

A Practice of Using Research Seminars in Teaching Advanced Students

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Teachers have been long relying on traditional classroom lectures in educating students. Though this might be an efficient way in conveying massive information to audience within a short time period, it has been proven to be hard to achieve deep learning for students. According to [Kiewra, 2002], only 20-40% of important lecture ideas could be recorded by students in notes, and students could remember 50% of noted information but only 15% of non-noted information by the time of a test. It must be unrealistic to expect students to understand all things by listening to them for the first time [Mertens, 2012]. To improve students' learning, the teaching method should be changed from teacher-centered paradigm to student-centered paradigm, as students will be able to remember and understand more things when they are actively involved in the learning process. Exercises and homework assignments could complement the traditional classroom lectures as students are requested to take responsibilities in their own learning. But exercises and homework assignments not necessarily lead to an active learning, especially when the exercises and homework are not assigned to be mandatory and students are not self-motivated. In fact, they might only make a difference on the teacher's side when the teaching becomes passive. Figure 1 shows different teaching methods that lead to either passive learning or active learning. Hands-on lab work, seminars and project-based learning are among the teaching methods that lead to active learning. In this paper, I present the seminar method, and in particular, our experience in adopting research seminars in the courses for advanced students.

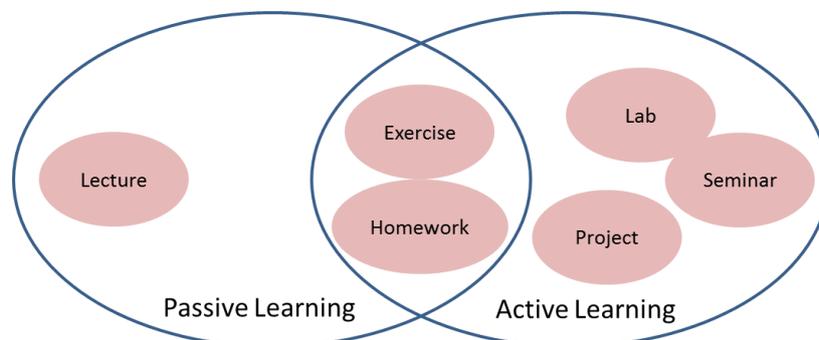


Figure 1: Teaching methods that lead to passive learning and active learning

The seminar method is one of the most modern and advanced teaching method. The word “seminar” comes from Latin and it means seed [Agora, 2009]. It is where ideas and thoughts are propagated. In general, the seminar method encourages active participation from the participants. On a seminar, a group of participants are guided to interact with each other on a theme. The important components of organizing a seminar include: 1. the preparation of the materials to be presented and discussed; 2. a lecture session where background information on a topic are shared with the audience; 3. A discussion session where participants could question and criticize what are presented; 4. Guidance from the chairman to ensure that the discussion is on the right track.

The seminar method motivates participants by actively involving them in the presentation and in the later discussion. It is a good way for socialization. Norms of behavior is developed and learned. Participants develop their questioning skills in a seminar, and they also need to learn to debate with arguments. For the presenter, a deep learning is achieved through the preparation, presentation, and defending of his/her arguments. The participants also learn good communication skills and learn to be open-minded to different ideas.

At Kristianstad University, we have used research seminars in our advanced courses for the students studying embedded computer systems. In our practice, teachers search and collect top quality research articles (from e.g. IEEE and ACM databases) for presentation and discussion on a seminar. A requirement to research papers is that they must belong to a theme that is taught by the course. Very often the research papers are grouped into multiple sub-themes that are covered in a course. Before the seminar, the prepared papers are circulated among the participating students and each student is required to choose one of the papers to read and present. During the seminar, students' presentation and discussion are arranged according to a pre-defined schedule. In our case, each student has 20 minutes to present his/her chosen paper and 5 minutes for questions and discussion. For each theme/sub-theme, a session chair is chosen from the participating students. The session chair is responsible for time management. Several opponents are assigned for each presentation in order to prevent silence from the audience. A teacher's role is for guidance and to ensure the presentation and the discussion is on the right track. The teacher could raise questions both to the presenter and to the other audience to activate discussion. The teacher also has the role of an expert, and is supposed to intervene at appropriate time to correct potentially wrong answers and to complete an incomplete answer. The students' performances on a seminar are examined by evaluating their understanding in the topic and the quality of presentation.

The research seminar method could fulfill our teaching objectives in several ways. Firstly, the research seminar ensures active participation of students and leads to deep learning of a subject. In Annex 2 (i.e. Qualifications Ordinance), Swedish Higher Education Ordinance [Ordinance, 2014], it is stated that students shall demonstrate "knowledge and understanding in the main field of study". Secondly, students' ability in retrieving and processing information is trained, as they must search for materials to support their presentation and argumentation. In Annex 2 (i.e. Qualifications Ordinance), Swedish Higher Education Ordinance [Ordinance, 2014], it is stated that students should demonstrate "the ability to search for, gather, evaluate and critically interpret the relevant information for a formulated problem and also discuss phenomena, issues and situations critically" (for a Degree of Bachelor [Kandidatexamen]). Thirdly, students become aware of the research questions in the taught subject and learn to think critically through reading, presenting and discussing research articles. In Annex 2 (i.e. Qualifications Ordinance), Swedish Higher Education Ordinance [Ordinance, 2014], it is stated that students shall demonstrate "awareness of current research issues" (for a Degree of Bachelor in Natural Science), or "insight into current research and development work" (for a Degree of Master in Natural Science). Fourthly, students learn to communicate properly with their peers and could improve their oral scientific presentation skills through a research seminar. In Annex 2 (i.e. Qualifications Ordinance), Swedish Higher Education Ordinance, it is stated that students shall demonstrate "the ability in both national and international contexts to present and discuss information, problems and solutions in speech and writing and in dialogue with different audiences" (for a Degree of Bachelor in Natural Science), or demonstrate the ability in speech and writing to clearly present and discuss his or her conclusions (for a Degree of Master in Natural Science). In general, students learn a typical approach used by the scientific community while developing their performance skills [Handbook, 2009].

In conclusion, the seminar method, which is widely used in scientific community, could be used as a teaching method that leads to active and deep learning. It motivates students to actively gather and process information, and it trains students' skills on questioning, presenting and debating. The seminar method also has requirements on time management and on flexibility. Unforeseen events might happen on a seminar as there is no rehearsal. Therefore, it should only be implemented by experienced teachers. A successful seminar also requires all its participants to already have some pre-requisite knowledge on the subject. Therefore, it might not be a suitable teaching form for low grade students. As to a course arrangement, it is recommended to put seminars close to the end of the course schedule in order to facilitate fruitful discussions on seminars. On the year 2013, course evaluations were made to two master level courses that the author was teaching through the university's EvaSys system. It turned up that the students liked research seminars a lot and they wanted more. As to the two other teaching methods that were also adopted in the same courses, the students expected more lab sessions but less lecture sessions. It should not be comprehended in the way that research seminars will replace lectures (for advanced students). No, it will not happen. In any subject, we would need some time slots in order to teach students facts and basic theories. It is only a question whether it is right to use up all available time on lecturing students.

References

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