

Report on Panel 4: Teaching and Learning in Dialogue

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Teaching and learning in dialogue have a long tradition in academia. In fact the term academia traces back to Plato's Academy, an institution that most likely was characterized more by dialogue than by lectures. Yet, lecturing is predominant in today's academic world. Many instructors appreciate dialogues in teaching but consider them to be incompatible with lecturing large classes or other characteristics of universities. In their talks both panel speakers emphasized that there is no such incompatibility by showing time proven examples of teaching in dialogue.

Christian Kautz of Technische Universität Hamburg-Harburg demonstrated that students experience characteristic difficulties with subject matter, a phenomenon often referred to as misconceptions. In his demonstration he involved the participants who served as students in a Peer Instruction session. In Peer Instruction (Mazur, 1997) instructors pose challenging questions, often related to a concept students have difficulties with. Students answer such questions first individually, often by means of clickers, *i.e.* devices by which they communicate with the computer of the instructor. Quite frequently, such questions reveal disagreement among students with respect to the concept under consideration. The instructor makes use of this by asking the students to turn to their neighbor and convince him or her why their previously given answer must be correct. This invariably leads to vivid discussions among students about the concept at hand. Instructors usually circulate around to eavesdrop into their students discussion and by that learn about their conceptual difficulty. After some minutes of discussion the instructor poses the original question again. Quite often this will lead to the result that most if not all students answer the question correctly. Finally the instructor leads a plenary discussion about the reasoning related to the concept at hand.

Besides Peer Instruction Christian Kautz introduced Just in Time Teaching (Novak, 1999) and cooperative learning as time proven and effective means for teaching in dialogue. The former uses pre-lecture reading assignments and web-based questions in order to engage students with subject matter prior to class. Lecture time then will be used predominantly to clarify students' questions. As for cooperative learning Christian Kautz pointed out that suitable and research based materials are available in particular for Physics and Engineering disciplines (McDermott, 2002; Kautz, 2010). He also reported research data showing that methods that interactively engage students actually do help students to overcome their misconceptions.

Karl Smith of the University of Minnesota who also serves as Professor of Engineering Education at Purdue University's STEM Education Center summarized what is known today about how people learn (Bransford, 2000) and the effective design of instruction (Ambrose, 2010). He elaborated on the limits of the transmission model of learning and teaching which well describes the situation in typical class rooms. To contrast he introduced the book ends model to structure lectures which slices a lecture into a sequence of repeated mini-lectures, students' discussions, and usage of feedback instruments (Smith, 2000). As Christian Kautz did before Karl Smith applied the presented ideas throughout his presentation by, for instance, structuring his presentation along the book ends model. He also gave examples of cooperative learning in large engineering classes at various universities in the United States. The data presented by him also strongly indicates that teaching and learning in dialogue leads to far better conceptual understanding by students.

The workshop provided to the participants space and time for exchanging their experiences (positive and negative) on teaching and learning in dialogue. They did so in a think-pair-share session, a method often used to engage students in meaningful dialogues about subject matter. To this end participants were first asked to summarize individually strategies they have tried to engage students. Then they teamed up in pairs to share their strategies and to list the challenges they had faced. In a last step pairs joined into groups of four in order to discuss possible changes to their teaching that help to overcome these challenges. The panel experts provided assistance by circulating among participants and later by answering open issues which had not been clarified in the think-pair-share session. By and large, however, most issues had been resolved by the participants themselves. Most prominent among those were:

Challenge: Lack of time

Solution: Focus on what students are struggling with; avoid focusing on content coverage

Challenge: Too large groups

Solution: Read more on alternatives to cope with large groups

Challenge: Getting/creating good questions/teaching materials/problems

Solution: Cooperate with other instructors; seek opportunities to listen to students' thoughts; materials and even research based materials are available in print and on the web

Challenge: Attitudes of students

Solution: Influence atmosphere to avoid fear of mistakes; clickers strongly support that; be patient and persistent

Challenge: Lack of training for instructors

Solution: Seek to educate oneself about effective techniques

Serving itself as a model for teaching and learning in dialogue the panel ended with a "bookend" by asking the participants for feedback. All but two of the 23 participants considered the workshop to be relevant or extremely relevant for their teaching. Two thirds viewed understanding how learning works and why learning often does not take place as a key for improving their teaching rather than searching for suitable methods or hoping for better boundary conditions.

References

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