Jan ELEN (Leuven) & Manfred PRENZEL[1] (Vienna)

Editorial: Effectiveness of instructional interventions in higher education

Introduction

Higher education gets constantly challenged by scientific and social developments. The question on whether higher education is performing its tasks well within the given context and whether higher education cannot perform its tasks even better is recurring. The question of the effectiveness of higher education fits seamlessly into this context and is the focus of this special issue.

Answering the question of effectiveness of educational interventions is no easy task for a multitude of reasons. First of all, it is not always completely clear what is meant by effectiveness. In simple terms, effectiveness refers to the question of whether the intended goal was actually achieved with a particular intervention. This assumes that the goal is clear, that the intervention is clear, that it can be clearly established whether the goal has been achieved and that the relationship between the intervention and the achievement of the goal can be clearly established. It is not easy to meet all these conditions: often there are several goals that are intertwined in a complex way and that are difficult to "measure", the implementation of the intervention may be more or less different from how it was conceived or the effect of an intervention is difficult to delineate from the impact of contextual elements or parallel measures. And this immediately touches on a second reason why answering the question of effectiveness of educational interventions is no sinecure. Again and again, it is important to take the context into account as well. The effectiveness

---

[1] email: jan.elen@kuleuven.be, manfred.prenzel@univie.ac.at

of an intervention depends not only on the intervention itself but also, for example, on the target group, the available infrastructure, the current legislation, the time of implementation or the expertise of the teachers.

However difficult, answering the question of the effectiveness of interventions remains an important task because it helps to scientifically substantiate and critically question such interventions. This special issue compiles on the effectiveness of an intervention. The special issue does not zoom in on one particular intervention but shows the diversity in the goals pursued and the interventions used to achieve them. It also shows methodological differences in effectiveness research.

The interventions in the special issue target various challenges for higher education. In addition to cognitive learning outcomes, also motivational, affective and metacognitive goals are aimed at. Some contributions address differences among new students whereas other look for ways in which students can be supported in their efforts to become competent professionals or in which societal issues can be brought into the curriculum. Given the diversity in the goals of the interventions it is not surprising that also the interventions themselves differ in multiple respects such as the focus (e.g., understanding, practice, reflection), the duration, the place in the curriculum (at the start, at the end) or the specific nature (e.g., counselling, gamification, ePortfolio).

The different contributions also reflect methodological diversity. While most are actual intervention studies, there are also more conceptual pieces (discussion of different practices to assess effectiveness, systematic review, etc.). The empirical studies differ in the sample size and the level of students, the nature of the assessment instruments (self-reports, exams) as well as the moment on which the assessment is done (immediate versus delayed results).

It was argued that studying the effectiveness of instructional interventions is complex. The different contributions nicely point this out by repeatedly arguing the need for nuanced interpretation and for explicitly considering the context for the intervention.

Overview

In their contribution ("Measuring effectiveness by evaluating teaching-learning arrangements") *Bianca Pircher and Eva Maria Jabinger* illustrate the diversity of ways in which effectiveness of interventions can addressed. Building on real cases they discuss a variety of measures to point out that 'effectiveness' can have very different meanings. It may relate to student reactions and perceptions over proxy measures and formal assessments. The authors emphasize the need for adequately interpreting statements about effectiveness by explicitly considering the methods used to formulate the statements.

In a study ("The effectiveness of invention activities on student teacher learning" by *Sonja Wedde, Annette Busse and Dorit Bosse* 'epistemic curiosity' and (awareness of) 'knowledge gaps' is aimed at. They analyzed the effects of two approaches to solve problems prior to instruction in a sample of 106 student teachers. In a first approach student teachers were encouraged to invent solutions, in the second approach student teachers studied worked out examples. While the approaches do not seem to result in different effects for 'curiosity', results show that students in the invention group became more aware of knowledge gaps. The study is a nice example of the research in which effectiveness of interventions is studied by looking for differential effects of specific approaches. In these studies, the question is not only whether an intervention is effective but also which approach is more effective than another one with respect to prerequisites of the students.

The recent pandemic has clearly revealed the importance in higher education of students' well-being. In her study ("Bringing stress management into students' curricula: Effectiveness of a holistic stress management intervention") *Natalie Peters* reports the effects of a 'stress management intervention' as implemented in a seminar. Given that for students participating in the seminar perceived stress was lower and contentment with life, well-being, and knowledge about stress and coping was higher in comparison to a group that did not attend the seminar, the stress management intervention is concluded to be effective. The study reflects the broadening scope of goals in higher education and illustrates research on effective-

ness in which a control group is used that does not attend an alternative intervention.

A recurrent point of discussion in higher education pertains to the relationship between higher education and society. Service learning aims to directly address this issue. In their paper ("Effectiveness of Service-Learning") *Peter Slepcevic-Zach and Karina Fernandez* present the results of an intervention study. They registered the perceptions of 82 students on the effects of a service-learning course across three measuring points. In this study the extent to which perceived effects are in line with intended effects is regarded to be a measure of effectiveness. The study further adds to the diversity by looking at long-term rather than immediate effects as the participants were also interviewed three years after completing the course.

Not all students are equally well-prepared for higher education. Numerous institutions offer provisions that may help students to be better prepared. In their contribution ("The effects of STEM pre-courses – A systematic literature review") *Sarah Berndt, Annika Felix and Judit Anacker* discuss STEM pre-courses. Given the potential impact of context on the effectiveness of instructional interventions, it is indicated to look at a multitude of studies prior to make strong claims. A literature review therefore helps to our understanding of the effectiveness of an intervention as it highlights general effects as well as contextual factors that affect the effect. Based on their review Berndt, Felix and Anacker report that pre-courses have rather short-term effects at the subject level, but also non-subject related effects can be retrieved.

Pre-courses are one approach to handle differences among students. Structuring the semester is another one. In their contribution ("Counselling in the introductory phase of studies") *Malihe Brensing, Till Dannewald, Annika Kanzinger, Ulrike Mayer and Joerg Zender* present the effects of such an intervention. Freshmen could choose to have three shorter exams during the semester or one exam at the end of the semester. Individual counselling was made mandatory for those who failed one of the shorter exams. As an indicator of effectiveness it was shown that

after counselling students performed better on remaining exams. It is to be noted that in this study exam results are regarded to be a direct measure of effectiveness.

Higher education aims at preparing students to be competent professionals who are able to apply their knowledge in actual practice. A wide range of interventions is directed towards fostering competence development. In their study ("Acquiring competences for (co-)constructivist, competence-oriented, adaptive teaching") *Matthias Baer, Mirjam Kocher, Anna Locher, and Christine Villiger* discuss the effectiveness of a three-parts intervention with both teacher students and experienced teachers. By doing so these authors highlight the importance of considering the target group when interpreting results of effectiveness studies. Data on a.o. self-assessments of teaching competence and attitude towards (co-)constructivist, adaptive, and competence-oriented teaching from the intervention groups were compared with similar data from two non-intervention groups (both student teachers and experienced teachers). The study illustrates the importance of considering multiple variables but also the complexity that results from doing so.

Preventing dropout and ensuring high learning outcomes are important goals of higher education. Multiple efforts are done to achieve these goals by using digital approaches. One of these approaches is gamification. While theoretically gamification has a huge potential, when, how and for whom it might work remains to be understood. A contribution in this regard ("Gamification: What's in it for engineers? Comparison of two study courses in Germany") by *Tim Pidun* points to the need for further research. Gamification was introduced in two engineering courses that share a computer science module: an economics-oriented and a technically oriented course. Positive effects (as measured on the one hand by exam results, and on the other hand by self-reported skills acquisition perceptions) could be retrieved only in the economics-oriented course, and not in the technically oriented course. The study highlights the importance for replication studies with different target groups in order to better understand the underlying mechanisms that affect effectiveness.

Effectiveness of interventions is not self-evident. That is nicely illustrated by the contribution ("Triggering Factors for (Self-)Reflection. An Inquiry in the Context of an ePortfolio Initiative") by *Gernot Dreisiebner, Peter Slepcevic-Zach and Michaela Stock*. The study pertains to the effects as measured by self-reported competence development of an ePortfolio. The intervention aims at enhancing (self-)reflection. It is shown that obligation is an important triggering factor. The authors claim that in order to be effective integration of interventions in the curriculum is important.

Context does play an important role when it comes to the effectiveness of interventions. That is also exactly what is brought forward in the contribution ("Planning Effective Instructional Interventions") by *Frank Ulbrich*. He proposes an approach to decide when and for whom an intervention is most suited in view of fostering the attainment of intended learning outcomes. In the approach the learners' perspective is explicitly taken into account. The contribution highlights that proactive planning may enhance the effectiveness of an intervention.

Editors

Prof. Dr. Jan ELEN ‖ KU LEUVEN, Centre for Instructional Psychology and Technology ‖ Dekenstraat 2, BE-3000 Leuven

jan.elen@kuleuven.be

Prof. Dr. Dr. h.c. Manfred PRENZEL ‖ Centre for Teacher Education, University of Vienna ‖ Porzellangasse 4, A-1090 Vienna

manfred.prenzel@univie.ac.at

Foto: facesbyfrank