

# Peer-Assisted Learning in Mathematics In Higher Education

Dr G. Nilsson

*Abstract— This paper explores opportunities for implementing a peer-tutoring system in mathematics in two contrasting settings: a traditional classroom environment with a teacher-centred educational process and the higher education environment where a range of student-centred teaching and learning methods has already been introduced. After a series of PAL sessions a questionnaire was distributed and in-depth interviews with the peer tutors were conducted. The analysis of the impact of peer-assisted learning (PAL) on the students' learning experience showed that the majority of students positively evaluated their PAL experience. The students felt that they were more actively engaged with and more in control of the learning process than during a traditional tutorial. This study demonstrated that the size of the groups, timing and the number of PAL sessions are crucial for successful implementation of PAL. The paper concludes with the recommendations for using PAL in a variety of educational settings.*

*The higher education sector has been experiencing a dramatic change during the past decade: it is rapidly expanding both in the number and diversity of students. Student to staff ratio has enormously increased. The students are coming from different ethnic, social, and cultural backgrounds and have different levels of knowledge. The change in higher education from an "elite" to a "mass" system creates new challenges for educators. At the same time, the main features of the modern knowledge-based society, the society we live in, are the fast pace of technological advancements, interdisciplinary work organisation and globalisation of the work market. Educators in Europe are facing new challenges in preparing young people for their social and professional integration, successful career and personal development.*

*The appropriate choice of teaching methods which meet the demands of the knowledge-based society, influence the learning process and accommodate the needs of young generation is crucial in achieving these tasks. Implementing student-centred approaches in the educational process creates the learning environment which stimulates students' learning developing their ability of independent and deep learning.*

*Index Terms— Peer-Assisted Learning, Peer-Tutoring, Mathematics, Higher Education*

## I. THEORETICAL FRAMEWORK

THIS study is underpinned by the socio-cultural theory of the learning processes which was originally formulated by Vygotsky and is based on

the idea that knowledge is socially and culturally constructed [1-4]. On the other hand, the research has also demonstrated

that the teaching practices that teachers adopt affect students' learning process. Our study adopted teaching methods based on the learning-focused conception. PAL is an example of a student-to student support scheme grounded in collaborative learning. PAL is aimed to improve student performance and to develop a range of study skills through creating an informal environment for learning. This method has been applied across a range of disciplines and is becoming an important part in programmes' delivery.

## II. METHODOLOGY AND RESEARCH DESIGN

This study is an on-going collaboration between University West, Sweden and Lancaster University, UK [5-8]. Our study was carried out in 2009 in Sweden and England. The English educational environment can be characterised as traditional classroom environment with a teacher centred educational process. In the case of Sweden, a range of student-centred teaching and learning methods has already been introduced.

The research carried out had the following objectives:

- To explore opportunities for implementing PAL in traditional classroom and in university settings to enhance students' performance.
- To evaluate and compare the quality of students' experience of using PAL in both settings;
- To analyse the challenges teachers face in implementing innovative approaches to teaching and learning in two different settings.

The amount of 96 first year students on the Land Surveyors and Mechanical Engineering undergraduate programmes from the University West (Sweden) and 48 students on Mechanical Engineering in Lancaster participated in this study. PAL sessions have been incorporated into the Physics subject and 'Mathematics' module delivery. The lectures were delivered in a traditional way; several PAL sessions were introduced during tutorials. English students were grouped according to their performance. Swedish university students were randomly divided into groups. A peer tutor from the same student cohort was assigned to each group and trained.

### III. FINDINGS AND CONCLUSION

Our findings showed that all English students and over 60% of the students at University Vast evaluated PAL method as useful and valuable. The students highly rated collaboration with peers and commented that it was easier to ask questions, get support and explanation although the English students did not feel confident at the beginning. Both groups of students felt that PAL stimulated their activity, that they were more in control of their learning and found it more enjoyable.

The English students felt more relaxed and were not afraid of getting a low mark as they normally would be in a traditional classroom. The evaluation of students' level of generic and subject specific competences prior to the study and after the study was analysed. The analysis shows that students developed such competences as critical thinking, problem solving, decision making etc which are importance for becoming active members of the society. This study showed that the number of students enrolled on the course, the choice of peer tutors and timing of the sessions are crucial for the successful implementation of PAL.

To learn from this study: Objectives of this study helped to evaluate students experience by assessing the impact of PAL on student competence developing. Both Swedish and English students showed that competences such as problem solving, decision making, capacity to adopt to new situations, ability to explain meaning to others, efficient time management, oral and written communication skills.

Similar project (pilot project), where Swedish and Russian students were compared. This will not be a part of my current presentation, if there is interest toward this I recommend reading "Nilsson G. and Luchinskaya E. Comparative case study of using non-traditional methods in two contrasting educational environments: implementing peer-assisted learning in Sweden and Russia. Paper presented at the European Educational Research Conference, ECER 2009, Vienna, Austria, September 2009."

- [6] Luchinskaya E., Nilsson G. and Williams C., "Developing students' competences in the light of Bologna process: the responses from Sweden and Russia". Paper presented at the European Educational Research Conference, ECER 2008, Gothenburg, Sweden, September 2008.

### REFERENCES

- [1] Vygotsky, L. S. *Mind in society. The development of higher psychological processes.* Cambridge, Harvard University Press, 1978
- [2] Phillips, D. *Constructivism in education: Opinions and second opinions on controversial issues.* Chicago, IL. University of Chicago Press, 2000
- [3] Light, G., Cox, R., & Calkins, S. (2009) *Teaching and learning in higher education: The reflective professional.* Thousand Oaks, CA: Sage, 2009.
- [4] Nilsson G. and Luchinskaya E. "Problem-based Learning and competence development: a Case Study of Teaching Mathematics to Computer Science Students", *Journal of Research in Teacher Education*, 2007, No 3. p 13-21.
- [5] Nilsson G. and Luchinskaya E. *Comparative case study of using non-traditional methods in two contrasting educational environments: implementing peer-assisted learning in Sweden and Russia.* Paper presented at the European Educational Research Conference, ECER 2009, Vienna, Austria, September 2009.