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Description of Research Seminar:
Organizing Teacher Education In
German Universities: An Operations
Research Approach

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Participants: UGOE
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Research Seminar

offered by Bob Grün

in February 2012,

in Auckland, New Zealand

Subject: Organizing Teacher Education In German Universities: An Operations Research Approach

Problem: After the university system in Germany had changed in 2002, the planning of the teacher education became more difficult. Since then, all the students have to attend lectures from three independent departments (educational science, 1st and 2nd subject). Additionally, they have to start their practical training earlier. Since the different lectures overlap several times, the students have problems to finish their studies in the required time period of 6 semesters. For this reason, the university of Kaiserslautern started in 2007 the project StuPlan (**Study Plan**). The aim of this project is to find efficient methods to provide an automated construction of study plans for students for their complete studies. Up to now, the used approach is a graph coloring heuristic. The talk is concerned with an approach to an exact determination of these study plans.

Main Results: Until 2008, the study plans didn't really exist or were constructed manually. Since 2008, the first version of the StuPlan Software computed the plans with the aid of different graph coloring algorithms. The applied algorithms were only heuristics with no indication about the quality of the approximative solution. Additionally, the determination of a single study plan had an average computation time of more than 10 seconds, which is a lot for instant study consulting. Therefore, the goal was to construct an approach which provides an exact solution in a reasonable time. This goal has been achieved with an integer program (IP)

approach with more than one objective function (e.g. no overlapping lectures, equal distribution of lectures over the semesters,...).

In a first step, the objective functions are combined with the scalarization method. The resulting problem can be solved with any integer programming solver. We used the commercial solver CPLEX which is able to solve the IP in a few seconds (1-3 seconds). Due to this, it is planned to implement this approach in the next version of the StuPlan software. Currently, we try to solve the IP model without commercial solvers, i.e. we want to find out why CPLEX is able to provide an optimal solution in such a short time. Unfortunately, until now we were not able to solve the IP model as fast as CPLEX.

In future research, we want to solve the bi-objective problem with the 2 objectives of overlapping lectures and the equal distribution of lectures over the semesters. This is reasonable since the decision maker wants to have more than one solution to present to the students.

Participants: Students and researchers from UOA. Early stage and experienced researchers from UGOE, UNIKL and UOA.