

# Software Engineering Education Goes Global

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## *Abstract*

*This tutorial describes our five-year on-going Global Software Engineering teaching initiative involving universities in Southeast Asia, India and Africa and uniting eight instructors and 164 students to date. It presents and discusses guidelines for instructors interested in embarking in similar initiatives.*

## **1. Context**

In today's software industry, development teams are no longer co-located but distributed over locations, and problems associated with different time zones and cultures come into play. Software engineering education must reflect these industry scenarios and better prepare students to capitalize upon the opportunities and learn to address the challenges of this context. Pace University in the United States and the Institute of Technology of Cambodia in Cambodia partnered in 2005 to investigate models of working for students to develop software collaboratively. They were joined by the University of Delhi in India in 2006 and by Mahidol University in Thailand and the Royal University of Phnom Penh in Cambodia in 2008. The 2009 scenario involved Pace University in the US, University of Delhi in India and Ecole Supérieure Polytechnique in Senegal in Africa. 164 students have been involved to date. While the goal of the initiative has been constant of preparing students for the real world by developing software for real clients, the emphasis has evolved each year to address particular themes including: global supply chains, tooling infrastructures, software quality assurance, integration, deployment and maintenance, entrepreneurship, socialization, and agile methodologies. Different models were examined – models that included distributed sub- and lead- contractors to expose students to global supply chain management, models with coaches and auditors to improve software quality and likelihood of deployment, and models emphasizing socialization between team members to improve team bonding. Choosing the right tooling infrastructure to support team coordination across distances and the software development process, while accommodating different backgrounds and prior exposures to technologies, has been at the center of the initiative. The software engineering process moved from a loose waterfall process with iteration and feedback to the use of agile practices and the Scrum framework. The tooling infrastructure, a mashup of technologies, comprised engineering, communication, project management, and socialization tools. The engineering tooling converged on the use of a professional integrated development environment, specifically Eclipse (with unit testing and version control) (<http://www.eclipse.org>) and java.net for bug tracking (<http://www.java.net>). The last version of the model emphasized the use of IBM Rational Team Concert (<http://www.jazz.net>) as an end-to-end tooling infrastructure. The communications took place via mailing lists and Internet chats to permit synchronous and asynchronous communication. A number of wikis served as repositories for all the software artifacts produced during the project, and thus facilitated team awareness and project management. Socialization activities were facilitated by Internet chats and by using the Second Life virtual world environment (<http://www.secondlife.com>). The wiki of this project can be found at: <http://atlantis.seidenberg.pace.edu/wiki/gsd2008>.

## **2. Description of the tutorial and intended audience**

This tutorial is a 3-hour session. It is based on our five years of experience in setting up and managing students' global software development projects. It comprises a description of our five-year on-going Global Software Engineering teaching initiative and a presentation of guidelines for instructors interested in embarking in similar initiatives.

This tutorial describes the models of working and the learning objectives for each of the 5 years of the initiative to date and explains the incremental changes that have been made to create an experience that reflects many of the realities of global software development, albeit in a classroom setting. The project logistics and key findings from each year are presented.

This tutorial explains the evolution of the tooling infrastructure to support team coordination and the software development process and discusses the current use of IBM Rational Team Concert as an end-to-end tooling infrastructure. The use, perception and difficulties with the tools are presented. It compares and contrasts the use of mashups of technologies with respect to the use of an end-to-end solution. It demonstrates some of the tools that were used to date (e.g., Second Life, java.net and IBM Rational Team Concert).

This tutorial proposes and discusses guidelines for instructors who are considering the global software development path for their student software engineering projects. The amount of planning required prior to and whilst running such a project and the number of tasks to attend to on completion are presented. It discusses the difficulties instructors should expect to meet and the project manager role of the instructor in such projects. 'Getting started' checklists for planning, running and reflecting on such projects are shared with attendees. Key questions on the role of the instructor are discussed with attendees.

This tutorial is intended for faculty interested in integrating a global component into their teaching of software engineering.

## **3. Presenters**

Dr. Christelle Scharff is an Associate Professor of Computer Science at Pace University in New York City. Her research background is in Formal Software Verification. She published articles in Formal Software Verification, Data Mining, Global Software Engineering, Mobile Computing and Education. She was awarded diverse grants from NSF (National Science Foundation), Microsoft, IBM and NCIIA. She is a certified Scrum Master.

Dr. Olly Gotel is a research consultant. Her research background is in Software-intensive Systems Engineering with practical experience in the UK defence sector. She has taught graduate courses in Software, Systems and Requirements Engineering, Quality and Reliability. She is active in research and practice in these areas. She is on the steering committee of the NY City SPIN and a certified Scrum Master.

Drs. Scharff and Gotel and their colleagues published more than ten papers in the Global Software Engineering and were awarded a best paper award at the International Conference in Global Software Engineering (ICGSE) in 2009 [1].

## **4. Acknowledgement**

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## **5. References**

[1] Gotel, O., Kulkarni, V., Say, M., Scharff, C. and Sunetnanta, T. "Quality indicators on Global Software Development Projects: Does 'Getting to Know You' really matter?". In the Proc. of the IEEE Conference on Global Software Engineering (ICGSE 2009), Limerick, Ireland, July 13 - 16, 2009.