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Towards Grand Challenges in Computing Education Across Disciplines: Setting an Agenda for Research and Pedagogy

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Categories and Subject Descriptors

K.3.2 Computer and Information Science Education

General Terms

Human Factors

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Computing education research; Information systems education research; Interdisciplinary; Grand Challenges

1. SUMMARY

PACE, the Partnership for Advancing Computing Education, held a workshop on Computing Education Research in Washington DC on August 21st and 22nd 2014. The goals of this invitation-only workshop were to

- explore the possibilities for developing a forward looking and challenging research agenda for computing education as a whole, one that will extend and enhance the computing education research community;
- enhance the standing of the computing education research community and galvanize it into meaningful and effective action;
- understand the ways in which professional and academic computing societies can best serve the computing education research community; and

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- establish a joint understanding and strengthen the sharing of research agendas and directions on computing education across various computing-related sub-disciplines.

One of the many conclusions from the workshop was that the community should consider articulating a set of Grand Challenges for computing education. If this could be achieved in a meaningful manner, it would directly support several of the goals of the workshop. For instance, it could address the research agenda: a true shared understanding of the Grand Challenges of computing education would have the potential to serve as a guiding mechanism for computing education research agenda. Identification of the Grand Challenges would also address the issue of the status and standing of computing education in general and computing education research in specific.

The purpose of this Special Session is to advance the discussion about Grand Challenges for computing education, specifically by including the community in that discussion. In line with the multi-disciplinary nature of the PACE workshop, the intent of this process is to incorporate the perspectives of all major computing (sub)disciplines.

2. TOPICS

Grand Challenges are not new. These have been used over the years within a number of research communities to provide a focus for activity and often funding in science and engineering. See [1], for instance. In the past, the mainstream research community in computing has identified as grand challenges topics such as autonomous vehicles, speech recognition, computer vision, automated reasoning, and natural language understanding. See also [2]. Even within the computing education community there have been earlier attempts to specify Grand Challenges [3].

In order to place the discussion on a sound footing, the Special Session will address fundamental issues such as

- Background on Grand Challenges in computing education, including lessons learned from earlier efforts.
- What should characterize a Grand Challenge in computing education?

- Why are Grand Challenges important and what role can they play?
- Are Grand Challenges in computing education research and practice similar? How can we construct an environment where research and practice inform each other? Can Grand Challenges of computing education practice truly inform computing education research?
- What broad themes appear across the computing disciplines? Which Grand Challenges are shared across all computing disciplines and which more specific?

The panel members will provide examples of what they regard as Grand Challenges. Discussion of these within the community is, however, the most critical component of the special session. At some level, the community has to be seen to own the challenges so that they will seek to engage with them. Ideally, the challenges may even serve to expand the community, invigorate it, and expand connections between various computing disciplines.

The discussion during this special session is not expected to provide a definitive list of challenges. Instead, it can be seen as an early step in a set of discussions that will identify current core challenges for computing education and through this process, invigorate computing education research.

3. PANELISTS

LECIA BARKER (MODERATOR)

Lecia Barker, as chair of the PACE Board, will act as moderator and chair the session.

JASON THATCHER

Jason Thatcher, will discuss the importance of the concept of a grand challenge and provide information regarding efforts to engage the wider community beyond SIGCSE.

HEIKKI TOPI

Heikki Topi will provide background information and provide a perspective on what constitutes a grand challenge.

ANDREW MCGETTRICK and STEPHEN COOPER

Andrew McGettrick and Stephen Cooper will provide initial ideas for grand challenges.

4. EXPECTATIONS

The session will highlight potential Grand Challenges that surfaced in the PACE workshop, but will include ample time for discussion.

In addition to the workshop results, there will be discussion of the relationship between computing education practice and computing education research in framing curriculum guidelines and informing research questions. The participation of the SIGCSE community is highly desired and will contribute to a fuller understanding of the issues involved in defining Grand Challenges in Computing Education.

The results of the session will be incorporated into a NSF-sponsored report on the state of Computing Education Research and shared with the ACM Education Board. A report of the session will be prepared and communicated with the SIGCSE community through Inroads and/or posts to the mailing list, as well as through the Ensemble portal.

5. SUITABILITY FOR A SPECIAL SESSION

SIGCSE Special Sessions were originally designed to provide a forum for connecting SIGCSE participants to results of NSF initiatives and other organizations with a commitment to computing education. This session matches that purpose exactly by fostering a conversation about an important computing education workshop that was conducted with funding from NSF. The topic is one of current interest and the involvement of ACM and NSF provides both resources and expertise to address the issue effectively. This opportunity to bring the results to the SIGCSE community is a natural and important component of the effort.

6. ACKNOWLEDGMENTS

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7. REFERENCES

- [1] Office of Science and Technology Policy, Executive Office of the President. A Research and Development Strategy for High Performance Computing. Washington, D.C. November 20, 1987.
- [2] Tony Hoare and Robin Milner (editors) *Grand Challenges in Computing: Research*, published by the British Computer Society, London, 2004.
- [3] Andrew McGettrick, Roger Boyle, Roland Ibbett, John Lloyd, Gillian Lovegrove and Keith Mander. *Grand Challenges in Computing: Education*, published by the British Computer Society, London, 2004.