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Back from "guide on the side" to "sage on the stage"? Effects of teacher-guided and student-activating teaching methods on student learning in higher education

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ABSTRACT

This field study compares the effectiveness of teacher-guided and student-activating teaching methods. Expert observations of 80 university courses were combined with self-report data from 1713 students attending the courses. Controlling for students' initial interest on the individual level and for course format, homework, and initial interest on the course level, two-level path analyses with the amount of teacher-guided and student-activating methods as predictors, and students' final interest, subjective learning achievement, and perceived development of academic competencies as criteria – all mediated by the students' cognitive involvement – revealed opposing effects of the two methods. Teacher-guided methods were associated with an increase in students' cognitive involvement, interest, learning achievement, and development of academic competencies, whereas student-activating methods tended to show negative effects.

1. Introduction

In many European countries, student-activating methods in higher education teaching are currently being promoted strongly. The German Council of Science and Humanities (2008, p. 62), for instance, has called for university students to be teachers' active partners in the learning process rather than passive receivers of learning material. These recommendations are reinforced by considerable financial incentives. For the period 2011–2020, the Federal Ministry of Education and Research invested two billion Euros toward improving student support and teaching quality in higher education. This exemplary national policy is interlinked with efforts in the field of higher education at the European level. Fostering student-centered learning became an explicit aim of the Bologna process during the follow-up conference in Leuven in 2009 (EHEA Ministerial Conference, 2009, p. 3 f.). In the Bucharest Communiqué (EHEA Ministerial Conference, 2012) three years later, the ministers again emphasized their commitment to "promote student-centred learning in higher education, characterised by innovative methods of teaching that involve students as active participants in their own learning" (p. 2). According to the European Students' Union (2015), one of the principles of student-centered learning is a preference for enabling over telling: "In simply imparting facts and knowledge to students (telling) the initiative, preparation and content comes mainly from the teacher. The SCL [student-centred learning] approach aims to give the student greater responsibility enabling the student to think, process, analyse, synthesise, criticise, apply, solve problems, etc." (p. 7). In particular, the goal of employability and the corresponding focus on acquisition of skills within the Bologna process led to a call for new teaching formats (e.g., German Rectors' Conference, 2013; Schaper, 2012). According to an expert report on competence orientation in higher education (Schaper, 2012) prepared for the German government, competencies are not gained through receptive

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learning, but require active, hands-on, and problem-oriented engagement with the learning material. Activating teaching formats and situated tasks are not only necessary prerequisites for developing competencies but also entail higher cognitive involvement and deeper processing of the learning contents (p. 56).

The described policy development is in line with the upward trend of the constructivist learning approach. In this approach, student-activating learning formats are believed to lead to deeper understanding, stronger motivation, and greater development of competencies, whereas traditional teaching formats are thought to produce inert knowledge and thus to be less effective. Under the catchy title "From Sage on the Stage to Guide on the Side" King (1993) called for more active, mostly cooperative learning formats in college classrooms as early as 1993. Not every scholar is, however, convinced that these strongly supported and publicly advocated learning formats really render the ascribed benefits. For instance, Tobias (2009) observed about the related literature: "There is stimulating rhetoric for the constructivist position, but relatively little research supporting it" (p. 346).

This study sought to contribute to the empirical evidence on the effects that student-activating and teacher-guided methods have on student learning in everyday university teaching.

1.1. Theoretical debate on constructivism

There is a long-standing debate on the concept of constructivism and its implications for pedagogical practice (e.g., Renkl, 2009; Tobias & Duffy, 2009). The debate originates in diverging understandings and thus inconsistent use of the term *constructivism* and is spurred on by two almost opposing views. One group of scholars thinks of constructivism more as an approach for student-centered teaching and is concerned mainly with specific learning formats (cf. Loyens & Gijbels, 2008; Steffe & Gale, 1995), whereas another faction of scholars puts forward that constructivism is mainly a theory explaining the cognitive mechanics of learning and does not yield immediate conclusions for recommendable teaching methods (cf. Mayer, 2009; Renkl, 2009).

1.1.1. Constructivism as an approach for student-centered teaching

The foundations of constructivism are located in the educational theories of Vygotsky (1978) and Piaget (1952), among others. As the more immediate stimulus for the ascent of constructivism in pedagogy, Tobias and Duffy (2009) point to articles emphasizing that learning is situated and knowledge is a product of an activity in a specific context (e.g., Brown, Collins, & Duiguid, 1989) or promoting the idea that "natural" learning involves socially shared activities, direct engagement, use of cognitive tools, and development of specific skills needed in that particular situation (e.g., Resnick, 1987). The central claim of these constructivist approaches to learning is that learners build up their knowledge themselves by individually discovering and transforming complex information, checking new information against old rules, and revising prior schemata if necessary. Great emphasis is put on students being active learners who are best supported by different forms of student-centered instruction (e.g., discovery learning, cognitive apprenticeships) that work with authentic learning tasks and complex problems rather than simplified ones (e.g., Duffy et al., 1993; Loyens & Gijbels, 2008; Steffe & Gale, 1995). The presumed benefits of these learning approaches include greater sustainability and higher transferability of knowledge and competencies as well as motivational advantages.

According to this understanding of constructivism, student-centered, activating learning environments are more likely to initiate student cognitive involvement than are traditional, teacher-centered settings. High-level cognitive processes are a precondition for desirable learning outcomes such as interest or learning achievement. The acquisition of competencies is deemed particularly dependent on actual experiences, hands-on tasks, project work, or problem-based learning. Traditional learning formats are thought to lead to passive learning, resulting in inert knowledge at best.

1.1.2. Constructivism as a theory of learning

In contrast, Mayer (2009) makes a case for constructivism as a theory of learning rather than as a prescription for instruction. In his understanding, the theoretical core claim of constructivism is that the learner builds mental representations by cognitively processing new information during learning. For Mayer, the "idea that constructivist learning is caused by active methods of instruction rather than by active learning" is the "constructivist teaching fallacy" (p. 188). He stresses that high cognitive activity during learning is not dependent on high behavioral activity. Thus, it may be inappropriate to assume that active cognitive learning requires teaching methods that promote hands-on behavioral activity; it may also be inappropriate to assume that passive instructional methods fail to promote active cognitive learning: "Behavioral activity during learning does not guarantee that the learner will engage in appropriate cognitive processing, and behavioral inactivity during learning does not guarantee that the learner will not engage in appropriate cognitive processing" (p. 185). As part of the ongoing debate, Renkl (2009) pointedly reminded the research community of what, as he sees it, constructivism actually claims – that all learning happens by means of knowledge construction on the part of the learner. There is no other way but for the learner himself to take in the new information, often presented in written or spoken texts, interpret it on the basis of prior knowledge, and integrate it into existing knowledge networks. Thus, every learning environment, if effective at all, will inevitably be constructive; there is no such thing as a non-constructive learning environment.

A growing body of literature aligning with this understanding of constructivism tries to deduce instructional designs from human cognitive architecture. Building on the theory of cognitive load, for instance, instructional techniques like spaced practice, retrieval practice, or worked examples are proposed (cf. Sweller, Ayres, & Kalyuga, 2011). In higher education, learning might be supported by a well-structured presentation of the learning material and by pointing out connections to prior knowledge. This may make it easier for learners to integrate the new information into their existing schemes, which may lead to more cognitive links, a better network, and deeper understanding. However, regarding global approaches like student-activating or teacher-guided settings, scholars refrain from deciding which of the two more strongly supports the construction of new knowledge (Mayer, 2009; Renkl, 2009). It is conceivable that a thoroughly prepared lecture is effective, but also in learning formats where the students themselves become active individually or in a group, they might co-construct knowledge together, or apply and thereby deepen their knowledge. None of the learning formats can guarantee that certain cognitive processes will occur, though. Thus, there is a consensus between the two branches of constructivism that knowledge is built up actively by the learner; but there is disagreement concerning conclusions for pedagogical practice and the teaching methods to be used.

1.2. Empirical evidence for and against the efficacy of student-activating methods

The question of what instruction formats are most effective in higher education triggered empirical research very early on (McKeachie, 1990). Krumboltz and Farquhar (1957) investigated instructor-centered, student-centered, and eclectic teaching and found no significant differences in student learning achievement but diverging results for motivation: Students in the eclectic courses were most highly motivated, the students in the instructor-centered courses ranged second, and the students in the student-centered courses showed the least increase in motivation. A decade later, Webb and Baird (1968) compared traditional teacher-centered instruction to student-centered instruction. Students taught in the student-centered course design had significantly better test scores than the control group with teacher-centered instruction.

Today, a vast number of studies support the superiority of student-centered, activating learning formats in tertiary education. Deslauriers, Schelew, and Wiemann (2011), for example, examined the benefits of teaching approaches involving challenging questions, reasoning, and problem solving in a large-enrollment introductory physics class. Student-activating methods led to higher engagement and much better learning than traditional lecturing. Freeman et al. (2014) conducted a meta-analysis with studies in the STEM disciplines and presented strong evidence for the predominance of activating learning settings in comparison to traditional lecturing: Grade scores were higher and failure rates considerably lower in active learning courses than in traditional ones. These results were robust over various disciplines and course sizes. Dochy, Segers, Van den Bossche, and Gijbels (2003) and Schmidt, van der Molen, te Winkel, and Wijnen (2009) conducted meta-analyses on studies investigating problem-based learning (PBL), a specific form of student-activating teaching that involves small group learning under the guidance of a tutor, work on authentic problems, and self-directed learning. Dochy and colleagues found robust positive effects of PBL on student skills, but a tendency toward negative results for student knowledge. Schmidt and colleagues focused on PBL in medical education and presented similar findings: Students performed much better in professional skills, i.e., interpersonal and practical medical skills, and drop-out rates as well as study time were lower in PBL programs. There were, however, only small and inconsistent differences with regard to medical knowledge and diagnostic reasoning. Tynjälä (1999) conducted a complex qualitative study to compare learning differences in students who studied the course material in a “constructivist” learning environment with regular writing assignments and group discussions and students who were taught in a traditional lecture setting. Although there were no differences between the groups in knowledge acquisition, students in the constructivist learning environment seemed to have acquired more diversified knowledge. When asked about their learning experience, they mentioned more frequently that they had developed their thinking and acquired skills during the course. An interesting approach to investigate the effect of activating teaching methods was taken by Cherney (2008). Instead of comparing groups of students in differing learning environments, Cherney compared undergraduate students’ free recall for course content delivered in differing ways and found that the items that were listed most frequently were concepts introduced through active learning exercises.

In contrast to these findings, however, a number of studies either found advantages of traditional teaching approaches or did not yield any differences at all between the instruction modes. In the attempt to show that student-centered learning environments encourage a deep approach to learning, for example, Baeten, Struyven, and Dochy (2013) compared a lecture-based and a student-centered learning environment. Lecture-based instruction did not lead to a change in the use of the deep approach to learning and brought about only a small increase in the use of surface technics. The student-centered learning environment led to less use of deep approach strategies and pushed students towards a surface approach. Comparing lecture-based and student-activating courses with the same content, Struyven, Dochy, and Janssens (2008) investigated the impact of students’ tastes in teaching methods on perceived quality of the learning environment, their own learning, and their actual performance. The study found that lecture-taught students were all quite content with their course, whereas the opinions on student-centered teaching diverged quite strongly – students felt either extremely positive or extremely negative about it. The students’ likes and dislikes regarding instruction reaped consequences and had a positive effect on their evaluation of the learning environments, their own learning, and their performance. As students liked lectures best, lectures were also attributed the highest quality, best teaching, clearest goals, and most appropriate workload; even on the scales on learning generic skills and independence in learning, lectures scored as high as the highest student-activating course. Furthermore, student performance was also best in lectures; only the student-centered course with a multiple-choice test led to similar results. In another study, Loveland (2014) for two semesters divided an introductory university-level statistics course into two sections – one section was taught entirely in traditional lecture style, the other using active learning methods and a minimal amount of lecturing. Analyzing student exam scores and their attitudes, Loveland found no significant differences in outcomes: The activity-based teaching method did not lead to higher student comprehension or procedural ability, nor did it lead to more positive student attitudes. The student comments indicated a positive response to the activity-based methods but also a desire for more teacher-centered time in the activity course.

Thus, no clear picture emerges from a look at publications on student- and teacher-centered instruction in higher education. This is partly due to the multitude of learning outcomes investigated. For example, student-activating teaching seems to really support the development of practical skills – at least in the PBL-context, but its effect on motivational and attitudinal student criteria is indistinct. With respect to measures of knowledge acquisition in particular, the findings are inconsistent and cannot substantiate the assumption that activating learning entails better understanding.

A challenge connected with the research on teaching methods is the fact that teaching effectiveness will always depend on the concrete implementation of any instructional approach. It is the appropriateness and the quality of realization of a method that is ultimately decisive. So, when comparing different methods, there is always the question of whether the implementation quality really was the same. As a number of studies set out to demonstrate the advantage of one teaching approach – currently mostly student-centered methods, it may sometimes be questionable whether the teaching format in the control condition was implemented as thoroughly as the one under investigation.

1.3. Implications for this study and research question

While there are numerous studies examining the influence of different teaching approaches on various outcome variables in higher education, little research is available on the immediate effect of the teaching methods – the process of learning, the construction of new knowledge itself. Several studies investigated the mediating effect of student engagement in higher education (e.g., Gasiewski, Eagan, Garcia, Hurtado, & Chang, 2012; Zumbrunn, McKim, Buhs, & Hawley, 2014). However, as engagement is mostly conceptualized as a broad construct covering classroom participation as well as the use of support systems like the professors' office hours or supplemental courses (cf. Fredricks, Filsecker, & Lawson, 2016; Sinatra, Heddy, & Lombardi, 2015), these studies hardly offer conclusions about the actual learning process. What is more, visible participation is more likely to occur in small courses, as they provide more opportunity for students to become involved behaviorally (e.g., by doing an exercise). One facet of engagement can equally occur in lectures and may thus be less confounded with the course format: student cognitive involvement. It is also applicable in various disciplines, whereas other measures of engagement may strongly depend on the specific "culture" or "logistics" of a certain subject. To advance the discussion on effective instruction modes based on constructivism, empirical evidence is needed that can trace student success in the outcome variables to their cognitive involvement in class, which was in turn triggered by the respective teaching methods.

In contrast to the majority of studies investigating the effectiveness of teaching approaches, the study presented here does not evaluate student-centered courses that were specifically designed for the purpose of comparison to traditional lectures. It is a field study analyzing "real life" university teaching as it commonly occurs. The subjects of comparison are not entire courses but the amount of certain methods used within each of the university courses investigated. The sample thus contains big lecture courses with activating elements and smaller student-centered seminar courses with teacher-guided parts.

To evaluate learning achievement, we employed two distinct measures – one to assess domain-specific knowledge gains and the other to detect the development of academic competencies, i.e., general abilities such as reasoning, critical thinking, or problem solving, all implicit goals of most university courses. According to Shavelson (2010, p. 18), both of these measures of learning outcome should be considered in assessing learning. Furthermore, our study includes interest as a motivational criterion, since activating methods are often said to especially boost student motivation.

Following the basic constructivist claim that the students' cognitive involvement is the decisive factor for any learning outcome, this paper suggests a mediation model with student cognitive involvement as a precondition for all outcome variables.

Our research question was: How do teacher-guided and student-activating methods in higher education affect student interest, learning achievement, and the development of academic competencies in a field setting, and does student cognitive involvement mediate the effects?[1]

2. Method

2.1. Sample

The sample was obtained at a middle-sized, public university in Germany and consists of 80 courses and the students enrolled in them. The courses were 48 lecture and 32 seminar courses in various academic disciplines, ranging from physics to social sciences, languages, and music: Twenty courses fell into the category of the natural sciences and mathematics, and 60 were in other disciplines. The courses usually consisted of 14 sessions which usually had a duration of 90 min each. The course teachers were asked personally to take part in the study with the incentive of receiving feedback on their teaching; the participation rate was 44%. Of all students enrolled in the courses, 1716 students took part in the entry survey as well as the final survey; 1713 of them have values on the exogenous student variable and are thus included in the analyses for this study. These students (59% female) were on average $M = 23.2$ years old ($SD = 4.3$) and had been studying for $M = 4.2$ ($SD = 2.6$) semesters. They made up 35.2% of all students who took part in the entry questionnaire and differed only slightly from students who did not participate in the final survey. The differences in the personal characteristics and preconditions of the students included and excluded in the analyses were small (max. Cohen's $d = .21$, conscientiousness). Participation was voluntary for both the teachers and students.

[1] We prefer not to use the terms 'teacher-centered' and 'student-centered teaching' in our study, as the teaching provided by an instructor – in any modus – is usually meant to be student-centered. To label our constructs we prefer a terminology that describes manifest, observable occurrences rather than terms that prescribe or interpret them. In this paper, therefore, the term 'teacher-guided methods' refers to methods where the instructor is in the foreground and actively steers students' learning. 'Student-activating methods' comprise all learning formats that activate all students at the same time (e.g., an exercise, a reading task, group work).

2.2. Procedure

The study design was correlational and longitudinal. To assess student preconditions, the students filled out an entry survey in each course during the first two weeks of the semester. At the beginning, in the middle, and at the end of the semester, trained observers visited each course to identify the teaching methods used. The final survey was conducted in the last two weeks of the semester; students were asked to describe retrospectively the course and their own engagement and to evaluate their learning outcomes. The data was gathered during three semesters in the years 2014–2015.

2.3. Instruments

2.3.1. Predictors (course level)

To assess the teaching methods employed in the various courses, trained observers inspected the courses (unannounced) three times, using a standardized rating form to describe each session. The observers were student research assistants who had completed approximately 24 h of training. About 25% of the visits were done jointly to determine the degree of agreement between the raters. Interrater reliability was calculated separately for each semester; the intraclass correlation coefficients ($ICC_{1,1}$) were satisfactory (see below). The three rating scores were averaged for each course. The observers documented the exact amount of time that distinct teaching methods were employed in the classroom. The measure used for the predictors in this study was the share of the total teaching time that was used for the particular type of teaching method. All observed teaching methods were grouped into different categories: The category *teacher-guided methods* included talks by the teacher or a guest speaker, the use of music or videos, and demonstrations by the teacher such as calculations or experiments. The reliability of the three measurements assessed by Cronbach's alpha was .93, indicating a high stability; the $ICC_{1,1}$ for this category in the three semesters were .88, .98, and .81. The category *student-activating methods* included methods that intend to activate all students (as opposed to only a few) without direct involvement of the teacher. Examples are reading tasks, exercises, pair- and group-work, or games. The reliability of the three measurements assessed by Cronbach's alpha was .73, indicating a high stability as well; the $ICC_{1,1}$ for this type of teaching methods were .58, .97, and .93. These two contrasting modes of instruction excluded methods of teacher-student interaction (such as discussions or text work with the teacher) as well as student-guided methods (such as student moderation, presentations, or micro-teaching), where only few students are directly activated.

2.3.2. Criteria and mediator (student level)

We assessed the three criteria – students' final interest, subjective learning achievement, and perceived development of academic competencies – and the mediator – cognitive involvement – at the end of the semester in the final survey (paper and pencil or online version). We developed a six-item scale for *cognitive involvement* that encompassed cognitive aspects of behavioral engagement (cf. Jang, Kim, & Reeve, 2016), focusing on student attentiveness in the sessions and elaborative processes in the aftermath ($\alpha = .82$, e.g., "During this course I was almost always thinking along"; "Sometimes I reflected on the learning content even after the course"). *Final interest* was measured with a five-item scale ($\alpha = .86$, e.g., "I found many of the topics covered in this course very interesting") aligned with the central aspects of interest theory: high subjective relevance, association with positive feelings, and intrinsic character (cf. Schiefele, 1991). *Subjective learning achievement* was evaluated with five items asking about the gain in domain-specific knowledge ($\alpha = .83$, e.g., "I learned a lot in this course"). The third criterion, perceived *development of academic competencies*, was measured by a 14-item scale; the items were derived from statements made by the participating university teachers in preliminary interviews when asked about their teaching goals. The construct had five facets: problem solving, reasoning and arguing, interrelating, adopting multiple perspectives, and elaborating ($\alpha = .93$, e.g., "I learned here to examine something from various perspectives or using distinct theories"; "I was encouraged to scrutinize data, assumptions, or the like critically"). The wording of the scale was similar to the wording of the generic skills scale of the Course Experience Questionnaire (Wilson, Lizzio, & Ramsden, 1997) and the knowledge processing scale of the instrument by Braun and Leidner (2009); the content also resembled the cognitive skills scale of the Personal and Educational Development Inventory (Lawless & Richardson, 2004). As recommended by Braun, Woodley, Richardson, and Leidner (2012), all four scales referred explicitly to the courses under investigation. Answers were given on a 6-point Likert-scale (1 *disagree*, 6 *fully agree*).

2.3.3. Control variables (student and course level)

To account for the influence of the students' preconditions – both on the course and on the student level, their interest in the course was assessed in the entry survey and used as a control variable: *Initial interest* (Schiefele, 1991) was measured with a seven-item scale ($\alpha = .89$, e.g. "I find many of the topics covered in this course very interesting"); answers were again given on a 6-point Likert-scale (1 *disagree*, 6 *fully agree*). To be able to investigate simultaneously teaching methods in distinct types of courses without neglecting their organizational differences, we also included the control variable *course format* (dichotomous: 0 *lecture*, 1 *seminar*). In Germany, lectures often imply large student numbers and teachers imparting a broad subject matter, whereas seminars usually come with small learning groups and an elaboration of more specific learning content with stronger student participation. However, courses of both formats vary in size and learning arrangement, blurring the lines. Lastly, a supplementary didactic feature of university courses that is meant to influence the students' cognitive involvement was included in the analyses to bring about the specific effects of the teaching methods: *homework*, i.e., obligatory learning activities outside of class (dichotomous: 0 *no*, 1 *yes*).

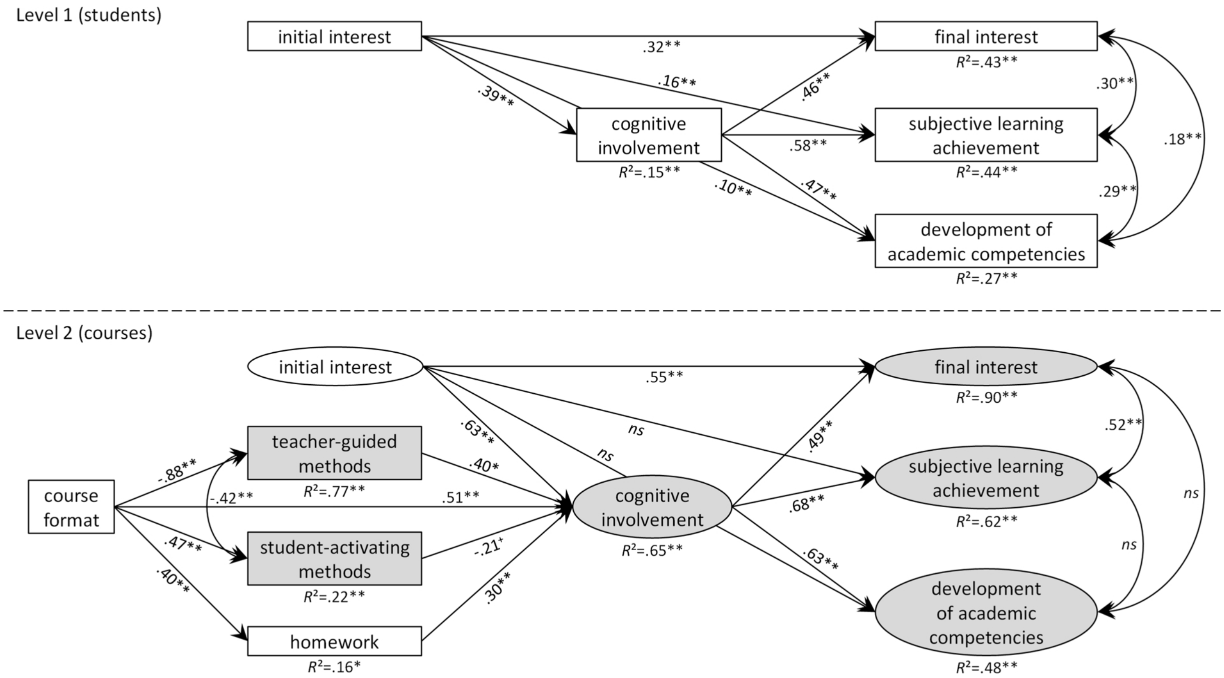

Fig. 1. Two-level path model of effects of teacher-guided and student-activating teaching methods in higher education on student learning outcomes mediated by student cognitive involvement with standardized coefficients; highlighted in gray is the theoretical model under investigation. $\chi^2(17) = 38.5$, $p = .00$; RMSEA = .03; CFI = .99; TLI = .98.
$^+p < .10$. $^*p < .05$. $^{**}p < .01$.

3. Results

Teacher-guided methods were found in almost every course ($n = 77$) and made up $M = 64.0\%$ ($SD = 34.5$) of the total teaching time in that subsample. Student-activating methods were less prevalent ($n = 32$) and, if employed at all, consumed on average $M = 13.8\%$ ($SD = 9.2$) of the teaching time.

Over all the courses, the students indicated average cognitive involvement of $M = 4.1$ ($SD = 1.0$). The average final interest amounted to $M = 4.1$ ($SD = 1.1$), mean subjective learning achievement was $M = 4.5$ ($SD = 1.0$), and development of academic competencies was indicated as $M = 3.2$ ($SD = 1.1$) on average.

To test our theoretical assumptions, we ran a two-level path model with the two teaching methods as predictors, and final interest, subjective learning achievement, and perceived development of academic competencies as criteria, all mediated by student cognitive involvement, using Mplus 7 (Muthén & Muthén, 1998–2014). Direct paths to the criteria were omitted; the model fit values assent to this decision. The $ICC_{1,1}$ of the dependent student variables, which indicate the agreement of the students within their course, ranged between .16 and .24, confirming the appropriateness of the multi-level approach. Fig. 1 displays the results.

Teacher-guided methods had a positive effect on student cognitive involvement. Student-activating methods, however, showed with $p = .07$ a marginal negative effect. Cognitive involvement in turn had strong positive relations with all three outcome variables, both on the individual and the course level, and thus served as a mediator.

As the main model featured rather high correlations between several predictor variables and as multicollinearity may lead to unreliable results, successive analyses were run to separately investigate the two teaching methods in lectures and seminars respectively (cf. Figs. 2 and 3). To support the analyses in the smaller seminar sample, two paths, which were not significant in the main model, were fixed to zero.

The effect of teacher-guided methods remained stable in lecture courses but did not reach significance in seminars. The negative effect of student-activating methods, in contrast, was only marginal in lectures but significant in seminars.

4. Discussion

This study investigated the effect of teacher-guided and student-activating teaching methods on student cognitive involvement, interest, learning achievement, and academic competencies in higher education. In accordance with the basic idea of constructivism – that learners build up new knowledge themselves – a mediation model was proposed with cognitive involvement conveying the effects of the teaching formats to the outcome variables. To increase the generalizability of the results, the study included university courses, both seminars and lecture courses, across disciplines. To further ensure ecological validity, the study refrained from comparing courses specifically designated as innovative to deliberately traditional courses in an experimental setting and instead

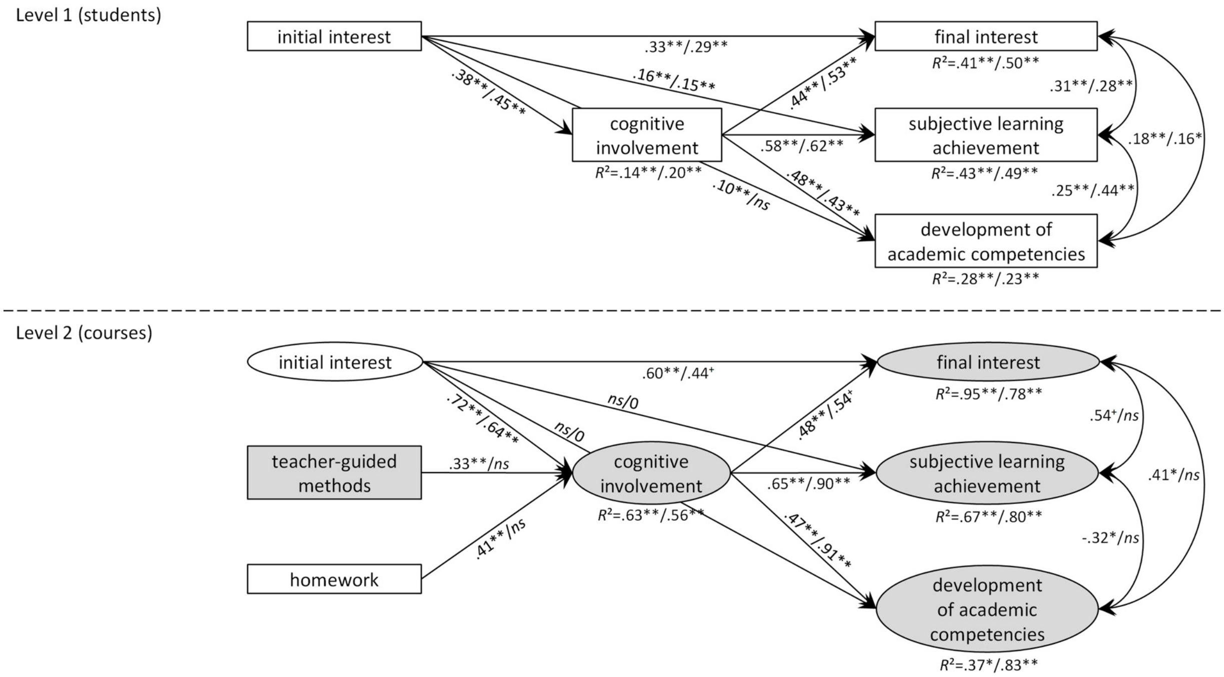

Fig. 2. Two-level path models of effects of teacher-guided methods in higher education on student learning outcomes mediated by student cognitive involvement with standardized coefficients, computed for each course format separately (lectures/seminars); highlighted in gray is the theoretical model under investigation. Model fit for lectures: $\chi^2(6) = 15.9$, $p = .01$; RMSEA = .04; CFI = 1.00; TLI = .98. Model fit for seminars: $\chi^2(8) = 10.6$, $p = .22$; RMSEA = .03; CFI = 1.00; TLI = .99.
$^+p < .10$. $^*p < .05$. $^{**}p < .01$.

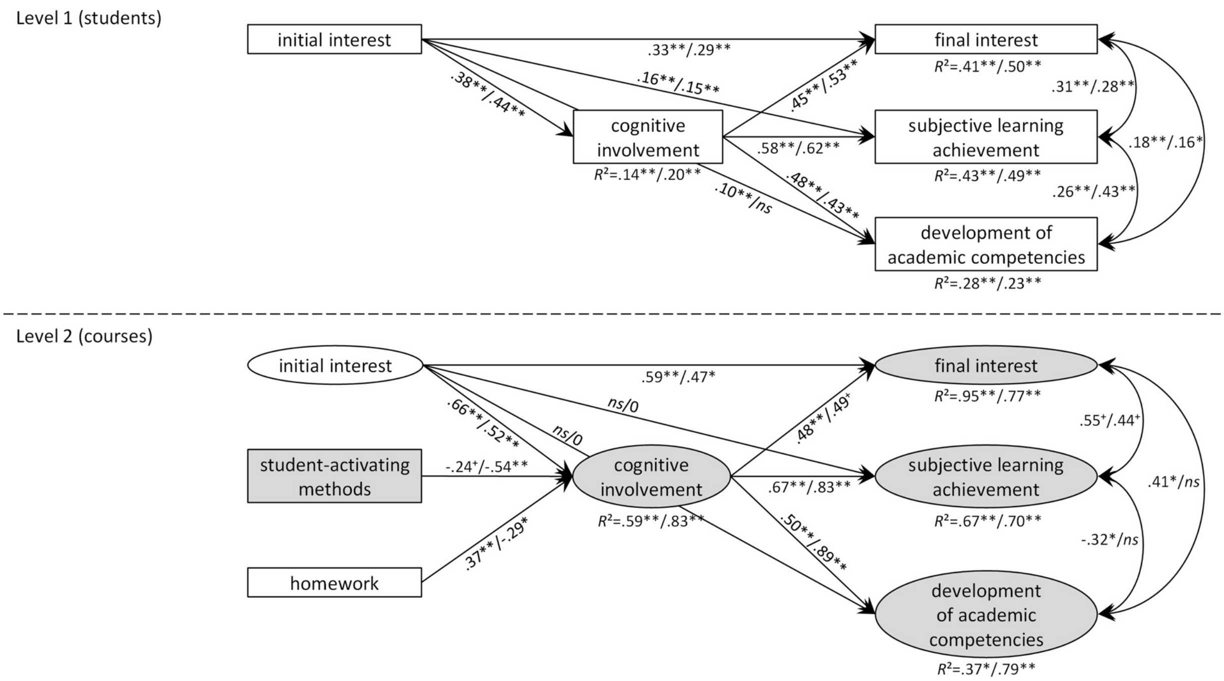

Fig. 3. Two-level path models of effects of student-activating methods in higher education on student learning outcomes mediated by student cognitive involvement with standardized coefficients, computed for each course format separately (lectures/seminars); highlighted in gray is the theoretical model under investigation. Model fit for lectures: $\chi^2(6) = 10.7$, $p = .10$; RMSEA = .02; CFI = 1.00; TLI = .99. Model fit for seminars: $\chi^2(8) = 7.6$, $p = .47$; RMSEA = .00; CFI = 1.00; TLI = 1.00.
$^+p < .10$. $^*p < .05$. $^{**}p < .01$.

investigated real life teaching at a middle-sized, public university. Expert ratings of the teaching methods employed were combined with student self-reports at the beginning and at the end of the semester, and two-level path analyses were carried out.

The results indicate oppositional effects of the amount of teacher-guided and student-activating methods in higher education teaching on student learning. While the use of teacher-guided methods seems to promote cognitive involvement – at least in lecture courses, the use of student-activating methods tends to have negative effects. This result complements the findings of previous studies (e.g., Baeten et al., 2013) but contradicts the research supporting the superiority of student-activating methods.

The suggested mediation model can be approved: The data conform to the hypothesis of cognitive involvement transmitting the effects of teaching methods to the outcome variables. Hence, the results are in line with constructivist learning theory regarding cognitive involvement as the prerequisite for learning. Only if a learner is actually thinking along and elaborating new information may he or she adopt higher interest, acquire greater learning achievement, and develop academic competencies.

4.1. Effectiveness of teacher-guided and student-activating methods

With regard to the positive association between teacher-guided methods and student cognitive involvement, it must first be stated that it is indeed misleading to label learning as *passive* in these learning formats. At the same time, it can be questioned whether behavioral activity indicated by the amount of time spent on student-activating methods actually supports or instead hampers cognitive involvement. Apparently, high behavioral activity does not automatically lead to cognitive activity (cf. Mayer, 2009). Concerning the debate on teaching approaches in higher education and other settings, we therefore advocate careful and clear use of language. From our point of view, the distinction between passive and active learning is not helpful. We agree with Renkl (2009) that learning is always an activity per se; there is no such thing as passive learning. And regarding the categorization of instructional settings, we also recommend avoiding the use of *passive* as an attribute. Listening is also an action, and it can prove conducive to learning. Whether a learning format involves hands-on activities or more cognitive reconstruction on the part of students should be expressed by describing what is actually happening without inferring the respective learning process (e.g., student-activating methods, teacher-guided methods).

Now, how can the effects of the two distinct teaching methods on the criteria be explained? The growth of student interest in courses with longer teacher-guided phases might be ascribed to the greater appearance of experts who may raise interest by somehow transmitting their own enthusiasm for the subject matter (cf. Patrick, Hisley, & Kempler, 2000). A possible explanation for the positive influence of the teacher-guided methods on the perceived development of academic competencies is Banduras' (1977) theory of model learning. Here, the learner re-enacts or reproduces observations of a role model, which may lead to a change of attitude or behavior. In higher education, students could thus learn and adapt to the academic way of thinking and arguing by listening to and observing their teachers. Whereas hands-on approaches in teaching might indeed be required for the development of practical abilities, the scientific thinking and reasoning might also be acquired – and possibly more effectively – in lecture settings through model learning. Learning how to think and reason academically by observing a "sage on the stage" during teacher-guided methods seems more likely than by working alone or with fellow students during activating phases, where the teacher operates only as a "guide on the side".

However, the results counter to the activating methods and in favor of lecture-style teaching may also partly be explained by students' personal likes and dislikes regarding teaching formats (cf. Struyven et al., 2008, see also Hativa & Birenbaum, 2000). It is well conceivable that a certain sense of appropriateness about how to study at university is decisive for acceptance and evaluation of any learning format. Activating teaching methods might be rejected just because they are not well liked or deemed inappropriate for higher education, in the sense of, "We are not school children anymore!" But even if the diverging effects of the distinct teaching approaches were indeed primarily caused by the students' taste and not the method itself, this dynamic would need to be considered when discussing the improvement of higher education teaching. The best learning format is worth nothing if students are unwilling to use it.

Another explanation for the findings lies in the question of teaching quality. Higher education teachers might be the most comfortable with teacher-guided methods, since giving talks is part of what they learn to excel at when pursuing a scientific career. Specific teacher training that might provide guidance on using activating methods in teaching is still not widespread in many countries. Hence, the quality of the well-known methods might be better. Following this path of argumentation, however, it must be kept in mind that if alternative teaching formats are being used at all, it is likely by people who are convinced of their usefulness and who try to implement them the best they can.

However, in regard to the above interpretations of the study's findings, it should be remembered that all the effects on the course level only refer to the part of variance that is explained by the level two variables (between 16% and 24%). Thus, when explicating the opposing effects of teacher-guided and student-activating methods, practical significance should not be overrated.

4.2. Limitations of the study

A number of limitations restrict the explanatory power of the study. First of all, the correlational design does not allow for straightforward causal interpretation. We attempted to rule out as many contesting explanations as possible through the inclusion of control variables. But indubitably there are decisive aspects of teaching, such as the level of demand or the speed of teaching, which may influence the students' cognitive involvement, that were not considered within the study.

Second, the two predictor variables are distributed rather unevenly. While most of the courses involved teacher-guided methods – many of them even predominantly, quite a large number of courses did not employ activating methods at all or only in very small doses. On a descriptive level the information about the occurrences of the methods is quite an interesting finding in itself. However, the analyses would certainly become more reliable and more meaningful if the sample contained more courses with larger portions of activating methods.

Third, it is important to note that learning achievement and development of academic competencies were assessed via student self-report. This might affect the validity of the measurement. Self-reported indications of learning outcomes may in particular be influenced by the students' likes and dislikes of the teaching. Nevertheless, as students' self-ratings of their achievement have been shown to correspond with objective achievement measures (e.g., Cohen, 1981), students' subjective assessment of their learning progress was deemed a suitable indicator in this study. Due to strong deviations in grading styles between but also within disciplines, it did not seem appropriate to use the actual grades given by the teachers. Similarly, it was not feasible to construct and use an overall achievement test, since the courses covered completely different content and were on different levels of demand. Concerning the evaluation of competencies, observation of actual behavior or some kind of hands-on test might seem to be more valid modes of assessment at first sight. However, self-report of competencies is still widely accepted as an appropriate measure (cf. Braun et al., 2012). Moreover, the academic competencies investigated in this study, which include, among others, a different mind-set or a change in values and approaches to scientific questions, may prove difficult to assess in a more practical context, as they may manifest differently across disciplines and are hardly observable.

Fourth, the time point of measuring student cognitive involvement – the mediator in our theoretical model – may be a limitation. As it was assessed retrospectively in the end of the semester together with the three final criteria, the associations among these variables might be overestimated.

Fifth, another point of critique may concern the measurement of the predictors: Of course, three observed sessions are only a small fraction of a whole course and there may be doubts as to whether this "extract" really reveals the usual teaching methods used. The reliability of the three ratings is satisfactory, though, indicating a good stability of measurement.

Sixth, we did not consider the varying academic disciplines in our study. It is possible that there are differential effects in certain subjects. Due to the sample size, analyses with subsamples were impossible. However, it was also the primary aim of this study to investigate preferably general relations between teaching methods and student learning, independent of disciplines.

Last, aside from aspects pertaining to the measurement of the investigated constructs, the reader may perceive the lack of a quality check of the employed teaching methods to be a serious limitation of the presented study. Of course, a measure assessing appropriateness and implementation quality of the different teaching methods would have been helpful to determine whether the reason for their effects lies with implementation issues rather than with the method itself. From our point of view, however, an assessment which is applicable to diverse ways of teaching and allows for their comparison seems hardly feasible. Instructional methods such as lecturing or group work come with specific requirements for a high-quality implementation, so that general quality criteria may not exist.

4.3. Conclusion

Even though this study may have its shortcomings and the effects of the distinct teaching methods must not be overrated, the results make an important contribution to the empirical base for educational theory building and political decision making.

Do our findings indicate that university teachers should stop being the guide on the side and return to being the sage on the stage (King, 1993)? We refrain from deducing this kind of prescription. However, the empirical data suggest that there might be a disadvantage in using student-activating methods, whereas teacher-guided learning formats seem to be beneficial. We therefore do call into question the blind plea for activating methods in higher education and stress the need for a stronger empirical basis – and as such, for additional meaningful studies. The results presented cast doubt on the quality of activating methods currently employed in university teaching. Any advances towards increased use of activating methods in higher education would need to be accompanied by concrete recommendations concerning measures of quality assurance.

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