many instructional programs in domains such as music, chess, and programming. From this viewpoint, learning from worked examples is of major importance in initial stages of cognitive skills acquisition.

Workshop activities and format

This is a full-day workshop, held from 8:30 AM to 5:00 PM on Sunday, October 19, in Belmont 1 (please check conference schedule for last-minute changes). The workshop is highly participatory, with different levels of contribution possible. Some fully-worked examples will be presented, as well as some examples which will be developed, by the workshop participants, into fully-worked examples.

In our workshop, participants will be encouraged to discuss examples that they have used in their teaching, whether it be in a traditional classroom or in an industry training setting. During the course of the pre-workshop and workshop activities, the workshop community has worked together to ensure that there is a clear description of the problem, the context in relation to a topic or course, relevant supplemental materials (e.g. diagrams, code snippets), and that there is a defined progression of how to present the example and eventual solution. This process might involve discussion of pure classroom examples (those that are demonstrated fully in the classroom), or pure assignments (those that are given solely for the students to complete), or ideally, an example that is started and explained in the classroom and then given to the students to finish as an assignment.

During the workshop the organizers will present the first worked example, worked out fully. Next one of the submitters will present their example (worked out to an almost complete state during the pre-workshop activies, under the guidance of the organizers), after which the workshop participants will actively engage to complete it. After this the next submitter presents an example which is a bit further away from completion; again the workshop participants actively engage to complete it. The next submitter presents an example even further away from completion, and have the workshop attendees actively engage to complete it. And so on. In this way the workshop itself functions as a worked example, which engages the workshop participants.

Post-workshop activities

After the workshop participants will be expected to submit final versions of their examples for inclusion on a web site for general dissemination via the workshop website:

`www.cse.buffalo.edu/faculty/alphonce/OOPSLA2008/`

We have in the past presented posters of the workshop at the conference poster session, and plan to do so again. The workshop poster is halfway prepared ahead of time, with general information about the workshop and its presentations, but with open space for workshop outcomes, to be filled in after the workshop. Workshop participants are encouraged to help present the poster.

References

[vanGog+2004] Tamara van Gog, Fred Paas, and Jeroen J.G. van Merriënboer. (2004). Process-Oriented Worked Examples: Improving Transfer Performance Through Enhanced Understanding. *Instructional Science* 32 (1-2): 83-98.

[Clark+2006] Ruth Clark, Frank Nguyen, John Sweller (2006). Efficiency in Learning, Evidence-Based Guidelines to Manage Cognitive Load. Wiley: San Francisco, CA, USA.