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University instructors' implicit theories of intelligence, achievement goals for teaching, and teaching quality

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ABSTRACT

University instructors' goals for teaching are important for teaching quality. However, studies examining factors that shape instructors' goal adoption are lacking. Using data from 785 instructors, we investigated whether implicit theories (ITs) about the malleability of intelligence constitute one such factor. Following achievement goal theory (AGT) and Dweck's achievement motivation framework, we analysed whether differences in teaching goals are attributable to differences in ITs, and whether goals mediate the relation between ITs and instructional quality. Structural equation modeling (SEM) yielded the expected relations between goals and instructional quality (positive for mastery and performance-approach goals; negative for performance-avoidance and work avoidance goals). As hypothesized, stronger endorsement of incremental ITs was positively related to mastery, and negatively to work avoidance goals. However, ITs were unrelated to performance goals. Indirect effects of ITs on teaching quality via goals were significant but rather weak. Implications for research and fostering teaching motivation are discussed.

Introduction

Recent scholarship on higher education faculty demonstrates: their motivation matters (Watt & Richardson, 2020) – for their occupational success and wellbeing (Hall et al., 2019; Stupnisky, BrckaLorenz, et al., 2019), students' learning outcomes (e.g. Umbach & Wawrzynski, 2005) and, by implication, scientific progress, and societal development (Daumiller, Bieg, et al., 2020; Daumiller, Stupnisky, et al., 2020). Teaching is a core task within this professional context: Instructional quality is of central importance for higher education (Smith & Baik, 2019), and its delivery a core indicator of academics' success. Mounting evidence in this burgeoning research field indicates that individuals' achievement goals for teaching can substantially influence the quality of instruction (Daumiller et al., 2016, 2019). Considering the functional importance of instructors' achievement goals for instructional quality, identifying factors that shape individuals'

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goal adoption and thus present potential starting points for fostering faculty motivation is an important next step for this field.

This study examines whether instructors' implicit theories (ITs) about the fixedness versus malleability of intelligence constitute one such factor shaping goal adoption, as implied by Dweck's (1999; see also Dweck & Leggett, 1988) influential social-cognitive framework of achievement motivation. Within this model, individuals' theories about intelligence are viewed as core determinants of their goal setting, while goals, in turn, are posited to regulate achievement-related behaviors. Since the models' inception, the proposed relations between its component constructs have undergone extensive testing, and meta-analytic summaries of this work suggest that, on average, ITs about intelligence are systematically linked to different goals, achievement behaviors, and academic achievement (Burnette et al., 2013; Sisk et al., 2018). The bulk of this research has focussed on students and academic learning, but studies targeting domains, such as sports or management (e.g. Thadani et al., 2015) have become increasingly frequent.

In contrast, linkages between teachers' ITs of intelligence, achievement goals for teaching, and relevant outcomes, such as teaching quality, have received surprisingly little attention. This is particularly true for the context of higher education, and for the mediational mechanism linking ITs with achievement outcomes via achievement goals as proposed by Dweck (1999). As detailed below, the latter applies to research on Dweck's model more generally, and studies testing the full-fledged mediation hypothesis beyond its single constituent paths have produced inconsistent findings (see Smiley et al., 2016, for a review). Against this background, we investigated whether differences in university instructors' achievement goals for teaching are attributable to differences in their theories about intelligence, and whether their goals mediate the link between ITs and quality of their instruction.

Motivation for teaching in higher education: achievement goal theory

Many scholars in higher education are not only responsible for conducting high-quality research, but also for providing high-quality instruction. As such, good teaching forms an important pillar of occupational success and achievement in academia, and can impact both hiring decisions and tenure. In the German higher education system within which our study was conducted, academic staff are frequently hired based on contracts delineating not only research- but also teaching-related responsibilities, irrespective of academic rank (i.e. often including PhD students; see Daumiller & Dresel, 2020, for details). It thus seems only natural that, for higher education teachers, too, classrooms constitute 'achievement arenas' (Butler, 2012) in which they strive to attain different goals. As reviewed below, research shows that achievement goal theory (AGT) provides a meaningful framework for describing the motivations of university scholars.

Achievement goals can be conceptualized as cognitive representations of end-states in achievement-related situations that individuals are committed to either approach or avoid (Hulleman et al., 2010). Based on their content and valence (i.e. approaching desired *versus* avoiding undesired outcomes), these end-states can be classified

into different goal classes. Within AGT, three goal classes are commonly distinguished: mastery goals[1], performance approach goals, and performance avoidance goals (Elliot, 1999). This trichotomous framework has been widely adopted by researchers studying teachers' achievement goals, but also expanded to include teaching-related work avoidance goals (Butler, 2007, 2012; Gorozidis & Papaioannou, 2016). Accordingly, we examined four major goal classes that constitute well-known sources of motivation for teaching.

Striving to improve one's teaching skills is a prime example for *mastery-oriented* goal setting. Following Elliot et al. (2011; see also Gillet et al., 2015), we differentiate *mastery goals* into two types of goals differing in terms of their underlying standards for defining achievement: learning goals that target the development of one's competencies based on intrapersonal standards as shown in the aforementioned example, as well as task goals focussed on completing tasks correctly/adequately versus avoiding inadequate completion relative to task-inherent standards. *Performance approach* and *avoidance goals*, in contrast, emphasize the importance of demonstrating competence (e.g. appearing as a competent instructor to students/colleagues) and avoiding the demonstration of incompetence (e.g. concealing a lack of knowledge)[2]. Individuals may also be pursuing *work avoidance goals* involving the desire to minimize effort. This goal class, originally proposed by Nicholls (1984), has recently come to be recognized as a distinct source of motivation rather than an indicator of the mere absence of mastery or performance goals (Butler, 2012; King & McInerney, 2014), and may be particularly relevant in contexts encompassing multiple tasks and demands, such as teaching.

While AGT is largely founded upon research on student motivation, recent work on K-12 (Butler, 2012) and higher education (Daumiller et al., 2019) teaching shows that the aforementioned goals capture important differences in educators' achievement goals for teaching and their development of teaching-related competencies. Notably, this research confirms that the differentiation between the aforementioned goals for teaching holds across different status groups of instructors (Daumiller et al., 2019).

Achievement goals for teaching and teaching quality

AGT proposes that achievement goals regulate individuals' affect, cognition, and behavior by providing purpose and direction (Elliot, 1999). The validity of this assumption is well-established for student populations (Huang, 2011; Senko et al., 2011) and, increasingly, for K-12 teachers' goals for teaching (Butler, 2012; Retelsdorf et al., 2010; Retelsdorf & Günther, 2011; Wang et al., 2017). First findings targeting university instructors' goals for teaching suggest these goals impact a host of outcomes, too. These include proximal outcomes such as teaching-related affect, help seeking, and attitudes towards teaching-related professional development (Daumiller et al., 2019; Hein et al., 2019), as well as distal outcomes pertaining to teaching quality that likely results from such proximal effects (Daumiller, Janke et al., 2021). These linkages between goals and teaching quality are of focal interest to this study and will be discussed in more depth after a brief clarification of the construct of 'teaching quality'.

Teaching quality can be conceptualized as the degree to which instructional practice involves student-centered didactics, student support, conceptual/organizational clarity, and other aspects considered 'best practice' in higher education (Smith & Baik, 2019). This conceptualization is reflected in Marsh's (1982) 'Student Evaluation of Educational Quality' (SEEQ) instrument. The SEEQ is an internationally renowned instrument used for obtaining students' evaluation of teaching (SETs) and research on instruction in higher education, and covers nine facets of teaching that correspond to prior theorizing on educational effectiveness. Importantly, prior research indicates teachers are able to reliably evaluate their teaching based on the SEEQ framework (Marsh et al., 1979). Generally, there seems to be consensus that no single source – students, teachers, or external observation – can be considered unequivocally superior. Instead, each source has advantages, and can be subject to certain biases (e.g. Künsting et al., 2016). SETs offer invaluable insight into students' perceptions of, and satisfaction with, instructors' teaching, but they can be distorted by personal preferences/beliefs (Esarey & Valdes, 2020), low response rates, and selection biases. In addition, similar to external ratings, obtaining SETs may not be feasible for studies involving large numbers of instructors and courses. Teacher ratings, in contrast, may be influenced by self-serving biases, but allow for economic assessment. Moreover, as experts on instruction, teachers should – to a substantial degree – be able to provide valid self-evaluations of their instructional practices. In addition to parsimony and face validity, teacher ratings can also have predictive validity for a host of educational outcomes (Künsting et al., 2016; Retelsdorf et al., 2010). Based on these deliberations, this study harnessed instructors' ratings of teaching quality based on the well-established SEEQ framework.

Based on AGT and a review of research on students' as well as K-12 teachers' achievement goals, Daumiller et al. (2016) reasoned that *mastery (learning) goals* for teaching should be positively, and *performance avoidance* as well as *work avoidance* goals should be negatively related to teaching quality. In their study involving over 9,000 students rating the quality of courses taught by 230 university instructors, they found empirical support for these assumptions. Studies relating teaching goals to select aspects of teaching quality, such as instructors' commitment/dedication to teaching (Han et al., 2016) or the use of content-related humor (Daumiller, Bieg, et al., 2020; Daumiller, Stupnisky, et al., 2020) provide additional support for these patterns.

Instructors' *performance approach goals*, in contrast, did not explain significant variation in students' ratings of course quality in the study by Daumiller et al. (2016). Findings linking these goals to achievement outcomes have generally been mixed (Huang, 2012; Hulleman et al., 2010). Research on K-12 teachers' performance approach goals and teaching practices has produced mixed findings as well (Mascret et al., 2017; Retelsdorf et al., 2010; Shim et al., 2013). In the context of university-level teaching, Daumiller et al. (2019) examined relations between different types of performance goals for teaching[2] and teaching quality, and found that instructors' performance approach goals targeting the demonstration of competence positively predicted teaching quality (see also Daumiller et al., 2021). Performance avoidance goals pertaining to avoiding demonstration of incompetence, in turn, negatively predicted teaching quality, in line with prior research on K-12 teachers.

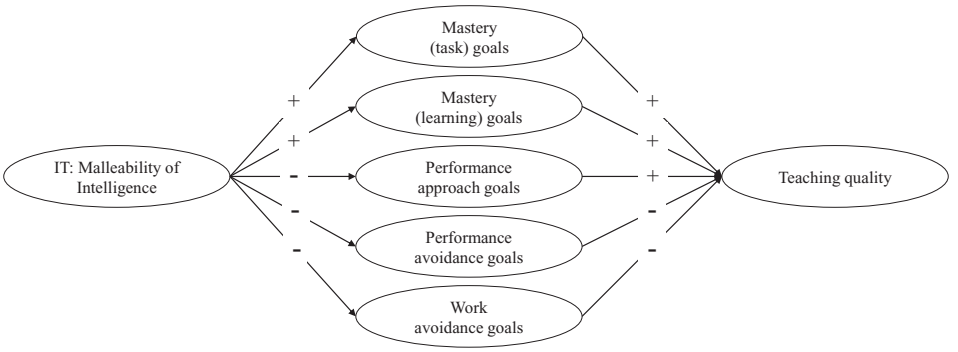

Figure 1. Hypothesized (structural) multiple mediation model. Intercorrelations between goals are omitted.

Based on this available evidence and prior theorizing on university instructors' goals for teaching, we expected instructors' mastery as well as performance approach goals to be positively related to teaching quality. Of note, research on both K-12 teachers' (Mascret et al., 2017) as well as university instructors' teaching-related goals (Daumiller et al., 2019) suggests that task-related goals may be more relevant to teaching quality than learning goals. However, prior work on teachers' learning goals has mostly documented positive effects of both goal classes on student- and teacher-perceived use of adaptive teaching practices (Butler & Shibaz, 2008; Daumiller et al., 2016; Retelsdorf et al., 2010). Moreover, learning goals constitute a core element in Dweck's (1999) motivational framework which is put to the test in this study. Therefore, we included both types of mastery goals in our analysis. For performance avoidance as well as work avoidance goals, in contrast, negative relations with teaching quality were expected (Figure 1).

Implicit theories of intelligence as origins of achievement goals

One important assumption underlying Dweck's (1999) social-cognitive framework of achievement motivation holds that individuals' ITs about the nature of human attributes such as intelligence function as meaning systems that promote perceptions and behaviors consistent with it. Specifically, it theorizes that individuals conceiving intelligence as a fixed attribute ('entity theorists') are oriented towards proving one's given abilities and masking inability (i.e. pursuing *performance approach* and *avoidance goals*), whereas those conceiving intelligence as malleable ('incremental theorists') are oriented towards improving one's abilities (i.e. pursuing *mastery [learning] approach goals*). As illustrated by Smiley et al. (2016), research on student motivation in which the theory has its longest history, has produced mixed findings for these assumptions. Indeed, some studies failed to find systematic linkages between students' ITs of intelligence and their achievement goals, while others report unexpected relations (Burnette et al., 2013).

For instance, Dinger et al. (2013) found that incremental theories predict secondary school students' mastery (learning) goals, as expected, but, surprisingly, not their performance avoidance goals. Further contradicting Dweck's propositions, the latter also

applied to performance approach goals. This finding, was in line with the authors' initial hypothesis suggesting that since entity theorists tend to fear failure feedback, they should be particularly likely to set performance avoidance goals (see Dickhäuser et al., 2016, for similar findings). In an experimental study, Dinger and Dickhäuser (2013) found that university students led to see intelligence as malleable reported higher mastery goals, and lower performance avoidance goals than those led to see intelligence as fixed. No differences emerged for performance approach goals, as anticipated by the authors. However, in two studies examining the predictive power of students' ITs, Cury et al. (2006) found positive relations between incremental theories and mastery (learning) goals, and positive relations between entity theories and both performance approach and avoidance goals, in line with Dweck's model (see also Liu, 2021). In a meta-analytic review, Burnette et al. (2013) found that, on average, incremental theories are positively related to mastery and negatively to performance goals. While relations with incremental theories were stronger for performance avoidance versus approach goals, the authors point out that relations between ITs and achievement goals are small in magnitude.

Turning to research on teacher motivation, evidence for linkages between ITs about intelligence and achievement goals for teaching is limited to few studies in K-12 settings. In a study with US teachers (Shim et al., 2013), entity theories regarding students' intelligence were negatively related to learning approach goals, but unrelated to both performance approach and avoidance goals. Mascret et al. (2017), in contrast, studied K-12 teachers' ITs of intelligence more generally, and examined both learning and task-based mastery goals in addition to performance goals. Correlational analyses revealed positive relations between incremental theories and learning-related mastery goals but, contrary to the authors' hypotheses, not task-based mastery goals, and positive relations between entity theories and both performance approach and avoidance goals.

Further evidence for differential relations between ITs and learning versus task-based mastery goals, and on higher education teachers' ITs as origins of their achievement goals, is lacking. As such, we adopted Mascret et al.'s (2017) original, theory-based hypothesis that conceptions of intelligence as malleable may be positively linked to striving for mastery and competence in terms of both task-based and intrapersonal standards implied by learning-related goals, notwithstanding that relations might be stronger for the latter. Furthermore, as entity theories should instil a general concern for performance evaluation in individuals as argued by Dweck (1999) as well as Cury et al. (2006), we hypothesized negative relations between incremental theories and performance approach as well as avoidance goals (Figure 1).

While work avoidance goals have started to gain attention in AGT, evidence concerning their linkages with individuals' theories about intelligence is scarce. King and McInerney (2014) examined this link in a sample of Filipino students and found that students conceiving intelligence as fixed were more likely to endorse work avoidance goals, presumably due to an increased desire to disengage from their school experience. Following this reasoning, we posited that instructors leaning towards an entity theory of intelligence should be more likely to strive for disengaging from teaching-related work and seeking to avoid effort.

Interplay between implicit theories, achievement goals, and achievement

Dweck's (1999) framework further implies that achievement goals should play an intermediary role in linking individuals' ITs with outcomes. Specifically, it implies that the mediating impact of individuals' goals on achievement behaviors should depend on their perceptions of personal competence. Subsequent research, however, quickly turned to zooming in on select components of this moderated mediation (e.g. Hong et al., 1999), often focusing on direct effects of ITs on achievement rather than testing the full hypothesized model implying a mediation via achievement goals rather than direct linkages. Many early studies setting out to do the latter were unable to unequivocally confirm the model's assumptions (e.g. Dresel, 2001; Smiley et al., 2016; Stipek & Gralinski, 1996). Recent studies such as those reported by Dinger et al. (2013) have set out to test the mediation hypothesis anew based on larger student samples than seen in prior work, as well as more sophisticated latent structural equation modeling (SEM) that accounted for interrelations among achievement goals (see Dickhäuser et al., 2016 and Smiley et al., 2016, for similar findings). Expanding upon Dweck (1999), Dickhäuser et al. (2016) found that students' incremental theories about intelligence positively predicted their academic achievement via mastery (learning) goals and intrinsic motivation. Performance avoidance goals were unrelated to students' ITs and did not exhibit any mediating function, while mediation was neither expected nor tested for performance approach goals. In contrast, in a longitudinal study examining the role of Korean students' achievement goals in linking ITs and standarized test scores, Lee and Seo (2019) found mediating effects of mastery and performance approach goals, but not performance avoidance goals. As such, open questions regarding the mediating function of achievement goals in linking individuals' ITs about intelligence with achievement remain, particularly for performance goals.

As for research on teacher motivation, studies targeting K-12 educational settings have set out to explore the impact of teachers' ITs on instruction, indicating that, for instance, teachers' endorsement of incremental theories positively predicted mastery-oriented instruction (e.g. focusing on individual progress; Matteucci et al., 2017), students' classroom engagement, and student achievement (Bostwick et al., 2020). Furthermore, Vermote et al. (2020) found that university instructors' ITs concerning the malleability of students' intelligence is associated with different teaching practices, suggesting that instructors perceiving intelligence as malleable adopt more motivating instructional approaches that entail the provision of guidance as well as tuning into students' needs (e.g. experiencing learning as personally relevant). Instructors endorsing entity theories, in contrast, reported less student-centered practices. Moreover, of focal interest to this research, recent years have also seen a slow revival of the mediation hypothesis linking ITs with performance outcomes via achievement goals. Shim et al. (2013) probed relations between US K-12 teachers' ITs concerning their students' intelligence, their mastery goals for teaching, and instruction. Using a multiple regression approach, the authors failed to find support for the mediation hypothesis. Additional examinations of the mediating function of teachers' achievement goals are lacking in both K-12 and postsecondary settings.

Against this background, based on our assumptions about links between instructors' ITs about intelligence and their achievement goals for teaching, as well as between their teaching-related goals and teaching quality, we explored whether

instructors' achievement goals mediate the link between their ITs and teaching quality. Initial research suggests that higher education teachers' ITs can influence their readiness to engage in professional development (Thadani et al., 2015) and the use of different instructional approaches (Vermote et al., 2020), but analyses of the possible interplay between ITs, goals, and teaching-related outcomes are missing.

The present research

Building upon prior theory and evidence suggesting that university instructors' achievement goals for teaching are linked to the quality of their teaching, we examined whether their ITs about intelligence relate to interindividual differences in goal adoption and teaching quality. We focused on five distinct goals for teaching: learning- and task-based mastery goals, performance approach and avoidance goals, and work avoidance goals. Based on our theoretically deduced model (Figure 1), we tested three core sets of assumptions:

1) ITs are correlated with achievement goals. Specifically, we expected the degree to which instructors perceive intelligence as malleable to be positively correlated with both task- and learning-oriented mastery goals, and negatively with performance approach, performance avoidance, and work avoidance goals.

2) Achievement goals are correlated with teaching quality. Specifically, we expected task- and learning-oriented mastery goals, as well as performance approach goals, to be positively, and both performance avoidance and work avoidance goals to be negatively correlated teaching quality.

3) The relation between ITs and teaching quality is mediated by achievement goals.

Method

Procedure and sample

We analysed data from the first measurement timepoint of a longitudinal study involving 819 German university scholars (Daumiller & Dresel, 2018; Hein et al., 2019)[3]. Overall, 10,244 scholars from 85 universities were invited to participate (response rate: 67%) and selected from departmental websites to represent a range of domains within the broader fields of the natural sciences, social sciences, and humanities, as well as different academic ranks (e.g. full professors, academic staff with/without PhD) and demographic characteristics (e.g. age and gender). The sample was representative of the academic staff population of the German higher education system (German Federal Statistical Office, 2016).

This study included data from all participants with teaching responsibilities ($N = 785$; $M_{age} = 38.6$, SD = 10.6; 352 female, eight missing). They reported an average teaching load of 5.92 h per week ($SD = 3.54$) in one of 12 different domains (mathematics: 14.6%; educational sciences: 12.2%; German studies: 10.1%; political sciences; 9.0%; sport sciences: 8.8%; romance studies: 8.3%; chemistry: 7.9%; biology: 7.3%; English studies: 7.3%; business studies: 7.3%; economics: 1.5%; pharmaceutics: 1.1%; other: 3.9%). The study was conducted in full accordance with the Ethical Guidelines of the German Association of Psychologists and the American Psychological Association.

Table 1. Descriptive statistics and manifest correlations.

	M	SD	1	2	3	4	5	6	7
1. Implicit theory	5.46	1.78	(.91)						
2. Mastery (task) goals	7.27	0.84	.09**	(.86)					
3. Mastery (learning) goals	6.73	1.18	.16***	.49***	(.90)				
4. Performance approach goals	6.13	1.40	−.05	.23***	.16***	(.87)			
5. Performance avoidance goals	6.24	1.75	−.03	.14***	.03	.51***	(.95)		
6. Work avoidance goals	2.90	1.79	−.09*	−.31***	−.28***	.09**	.15***	(.93)	
7. Teaching quality	6.39	0.72	.15***	.33***	.25***	.14***	−.03	−.23***	(.79)

Note. Internal consistencies (α) in the diagonal in parentheses.
*$p < .05$; **$p < .01$; ***$p < .001$.

Measures

Data were collected via paper-pencil questionnaires sent out to participants. Internal consistencies (range = .79 − .95) of all scales are provided in Table 1.

Implicit theories about intelligence

Instructors' theories were assessed using a German three-item measure developed by Spinath and Schöne (2003). Items were rated on bipolar 8-point Likert-type scales with lower scores reflecting entity theories, and higher scores indicating incremental theories about intelligence. For instance, for the item 'Intelligence is something that, …', answers could range from '… can barely be changed' (1) to '… can be changed' (8). Items were based on Dweck et al. (1995) and have been validated with students at elementary, secondary, and tertiary levels of education.

Achievement goals

Achievement goals for teaching at university were measured using five subscales from the instrument developed and validated by Daumiller et al. (2019). We assessed instructors' task-oriented mastery (e.g. 'In my current teaching activities, my goal is to teach well'), learning-oriented mastery ('… I strive to constantly develop my competencies'), performance approach ('… I want to be perceived as competent'), performance avoidance ('… I want to avoid being perceived as incompetent'), and work avoidance goals ('… I want to reduce my workload as much as possible'). Participants reported on their goals on a Likert-type scale ranging from 1 (*do not agree at all*) to 8 (*completely agree*) with four items per subscale.

Teaching quality

As our sample included more than 800 instructors from 85 different universities, obtaining student course evaluations as a proxy for teaching quality was not feasible. Instead, based on the deliberations on measures of teaching quality outlined in the introduction, participants were asked to self-evaluate the quality of their teaching based on the nine dimensions underlying Marsh's (1982) SEEQ as well as its German adaptation developed by Daumiller, Grassinger et al. (2021): (1) student learning, (2) instructor enthusiasm, (3) organization/clarity, (4) group interaction, (5) individual rapport, (6) breadth of coverage, (7) examinations/grading, (8) assignments, and (9) overall course quality. Ratings were given on a Likert-type scale ranging from 1 (*very poor*) to 8 (*very good*) with one item per dimension. Instructors were given brief descriptions

of each dimension and asked to consider their overall teaching quality based on all courses currently taught (e.g. 'Breadth of coverage: Extent to which you teach taking different perspectives into consideration; e.g., inclusion of current scientific developments, consideration of different theoretical views and backgrounds'). Using exploratory factor analysis, we found the scree plot, parallel analysis, and minimum average partial (MAP) test to point to one-factor solutions of this scale; thus, ratings were averaged for an overall index of teaching quality for each instructor.

Statistical analysis

To test the hypothesized relations, we estimated a SEM using Mplus version 7.3 (Muthén & Muthén, 1998–2017). ITs were modelled as predicting goals for teaching and goals as predicting teaching quality (Figure 1). Correlations between all five goal categories were modeled. Missing data ($\leq$ 2.8% per item) was handled using full-information maximum likelihood estimation. ITs, achievement goals, and teaching quality were modelled as a latent variable with three, four (per goal), and nine indicators, respectively.

Prior to examining the hypothesized structural model, we evaluated the fit of the underlying measurement model including all study variables. Next, we specified a structural model to test for multiple mediation using bias-corrected bootstrapping based on 10,000 samples, and parameters were estimated using robust maximum likelihood estimation to account for non-normal distributions of observed variables. Following Hu and Bentler (1999), comparative fit index (CFI) and Tucker-Lewis index (TLI) values $\geq$ .95, and root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) values $\leq$ .06 can be interpreted as indicating good fit. These values, however, may be overly strict for naturalistic data and should not be used as strict cut-off criteria (e.g. Heene et al., 2011).

Results

Descriptive statistics and correlations

Descriptive statistics for all variables are reported in Table 1. With the exception of work avoidance goals, mean levels of instructors' goals were moderate to high, and particularly high for task-oriented mastery goals. Standard deviations indicate variability in goal endorsement across participants. Instructors' perceived teaching quality also averaged to a moderate-to-high level. Furthermore, instructors substantially differed in their ITs about intelligence.

Zero-order correlations among all variables are shown in Table 1. The correlation between instructors' ITs and teaching quality was small to moderate in magnitude but significant, implying a systematic link between these constructs.

Associations between implicit theories, achievement goals, and teaching quality

The measurement model fit showed a good fit to the data ($\chi^2(443) = 1166.43$, $p < .001$; CFI = .940; TLI = .933; RMSEA = .046, 90% CI [.042, .049]; SRMR = .041), indicating that measures were operating in the intended ways.

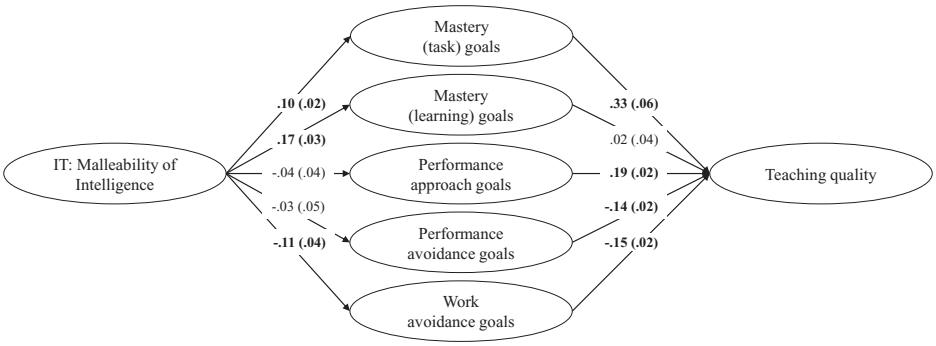

Figure 2. Direct effects estimated as part of the multiple mediation SEM linking implicit theories with teaching quality via achievement goals. Presented are standardized coefficients (standard errors in parentheses). Significant coefficients are printed in bold ($p < .01$, one-tailed). Intercorrelations between goals are omitted.

Table 2. Standardized coefficients and confidence intervals for multiple mediation analysis.

	Estimates			
			90% CI	
Predicted effect	β	SE	LL	UL
IT → Mastery (task) goals → TQ (+)	.03*	.02	.01	.06
IT → Mastery (learning) goals → TQ (+)	.00	.01	−.02	.02
IT → Performance approach goals → TQ (−)	−.01	.01	−.02	.01
IT → Performance avoidance goals → TQ (+)	.00	.01	−.01	.01
IT → Work avoidance goals → TQ (+)	.02*	.01	.02	.03
Total indirect effect (+)	.05*	.02	.01	.08

Note. IT: implicit theory; TQ: teaching quality. Plus signs indicate expected positive, minus signs expected negative effects.
*$p < .05$ (one-tailed).

The mediational SEM also showed a good fit ($\chi^2(444) = 1358.97$, $p < .001$; CFI = .941; TLI = .933; RMSEA = .051, 90% CI [.048, .054]; SRMR = .043). Standardized effects of instructors' ITs of intelligence on their goals are shown in Figure 2. Corroborating our assumptions, the degree to which instructors perceived intelligence as malleable was positively related to task- and learning-oriented mastery, and negatively to work avoidance goals. However, these effects were fairly small. Contrary to our expectations, however, performance approach and avoidance goals were uncorrelated with instructors' ITs.

Standardized effects of instructors' goals on teaching quality are shown in Figure 2. With the exception of learning-oriented mastery goals, all goals showed the expected relations with teaching quality, with effects ranging from small to moderate magnitude. Teaching quality was positively related to instructors' task-oriented mastery and performance approach goals, and negatively to performance avoidance as well as work avoidance goals.

Results of our multiple mediation analysis are reported in Table 2. Partially supporting our assumptions, the effect of instructors' ITs on teaching quality was in part attributable to mediational effects of their goals, albeit to a small degree. Examination of specific indirect effects for the five goals revealed that both task-oriented mastery and work avoidance goals mediated the positive relation between ITs and teaching

quality. No significant indirect effects emerged for the other goals. The model explained about one-fifth (21%) of the total variance in teaching quality.

Discussion

This study examined relations between university instructors' ITs of intelligence and their achievement goals for teaching, and explored whether their goals function as mediators linking their ITs with teaching quality. ITs have attained a prominent status in motivation research, and are widely viewed as important determinants of personal success, as well as focal targets for interventions aiming to foster adaptive motivation in diverse populations (Sisk et al., 2018). Nevertheless, inconsistent findings concerning the interplay between ITs of intelligence, achievement goals, and outcomes continue to cast doubt on the validity of the mediational assumptions underlying Dweck's (1999) motivational framework (Dickhäuser et al., 2016; Lee & Seo, 2019; Smiley et al., 2016). Moreover, research ascertaining whether, and how, ITs endorsed by instructors in higher education – a unique population facing the complex task of balancing teaching and research (Watt & Richardson, 2020) – matter is entirely lacking to date. As their achievement goals for teaching have, however, been shown to matter for a host of outcomes including teaching quality, we tested whether interindividual differences in their theories about the malleability versus fixedness of intelligence are linked to the adoption of different goals.

To do so, we drew on data from a large, nationally representative sample and adopted a latent SEM approach. Herein, we accounted for the known interdependencies among achievement goals by including them in one model (Dinger et al., 2013), and for the domain-specificity of university scholars' achievement goals (Daumiller & Dresel, 2020) by employing a measure explicitly targeting their goals for teaching. Moreover, our model was grounded in the prominent framework of achievement motivation proposed by Dweck (1999; Dweck & Leggett, 1988), and incorporated recent evidence for relations between instructors' goals and teaching quality.

Achievement goals and teaching quality

We first consider relations between instructors' achievement goals and their reported teaching quality as evidenced in our data. The effects ranged from small-to-moderate magnitude, and largely corroborated our hypotheses. Of note, given our analytic approach, these relations represent unique effects of each goal on teaching quality and thus help to elucidate differential but simultaneously unfolding functions of goals for teaching. Specifically, we found that both performance avoidance and work avoidance goals negatively predicted teaching quality, a finding that mirrors prior research on maladaptive effects of these goals in students and K-12 teachers (Butler, 2012; Huang, 2012). In contrast, both task-oriented mastery and performance-approach goals positively impacted teaching quality, as found in prior research on instructors' goals for teaching (Daumiller et al., 2019). Thus, both the aim to master teaching-related tasks and to appear as a competent instructor are associated with higher teaching quality in university settings. The latter relation is particularly interesting in light of meta-analytic evidence suggesting that appearance-oriented performance approach goals are maladaptive for student outcomes (Hulleman et al., 2010), indicating that achievement goals

may function differently for learning versus teaching-related outcomes. Future research should examine such patterns in conjunction with instructors' perceived importance of teaching-related quality relative to other tasks (e.g. research/scholarship).

The expected positive effect of learning-oriented mastery goals on teaching quality, however, did not emerge, suggesting that striving to build teaching-related competencies is unrelated to actual teaching behaviors realized in the classroom. Past studies comparing learning-oriented with task-oriented mastery goals have shown that the latter are more strongly connected to instructional practices in K-12 (Mascret et al., 2017) and university instructors (Daumiller et al., 2019). Learning-oriented goals, in contrast, may be more immediately associated with instructors' attitudes towards, or actual completion of, professional training which, in turn, translate to differences in teaching quality. More research examining these patterns is needed to promote our understanding of relations between achievement goals and teaching in higher education.

Implicit theories and achievement goals

Instructors' theories of intelligence predicted three of five goals in the expected ways. In line with research on K-12 teachers (Mascret et al., 2017), stronger conceptions of intelligence as a malleable, cultivatable attribute were most strongly associated with instructors' learning-oriented goals. They were also positively associated with task-oriented mastery, and negatively with work avoidance goals. These findings suggest that instructors' ITs can orient them towards certain types of goals for teaching. Relations, however, were of small-to-moderate magnitude.

Notably, ITs were unrelated to instructors' performance approach and avoidance goals. These findings contradict our hypotheses predicting negative relations for both goals as postulated by Dweck (1999), and are particularly surprising given our operationalization of these goals: We focused on appearance-oriented performance goals targeting the desire to demonstrate competence and avoid demonstrating incompetence goals which, according to Dweck's work, should come into focus the more individuals perceive intelligence to be fixed. While, more recently, scholars have argued that entity theories should render performance avoidance goals particularly salient, more so than performance approach goals, by inducing a stronger fear of failure in individuals (Burnette et al., 2013), their lack of effect on performance avoidance goals as observed in our study seems puzzling.

Dinger et al. (2013) reported similar findings in a study examining students' ITs and achievement goals. In their study, ITs also failed to predict performance avoidance goals, suggesting that our finding is *not* indicative of motivational processes that are somehow unique to the population under study at present. The authors point out that findings for these linkages have indeed been inconsistent, but also contend that, as outlined by Elliot (1999), performance goal adoption may be driven by an interaction between ITs and perceived competence. Specifically, they argue that individuals should be oriented towards performance avoidance goals if they view intelligence as fixed *and* their competence as low, but were unable to confirm these assumptions in a later study (Dickhäuser et al., 2016). However, interaction effects are difficult to detect, and more research is needed to examine the joint function of potential goal

antecedents using larger samples – an undertaking that certainly applies to research on university instructors' goals as well.

Overall, ITs explained little variance in instructors' goal pursuit. In interpreting this finding, the operationalization of both constructs needs to be considered: While achievement goals were measured in a *domain-specific* manner, our ITs measure targeted perceptions about the nature of *domain-general* intelligence. Future research should examine to which extent instructors' domain-specific theories about the malleability *versus* fixedness of teaching-related abilities (Thadani et al., 2015) account for individual differences in teaching-related goal setting.

Indirect effects of implicit theories on teaching quality via achievement goals

As follows from the direct effects discussed above, mediating effects of achievement goals emerged for task-oriented mastery approach and work avoidance goals. Both effects were rather weak, but the patterns suggest that stronger endorsement of malleable conceptions of intelligence positively impact teaching quality by enhancing task-oriented mastery goals and reducing work avoidance goals, as hypothesized. The remaining goals did not play a significant role in linking ITs with teaching quality.

The mediational effects of achievement goals for teaching explained about one-fifth of variance in instructors' teaching quality. This implies that future research should reconsider this mechanism and examine alternative routes of interaction between the focal variables involved, and incorporate additional explanatory variables. Future studies should consider whether the mediational chain requires additional intermittent variables linking achievement goals to teaching quality. These may include preparatory behaviors, professional training, or teaching-related emotions that may shape instructors' in-class behaviors (Stupnisky, Hall, et al., 2019; see also Daniels et al., 2009, on the role of emotions in linking students' goals and performance).

In this study, instructors' achievement goals predicted teaching quality largely in the expected ways, but their performance goals were unrelated to ITs. As such, considering additional antecedents shaping instructors' goal adoption is a pivotal task for future research. Evidence from research on student motivation suggests that dispositional achievement motives including hope of success and fear of failure may be prime candidates (Dickhäuser et al., 2016), but it remains to be seen whether this applies to instructors' teaching-related motivation as well.

Limitations and directions for future research

While our study has a number of strengths, several limitations need to be considered and provide important directions for future research in addition to those already mentioned. First, our cross-sectional design precludes causal inferences about the interrelations between our focal variables. While our hypotheses concerning directions of effects were theoretically grounded, longitudinal designs examining relations over time, as well as studies involving experimental priming or more 'permanent' manipulations of ITs as aimed for in educational interventions (Sisk et al., 2018), and analyses of concomitant changes in state-level goals are needed.

Second, our study involved German university instructors only. While we do not assume core psychological mechanisms such as those tested in this study to vary by culture, goal striving, and general valuation of teaching may be subject to cultural variation that needs to be considered by widening perspectives to additional higher education contexts.

Third, we relied on instructors' self-reports that could be affected by social desirability. It may be that instructors' appearance goals influence their self-evaluations of teaching quality. Follow-up studies drawing on student ratings of teaching quality or external observation should be considered, the potential cost of resorting to smaller samples to ensure feasibility as well as potential biases associated with these sources notwithstanding (see e.g. Esarey & Valdes, 2020; Künsting et al., 2016).

Fourth, alternative measures of instructors' ITs should be considered. While appropriate measurement of this construct has long been debated (see Lüftenegger & Chen, 2017, for a review), the general validity of self-report measures may be particularly threatened for teacher populations. Teachers, including university instructors, may be particularly aware of the (growing) social desirability of incremental theories of intelligence due to their professional training, and bias their ratings accordingly. Implicit measures as recently tested with K-12 teachers (Mascret et al., 2015) could be used in future work to extract 'truly implicit' theories about intelligence.

Practical implications

Despite the questions that remain for future research, our study offers preliminary practical implications concerning university instructors' motivation. As both instructors' ITs of intelligence and goals for teaching impacted teaching quality, and these beliefs explained some variation in goal setting as well, professional development for instructors should target both constructs. Recent meta-analyses show that mindset interventions targeting ITs can have powerful effects particularly for low-achieving students (Sisk et al., 2018), and formats that have proven useful could be adapted for instructors. Furthermore, professional development could focus on instructors' goal setting to promote mastery approach goals, and task-oriented goals in particular, by fostering intraindividual and task-oriented standards for evaluating personal performance. In contrast, they should aim for reducing appearance-oriented avoidance and work avoidance goals, for instance, by reducing excessive concerns with external evaluation, and discussing ways of handling multiple demands by means other than pursuing work avoidance goals.

Conclusion

Our findings add to the growing body of research documenting that instructors' motivation, and achievement goals for teaching, matter. Guided by prominent motivation theories, it expands upon prior research by probing the degree to which instructors' ITs of intelligence can predict their adoption of different goals. Our findings show this may be the case for select goals, and mastery approach goals in particular, but more work is needed to pin down the mechanisms at play, and to identify additional determinants of instructors' goals that can be leveraged for fostering adaptive motivational orientations in this still under-researched population.

Compliance with ethical standards

All procedures performed were in accordance with the ethical standards of the institutional and national research committee studies involving human participants and with the 1964 Helsinki declaration and subsequent amendments. Informed consent was obtained from all participants.

Notes

1. To enhance readability, we use the term *mastery goals* to refer to mastery *approach* goals as the focal construct under study.
2. Research has begun to explore effects of different types of performance goals on teaching. As reviewed by Daumiller et al. (2019), performance goals can be differentiated in terms of whether performance is evaluated based on *normative* comparison relative to others, or whether one's *appearance* as competent or incompetent is decisive. Importantly, their study implies that appearance goals are more useful for explaining differences in teaching quality as compared with normative goals, potentially reflecting a higher salience of appearance-related aspects of teaching under constant observation by students as compared with normative concerns for outperforming colleagues. We employed a measure designed to take these nuances into account, and focussed on instructors' appearance-oriented performance goals.
3. The data reported in this article stem from the first measurement timepoint of a larger longitudinal study described in Daumiller and Dresel (2018) as well as Hein et al. (2019). The research questions addressed in this article do not overlap with those examined by the aforementioned publications.

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We have no known conflict of interest to disclose.

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