Teaching and Learning with the "Statistical Lab"

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1. Background

The project NEW STATISTICS, funded by the German Federal Ministry of Education and Research, addresses the didactic modelling and the production of multimedia based learning material, to be used in ordinary education at universities. Together with 13 partners from 10 universities we are now running courses with several hundreds of students.

2. The Problem

How to teach students of different faculties and studies in achieving core competences in statistics? How to develop a set of teaching material that can be adapted and used by different teachers in their genuine discipline? Can students be prepared to know not only the theoretical background but also to solve statistical problems? The "missing link" between too abstract theory and real or realistic issues is an often mentioned reason for students' problems in achieving essential skills. So what can we do?

3. The Statistical Laboratory

Within the scope of NEW STATISTICS, we have developed various approaches to tackle the problems. Actually from our point of view it is not the key to drop traditional teaching material, but to emphasize less formal, media based presentations. Our experiences so far show that our so called *Statistical Lab* can take on a dominant role. This interactive and explorative application is designed as a toolbox in order to enable students to "act statistically". But different from other statistical applications (like SPSS or Splus), the *Statistical Lab* doesn't take over the perspective of statistical experts but of statistical learners. More constructivistic elements and instruments come to the fore. Formal aspects – at least within the scope of the *Lab* – take a back seat. The functional complexity of the clearly data oriented *Lab* allows the design and creation of more authentic statistical scenarios. A creative handling of various solutions dominates highly aggregated arithmetic. Added value occurs if teachers contribute their own ideas in the form of individual digital scenarios.
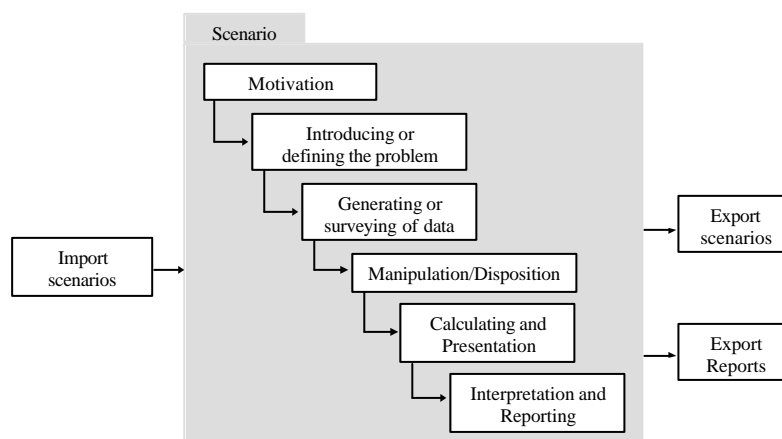

Fig. 1

An ideal type of an "algorithm for problem solving" has been selected as blueprint for the didactic approach (see fig. 1). Given an externally or internally motivated problem or statistical task, the students deal with data, that have to be manipulated, filtered, formed, and presented graphically. The *Statistical Lab* is built on the statistical R-environment (www.r-project.org), so that the individual development of simple or even complex programs based on R works around functional limits of the base architecture.

In figure 2 you can see the *Lab's* runtime environment and examples of the core objects to represent the "workflow of data and solutions".
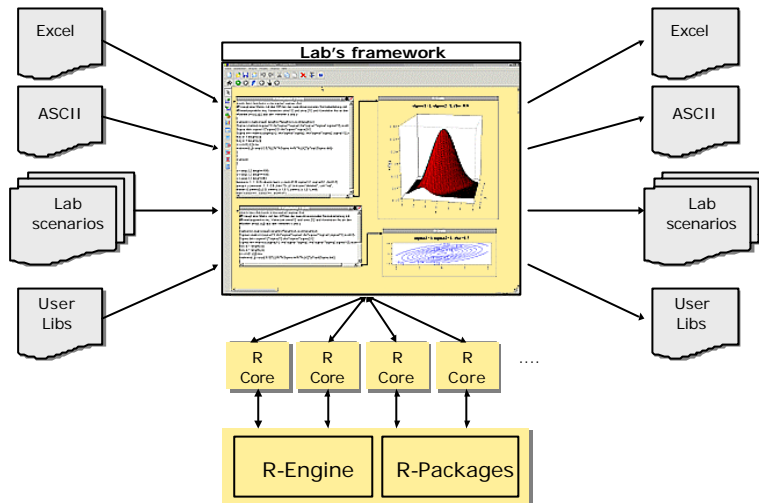

Fig. 2

4. Teaching and Learning

The didactic principles of the *Statistical Lab* aim at a qualitative change of teaching and learning: enabling a problem-oriented and case-oriented access to statistical methods and concepts, support of fault-tolerant and explorative learning on the base of given or self-constructed scenarios, flexible integration in various application scenarios and course formats.

Finally the understanding of abstract statistical methods is highly individual. It can be achieved if students get support for alike "I see"-experiences.

REFERENCES

The R-project: http://www.r-project.org
The project NEW STATISTICS: http://www.neuestatistik.de (only German)

RÉSUMÉ

Le projet "La Nouvelle Statistique", financé par le ministère allemand de l'éducation et de la recherche, s'occupe de la modélisation didactique et de la production de matériel d'étude basé par multimédia afin d'employer ces matériaux de la matière statistique dans l'enseignement traditionnel à l'université. Pour pouvoir appliquer les matériaux en question dans l'enseignement, un laboratoire statistique a été développé. Ce laboratoire sert comme outil numérique à permettre aux étudiants de travailler de façon explorative.