Faculty members' professional learning

What role do achievement goals play in the learning process?

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Inauguraldissertation zur Erlangung des akademischen Grades einer Doktorin der Sozialwissenschaften der Universität Mannheim

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20.09.2021

Declaration of the manuscripts

This manuscript is a publication-based dissertation submitted in partial fulfillment of the requirements for the degree Doctor of Social Sciences in the School of Social Sciences at the University of Mannheim. It is based on three publications, which are introduced by an overview paper. The aim of this overview paper is to present the research background underlying the individual publications and to clarify the connections between the three publications.

The following three publications are included in this publication-based dissertation:

Study 1:

Hein, J., Daumiller, M., Janke, S., Dresel, M., & Dickhäuser, O. (2019). How learning time mediates the impact of university scholars' learning goals on professional learning in research and teaching. *Learning and Individual Differences, 72,* 15–25. https://doi.org/10.1016/j.lindif.2019.04.002.[1]

Study 2:

Hein, J., Janke, S., Daumiller, M., Dresel, M., & Dickhäuser, O. (2020). No learning without autonomy? Moderators of the association between university instructors' learning goals and learning time in the teaching-related learning process. *Learning and Individual Differences, 83 - 84,* 101937. https://doi.org/10.1016/j.lindif.2020.101937.

Study 3:

Hein, J., Janke, S., Rinas, R., Daumiller, M., Dresel, M., & Dickhäuser, O. (2021). Higher education instructors' usage of and learning from student evaluations of teaching – Do achievement goals matter? *Frontiers in Psychology.* https://doi.org/10.3389/fpsyg.2021.652093. Psyarxiv.com/mt8rw.

[1] The first paper of this dissertation (Hein et al., 2019) was partially inspired by a master's thesis (Hein, 2017) regarding the mediation idea for learning approach goals and the corresponding data. However, the paper expands on and differs from the thesis in that a new analysis method involving a larger sample was incorporated, along with input from and in cooperation with the co-authors.

In accordance with §9 section 1c) of the "Promotionsordnung" of the Faculty of Social Sciences at the University of Mannheim, I, Julia Hein, confirm with my signature that all manuscripts listed were primarily conceived, prepared, produced, and written by me. In doing so, I was supported by my co-authors[2] through their direct suggestions for improvement of working versions of the manuscripts. The hypotheses investigated in the three articles were developed by me, and the data analyses and the corresponding interpretation of the data were primarily carried out by me.

Since the data reported in the three manuscripts was collected as part of a collaborative research project funded by the German Research Foundation (DFG) Grant DI 929/5-1 awarded to Oliver Dickhäuser and Grant DR 454/8-1 awarded to Markus Dresel, the data collection was a joint endeavor of the two working groups. In the case of Study 1, the development of the design and data collection were carried out primarily by my co-author, Martin Daumiller. For Study 2, the study design was developed with my co-authors and the data was equally collected at two universities; Martin Daumiller conducted the sampling at the University of Augsburg and I at the University of Mannheim. For Study 3, Raven Rinas and I were both equally responsible for data collection, while the study design reported within the third study was developed primarily by me. Regarding the technical development and administration of the homepage "www.lehr-evaluation-online.de" that was used for data acquisition in Study 3, I was supported by our programmers, Jan Siebert and Hannes Kohlsaat, as well as our research assistant Maurice Wendel. In individual cases, data collection and processing were supported by the following research assistants: Lena Schwinge, Melanie Alsmeyer, Miriam Neissner, Melissa Joy Montagna, Johanna Friederike Klein, and Antonia Blunck.

Mannheim, den 15.05.2021

Place, Date	Signature

[2] Personal statements signed by my co-authors Martin Daumiller, Oliver Dickhäuser, Markus Dresel, Stefan Janke, and Raven Rinas, in which they confirm my contributions to the embedded manuscripts in accordance to §9 section 1c) are attached to this dissertation thesis in Appendix D.

Reflection and acknowledgements

Much like the theoretical framework of my publication-based dissertation, my own development that led to this written document can be distinguished in terms of self-regulated learning into three phases (pre-PhD phase, PhD-phase, and post-PhD phase). Throughout these three phases, I was guided and supported by several notable companions that need to be mentioned and thanked, as this manuscript could not have been written without them.

In the beginning, I was faced with the decision of whether or not I should pursue the long path of becoming a doctor of social sciences (pre-PhD phase). For guidance in this decision, I would like to thank *PD Dr. Udo Käser*, who awakened my interest for pedagogical-psychological research (first on mathematical reasoning skills), motivated and supported me to present our study results at the PAEPS conference in 2015 (during my time as an undergraduate student), and advised me in my professional journey. Within my master studies, the mentoring program of the University of Trier helped me to make this decision. I would also like to thank *Prof. Dr. Michael Schneider* for supporting me in my decision and the later application process. He helped me to realize that the question should not be *whether* I will pursue a PhD, but rather, *how* this should be done in terms of the specific subject area, topic, and supervisor. Shortly after this, I crossed the Rubicon, applied to work in a research project at the University of Mannheim, and started my PhD journey.

In my PhD-phase within the DFG-supported project "Zielorientierungen von Dozierenden (ZIDO), berufliches Lernverhalten und Lehrqualität: Determinanten, Konsequenzen, Moderatoren", I had the opportunity to learn, engage in new experiences, and grow in my professional as well as my personal life. Initially, I spent my time getting to know the field of research and reading a lot, learning to plan and conduct longitudinal studies, teaching my first class, as well as applying for and presenting at research conferences (in German and English). Later, I began writing papers, developing and administering a homepage for teaching evaluations, and learning how to deal with rejections of submitted manuscripts and reviewer comments. I would like to share some of the most important lessons that I learned within this phase of my PhD. During my time within the ZIDO project and as PhD-student, I experienced more than once, that deadlines can have "healing effects", as my supervisor, Prof. Dr. Oliver Dickhäuser, likes to say. When it came to the submission of my master's thesis, only if the thesis was completed until a specific deadline, could I achieve the reward of participating in the graduation ceremony with my friends. Even though the end of the research project was postponed, it constituted a motivating deadline to finalize my thesis. I learned that I can master

great professional and personal challenges and that there is nothing more important in life than time with family, colleagues and friends. Altogether, the journey within my PhD-phase can be described as a continuous change between uphill and downhill stretches (e.g., joy regarding my first accepted publication, or challenges in managing my time between research- and teaching-centered tasks). With time, I was able to master these challenges and finally reach the stage of writing my doctoral thesis.

In this important phase of my life, the action phase within my PhD, I would like to thank my supervisor, colleagues, research assistants, boyfriend, family, and friends for their professional and/or emotional support. I would especially like to express my gratitude to my supervisor, *Prof. Dr. Oliver Dickhäuser*, for his professional and personal support even in difficult times, for believing in me, having trust in my work, mentoring me throughout the PhD, and teaching me, among other things, that there are times in everyone's life, in which individual performance levels vary. I am very grateful for his guidance and warm-hearted support. Next, I would like to thank my colleague, *Dr. Stefan Janke*, who helped me to find answers to every imaginable question a PhD student could have, provided advice, believed in me and my work, taught me self-trust, and always had an open door for me.

Without team work, the work behind the publications reported in my dissertation would not have been possible. For this, I would like to thank all members of the ZIDO-project (*Prof. Dr. Oliver Dickhäuse, Prof. Dr. Markus Dresel, Dr. Stefan Janke, Dr. Martin Daumiller* and *Raven Rinas*) for their excellent cooperation, mutual support, professional and personal exchanges, and helpful suggestions on the content and language of previous versions of my publications. I would like to thank *Prof. Dr. Markus Dresel* for providing the opportunity to discuss my research at the colloquium in Augsburg, where I received valuable feedback that contributed to this dissertation. I would also like to thank *Dr. Martin Daumiller* for everything he taught me, for challenging me methodologically, and for our joined data collections, as well as *Raven Rinas* for being a true friend and an amazing colleague. A special thanks also goes out to all of my research assistants, but especially *Lena Schwinge* who supported me from the start of the project through her engagement and conscientious work and through independently taking on the responsibility of data collection in times of need. Without the technical support of *Jan Siebert, Hannes Kohlsaat,* and *Maurice Wendel*, the online evaluation tool (named LEO) would not exist or work as smoothly as it does. I would like to thank these programmers for their spontaneous troubleshooting, and for supporting my research through their thorough work.

The pleasant atmosphere within the chairs of the "Lehrstuhl für Pädagogische Psychologie", "Lehrstuhl für Bildungspsychologie" and "Juniorprofessur für

Unterrichtsqualität in heterogenen Kontexten", provided an excellent learning environment for my development within the PhD. For this, I would like to thank all members and former members of our teams for any formal and informal exchanges, for enjoyable lunch breaks, team trips, being my role models, digital coffee breaks, and the overall good mood in the office. In addition, I would like to express my gratitude to *Gabi Atkinson* for her empathy, always doing more then she has to do, helping me in many organizational tasks, and helping with my English in publications and conference submissions. For making me laugh when I needed it the most, believing in me, and never giving up on me, I would also like to thank my boyfriend, *Janik Wegenka*. A further special thanks goes to my friends and colleagues, *Marie-Therese Kleinsorge, Cordula Mayerhofer, Belinda Merkle, Laura Messerer, Sophie Bossert,* as well as to my brother, *Dominik Hein,* who always had an open ear for me and time for joint stress reduction in leisure activities. For raising me with unconditional love and always supporting me in finding my own way and doing things right, I would also like to thank my parents, *Ulrike* and *Alfred Hein*. In the final phase of my dissertation, I once more need to thank *Dr. Stefan Janke* and *Janik Wegenka* for motivating me to finalize and complete my dissertation for intrinsic and extrinsic reasons. Regarding my dissertation, I would like to thank my colleagues *Dr. Stefan Janke* for his useful and thorough comments that helped me to improve a previous version of my dissertation, as well as *Raven Rinas* for reviewing the language and grammar. Lastly, I would like to thank *Prof. Dr. Stefan Münzer* and *Prof. Dr. Jürgen Seifried* for taking the time to review and discuss my dissertation, and especially for their valuable feedback within the research colloquium that helped me to widen my perspective and gain deeper insights into my research topic. I would lastly like to thank my anonymous reviewers for their valuable comments that helped me to improve my writing and research.

Now, at the end of my PhD, I look back with both laughter and tears at all the good times I have had with my friends and scientific family across Germany that I have gained throughout this experience. In my post-PhD phase, I am now a student once more. I am currently dedicating my time to my next journey, which entails training to be a psychotherapist, and ultimately supporting people to get through difficulties they face in their lives.

List of Content

Abstract

The presented research aims to integrate research on motivation (in the form of achievement goals) into models of self-regulated learning to explain faculty members' learning processes within the context of professional development. Models of self-regulated learning and workplace learning propose that motivation (in the pre-action phase) is a prerequisite of learning behavior (in the action phase), and thereby of learning results (in the post-action phase). Faculty members' motivation can be described in terms of their learning goals (striving for competence expansion), performance goals (striving for competence demonstration), and work avoidance goals (striving for effort reduction), in the work domains of research and teaching. This dissertation focuses on achievement goals as antecedents of the learning process, within which personal conditions of motivation are thought to impact learning behavior, and learning behavior is proposed to mediate the relationship between motivation and learning outcomes. To this end, a model on motivated learning processes of faculty members was postulated and three studies on the hypothesized associations were conducted. Within a first longitudinal survey study, the mediating role of learning behavior (indicated by learning time) in the relationship between learning approach goals and self-reported learning results both in the teaching and the research domain was investigated (Hein, Daumiller, et al., 2019). Secondly, a micro-longitudinal survey study advanced the framework of the first study by taking learning avoidance goals into account and by looking at interactions between learning goals, general workload, and perceived autonomy within the learning process in the teaching domain (Hein, Janke, et al., 2020). Both studies partly supported learning goals as predictors of learning results, as well as the mediating role of learning time in the teaching-related learning process (Study 1: for learning approach goals, Study 2: for learning avoidance goals only). Additionally, autonomy in teaching strengthened the association between learning avoidance goals and learning time (in Study 2). Moreover, the model on motivated learning processes of faculty members was tested in a concrete informal learning situation (the usage of student evaluations of teaching), while taking objective measures for the process variable into account (Hein et al., 2021). In Study 3, the importance of learning goals was confirmed in multifactorial models, which further strengthens the assumption of motivation as a predictor within the self-regulated learning process. The model on motivated learning processes of faculty members offers a foundation for future research on faculty members' professional learning and provides first ideas for practical implications. In accordance with the model and respective findings, faculty members might profit from striving for strong learning goals and engagement in diverse

learning activities, and could be supported to reflect on the results of student evaluations of teaching in the post-action phase. The respective model can also support intervention development focused on making professional learning for this group more effective.

1 Introduction

Ongoing professional development is important for the acquisition of knowledge and skills, and consequently, for job performance in many different professions (Kunter et al., 2013; Mizell, 2010). It is important to study professional development in higher education faculty in particular, as their competences are relevant for the quality of research and teaching and, in turn, for societal progress. To illustrate the importance of this research topic in the sample of faculty members, a comprehensive overview of this context and topic will first be described.

For teaching professionals, it is a widespread assumption that professional development can improve teaching (Kennedy, 2016). In the context of higher education, high quality instruction supports student engagement, learning, and achievement (BrckaLorenz et al., 2012; Schneider & Preckel, 2017; Umbach & Wawrzynski, 2005). From this, we can contend that the pedagogical and content knowledge of instructors play important roles in the development of university students (see Kunter et al., 2013 for empirical evidence at schools). Aside from this, educators also deem their knowledge of educational principles (didactical knowledge), the content they teach (professional knowledge), research methods, and more general competences (e.g. communication skills) to be relevant for their own professional development (Steinert, 2012). As the acquisition of knowledge depends on the usage of learning opportunities (see Watson et al., 2018), it is of high importance to understand faculty members' engagement in professional development to identify how it can be supported in higher education institutions.

Regarding the domain of research, methodological competencies can be considered to be important for ensuring high-quality research. While the reasons for a surprisingly high prevalence of researchers engaging in questionable research practices (e.g., in psychology, economy, and medical research; Gardner et al., 2005; Janke et al., 2019; John et al., 2012; List et al., 2001; Martinson et al., 2005) are not fully clear yet, a lack of skills and knowledge (as a potential reason for this behavior) might be prevented by trainings to enhance methodological competencies. Moreover, as (at least in the USA) the number of articles published in peer-reviewed journals continues to stagnate despite research expenditures increasing (Daumiller, Stupnisky, et al., 2019; Hill, et al. 2007; Litwin, 2014), research on faculty members'

professional development can be considered relevant for enabling faculty members to conduct research more effectively.

To sum up, faculty members' work in research and teaching is relevant for societal progress as it is used to advise political decisions (Landry et al., 2003), has the potential to enrich and improve educational practice in schools and higher education institutions (Hattie & Timperley, 2007; Kennedy, 2016; O'Neil et al., 2019; Schneider & Preckel, 2017), is associated with economic activity (Weinberg et al., 2014), and shapes the minds of future graduates who will enter the job market. For these reasons, it is important to better understand how faculty members learn to improve regarding their work, as well as under which conditions they become more likely to use learning opportunities and profit the most from them.

Models of workplace and self-regulated learning seem promising in further differentiating the learning process and identifying individual characteristics that might predict faculty members' learning for work. Diverse models (Panadero et al., 2019; Schmitz & Wiese, 2006; Tannenbaum et al., 2010; Tynjälä, 2013) postulate motivation to be a possible individual predictor of engagement in learning activities and their effects on learning outcomes. Because researchers and educators in the context of higher education need to continuously extend their knowledge and competences for their work and can mostly autonomously engage in learning opportunities, this sample is particularly suitable for examining the role of motivation in professional learning processes. However, studies on faculty members' motivated learning actions are rare (Diethert et al., 2015; Fritzsche & Daumiller, 2018) and suggest associations between learners' motivation and (intended) participation in voluntary trainings. Although research on adult samples in occupational and educational contexts suggests that the associations of motivation and learning outcomes vary substantially (Payne et al., 2007), faculty members' engagement in formal and informal learning situations (e.g., training participation or informal exchange with colleagues) has yet to be researched as a potential mechanism between motivation and learning results prior to the year 2017. This is primarily due to a lack of a clear model that can explain how faculty members' motivation drives further learning processes (which expands on the above models that explain what predicts learning intentions, see Diethert et al., 2015). In the present dissertation, I thereby aim to address the above-mentioned research gap and explain what moderators and mediators lie behind the varying strength of associations between faculty members' motivation and learning results by developing a model concerning the motivated learning processes of faculty members throughout the different chapters. Within this model, I address the following questions: *Whether* motivation predicts faculty members' learning behaviors and learning outcomes (motivation as antecedent), *under which conditions*

motivation impacts their learning behaviors (interactions with motivation), and *how* motivation impacts the learning outcomes (mechanism between motivation and learning outcomes). To clarify the learning process of faculty members, a deeper look at applicable models used to describe faculty members' professional development processes will be provided in the next section (chapter 1.1) before specifying the role of motivation (chapter 1.2) and addressing possible moderators (chapter 1.3) within this process.

1.1 Applicable theoretical models to describe faculty members' professional learning

Different perspectives can be taken when describing how faculty members learn for work and what individual characteristics might determine their professional learning. On the one hand, faculty members are employees at a workplace within higher education institutions. Thereby, their experiences and actions can be viewed from the perspective of work psychology. On the other hand, faculty members instruct students and are learners that engage in diverse learning situations. For this reason, this topic can also be outlined from the view of educational psychology, which constitutes the scholarship that tries to understand, predict, and control the experience and behavior of learners and instructors. In the present section, I aim to shed light on the learning process from different perspectives and outline what these theoretical approaches have in common to ultimately postulate an integrative model on motivated learning processes of faculty members.

Firstly, the theory of planned behavior (Ajzen, 1991) generally states that motivational factors (such as intentions to conduct specific behaviors) guide human behaviors in situations where they can control their behavior. The notion that motivation impacts (learning) behavior is also stated in models of workplace learning and self-regulated learning (Schmitz & Wiese, 2006; Tynjälä, 2013; Zimmerman, 2000). Models of workplace learning and self-regulated learning agree on a process view of learning and postulate three consecutive phases of the learning process. However, these different lines of research use different terms for the phases of the learning process. The further development of the 3-P model of workplace learning (Tynjälä, 2013) distinguishes the phases of presage, process, and product, while models of self-regulated learning (Panadero et al., 2019; Schmitz & Wiese, 2006; Zimmerman, 2000) distinguish the phases of pre-action/forethought, action/performance, and post-action/reflection. According to these models, personal characteristics of the learner (such as motivation) and characteristics of the context (in the pre-action phase) influence their engagement in learning activities and learning behaviors (in the action phase), and thereby individual and organizational learning outcomes as well as self-reflection (in the post-action

phase). Consequently, these models also support the importance of motivation for engagement in learning activities and learning outcomes.

The main differences of the models of workplace and self-regulated learning lie in (1) the extent of how far they consider the learning context, as well as task and situation specific characteristics, and (2) the varying constructs postulated as relevant within the different phases, especially in the description of learning activities in the process/action phase. Regarding the extent of considering context and individual factors, the focus of the present dissertation lies in individual factors and outcomes, as faculty members' contexts usually provide opportunities and resources that generally enable them to engage in learning activities. Nevertheless, the diverse learning activities that faculty members might engage in within the process/action phase should be further clarified regarding models of workplace and self-regulated learning.

Faculty members' intentional engagement in learning activities in the workplace might also be described by models of self-regulated learning (Panadero et al., 2019; Schmitz & Wiese, 2006; Zimmerman, 2000) and workplace learning (Tannenbaum et al., 2010; Tynjälä, 2013). According to the component model of self-regulated learning (Schmitz & Wiese, 2006), engagement in learning activities in the action phase is called "learning behavior" and can be described qualitatively (e.g., by learning strategies, metacognitive strategies, self-monitoring and resource management strategies) and quantitatively (e.g., by learning times for formal and informal learning activities, or training participations). Although the definition of workplace learning varies throughout the literature and includes diverse disciplinary backgrounds, formal and informal learning activities are often contrasted as parts of it (but not limited to it, see (Eraut, 2004; Kyndt & Baert, 2013; Manuti et al., 2015; Tynjälä, 2013).

Formal learning activities are structured learning opportunities that are usually led by an instructor, limited to a specific time, and involve the pursuit of concrete goals to reach learning outcomes, which are evident to learners prior to participation (Kyndt & Baert, 2013). Typical examples of faculty members' formal learning include participation in conferences, workshops (e.g., at didactic competences), or digital trainings (see Daumiller, 2018) which can be offered either directly by or independently from the higher education institution. Informal learning activities such as reading journal articles or textbooks and seeking help from colleagues are less structured (Daumiller, 2018), take place outside of formal learning situations, and are used to reflect upon the improvement of one's own knowledge and skills (Cerasoli et al., 2018). Faculty members can undertake this type of learning independently or in social exchange with colleagues (compare Kyndt & Baert, 2013). Informal learning can thereby include characteristics such as being self-directed and intentional (Cerasoli et al., 2018).

According to the dynamic model of informal learning (Decius et al., 2019; Tannenbaum et al., 2010), employees can undertake different informal learning activities by model learning, applying their own ideas (experience), through the use of feedback provided from colleagues and supervisors (directly or indirectly), or reflecting on new and completed tasks. That faculty members' workplace learning can happen at different places within the higher education institution itself (e.g., reading at one's desk, taking part in workshops at the university) or outside of the immediate working environment (e.g., at conferences), can be called on and off the job (Manuti et al., 2015). Formal and informal learning can occur on and off the job in terms of the physical location (at the workplace or outside of the workplace). Because formal and informal learning activities constitute learning opportunities in faculty members' work lives, both aspects are considered throughout the conducted studies in the present dissertation.

Regardless of the differences between models of workplace and self-regulated learning, these models consistently postulate that motivation plays an important role for engagement in work-related learning activities (Panadero et al., 2019; Schmitz & Wiese, 2006; Tannenbaum et al., 2010; Tynjälä, 2013; Zimmerman, 2000). As the models mentioned above indicate a mediating role of (learning) behavior (action phase) between motivation (pre-action phase) and learning outcomes (post-action phase) within faculty members' work-related learning processes, and current research on faculty members' learning processes lack in investigating this potential mechanism (Diethert et al., 2015; Fritzsche & Daumiller, 2018), I focus on this mediating role in the following studies. As the process begins with motivation, it is important to shed light on faculty members' motivation (pre-action phase) before looking into its relevance for later phases of the learning process (action and post-action phases).

1.2 Faculty members' motivation in the learning process

Motivation can be seen as an activating orientation towards positive valued target states (Rheinberg, & Vollmeyer, 2012). It concerns the initiation of behavior by the selection of desirable and feasible goals, as well as sustaining behavior in interesting and satisfactory activities or activities with rewarding consequences, and consequently regulates goal-directed behavior (Achtziger & Gollwitzer, 2018; Daumiller, Stupnisky, et al., 2019; Gagné & Deci, 2005). Next to self-regulatory processes (such as effort and persistence), motivational constructs (such as goal level and self-efficacy) have been found to have the strongest effects on learning results in work-related trainings (Sitzmann & Ely, 2011). According to an overarching model on faculty motivation (Daumiller, Stupnisky, et al., 2019), faculty members' motivation in specific achievement situations in different domains (e.g., research and teaching)

in higher education can be determined by overarching person characteristics (e.g., self-concept, self-efficacy beliefs, or achievement goal orientations) and contextual features (e.g., expectancies and values of colleagues or opportunities to experience basic need fulfillment). In addition, faculty members' motivation can be expected to influence their cognitions, behaviors, and emotions in specific achievement situations. Different theoretical approaches have been applied to describe faculty members' motivation in terms of their self-efficacy (Fong et al., 2019; Ismayilova & Klassen, 2019; Yin et al., 2020; Zhang et al., 2019), achievement goals (Daumiller, Dickhäuser, et al., 2019; Daumiller & Dresel, 2020), and need satisfaction (Lechuga & Lechuga, 2012; Stupnisky et al., 2017, 2018) in the domains of research and/or teaching.

In this dissertation, I adapt an achievement goal approach to describe faculty members' motivation in teaching and research for theoretical and empirical reasons. From a theoretical point of view, the achievement goal approach enables meaningful description regarding the quality of motivation (instead of only reporting on the quantity, see Pintrich, 2000). *Achievement goals* are defined as future-focused cognitive representations of and preferences for specific competence-related results or end states that an individual is committed to either avoid or approach (Hulleman et al., 2010; Payne et al., 2007). Thereby, achievement goals complement models of workplace and self-regulated learning (Schmitz & Wiese, 2006; Tynjälä, 2013), which propose motivation to be a predictor of learning behavior and thereby of learning results, by definition. Achievement goals can be considered relevant for the further professional learning processes, as preferences for specific results should impact learning behaviors (action phase) that lead to later learning results through goal attainment (post-action phase).

From an empirical perspective, achievement goals can be considered to be important for the behaviors, cognitions, and emotions of learners, including faculty members (Daumiller, Dickhäuser, et al., 2019; Diethert et al., 2015; Hulleman et al., 2010; Janke & Dickhäuser, 2018; Payne et al., 2007; Rinas et al., 2020). In student samples, achievement goals have been found to be associated with the usage of self-regulated learning strategies including metacognitive strategies, deep processing, surface learning, help seeking, time management, and peer learning (Elliot et al., 1999; Karabenick, 2004; Liem et al., 2008; Roussel et al., 2011; Won et al., 2018). In the work context, employees' achievement goals have been associated with work effort (Dysvik & Kuvaas, 2013), satisfaction with job performance (Avery et al., 2015), feedback seeking (Baranik et al., 2013), and the usage of formal and informal learning activities in school teachers (Nitsche, Dickhäuser, Dresel, et al., 2013; Nitsche, Dickhäuser, Fasching, et al., 2013).

Achievement goals have also been found to be associated with learning results in a meta-analysis examining adult learning in occupational and educational settings (Payne et al., 2007). Research investigating the link between achievement goals and professional learning in different phases of the learning process for faculty members' learning behaviors in the action phase and for learning outcomes in the post-action phase is a growing research field (Daumiller et al., 2020; Daumiller & Dresel, 2020; Diethert et al., 2015; Fritzsche & Daumiller, 2018; Kücherer et al., 2020). To sum up, it can be assumed that especially achievement goals also impact faculty members' engagement in work-related learning activities and their resulting learning. Now that the general relevance of achievement goals for faculty members' learning process has been clarified, the structure of achievement goals applied within this work will be described.

Research on achievement goals distinguishes diverse types of goals (Daumiller, Dickhäuser, et al., 2019; Daumiller & Dresel, 2020; Hulleman et al., 2010; Korn & Elliot, 2016). These models typically distinguish between mastery and performance goals based on absolute, intra- or inter-individual representations of competence (Elliot & McGregor, 2001). Furthermore, a fundamental differentiation of the *approach* (striving to reach specific end states) and *avoidance* (striving to avoid specific end states) *valence* of achievement goals has been established in prior research (Elliot & Church, 1997; Elliot et al., 2011; Elliot & McGregor, 2001). Models on achievement goals describe motivation in educational contexts, mostly for students or school teachers (Butler & Shibaz, 2008; Elliot et al., 2011; Hulleman et al., 2010). The hexagon model is an integrative model for faculty members' goal striving in the work domains of research and teaching (Daumiller, Dickhäuser, et al., 2019; Daumiller & Dresel, 2020), which includes 10 achievement goals per work domain. It offers a framework to define and measure faculty members' strivings in teaching- and research-related achievement situations at work that can be fully or partly (through looking at single goals) adapted to enable this line of research to use different labels for different goals (Hulleman et al., 2010). Mastery goals can be divided by their content into *task* (focus on the quality of task fulfillment by absolute standards) and *learning* (focus on competence development by own standards) *goals*, while performance goals can be distinguished into *appearance* (focus on own appearance of competence to others) and *normative* (focus on own competence compared to others) *goals* (Daumiller, Dickhäuser, et al., 2019). These goals are further differentiated by their valence (approach and avoidance). Additionally, the hexagon model takes *relational goals* (focus on developing close and caring relationships with students) and *work avoidance goals* (focus on effort reduction in tasks fulfillment) into account. Considering 20 diverse goals entails the risk

of multicollinearity due to high correlations between the achievement goals. Thereby, it is important to consider types of goals in a theory driven manner.

As a first step to reducing the complexity, I look solely into relations of domain specific goals and learning processes (e.g., teaching-related learning goals can be considered primarily relevant for the learning process in teaching) and mainly focus on teaching-related professional learning processes of faculty members. Especially faculty members pursuing learning goals can be expected to orient their actions toward behaviors to develop competences. In addition, only learning goals (and no further types of goals) were associated with learning results in a meta-analysis (Payne et al., 2007). For these reasons, I primarily focus on learning goals throughout my studies on faculty members' professional learning. However, it is important to mention that the above-mentioned meta-analysis (1) does not account for all proposed types of achievement goals of faculty members (e.g., work avoidance and relational goals are missing), and (2) does not distinguish between the normative and appearance aspect of performance goals despite naming both aspects within definitions of performance goals. Due to its limitations, the results of this meta-analysis should not lead to a sole focus on learning goals, but rather lead to a situation specific approach of deriving hypotheses. Professional learning constitutes an intrapersonal process of faculty members. Thereby, goals that focus on the learners' internal standards as learning, appearance, and work avoidance goals should matter for different steps in their professional learning process[3]. Consequently, I consider achievement goals in line with the 2 x 2 standpoints model of achievement goals (Korn & Elliot, 2016), as well as work avoidance goals, which can be considered relevant for engagement in learning activities for educational professionals (Butler & Shibaz, 2008; Daumiller, Dickhäuser, et al., 2019; Daumiller et al., 2016; Daumiller & Dresel, 2020; Nitsche, Dickhäuser, Fasching, et al., 2013; Retelsdorf et al., 2010) to further describe goal strivings and sharpen the focus on concrete achievement goals within my dissertation. Different *standpoints on competence* (Korn & Elliot, 2016) focus on the development of competence or demonstration of it. In faculty members, *learning approach* (focus on developing competence), *learning avoidance* (focus on avoiding not developing own competencies to the fullest extent), *appearance approach* (focus on being perceived as competent), and *appearance avoidance* (focus on avoiding appearing

[3] This dissertation does not focus on task, normative, or relational goals. However, exploratory analyses on further goal classes are reported in the supplemental material of Study 3 (Hein et al., 2021). Beyond this, associations of further types of goals with indicators of professional learning for researchers have been reported in recent literature (see Daumiller & Dresel, 2020).

incompetent) *goals* describe these strivings for competence development and demonstration (Daumiller, Dickhäuser, et al., 2019). The importance of different standpoints on competence has also been highlighted for student achievements in prior research (Elliot & Church, 1997; Grant & Dweck, 2003). To move forward, it is important to look into how these specific achievement goals (learning goals, appearance goals and work avoidance goals) might impact the learning process of faculty members.

1.2.1 Learning goals

Learning approach goals should act as a lens that focuses learners' cognitions and behaviors on the development of competences, and facilitates the search for and engagement in professional learning opportunities. Previous studies have indeed shown that personal characteristics such as learning approach goals are closely tied to the learning behavior in occupational and educational contexts (Choi & Jacobs, 2011; Diethert et al., 2015; Hurtz & Williams, 2009; Nitsche, Dickhäuser, Dresel, et al., 2013). Learning approach goals have more concisely been linked to the effective use of formal and informal learning activities in employees (Choi & Jacobs, 2011), the intended and actual participation in formal trainings in academia (Diethert et al., 2015; Fritzsche & Daumiller, 2018), and reading of specialist journals as well as workshop participation in school teachers (Nitsche, Dickhäuser, Dresel, et al., 2013; Nitsche, Dickhäuser, Fasching, et al., 2013). Recent research on faculty members also suggests a positive association with observed attention in voluntary teaching-related training courses (Kücherer et al., 2020). As only learning approach goals have been significantly associated with learning results on a meta-analytic level (Payne et al., 2007), this goal class can be considered highly important for the learning process. Taken together, based on models of workplace and self-regulated learning (Schmitz & Wiese, 2006; Tynjälä, 2013, see chapter 1.1) as well as the aforementioned empirical findings regarding direct associations, I hypothesize that the positive association between learning approach goals and learning results should be mediated by the learning behavior of faculty members (see also Hein, 2017).[4] In my dissertation, I pursue this mediation hypothesis within three longitudinal studies.

While the relevance of learning approach goals for learning is generally well-studied (Cerasoli et al., 2018; Diethert et al., 2015; Elliot et al., 1999; Liem et al., 2008; Payne et al., 2007; Won et al., 2018), the natural occurrence and relevance of learning avoidance goals has sparked scientific debate (Cury et al., 2006; Hulleman et al., 2010). Measurements of this goal class differ between studies (Hulleman et al., 2010) and concerns regarding whether this type

[4] The mediation hypotheses for learning approach goals was developed within the previously cited master's thesis.

of goal is a necessary addition to the achievement goal framework have been reported (Cury et al., 2006). However, in the context of work, there is evidence that employees adopt mastery avoidance goals (Baranik et al., 2013). Especially within the sample of faculty members, this type of achievement goal might be prevalent given that they are older and more experienced than students and might strive to a higher degree not to fall behind in their professional development (de Lange et al., 2010; Ebner et al., 2006). In an interview study on faculty members' achievement goals (Daumiller et al., 2015), learning avoidance goals were spontaneously mentioned as an important aspect of teaching-related motivation. Moreover, this type of goal was directly associated with faculty members' professional learning and learning outcomes in the research domain in recently published quantitative studies (see cross-sectional study 2 and longitudinal study 3 in Daumiller & Dresel, 2020)[5]. Avoiding missing out on learning opportunities might enhance faculty members' participation in learning activities. As it is possible that learning avoidance goals promote a focus on the necessity of competence development, learning avoidance goals might be associated with learning behaviors and learning results. In addition, engagement in learning activities might mediate the association of learning avoidance goals (as motivational factor) and learning results regarding models of workplace learning and self-regulated learning (Schmitz & Wiese, 2006; Tynjälä, 2013). This mediation hypothesis for learning avoidance goals is investigated within two longitudinal studies in my dissertation. Despite the fact that empirical findings support direct associations of learning approach/avoidance goals, learning behaviors, and learning results in the contexts of work and academia, the mediating role of faculty members' learning behavior between learning goals and learning results has not been addressed prior to the studies embedded in this dissertation.

1.2.2 Appearance goals

In this subsection, I will discuss how appearance goals (as a motivational component) might impact later steps in the learning process. Research on performance goals does not indicate consistent associations with professional learning, neither for learning behavior nor for learning results. Within school teachers, performance approach goals have been found to be positively associated with formal training participation, however, nil associations have also been reported (Nitsche, Dickhäuser, Dresel, et al., 2013; Nitsche, Dickhäuser, Fasching, et al., 2013). Taking

[5] For learning goals, I did not refer to this study because there is an overlap in the sample and data reported within the first paper that is included within this dissertation (Hein, Daumiller, et al., 2019) and data reported in Study 3 (Daumiller & Dresel, 2020). See "Erklärungen der Co-Autoren" for further information.

a closer look at faculty members' performance approach goals in formal learning situations, positive associations with learning engagement (Daumiller et al., 2020), as well as negative or no associations with the number of participated trainings have been reported (Fritzsche & Daumiller, 2018). Although positive associations have been found for researchers' appearance approach goals and learning time/results for formal and informal activities in bivariate analyses, multivariate analyses also reveal negative associations between appearance approach goals and learning time (Daumiller & Dresel, 2020). On a meta-analytic level of adults in educational and occupational settings, neither performance approach goals nor performance avoidance goals were significantly associated with the distal consequence of learning (Payne et al., 2007). In addition, the direction of the link between appearance approach goals and steps in the professional learning process, or whether they exist, are not clear from a theoretical perspective either. The positive valence of appearance approach goals might support engagement in behavior, while the focus on performance might not facilitate learning behaviors or learning results at all. Consequently, no clear hypotheses were made regarding appearance approach goals in the learning process with professional learning.

The literature concerning performance avoidance goals also paints a rather unclear picture. For performance avoidance goals, positive, negative, or no associations with participation and engagement in learning activities have been found in studies on faculty members and school teachers (Daumiller & Dresel, 2020; Fritzsche & Daumiller, 2018; Nitsche, Dickhäuser, Dresel, et al., 2013; Nitsche, Dickhäuser, Fasching, et al., 2013). In addition, in the meta-analysis, the not statistical significant association between performance avoidance goals and learning results was descriptively negative (Payne et al., 2007). Moreover, also for appearance avoidance goals, the link with learning behavior and learning results is not clear (Daumiller et al., 2020). From a theoretical perspective, the valence of appearance avoidance goals should be detrimental for engagement in learning behavior and thereby for learning results, however, the focus on competence demonstration might not impact learning behaviors or learning results. Consequently, no general hypotheses for appearance avoidance goals and professional learning can be made.

Nevertheless, these types of goals might be relevant in learning situations that also constitute a situation where faculty members have the opportunity to demonstrate competence. The role of appearance approach and avoidance goals in the learning process should be looked at in a theory driven and situation-specific manner, as single theoretical ideas and empirical results suggest their relevance for professional learning. In study designs that focus on concrete informal or formal learning situations, which can be interpreted as performance situations with

opportunities of competence demonstration next to the interpretation as learning situation, appearance approach and avoidance goals might impact learning behavior as well as learning results (see hypotheses regarding appearance goals in Study 3 within this dissertation for a concrete example).

1.2.3 Work avoidance goals

By definition, work avoidance goals imply that faculty members pursuing this type of goal focus on the reduction of effort in the fulfillment of their work tasks. Thereby, it is highly plausible that work avoidance goals are negatively associated with different steps in the learning process. Engagement in leaning activities can be considered to be an effortful task, and thereby work avoidance goals should be detrimental for learning results. In line with these assumptions, students' work avoidance goals have been associated with maladaptive learning strategies (Nolen, 1988), worse behavioral and emotional engagement in learning, and lower school grades (King & McInerney, 2014). In addition, empirical studies on teaching professionals suggest that work avoidance goals are negatively associated with number of attended training workshops (Nitsche, Dickhäuser, Fasching, et al., 2013), frequency of reading specialist journals (Nitsche, Dickhäuser, Dresel, et al., 2013), observed attention in professional training courses (Kücherer et al., 2020), and learning engagement within professional training courses (Daumiller et al., 2020). This negative association between faculty members' work avoidance goals and learning results has also been found to be mediated by single indicators of learning engagement (namely effort, intensity, and elaboration) in a teaching-related formal learning situation (Daumiller et al., 2020). Beyond this, I investigated the mediating role of learning behavior between work avoidance goals and learning results in an informal learning situation within Study 3 of my dissertation. Next to direct associations of achievement goals and the later steps of the learning process, interaction effects might additionally be relevant.

1.3 Interactions in the learning process

As the associations of achievement goals and learning results vary substantially (Payne et al., 2007) personal or situation characteristics might interact with the impact that achievement goals have on work-related learning. Next to learning behavior as a possible mediator between motivation and learning outcomes, it is highly plausible and important to search for possible moderators of these associations. In accordance with the theory of planned behavior (Ajzen, 1991; Diethert et al., 2015), motivational aspects should only affect individuals' behaviors (and thereby outcomes), if they have the opportunities and resources to perform the intended

behaviors. For this reason, perceived autonomy could support the learning process, as this construct represents how far faculty members are free to choose between different options, while experienced pressure through high experienced workload might be detrimental for the usage of learning opportunities due a lack of resources to perform intended learning behaviors. As the job characteristics in samples of faculty members provide formal and informal opportunities for professional learning (compare Diethert et al., 2015), it seems to be a worthwhile endeavor to focus on individual characteristics that might impact how motivation leads learning behaviors in this sample. Within the later presented papers, the role of diverse moderators (e.g., experienced workload and perceived autonomy) will be examined. Further individual characteristics that I consider to be of relevance in concrete learning situations (as learning from student feedback) will be examined in Study 3 embedded within this dissertation.

More concisely, autonomy at work is achieved when individuals are free to decide which options they choose and are allowed to consider their own goals and actions in such decisions (Deci & Ryan, 2002). If individual faculty members do not have the opportunity to decide which learning activities they choose and how to conduct their own work tasks, there should theoretically be less room for motivated action. Empirical evidence supports this notion. In school teachers, learning approach goals have been found to only be associated with participation in voluntary training courses as there is less room for motivated action in obligatory courses (Nitsche, Dickhäuser, Dresel, et al., 2013). In addition, professional development courses that teachers voluntary choose to participate in have been found to be more effective than those with mandatory participation requirements in experimental intervention studies (Kennedy, 2016). While motivation (indicated by interest) has been found to predict the choice of advanced courses in less structured settings, it has not been associated with more structured learning in mid-grade students (Köller et al., 2001). I assume that the condition of lower autonomy at work also reduces faculty members' ability to act on their goals and therefore looked into its moderating role for the domain-specific engagement in teaching-related learning activities in Study 2.

In the German work context, faculty members are required to deal with multiple demanding work tasks concerning teaching, research, and administration (Esdar et al., 2016). The subjective perceptions of the research-teaching nexus are associated with occupational stress at universities (Daumiller & Dresel, 2018). The different tasks result in goal conflicts for faculty members and compete for limited work time invested in each task due to time pressure (Janke & Dickhäuser, 2018). Thus, under conditions of a generally high workload across both of the primary work domains, research and teaching, faculty members might be limited in their

goal pursuit, resulting in less engagement in learning activities as well as time invested in them. Therefore, workload might interact with faculty members' achievement goals. Aside from possible interaction effects, autonomy and workload can also be seen as antecedents of engagement in work and learning opportunities (Cerasoli et al., 2018; Janke & Dickhäuser, 2018), which should be considered within moderation analyses on this topic.

1.4 Overview

In the studies presented within this dissertation, I aim to shed light on the questions of *whether, under which conditions,* and *how* faculty members' achievement goals impact their professional learning during different phases of the self-regulated learning process. I address the research gap regarding varying associations between achievement goals and learning results (Payne et al., 2007) by focusing on (a) the mediating role of learning behavior (in all three studies), and (b) the possible interactions with personal characteristics (Study 2 and Study 3). For this purpose, a model on motivated action (see Figure 1) was developed (throughout the chapters 1.1 to 1.3) and three longitudinal studies were conducted. As performance goals might be less important for learning (Payne et al., 2007), I focused only on the mediating role of learning behavior for effects of learning approach (in all studies), learning avoidance (in Study 2 and Study 3), and work avoidance goals (solely in Study 3).

The first study embedded within this dissertation (Study 1), a longitudinal study with two measurement points across a half year, focusses on the mediation hypotheses for learning approach goals only and tackles the questions of *whether* and *how* faculty members' learning approach goals impact the later phases of the learning process (action and post-action phase). For this purpose, direct associations of learning approach goals with the learning behavior (indicated by learning time invested for formal and informal learning activities) and learning result (indicated by self-reported learning gains) in both work contexts, research and teaching, were investigated.

In the second study (Study 2), I looked into the connecting role of learning behavior (indicated by weekly assessed learning time in hours within the first four weeks of the semester) in the relationship between learning (approach and avoidance) goals and learning results (indicated by self-reported learning gains in the fifth week of the semester) in the context of teaching. To address a major limitation of prior research, this study used a longitudinal correlational design with six measurement points to qualify temporal ordering of all variables. Moreover, the moderating roles of autonomy and workload were investigated within this micro-

longitudinal study to additionally contribute to the question of *under which conditions* achievement goals relate to learning behavior.

The third study (Study 3), focusses on the learning process within the specific informal learning situation of using student evaluations of teaching (SETs) for further improvements in teaching (in contrast to recent research within a formal learning situation in didactical courses, Daumiller et al., 2020). Possible impacts of achievement goals on the actual voluntary usage of SETs (pre-action phase), and on intentions to act on SET-results and improve future teaching (post-action phase) via engagement in SET-results indicated by processing time (action phase) were investigated. Beyond this, two further moderators, namely validity beliefs regarding students as evaluators and threat experienced in regard to negative feedback, were considered within this study to examine *under which conditions* achievement goals impact the voluntary usage of SETs. This study especially contributes to all raised questions (*whether*, *how*, and *under which conditions*) and compliments prior research by the consideration of objective data on faculty members' behavior in a teaching-related informal learning situation.

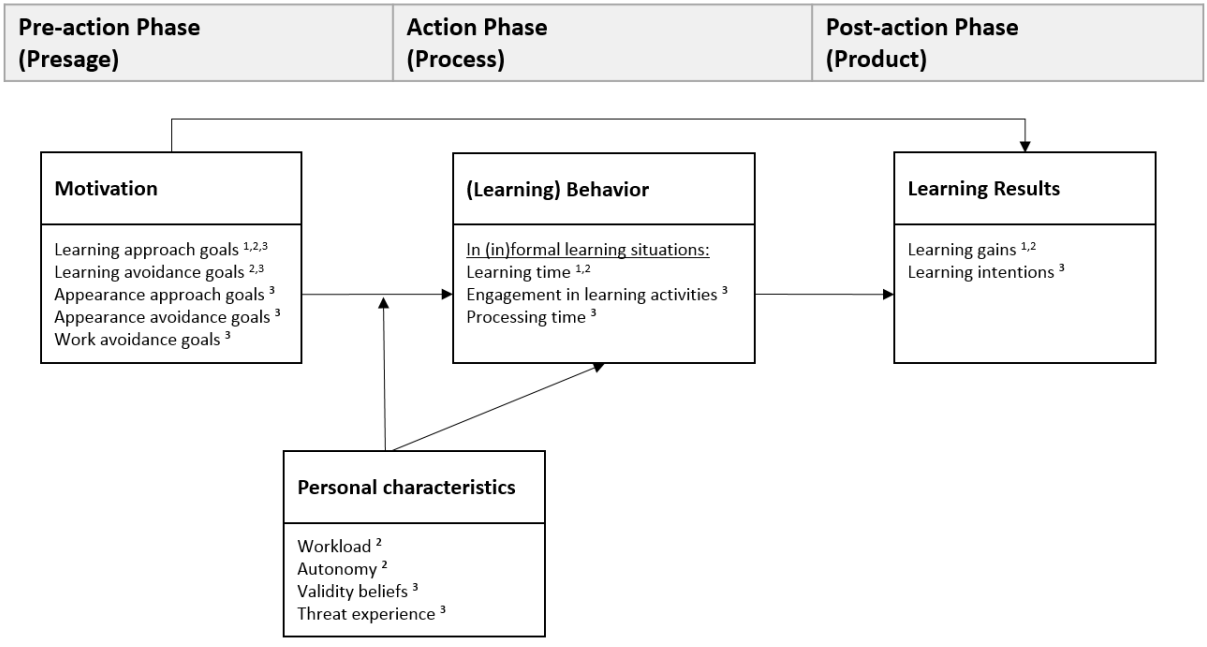

Figure 1. The model on motivated learning processes of faculty members provides an overview of the investigated hypotheses. The superscript numbers indicate the studies within this dissertation in which the constructs were investigated ([1] for Study 1, [2] for Study 2, and [3] for Study 3).

2 Conducted studies

2.1 Study 1: Learning approach goals in the learning process in teaching and research

In the first included manuscript (Hein, Daumiller, et al., 2019), I investigated learning time as a possible mechanism between the established association of learning approach goals and learning results (Payne et al., 2007). Knowledge of prior research was transferred to the main work contexts of faculty members, namely research and teaching. Learning approach goals were hypothesized to be beneficial for the invested time for learning and learning outcomes in both work contexts (compare also, Hein, 2017).

For this purpose, data of a longitudinal study with two measurement points (T1 and T2) during two semesters, which were approximately half a year apart, was analyzed. In the prospective correlational survey study, a sample of 705 faculty members working in research and teaching (at T1: on average 38.67 years, *SD* = 10.80; 46% female) at public universities across Germany reported their learning approach goals (at T1). Half a year later (at T2), the sample reported their average monthly invested learning times for formal and informal learning activities within the last six months as well as their perceived learning gains within the last half year. All constructs were assessed separately for research and teaching. Within two latent structural equation models (one per context), the proposed hypotheses were mainly confirmed. Learning approach goals and learning times explained substantial parts of variance (around 60%) in the outcome variable, self-reported learning gains, in both contexts. Although the indirect effects across learning time in both domains reached levels of significance, research-related learning approach goals did not explain a statistically significant amount of variance in learning time that was invested to enhance research-related competences.

In conclusion, this study constitutes first evidence supporting the mediating role of learning time, especially in faculty members' teaching-related learning process. Faculty members seem to profit from pursuing learning approach goals, as this goal class indicates beneficial links to the later phases of the learning process (action and post-action phase). In addition, the positive link between learning approach goals and learning outcomes in adult samples in occupational and educational contexts (Payne et al., 2007) were transferred to faculty members' work-related learning. Consequently, this study provides insights into *whether* learning approach goals might impact faculty members' work-related learning (in terms of learning time and gains), and *how* learning approach goals possibly work (through indirect associations across the learning time). Despite the strengths of this study (especially

prospective study design and representative sample), it is important to briefly discuss some limitations. Due to a long recall interval within the retrospective measure of learning time and the limitation that temporal ordering of learning time and learning gains is not possible, the results might be biased. Study 2 addresses these methodological limitations.

2.2 Study 2: Learning approach/avoidance goals in the learning process in teaching

Within the second study (Hein, Janke, et al., 2020), I looked into learning time as mediator between the positive expected associations of learning (approach/ avoidance) goals and learning outcomes. Additionally, I investigated whether perceived autonomy in teaching and general experienced workload interacted with these goals. I proposed that perceived autonomy would strengthen the association of learning goals and learning behavior (indicated by weekly learning time), and that workload would weaken this association. For this, I applied a prospective correlational study design that clearly allowed for a temporal ordering of the variables regarding the mediation analyses, and in doing so, addressed this methodological limitation of Study 1.

To investigate these research questions, 107 instructors (on average 40.85 years, *SD* = 10.62; 49% female) from two public universities in Germany were asked to report their current learning (approach and avoidance) goals prior to the semester start. Within the first four weeks of the semester, the participants reported weekly on the same day at the same time, how much time in hours they had invested within this last week in enhancing their professional and methodological knowledge for their teaching-related work in an open-ended question. In the fifth week of the semester, the participants reported on the extent of their perceived learning gains for their teaching-related learning in the last five weeks.

Manifest structural equation models revealed that learning (approach and avoidance) goals as wells as learning time predicted self-reported learning gains. However, only learning avoidance goals predicted the later reported learning time. As a result, only an indirect association of learning avoidance goals and self-reported learning gains via learning time was supported in this study. In addition, one of four manifest interaction models supported the notion of autonomy as moderator between learning avoidance goals and learning time. As expected, the association between learning avoidance goals and invested learning time as an indicator of learning behavior was stronger when paired with higher perceived autonomy in teaching.

These findings explain *whether* (by positive direct associations to learning time and gains), *how* (due a mediating role of learning time), and *under which conditions* (with high perceived autonomy in teaching) learning avoidance goals relate to later phases of the learning

process in the action and post-action phases. On the other hand, for learning approach goals, the findings only support the assumption of *whether* they relate to later reported learning gains in teaching. Despite this, the results support that pursuing learning goals is beneficial for the engagement in work-related learning of faculty members. Despite the strengths of Study 2, namely a clear temporal ordering of the indicators for motivation, learning behavior, and learning results, and the shortened recall interval of one week that prevents memory biases compared to the long recall interval of a half year in Study 1, the main limitation of this study is method bias, as all constructs were assessed by self-report measures. This does only allow an approximation of the association between motivation and actual behavior of faculty members and might overestimate the real associations. Study 3 addresses this methodological limitation by taking objective measures of faculty members' learning behavior in teaching into account.

2.3 Study 3: Achievement goals and the usage of student evaluations of teaching

In Study 3 (Hein et al., 2021) of my dissertation, I investigated the question of if achievement goals predict whether higher education instructors voluntarily conduct student evaluations of teaching (SETs) to willingly use it as an informal learning opportunity. Receiving student feedback (in form of SETs) can be interpreted as a learning opportunity as well as a performance situation by faculty members, as it contains students' judgements of instructors' performance, competence demonstration, and appearance in class. For this reason, I hypothesized that also appearance goals could matter for how faculty members voluntary use student evaluations of teaching in this specific informal learning situation. In Study 3, I proposed positive statistical effects of learning approach/avoidance goals and appearance approach goals on the behavior of voluntary asking students for feedback, and that appearance avoidance and work avoidance goals would be detrimental for the decision to voluntarily conduct SETs in the pre-action phase of the self-regulated learning process. In addition, I hypothesized that for learning goals, the strength of the positive link to later voluntarily conducted SETs would be supported by instructors' positive validity beliefs regarding students as evaluators, because if student feedback is not seen as a valid judgement, SETs might not be seen as a potential learning situation. Moreover, the general experienced threat in regard to negative feedback might weaken the association of learning goals and voluntarily conducted SETs since SETs entail the possibility of receiving unfavorable feedback. This might be especially true, given that faculty members could also engage in several alternative learning activities (e.g. didactic courses) to pursue their learning goals. For the later phases of the learning process, I proposed that the associations of learning and work avoidance goals with intentions regarding the SET-results

(post-action phase), would be mediated by the processing time regarding these results (action phase).

To test these hypotheses, I developed a digital tool for evaluation in cooperation with our programmers (see Janke et al., 2020). A net sample of 407 instructors (with an average age of 38.60 years, *SD* = 10.21 years; 46% female) from higher education institutions (including public, private, and applied universities) in Germany and Austria answered a baseline questionnaire assessing their current teaching-related achievement goals, general experienced threat through negative feedback, validity beliefs regarding student feedback, and reported a current teaching commitment that would allow them to conduct a voluntary SET. After finishing the baseline questionnaire, the instructors could voluntarily use the option of the online tool to plan and conduct student evaluations of teaching. The first time they received students' feedback (the results of the SET) on the online platform, the processing time of instructors was tracked on the homepage. After viewing the results for the first time, instructors were asked to answer a short questionnaire on their intentions regarding the concrete SET-results. They reported their intentions to act on the processed SET-results in closed questions and their intention to improve future teaching in an open-ended question.

Latent multivariate structural equation model confirmed the hypotheses regarding associations between learning avoidance goals, appearance approach/avoidance goals, and the actual behavior of whether instructors conducted at least one SET within half a year after their participation in the baseline questionnaire. Moreover, learning approach goals predicted intentions to act on SET-results and intentions to improve future teaching regarding concrete SET-results while controlling for quantitative and qualitative differences between these results (e.g., teaching quality and number of students who provided feedback). Only learning avoidance goals were positively associated with later reported intentions to act on SET-results. However, neither the postulated interaction effects nor the mediation effects were statistically significant in this study.

This study provides insights into the relevance of achievement goals for the objectively measured behavior of whether instructors voluntarily conduct SETs, next to the role of learning goals for self-reported intentions to act on concrete SET-results and improve future teaching in an online study. It thereby supports prior findings that I reported within this dissertation regarding the question of *whether* learning goals might impact engagement in learning activities (conducting SETs, early step in the learning process), as well as the achieved learning results (building intentions to act on SET-results and improve future teaching, late step in the learning process). This was true regardless of objective measures being been applied. To this end, it

seems to be the case that motivation predicts faculty members' actual learning-related behavior such as the voluntary usage of SETs. Nevertheless, it is important to mention that this study does not provide new insights into *how* and *under which conditions* learning goals impact the learning process, as neither the proposed moderators nor the proposed mediators revealed the expected associations. Given these findings, especially learning goals seem to matter for what faculty members do in their teaching-related learning process and intent to do in future teaching.

3 Short summary of the results

To provide an overview of the results of the main hypotheses presented in this dissertation (the mediating role of learning behavior between motivation and learning outcomes), the statistical effects reported in the three studies are depicted within Table 1.

Table 1. *Overview of the effects on the later learning process across three longitudinal studies.*

	(Learning) Behaviors			**Learning Results**								
	Direct effect			Total effect			Direct effect			Indirect effect		
	S	β	*p*	*S*	β	*p*	*S*	β	*p*	*S*	β	*p*
In research												
Lap goals	1	**.27**	<.001	1	**.33**	<.001	1	.13	.050	1	**.20**	.003
In teaching												
Lap goals	1	**.39**	<.001	1	**.40**	<.001	1	.11	.065	1	**.30**	<.001
	2	.03	.368	2	**.29**	.002	2	**.28**	.001	2	.01	.366
	3[a]	–.04	.705	3[c]	**.42**	<.001	3[c]	**.42**	<.001	3[c]	–.00	.604
	3[b]	.03	.117	3[d]	**.24**	<.001	3[d]	**.23**	.002	3[d]	.01	.204
Lav goals	2	**.26**	<.001	2	**.47**	<.001	2:	**.40**	<.001	2	**.07**	.009
	3[a]	**.15**	.013	3[c]	**.24**	.013	3[c]	**.24**	.012	3[c]	–.00	.567
	3[b]	.08	.153	3[d]	–.04	.649	3[d]	–.05	.690	3[d]	.01	.837

Notes. S = study number (Study 1, Study 2 or Study 3); β = standardized regression coefficient; *p* = one-tailed levels of significance are reported for all studies; Lap = learning approach goals; Lav = learning avoidance goals. The beta coefficients and significance levels were retrieved from the mediation analyses reported in the three embedded studies (Hein, Daumiller, et al., 2019; Hein, Janke, et al., 2020; Hein et al., 2021). Significant effects (p <.05) are printed in boldface. It should be noted that all three studies report separate mediation analyses for each type of goal (learning approach vs. avoidance goals), but that Study 3 included further control variables in contrast to the other studies. In Studies 1 and 2, (learning) behavior was assessed by learning time and learning results were assessed by self-reported learning gains. In Study 3, (learning) behavior was assessed by voluntarily conducted SETs (3[a]) and processing time (3[b]), while learning results were assessed by intentions to act on SET-results (3[c]) and intentions to improve teaching (3[d]). As only processing time (3[b]) could be considered a mediator in the mediation model of Study 3, for 3[a], the bivariate latent correlation coefficients of learning goals on this outcome are reported.

Table 1 summarizes the results for the research questions of *whether* and *how* learning goals impact the later phases of the learning process, (learning) behavior in the action phase, and learning results in the post-action phase. To elaborate on the findings reported in Table 1, it should first be mentioned that especially faculty members' learning approach goals relate to the invested learning time (in Study 1), self-reported learning gains (in Study 1 and 2), the intention to act on SET results (in Study 3), and intentions to improve future teaching (in Study 3). These findings are in line with prior research in adult samples (Diethert et al., 2015; Nitsche, Dickhäuser, Dresel, et al., 2013; Nitsche, Dickhäuser, Fasching, et al., 2013; Payne et al., 2007) and strengthen the claim of the beneficial impression of learning approach goals on professional learning (in terms of both learning behavior and results). Next to these well documented links regarding learning approach goals, this dissertation also provides first evidence for a potential beneficial role of a controversial type of achievement goals, namely learning avoidance goals (Cury et al., 2006; Hulleman et al., 2010), at least in samples of faculty members in Germany and Austria. Learning avoidance goals of faculty members were positively associated with weekly invested learning times (in Study 2), self-reported learning gains (in Study 2), the behavior of voluntarily conducting SETs (in Study 3), and the intention to act on processed SET-results (in Study 3). In addition to the first research questions, Study 3 provided additional information on *whether* achievement goals matter for the later learning process by investigating direct associations between appearance (approach and avoidance) goals and the behavior of voluntarily conducting SETs in multivariate models, which is a precondition for later learning from SET-results.

4 Overarching Discussion

Research on what motivates teaching professionals, what they do in the learning process, and how they learn is important for enhancing knowledge about instructors' professional learning (Kennedy, 2016). In the previous sections, I presented three studies that contribute to the general question of what motivates faculty members to learn at work and what processes impact the success of their motivation on outcomes of professional learning. Given that even for teachers, strong theories regarding professional learning are still missing (Kennedy, 2016), it is important to test and adapt frameworks from other contexts to advance theory development in the area of professional learning of teaching professionals. I aimed to contribute to a clarification of the work-related learning process of faculty members in higher education. In my dissertation, I developed a model on motivated learning processes of faculty members to contribute to the research gap and derive an explanation for the varying strength of associations

between motivation and learning outcomes reported in prior research (Payne et al., 2007). According to models of self-regulated learning (Schmitz & Wiese, 2006; Zimmerman, 1990) and workplace learning (Tannenbaum et al., 2010; Tynjälä, 2013), I proposed that motivation (in the form of achievement goals) is essential for engagement in voluntary learning activities and thereby for professional learning outcomes. Within this model, I proposed that a) learning behavior should mediate the association between motivation and learning results and b) diverse personal characteristics should interact with motivation, which facilitates or hinders the success of faculty members' goal strivings. In my research, I shed light on the questions of *whether* achievement goals (as indicators of motivation) relate to engagement in learning opportunities and the respective learning outcomes, and *how* achievement goals work. Additionally, I investigated *under which* potential conditions it might be easier or more difficult for faculty members to pursue their goals.

To sum up, the three studies emphasize that especially learning (approach and/or avoidance) goals are positively associated with (learning) behaviors (e.g., indicated by learning time or conducting SETs) and learning results (e.g., indicated by self-reported learning gains or intentions regarding SET-results), which partly answers the *whether*-question. In addition, the studies provide an empirical perspective on the possible mediating role of learning behavior (indicated by learning time) between learning goals and self-reported outcomes, partly explaining *how* learning goals work. And lastly, evidence for a possible interaction between teaching-related autonomy and learning avoidance goals was found, this can be seen as a first glimpse into the question of *under which conditions* learning goals matter. However, the results are not fully consistent between the three studies (especially regarding the mediation for learning approach vs. learning avoidance goals and direct associations of these goals with the diverse outcomes), and the empirical studies did not support any of the further proposed interactions. This indicates that the question of *under which conditions* learning goals impact the different phases of the learning process can still not be completely answered yet and require further research. Despite this, the reported studies contribute to the current field of research on professional learning of faculty members through their theoretical and methodological strengths.

4.1 Theoretical implications and contribution to the field

The proposed model of motivated learning processes of faculty members contributes to the field of research as it provides an opportunity to answer the question of why the success of goal

pursuit varies, and simultaneously takes the much discussed achievement goal class of learning avoidance goals into account.

While there was first empirical evidence for direct associations of learning approach goals and engagement in professional learning activities in faculty members prior to the present dissertation (e.g., Diethert et al., 2015; Fritzsche & Daumiller, 2018), research in this field did not investigate mediating or moderating processes between motivation and learning results, despite varying associations between achievement goals and learning results on a meta-analytic level in adult samples (Payne et al., 2007). I proposed such mediating and moderating processes within the model on motivated learning processes of faculty members. The empirical findings suggested that in the three studies, support mainly existed for the mediation hypotheses of the model on motivated learning processes of faculty members. Namely, the proposed link between motivation (pre-action phase) and learning results (post-action phase indicated by self-reported learning gains) was mediated through engagement in learning behaviors (action phase indicated by self-reported learning times). The studies supported this assumption for learning approach goals in Study 1 and for learning avoidance goals in Study 2. My dissertation complements prior research (Diethert et al., 2015; Fritzsche & Daumiller, 2018) by considering both self-reported learning times for formal and informal learning activities simultaneously (in Study 1), and by considering the enhancement of methodological-didactical as well as professional competences (in Study 1 and Study 2). Study 1 (Hein, Daumiller, et al., 2019) in particular motivated further research on the mediating role of learning behavior (Daumiller et al., 2020) and on direct associations with attention in professional training courses (Kücherer et al., 2020). Recent research on achievement goals (Daumiller et al., 2020) that extended the research reported within the first paper of this dissertation (Hein, Daumiller, et al., 2019) showed that the association between learning approach goals and learning results in professional training courses was mediated by several learning engagement indicators (namely intensity, elaboration, persistence, and implementation). Thereby, the studies within my dissertation not only began addressing this research gap, but also motivated further research in this field.

In regard to the proposed interactions between achievement goals and personal characteristics, my dissertation provides first empirical evidence only for the moderating role of faculty members' perceived autonomy. So far, beneficial associations between learning avoidance goals and weekly invested learning times have been found to be strengthened by the extent of perceived autonomy in teaching (in Study 2), which corresponds with prior findings suggesting that motivated actions are important to consider (Esdar et al., 2016; Köller et al., 2001; Nitsche, Dickhäuser, Dresel, et al., 2013), and contributes to the question of *under which*

conditions learning goals work. However, the model on motivated learning processes of faculty members additionally provides an opportunity for future research to advance theory development in the area of professional learning of teaching professionals even though not all hypotheses were empirically supported within my dissertation.

In addition to this, within two longitudinal studies (Cury et al., 2006; Elliot & McGregor, 2001; Hulleman et al., 2010), learning avoidance goals were not only considered as possible predictors of faculty members' professional learning, but also showed positive associations with later reported constructs such as weekly learning times in teaching, learning gains, objective behavior of conducting voluntary SET(s), and intentions to act on SET-results. In light of these results, learning avoidance goals might be considered relevant for motivating teaching-related professional learning of higher education instructors. Thus, at least in samples of German and Austrian faculty members, learning avoidance goals can be considered to be a relevant part of their goal striving (Daumiller, Dickhäuser, et al., 2019; Daumiller et al., 2015). The reported results for learning avoidance goals are especially interesting, as in an interview study on faculty members' goal strivings, only a single participant spontaneously mentioned this goal class (Daumiller et al., 2015). Although measurement of this goal class is not easily achieved with open question formats, faculty members report the pursuit of this goal class to be quite strong in closed ended questionnaires (Daumiller, Dickhäuser, et al., 2019; Daumiller & Dresel, 2020). Consequently, this construct still entails room for discussion. Nevertheless, in Study 3, learning avoidance goals predicted faculty members' behavior to voluntary conduct at least one student evaluation of teaching. This finding implies that this achievement goal class has the potential to influence instructors' autonomous choice of participation in research studies. Despite this, the possibility of a pre-selected sample due to the study design would only lead to a conservative estimation of the association between learning avoidance goals and learning behavior/gains due to a limited range in learning avoidance goals. Taken together, it is important to consider learning avoidance goals as potential predictors of professional learning in future research, but also for further outcomes (Daumiller, Dickhäuser, et al., 2019; Rinas et al., 2020), as the reported findings indicate a predictive power of this goal class, even in situations where learning approach goals are not associated with later shown or self-reported behaviors (see Study 2 and Study 3).

From a methodological perspective, this dissertation contributes to the field of research by including longitudinal field study designs in all three studies, which allowed for temporal ordering of the variables, provided the opportunity of prospective correlational analyses, and had the advantage of a high ecological validity. Prior research on faculty members' professional

learning primarily included cross-sectional studies which did not allow for prospective analyses (Diethert et al., 2015; Fritzsche & Daumiller, 2018). Study 2 in particular provided a clear temporal ordering of all of the constructs relevant for the mediation hypotheses, learning (approach and avoidance) goals, weekly reported learning times, and self-reported learning gains. These prospective designs lead to the conclusion that higher education instructors' motivation (in form of learning goals) has the potential to predict future actual and intended behaviors in the form of invested learning times, voluntarily conducting SETs, as well as intentions to act on SET-results and improve future teaching.

Finally, a major contribution of Study 3 is that it provides objective measures for higher education instructors' engagement in the informal learning activity of voluntarily using non-mandatory student evaluations of teaching and assessing the processing time of SET-results. Given that the identified associations between achievement goals (learning avoidance, appearance approach, and appearance avoidance goals) and the objective measures (conducting SETs) were small, this might indicate the need for motivation (in the form of achievement goals) and actual behavior to be further investigated in future studies. This is especially true, considering that the amount of explained variance was only statistically significant when including the control variables (academic status and duration of contract). In addition to this, an unexpected correlation between appearance avoidance goals and processing time was reported in this study. This unexpected finding strengthens the claim that motivation in form of achievement goals might be relevant for faculty members' behavior. Moreover, this finding can potentially be explained by the rationale that higher education instructors might invest time in processing SET-results for various reasons (to identify learning potentials if they pursue learning goals, or possibly regarding a focus on how one appears to students if they pursue appearance goals). Thereby, processing time is not a valid measure of learning time and was not proposed as such a measure. Instead, it was expected that a more thorough processing of SET-results also provides the opportunity to identify more learning potentials and thereby benefits later learning results. This hypotheses was only supported by a bivariate association between processing time and intentions to improve future teaching (and not in the multivariate mediation model). Consequently, there are clear indications regarding the potential impact of motivation on instructors' behavior, which allows for the conclusion that achievement goals (especially learning goals) seem to matter for what faculty members do and intend to do in their professional learning. For this reason, future studies on antecedents of faculty members' professional learning should investigate achievement goals further.

4.2 Practical implications

Taking into account the importance of faculty members' professional learning for the quality of research and teaching, especially studies that shed light on the teaching process and individual characteristics as antecedents of professional learning can provide relevant practical implications. Basic ideas of the model on motivated learning processes of faculty members offer starting points for supporting instructors in their professional learning. To this end, I looked into motivation (especially in form of learning goals) of faculty members as antecedents of engagement in learning activities and self-reported learning gains. In light of the results of the three studies, fostering higher education instructors' learning (approach and avoidance) goals regarding concrete learning situations (e.g., professional learning for teaching or SETs as learning opportunities) might be helpful to support the further learning processes in higher education institutions. In practice, activating faculty members' achievement goals might also be possible through instructions comparable to those used in student samples (Elliot & Harackiewicz, 1996; Elliott & Dweck, 1988). Such instructions could place a value on the importance of professional learning, improvement in teaching, and evaluating one's own performance at work on the basis of individual changes over time. In educational practice, several suggestions can also be made to strengthen faculty members' learning goals. In professional training courses, instructors could emphasize the aforementioned values in their courses. Superiors could instruct their employees or the quality management could provide goal activating information in their communication to faculty members before they receive SET-results. Furthermore, as teaching-related autonomy might strengthen the positive link between learning avoidance goals and weekly invested learning times, it could be beneficial to foster this work-related aspect by enabling instructors to manage their time in a self-determined manner, allowing a free choice for the engagement in formal and informal learning activities as well as choosing instructional methods or course topics. Further, small workplace interventions that target the fostering of autonomy have also been discussed in previous literature on faculty members' goal striving (Janke & Dickhäuser, 2018). These suggestions for practical applications primarily focus on motivation and autonomy as variables of the pre-action phase of the model on motivated learning processes.

Next to this, it might be beneficial to support faculty members in the later phases of the learning process (action and post-action phases). Even if teaching professionals' participation in formal or informal learning activities would be mandatory, learning from such opportunities is not (Hein et al., 2021; Kennedy, 2016). For this reason, the later phases are particularly important in fostering faculty members' professional learning. Since faculty members might

profit from engagement in professional learning activities, it can be considered a worthwhile endeavor to support learning behaviors in research and teaching (e.g., financially, socially, or by providing resources as time for development). Higher education institutions and faculty members in leadership positions could support the attempts of the instructors and researchers to participate frequently in diverse learning activities for both work domains (starting directly in the action phase), as the results reported in my dissertation highlighted a connection between learning behaviors (indicated by self-reported learning times or processing time of SET results) and later learning results (indicated by self-reported learning gains or learning intentions regarding SETs). Formal and informal learning activities designed to enhance research- or teaching-related competencies could be encouraged. Supportable formal learning activities that might enhance learning results for instructors and researchers include participation in didactical-trainings, conferences, or workshops, next to informal learning activities such as the reading of textbooks and specialist journals to enhance professional and/or methodological knowledge as well as exchange ideas with colleagues.

Individual support of instructors in the post-action phase of the learning process might encourage faculty members' proactive reflection (e.g., for faculty reflection on weekly SETs see Winchester & Winchester, 2011) on their individual professional learning processes in research and teaching. It might be helpful for faculty members to receive qualitative surveys that guide them in reflecting upon their professional development and competences (e.g., for manuscript writing, learning statistical methods, or facilitating a better understanding of further research methods) once a year to detect areas for improvement, formulate goals, and derive intentions for future learning behaviors (e.g., training participations or reading). Regarding teaching-related learning from SET-results, intentions to act on SET-results and improve future teaching might be fostered after faculty members' receive student feedback. More concisely, faculty members' professional learning might be supported by superiors who encourage faculty members to discuss SET-results with colleagues and/or students to identify learning potentials to improve future teaching, to reflect on possible changes for further improvement and innovation, or to plan participation in further relevant didactical courses. A short qualitative survey, which faculty members complete after processing SET-results, might foster their professional learning in the post-action phase. This survey could entail questions on what instructors learn from the feedback, what they would like to improve in future teaching, and how they could do that by formulating implementation intentions to support goal attainments (Gollwitzer & Sheeran, 2006).

As I did not conduct interventional studies within my dissertation, it is not clear which concrete interventions might support faculty members in their own learning process. The results that I report also require further support on the causality of the associations between motivation, learning behavior, and learning results. Consequently, future trainings and interventional studies are needed to test the proposed ideas for practical applications before they can be implemented into higher education systems.

4.3 Limitations of the longitudinal studies and implications for future research

Next to the strengths of the presented studies, their contribution to the field of research, and implications for educational practice, some limitations need to be considered when interpreting the results. These limitations offer starting points for improvements in future research on faculty members' professional learning. The most severe limitation of the three reported longitudinal studies is that the prospective correlational designs do not enable us to draw causal conclusions, as the independent variables, moderators, and mediators were not manipulated throughout the studies as neither experimental nor interventional studies were conducted. For this reason, the reported results do not provide causal proof. However, the results can still be seen as evidence of temporal trends for those constructs that were assessed at different measurement occasions throughout the studies, and offer approximations. Consequently, future research in the population of faculty members might focus on experimental and interventional studies to advance knowledge on the impact motivation has on engagement in learning activities and learning results, and to allow for more realistic estimations of the investigated associations.

Furthermore, a potential single source bias (Podsakoff et al., 2003) limits the interpretation of the results (in Studies 1 and 2), which could have led to an overestimation of the reported associations in these studies. Especially in Study 1, an overestimation of the relationship between learning time and self-reported learning gains seems possible, as both constructs were not only measured by self-report, but also at the same measurement occasion. To weaken such a possible bias, Study 2 adopted a longitudinal approach that allowed for clear temporal ordering of learning goals, weekly learning times, and self-reported learning gains. In Study 3, I improved dealing with such a possible bias, by assessing the objective processing time technically in the background of the evaluation tool and thereby including multiple sources. Across all three studies, I found relevant associations of learning/processing times and learning outcomes at least on bivariate levels. When applying study designs that are potentially limited by overestimations, the reported results can only be interpreted as approximations for the real associations in this population. It can be observed, that the strength of the associations

between learning/processing time and learning results drops throughout the studies (from around .75 in Study 1, to around .30 in Study 2, to around .20 in Study 3). This strengthens the claim that throughout the studies, potential overestimations through single source biases decrease, resulting in more realistic estimations of the true associations in the population of faculty members. In light of these results, future research should attempt to prevent possible single-source biases or at least weaken them by applying designs that truly enable temporal ordering of variables, and assessing the constructs multifactorial including multiple sources (e.g., self-reports, observations, and objective indicators for the constructs). When applying such improved study designs, it needs to be kept in mind that smaller statistical effects can be expected. In planning the study, this is important for power analyses and planning of the sample size. This constitutes a challenge for future research that on the one hand, multifactorial designs including objective measures need to be applied to larger samples to prevent analyses with low statistical power.

Despite attempts to limit single source bias for the associations with (learning) behaviors throughout the studies, learning goals and learning outcomes were both assessed as self-report measures in all three studies. Nevertheless, a potential single-source bias between these variables might be weakened due to their measurement at different time points in all three studies. Future investigations could also allow for deeper insights through the use of multi-faceted measures for motivation and learning outcomes that are not limited to self-report measures. Such multifactorial measures should be selected in a situation specific manner. While a multifactorial assessment of motivation might only include different self-report scales (because it is hard to measure this construct otherwise), learning outcomes can be assessed by applying observations and objective measures (e.g., knowledge tests as indicators of learning results after participation in didactical-courses) to limit possible single-source bias in future studies. This would also solve the limitation of it not being possible to assess learning results more objectively throughout the designs of the reported studies (including faculty members from different countries, higher education institutions, and divisions). For this reason, the reported association with learning results also resembles approximations rather than exact estimates, which can serve as starting points for future research. Since my results already suggest a direction of possible interactions between diverse motivational constructs (such as learning avoidance goals and autonomy, in Hein, Janke, et al., 2020), it would be highly interesting to look into the interplay of motivational constructs on faculty members' learning behavior and outcomes. This is especially true given the fact that the empirical evidence for the proposed interaction between goals and further personal characteristics is still weak. Future

research could look into concrete goals (e.g., regarding the use of SETs and reasons for it), self-efficacy, and need fulfillment (Daumiller, Stupnisky, et al., 2019) as possible antecedents of faculty members' professional learning.

It is important to note that although the operationalization of engagement in learning activities in the action/process phase was constantly improved throughout the three reported studies, there is still room for further improvement. Firstly, learning time was measured with an ordinal response format and a long recall interval across half a year, leaving much room for memory biases. Following this, learning time was then assessed in hours with a shorter recall interval of a week, which prevented heavy memory biases. Lastly, also the objective behavior of conducting SETs and concrete processing times were assessed. It needs to be kept in mind that Study 3 does not propose that processing time could be an indicator for learning behavior, but needs to be interpreted as a further process variable between motivation and learning results. Moreover, this dissertation also assessed quantitative indicators of engagement in learning activities. After all, learning behavior can be described by further facets (e.g., application of qualitative learning strategies or self-monitoring) and learning gains can be expected to be determined by multiple factors. To list one example, time management was also positively associated with self-reported learning gains and moderated the positive association of learning approach goals and self-reported learning gains in a cross-sectional study with faculty members (Hein, Kohler, et al., 2019). Additionally, it might be possible that the choice of high quality learning strategies (Elliot et al., 1999) or goal commitment (Klein & Lee, 2006) facilitates effects on learning gains. Despite this, many strategies (more concisely, planning, monitoring, help seeking, and emotion control) postulated in models of self-regulated learning were not significantly associated with learning in work-related trainings within a meta-analysis (Sitzmann & Ely, 2011). Models on workplace learning and informal learning (Tannenbaum et al., 2010; Tynjälä, 2013) differentiate learning activities that can be undertaken at work more clearly, and thereby have the potential to enrich the model on motivated learning processes of faculty members in future studies. Consequently, it appears fruitful to consider informal workplace learning activities such as reflection, feedback, experience/action (Decius et al., 2019) in future research on faculty members' work-related learning process. In the present research, a questionnaire to assess informal workplace learning (Decius et al., 2019) was adapted for higher education instructors and validated to the context of teaching-related learning (Hein, Dickhäuser, et al., 2020) and could be applied in future research.

While the studies embedded in this dissertation focused on the teaching-related learning process, it is of high interest to also look into the learning process in the research-related

learning process. This is especially the case as research expenditures have increased, while the number of peer-reviewed published articles has stagnated, at least in the USA (Daumiller, Stupnisky, et al., 2019; Hill, et al. 2007; Litwin, 2014). There are a few studies on the role of researchers' motivations for professional learning and research productivity (Daumiller & Dresel, 2020; Hein, Daumiller, et al., 2019; Phillips & Russell, 1994). However, these studies do not include potential objective indicators for research-related learning results and researchers' performance (e.g., number of publications, number of conference contributions, and adapted statistical methods within their papers in a specific discipline), and do not take competing goals across the main work domains of research and teaching simultaneously into account.

Furthermore, the studies attempted to increase the generalizability of the reported findings. In Study1, the recruited sample that was gathered across approximately 83 universities and 12 different disciplines was representative for scientific staff at universities in Germany regarding gender, percentage of professors, and number of different divisions (Daumiller & Dresel, 2018; Hein, Daumiller, et al., 2019). This provided the opportunity to generalize the findings regarding learning approach goals to faculty members working in research and teaching at public universities in Germany. Study 3 additionally included Austrian faculty members. Thereby, both studies constitute first steps to enable a generalization of the findings in future research. However, the current state of research on faculty members' learning for work does not yet offer the opportunity to transfer indirect associations of learning goals and learning results to further cultures, concrete situations in learning to enhance research-related competencies, and employment situations in further higher education systems, which are less characterized by competition.

In sum, future research on faculty members' professional learning should contribute to questions of generalizability of the presented results (across nations with other work contexts), that provide more realistic estimates for the presented associations, and allow causal conclusions. In addition, new questions can be raised, such as what further (motivational) antecedents predict the work-related learning behaviors, which learning activities predict objective learning results, and what personal or contextual characteristics interact with these variables. If research on faculty members' professional development continues to flourish by being taken up by further research groups, looking more closely into faculty members' learning in the work context of research, including studies conducted in further nations, and taking objective measures on learning results into account, then it would be a worthwhile endeavor for future research to synthesize prior empirical findings. Meta-analytical structural equation

models (Steinmetz et al., 2020) allow meta-analytical analyses of complex models to test indirect effects and multivariate models above different studies. At this moment, the data base is not sufficient to conduct meta-analytical structural equation models for the mediation hypotheses in the sample of faculty members. However, it would strengthen the claims proposed by the model on motivated learning processes of faculty members on the mediating role of learning behavior between motivation and learning results and should be aimed at in future research on this topic. Despite this honorable long-term goal that this line of research should pursue, in the short run, it is important to conduct further studies on the professional learning of faculty members to answer open questions raised in this line of research.

5 Conclusion

Prior to my dissertation, theoretical models on teaching professionals' learning processes were still missing (e.g., for teachers, Kennedy, 2016). This was especially true concerning models that also provide an explanation for the varying strength of the relationships between motivation and learning outcomes in adult samples (Payne et al., 2007). In accordance to models of self-regulated learning (Schmitz & Wiese, 2006; Zimmerman, 1990), workplace learning (Tannenbaum et al., 2010; Tynjälä, 2013), and the theory of planned behavior (Ajzen, 1991; Diethert et al., 2015), I developed a model on motivated learning processes of faculty members. In this model on motivated learning processes of faculty members, I proposed two clear explanations for the varying strengths of associations between motivation (in the form of achievement goals) and the outcomes of professional learning. Firstly, (learning) behaviors should mediate the link between motivation and learning results. Secondly, various personal characteristics (such as autonomy, workload, personal beliefs, and experienced threat) should interact with motivation and facilitate or hinder the success of faculty members' goal strivings. Across three longitudinal studies, the motivations ("to learn something new" and "to avoid not developing own competencies further"), predicted diverse learning behaviors and outcomes including self-reported learning times and gains, whether faculty members voluntarily evaluate their teaching, as well as their intentions to use evaluation results for further improvements in teaching. Secondly, the self-reported weekly learning times partially mediated the associations of motivation (indicated by learning goals) and self-reported learning gains. Lastly, the personal characteristic of autonomy in teaching strengthened at least the association of learning avoidance goals and the weekly invested learning times. These empirical results support some of the notions of the model on motivated learning processes of faculty members and contribute to the highlighted research gap. As a consequence, further research investigating mechanisms

behind the associations of motivation, learning behavior, and learning gains is a worthwhile endeavor. All in all, the presented ideas provide a foundation for future research on faculty members' professional learning in the teaching domain. This research should pursue the goal of advising higher education institutions, superiors, (didactical) instructors, and quality management professionals on how to support faculty members to profit from their goal pursuit and make professional learning more effective.

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Appendix

Appendix A:

Hein, J., Daumiller, M., Janke, S., Dresel, M., & Dickhäuser, O. (2019). How learning time mediates the impact of university Scholars' learning goals on professional learning in research and teaching. *Learning and Individual Differences*, 72, 15–25. https://doi.org/10.1016/j.lindif.2019.04.002.

Appendix B:

Hein, J., Janke, S., Daumiller, M., Dresel, M., & Dickhäuser, O. (2020). No learning without autonomy? Moderators of the association between university instructors' learning goals and learning time in the teaching-related learning process. *Learning and Individual Differences*, 83–84, 101937. https://doi.org/10.1016/j.lindif.2020.101937.

Appendix C:

Hein, J., Janke, S., Rinas, R., Daumiller, M., Dresel, M., & Dickhäuser, O. (2021). Higher education instructors' usage of and learning from student evaluations of teaching – Do achievement goals matter? *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2021.652093. Psyarxiv.com/mt8rw.

Learning and Individual Differences 72 (2019) 15–25

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

How learning time mediates the impact of university Scholars' learning goals on professional learning in research and teaching

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ARTICLE INFO

Keywords:
University scholars
Learning goals
Self-regulated learning
Teaching
Research

ABSTRACT

Empirical investigations of university scholars' learning goals are important to foster high-quality teaching and research. A well-established tenet in achievement goal research is that learning goals elicit actual learning. However, few studies have investigated the mechanisms behind this association. In this study, we propose that learning time links learning goals (i.e., the goal to enhance one's own competences) to learning outcomes in both contexts, research and teaching. In a prospective correlational study, we questioned a representative sample of 705 German university scholars (highest qualification: 25% full professors, 36% with Ph.D.) during two successive semesters. Applying structural equation models, we found positive associations of learning goals and self-reported learning gains (in research and teaching) that was mediated by learning time within the teaching domain. University scholars seem to profit from pursuing learning goals. Future training programs might consider this variable as a starting point for increasing learning.

1. Introduction

University scholars have many responsibilities such as teaching, conducting research, and self-administration. To fulfill their duties in these diverse domains and grow in personal competencies, university scholars need to simultaneously acquire knowledge for good teaching (e.g., didactical knowledge) as well as for their research (e.g., methodological skills). Given the importance of didactical competencies and expert knowledge for high-quality instruction and, in turn, for the learning success of students (Biggs & Tang, 2011), it is of high interest to discover factors that influence this learning process within university scholars. Previous studies on the learning and teaching behavior of teachers in primary- and secondary-school education have shown that motivation is associated with the professional skill development of teachers (e.g., Butler, 2012; Butler & Shibaz, 2008; Nitsche, Dickhäuser, Fasching, & Dresel, 2013). This makes motivation a promising candidate in our search for factors that influence university scholars' learning and teaching behavior as well. More specifically, university scholars' learning goals (i.e., pursuit to enhance one's competences) could be directly linked to their learning behavior as research on secondary school teachers suggests that especially learning goals are positively associated with participation in professional training programs to enhance competence (Nitsche, Dickhäuser, Fasching, & Dresel, 2013). Therefore, such association likely also exist within teaching staff. Given these findings, we investigate whether learning goals are also associated with the professional learning of university scholars. Despite the well-established positive association between learning goals and learning ("the acquisition of declarative and procedural knwoledge", p. 133; Payne, Youngcourt, & Beaubien, 2007) in educational and occupational settings, the meta-analytical results do not explain why this relationship exists. The present study aims at closing this research gap by investigating a potential mechanism behind the relationship between learning goals and learning outcomes. To this end, we apply the component model of self-regulated learning by Schmitz and Wiese (2006), which highlights that learning time as an indicator of learning behavior could be a possible mediator of the association between learning goals and learning outcomes. We will elaborate on the component model of self-regulated learning in the following sections and further illustrate why we think that learning time could play such an important role. However, before we examine learning time as a possible mechanism, we need to define learning goals as potential driving force of the learning process.

1.1. Learning goals and learning outcomes

Learning goals are a specific kind of achievement goals, which are

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https://doi.org/10.1016/j.lindif.2019.04.002
Received 22 May 2018; Received in revised form 28 March 2019; Accepted 2 April 2019

defined as future-focused cognitive representations of competence-related results or end states an individual is committed to either avoid or approach (Dweck & Leggett, 1988; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010; Nicholls, 1984). Learning goals are approach-oriented achievement goals that are directed to the acquisition and development of own competence (e.g., improving didactical skills) and assumed to guide behavior. As such, they are neither implicit needs nor drives, but a preferred focus on a specific end-state. In line with Grant and Dweck (2003) and Elliot and McGregor (2001), we define learning goals as an active striving toward development and growth of own competence, an increase in one's ability based on an intrapersonal standard and one's maximum potential attainment (see also Hulleman et al., 2010). University scholars with strong learning goals want to further develop their competence and gain broader as well as deeper knowledge (improvement aspects) as much as possible (potential attainment; Hulleman et al., 2010). Furthermore, learning goals are highly context specific; the goal to enhance competences also varies across subjects or tasks (Baranik, Barron, & Finney, 2010). Daumiller, Figas, and Dresel (2015) showed that most university scholars spontaneously name self-related learning goals as an important aspect of their vocational motivation. Learning goals can be considered relevant for university scholars and appropriate for describing the pursuit of their goals.

Dweck (1986) and Nicholls (1984) theorized that learning goals have positive effects on a wide range of educational outcomes. Primarily concerning students, learning goals are beneficial for collaborative learning and for self-efficacy and decrease cheating (Senko, Hulleman, & Harackiewicz, 2011). In addition, research on teachers has shown that their learning goals are beneficial for a vast array of outcome variables such as adaptive instructional practices (Butler & Shibaz, 2008; Retelsdorf, Butler, Streblow, & Schiefele, 2010), interest in teaching (Retelsdorf et al., 2010) as well as for the positive perception and frequency of help-seeking (Butler, 2007; Dickhäuser, Butler, & Tönjes, 2007). Moreover, the learning goals of teachers seem to be a protective factor against emotional exhaustion (Retelsdorf et al., 2010; Tönjes & Dickhäuser, 2009). In contrast to the rising number of research on achievement goals within school teachers, research on the achievement goals of university scholars is a young field of research. The learning goals of university scholars have been found to be positive predictors of student learning and teaching quality (Daumiller, Grassinger, Dickhäuser, & Dresel, 2016). However, we know very little on how the learning goal of university scholars might influence their own professional learning.

Nevertheless, we have evidence from other domains that was most prominently gathered in a meta-analysis by Payne et al. (2007). This meta-analysis showed a positive correlation between learning goals and both learning and academic performance in samples of adults from 43 different studies. The estimated true mean correlation of learning goals and learning (Payne et al., 2007) was $r = 0.16$, but neither the performance approach nor avoidance goals correlated significantly with learning in this meta-analysis. Based on such results and the theoretical reasoning by Dweck (1986) and Nicholls (1984), we expected that university scholars' learning goals are positively associated with their learning outcomes. We assumed that the extent of learning goals would predict the extent of learning outcomes in university scholars. However, even given the convincing empirical evidence, we still know little about the process behind this association of learning goals and learning outcomes. We think that the inclusion of learning goals in the component model of self-regulated learning by Schmitz and Wiese (2006) can shed new light on this issue. Thus, we will examine self-regulatory skills as possible process variables as well as the self-regulation process in the next section.

1.2. Learning time as mediator

The component model of self-regulated learning by Schmitz and Wiese (2006), which is a process-focused adaption of Zimmerman's (2000) self-regulated learning model, distinguishes between three phases of an action: the pre-actional, actional, and post-actional phases. Motivation (which can be described by achievement goals) is assumed to be important in the pre-actional phase and supposedly influences learning quality, self-monitoring, volitional strategies, and learning quantity in the actional phase. The authors postulate that aspects of the actional phase influence quantitative and qualitative learning outcomes as well as satisfaction with learning outcomes, emotions, and reactions. According to the authors, possible process variables that might explain the relationship between motivation and learning outcomes are learning quality and quantity, self-monitoring as well as volitional strategies. Here, we focus on learning quantity as a possible mechanism behind the association between learning goals and actual learning. Within school students, learning quantity (the time invested in learning) correlated even more strongly with school achievement than with intelligence (Gettinger & White, 1979). Furthermore, learning quantity (more precisely students' class attendance) has proven to be one of the strongest predictors of actual student learning in higher education (Schneider & Preckel, 2017) and we assume that it is directly tied to learning goals.

According to Schmitz and Wiese (2006), a way of orienting one's actions toward a goal is to invest more time in learning. Nitsche, Dickhäuser, Fasching, and Dresel (2013) provided empirical support for this assumed association between learning goals and learning quantity within school teachers. They showed that the learning goals of school teachers were positively related to the amount they participated in competence-enhancing professional training. Another study by Nitsche, Dickhäuser, Dresel, & Fasching, 2013 showed that learning goal orientations significantly predicted informal learning for teachers (e.g., reading of specialist journals and participation in optional trainings). In addition, empirical findings from longitudinal studies within workplaces outside of the educational context further support the assumed association between learning goals and actual participation in development activities (Hurtz & Williams, 2009). Diethert, Weisweiler, Frey, and Kerschreiter (2015) provided initial evidence for university scholars. According to the authors, learning goals correlated with intention to participate in further training and with (positive) attitudes toward further training, even when they controlled for other variables such as self-efficacy, self-determination, and implicit theories. In sum, the component model of self-regulated learning (Schmitz & Wiese, 2006) as well as past empirical evidence point to the assumption that the actual time spent on learning is a consequence of learning goals.

Furthermore, we expected that learning time predicts learning outcomes, in line with the component model of self-regulated learning (Schmitz & Wiese, 2006). In a longitudinal study, Britton and Tesser (1991) demonstrated that the time-management of college students predicted their college grade point average. In their systematic review of meta-analyses, Schneider and Preckel (2017) showed that self-regulated learning strategies such as the time management of students in higher education are beneficial for student achievement. One of the most effective strategies of students was class attendance with an average effect of $d = 0.98$. This empirical evidence supports our assumption that time spent on learning might determine the learning outcomes. Because we expected that learning goals and learning time predict learning outcomes, we assumed an indirect association through learning time as mechanism in the learning process.

In addition, we think that time is an especially crucial factor for learning outcomes within the population of university scholars as they have to balance the time spent for teaching and research, which can lead to goal conflicts and puts high demands on people's ability to self-regulate their actions (Esdar, Gorges, & Wild, 2016). University scholars can deal with competing goals in different ways: They can set priorities, manage their time, or find compromises (Kleinbeck, 2010). Due to multiple demands at work, university scholars have to continuously decide how much time they want to invest in research and in preparing

teaching (Esdar et al., 2016). With the exception of their teaching commitments, most university scholars are free to manage their time at work in a self-determined manner and prefer spending time on research rather than on teaching (Menges & Austin, 2001). In a typical week, full-time senior scholars at universities in Europe spend 14 h on teaching, 18 h on research, and 16 h on other tasks at work (Höhle & Teichler, 2013). Most university scholars see an advantage in combining research and teaching, and their attitude is that "research reinforces teaching" (Höhle & Teichler, 2013, p. 100). However, a big proportion of university scholars think that research and teaching are hardly compatible and experience goal conflicts between these domains (Höhle & Teichler, 2013). This is why we assume that learning goals concerning research can differ from learning goals concerning teaching. This means that we have to focus on both domains separately when elaborating on the relationship between learning goals, learning time and learning outcomes.

The last open question is how we define university scholars' learning time within our study. For samples of students, learning time is the amount of time the student spends actively engaging in an academic task (Fisher et al., 1981), for example, the time spent on learning vocabulary. Considering Fisher's definition, we define university scholars' learning time as the amount of time they devote to their professional development, during which they actively engage in learning activities at work. While previous researchers have investigated only a small part of these learning activities, such as the actual or intended time spent on further training or the time devoted to reading specialist journals (e.g., Nitsche, Dickhäuser, Dresel, & Fasching, 2013), we want to integrate all kinds of different learning activities. We distinguish between formal and informal learning activities (Manuti, Pastore, Scardigno, Giancaspro, & Morciano, 2015). Formal learning activities are structured learning opportunities and include participation in workshops, training sessions, or online courses. Informal learning activities are unstructured learning opportunities, for example, reading papers or textbooks, seeking help from colleagues, and sharing knowledge with them. We also need to distinguish between other aspects of university scholars' learning activities: professional and methodological competences in research and teaching. Formal and informal learning activities can address different contents of competence. For example, the further training of university scholars can address explicit didactical or methodological knowledge that is relevant for teaching (e.g., instructional practices) or research (e.g., statistical knowledge). University scholars can gain relevant professional knowledge at conferences or through literature search. Consequently, we considered time spent on formal and informal learning activities in order to gain professional or methodological knowledge in research and teaching as indicators of learning time in our study.

1.3. The present research

In the present study, we aimed to determine the relationships between university scholars' learning goals, their learning behavior related to their own professional development (indicated by the average hours spent on formal and informal learning activities per month), and learning outcome (indicated by self-reported learning gain) in teaching and research. We were especially interested if we could show the postulated mediation in a prospective correlational design. Taking the theoretical assumptions of the component model of self-regulated learning by Schmitz and Wiese (2006) and the empirical evidence of previous research into account, we propose a mediation model. Based on the idea that learning time is one of the potential mechanisms linking learning goals and learning outcomes, we postulated a positive association of university scholars' learning goals and their self-reported learning gain (*Hypothesis 1*). Furthermore, we assumed that university scholars' learning goals predict the time invested in learning (*Hypothesis 2*). Learning goals were expected to be a predictor of invested learning time and self-reported learning gain over the investigated time span.

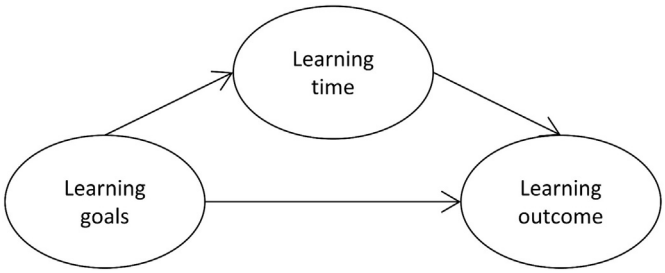

Fig. 1. Proposed mediation model for both domains, teaching and research.

We were confident that we could show positive associations of learning goals with the mediator learning time and learning gain over a substantial time period as learning goals are characterized by some degree of temporal stability (Fasching, Dresel, Dickhäuser, & Nitsche, 2010; Jagacinski, Kumar, Boe, Lam, & Miller, 2010; Praetorius et al., 2014; Tuominen-Soini, Salmela-Aro, & Niemivirta, 2011). Moreover, we proposed a positive association of learning time and self-reported learning gain in the same learning phase (*Hypothesis 3*). Finally, we assumed that learning time mediates the positive relationship between learning goals and actual learning. Learning goals have a positive indirect statistical effect via learning time on future self-reported learning gain (*Hypothesis 4*). We postulated that all these hypotheses apply to teaching (*Hypothesis 1a-4a*) and to research (*Hypothesis 1b-4b)*. The postulated process model is depicted in Fig. 1.

2. Method

We used a prospective correlational design and asked university scholars of different German universities to answer questionnaires anonymously at two times in the middle of successive semesters. The university scholars reported on their current learning goals a half year before they reported the time spent on learning activities per month, and their learning gain for the last half year using self-report scales.[1,2]

2.1. Procedure

We invited 10,240 university scholars from 85 universities located in Germany to participate in our study via postcards. 1296 university scholars returned the post cards (12.7% response rate). Of the 1004 university scholars, who agreed to participate in the study, 902 university scholars fulfilled the inclusion criterion and were invited to participate in the study. The inclusion criterion required them to work primarily in both research and teaching. The sample was representative of scientific staff in German universities (with regard to gender, percentage of professors, number of universities and divisions compared to data from the Statistisches Bundesamt, 2015). We asked the 902 university scholars to answer anonymous paper-and-pencil questionnaires to collect information on their learning goals, learning time, and learning outcomes at two time points in the middle of successive semesters. The measurement points were approximately five to six

[1] This study used the data of a longitudinal study with more time points. Here, we report only on the aspects of the study that are relevant for our specific hypotheses and analyses. For further study information, see Daumiller (2018) or Daumiller and Dresel (2017).

[2] The study was conducted in full accordance with the Ethical Guidelines of the German Association of Psychologists (DGPs) and the American Psychological Association (APA). By the time the data was acquired, it was neither customary at the respective university, nor at most other German universities, to seek ethics approval for survey studies on motivation and self-ascribed learning. The study exclusively makes use of anonymous questionnaires. We had no reasons to assume that our survey would induce any negative states in the participants.

months apart from each other.

At the first time point, 609 persons participated in the study (67.5% participation rate at T1) and 495 participated at the second (54.9% participation rate at T2). Dropout analyses revealed no differences in demographic aspects such as gender, percentage of full professors, number of universities or number of disciplines between persons who agreed to participate, those that did not want to participate, and those who actually participated. The general demographics (Statistisches Bundesamt, 2015) of the basic population were not significantly different of the demographics of our sample. We conclude that there was no systematical drop out and that the fluctuation in participation is unlikely to change the results. While we could not compare the learning goals of participants with non-participants (due to a lack of data on learning goals in the general population), we were able to compare the learning goals of those individuals who initially responded on the postcards to those who finally agreed to participate and met the inclusion criteria over the whole scope of the study. We did not find any statistically significant differences between those two groups and, thus, no indication of selection bias (see electronic Supplement 1 for further information on the demographics of university scholars in the recruiting process).

To match data over time points, we used an anonymous self-generated code. Participants that had not reported their self-generated code were deleted before the data of the different time points was matched (this was the case for 11 persons of the first time point and 14 persons of the second time point). This resulted in 598 university scholars participating at the first time point and 481 participating at the second. After matching data this resulted in a total sample of 705 university scholars, participating at least in one time point (377 of 705 university scholars participated at both time points). Nonresponse of participants was possible at both time points and resulted in 15% missings at the first time point and due to drop out in 32% missings at the second time point. There were no statistical differences between the demographic variables at the two time points.

2.2. Sample

For the present analyses, we used data from 705 university scholars (46% female, 54% male at the first time point). These 705 university scholars were all participants in at least one of two time points that reported their self-generated code to enable matching over time points and matched the inclusion criterion working primarily in both teaching and research. The university scholars were from approximately 83 German universities and 12 different disciplines (8.7% English, 8.7% biology, 3.4% business administration, 9.5% chemistry, 8.4% educational science, 9.5% German studies, 7.7% mathematics, 1.2% pharmacy, 11.7% political science, 9.9% romance studies, 12.2% sport science, 6.8% economics, and 2% other subjects). The sample of university scholars varied with regard to their highest formal academic qualification (38.9% without Ph.D., 36.2% with Ph.D., and 24.8% full professors were assessed). Doctoral candidates (usually university scholars without Ph.D.) at German universities are typically members of the academic staff (and not doctoral students). They mostly perform working tasks such as teaching students and conducting research. The mean age of the university scholars was 38.67 years (SD = 10.80), ranging from 23 years to 68 years.

2.3. Instruments

As measurement instruments, we used three self-report scales that had been developed and validated in earlier studies to assess university scholars' learning goals, learning time, and learning outcome. University scholars' learning goals were assessed approximately half a year prior to learning time and learning outcome.

2.3.1. Learning goals

To assess the learning goals of university scholars, we used the instrument of Daumiller, Dickhäuser, and Dresel (2018). Although the instrument originally focused on the teaching domain, it can easily be used to assess goals in the research domain (Daumiller & Dresel, 2018). Therefore, we used this scale to refer to both main tasks in the university context, research and teaching, which is crucial because learning goals are context specific (Baranik et al., 2010). We assessed the university scholars' learning goals with regard to their current teaching or research activities using the formulation (e.g., "*In my current teaching (research) activities…*") with two separate scales. For each domain, the scales assessing learning goals were based on four items (e.g., "*…I want to further develop my own competences as much as possible*", see electronic Supplement 2 for item wording). The parallel items used goal-relevant language, which previous research often neglected according to Hulleman et al. (2010). All items were answered on Likert-type scales ranging from 1 (*do not agree at all*) to 8 (*agree completely*). The wide scale range was necessary to avoid ceiling effects, because university scholars are generally highly motivated (Daumiller et al., 2016). The Cronbach's Alphas indicated good internal consistencies for the scales of university scholars' learning goals and ranged between 0.90 and 0.91 (see Table 1).

2.3.2. Learning time

As an indicator for learning behavior, we assessed the learning time devoted to formal and informal learning activities separately. Previous studies in achievement goal research on school teachers used indicators focused on specific formal aspects, such as the number of training programs attended or the frequency of participation in internal school learning opportunities, or specific informal aspects, such as the frequency of reading professional journals (e.g., Nitsche, Dickhäuser, Dresel, & Fasching, 2013; Nitsche, Dickhäuser, Fasching, & Dresel, 2013). However, such indicators do not include all aspects of formal and informal learning activities that are relevant for university scholars (which encompass a plethora of formal and informal learning activities, including workshops, online courses, discussions with colleagues, etc.). Therefore, a qualitatively different indicator was required that focused comprehensively on the learning times for different learning activities.

To this end, Daumiller (2018) developed and validated[3] an instrument to assess the overall learning time of teaching and research, which we used in the present study. This measure encompasses the time spent on formal and informal learning activities separately for both work domains. After a provision of examples for *formal learning activities*, participants were asked how much time they had spent on such learning activities on average per month in the last six months to enhance their professional or methodological expertise. Afterwards, they were provided with examples of *informal learning activities* and again asked for their corresponding learning times (see electronic Supplement 2 for item wording). The examples for the formal and informal learning activities as well the distinction between learning activities focused on professional or methodological content serve to make sure that participants think about and include all relevant content aspects of the construct (which increases the content validity of the measurement). Altogether, the learning times in research and teaching were measured

[3] Daumiller (2018) reported indicators for the validity of the scale: Learning time was only moderately associated between the domains (research and teaching), indicating that these are separate constructs. Learning times were associated with self-rated learning gains in the same domain (teaching: r = 0.52; research: r = 0.35), but not with the self-rated learning gains of the other domain (r = 0.06 to.08), indicating its convergent and divergent validity. Theoretically expected negative associations of learning time and the subscales of the Maslach Burnout Inventory (Büssing & Glaser, 1998) were found. In terms of construct validity, these results suggest that teaching and research are different contexts of university scholars' work and need to be assessed separately for both contexts.

Table 1
Descriptive statistics and correlations of university scholars' current learning goals, learning time and self-reported learning gain within the last six months in the teaching and research domains.

	Min	*Max*	*M*	*SD*	*Sk*	α	*N*	[1]	[2]	[3]	[4]	[5]
Learning goals												
[1] in teaching at T1	1.25	8.00	6.70	1.20	−1.17	0.90	598					
[2)] in research at T1	3.50	8.00	7.32	0.83	−1.61	0.91	595	0.51***				
Learning time												
[3] in teaching at T2	–	–	–	–	–	–	–	0.40***	0.05			
[4] in research at T2	–	–	–	–	–	–	–	0.01	0.23*	0.53***		
Learning gain												
[5] in teaching at T2	1.00	8.00	4.77	1.63	−0.36	0.89	478	0.41***	0.13	0.79***	0.01	
[6] in research at T2	1.00	8.00	5.60	1.54	−0.71	0.92	478	0.09	0.35***	0.06	0.77***	0.30***

Notes. *Min* = Minimal, *Max* = Maximum, *M* = Mean, *SD* = Standard deviation, *Sk* = Skewness, α = Kurtosis, and *N* = Number of participants are reported for manifest scales of learning goals and learning gain only, because learning time is considered an ordinal variable; the bivariate correlations of the latent constructs are reported for *N* = 373–595 university scholars and missing cases were deleted pairwise.

* $p < .05$.

*** $p < .001$.

with four items each, assessing the average time spent per month on formal and informal learning activities (one item considered methodological and one item considered professional knowledge each). To make their assessments, the participants used an ordinal response scale consisting of seven unequal time categories in hours (0, 1–2, 3–5, 6–10, 11–20, 21–40, 41 + h).[4] The ordinal categories ranged from 1 (0 h) to 7 (41 + h). The internal consistencies cannot be reported due to the ordinal scaling.

2.3.3. Learning outcome

In order to measure the learning outcome separately for the research and teaching contexts, we asked the participants to what extent they had enhanced their professional competence (e.g., "*To what extent have you enhanced your professional competence for teaching?*") and methodological expertise (e.g., "*To what extent have you enhanced your knowledge of research methodology?*") in the last six months (Daumiller, 2018). All items were answered on Likert-type scales ranging from 1 (*not at all*) to 8 (*particularly extensively*). The items varied systematically with regard to their knowledge and competence orientation. Two items per sub-facet (professional-research, professional-teaching, methodological-research, methodological-teaching) assessed the learning outcome (see electronic Supplement 2 for item wording). In the confirmatory factor analysis, the model fits of the four-factor model and the four-factor model with two higher-order domain-specific factors were not significantly different (Daumiller, 2018). The Cronbach's Alphas of the self-reported learning gain ranged between 0.89 and 0.92 (see Table 1).

2.4. Analyses

To test the mediation hypothesis, we conducted structural equation modelling using MPlus version 7.2 (Muthén & Muthén, 2014). We specified the mediation models for each domain separately and tested the hypotheses with latent mediation models. We assumed, that university scholars' current learning goals (from the first measurement occasion, T1) predict their self-reported learning gain (from the second measurement occasion, T2). This association should be mediated by the time invested in learning activities per month over the last six months (from the second measurement occasion, T2).

Prior to further analyses, we verified whether the data and model met the requirements for structural equation modelling. The distribution of data violated the assumptions of normal distribution in Kolmogorov-Smirnov tests for all variables and consequently the assumptions of multivariate normality. Therefore, we used a weighted least squares means and variance (WLSMV)-adjusted estimator, that is robust to multivariate non-normality. This estimator allows the inclusion of variables as indicators of latent factors that are characterized by a strong limitation of range (Flora & Curran, 2004). In order to determine whether the given sample size was appropriate for structural equation modelling, we calculated a ratio of the estimated parameters to the sample size of 1:9, which is between 1:5 and 1:10 as recommended by Bentler and Chou (1987). An a priori power analysis (Sloper, 2017) resulted in a sample size of 545 for the detection of a small to medium effect size of 0.15 with a power of 0.8. Our representative sample of 705 university scholars fitted these criteria.

We estimated the specified latent factors for current learning goals (teaching-related learning goals, research-related learning goals), invested learning time (learning time in the teaching domain, learning time in the research domain) and self-reported learning gain (self-reported learning gain in the teaching domain, self-reported learning gain in the research domain) for each four manifest items per construct per domain in all models. For the mediator learning time and for learning goals, we defined the items as categorical.[5] We did not differentiate further between professional and methodological expertise for the learning outcome or learning time, because we could not separate these aspects in the predictor variable. We used the option modification indices in Mplus, which reveals possible reasons for a model misfit. We allowed theoretically reasonable residual correlations for the learning outcome and the learning time post hoc to control for the construction of the questionnaire. More specifically, we allowed correlations of error variances between each two items concerning professional expertise, methodological expertise, formal learning activities or informal

[4] This response format builds on the notion that it is difficult and time consuming for university scholars to provide detailed answers on their learning times, especially when these are quite high. Also, small differences in high learning times (e.g., 35 and 36 h per month) are not of interest for research projects such as ours and probably not validly interpretable. Because of this, an ordinal response scale is often more adequate, especially in terms of efficiency of assessment. The categories in the response scale used were determined by Daumiller (2018) who fitted the categories to yield a uniform distribution among them based on the learning times reported by 300 scholars in an open format.

[5] The items measuring learning goals in teaching or research context were asymmetrically distributed. Responders primarily used the four highest answer options of the 8-point Likert-type scales. This poses a problem for estimators such as the maximum likelihood estimator, which requires more uniform functions (Rhemtulla, Brosseau-Liard, & Savalei, 2012). Therefore, we used WLSMV-adjusted estimator and treated the items of the mentioned scales as categorical variables (see electronic supplement 5 for information on the item distribution).

learning activities within the items measuring learning time as well as learning gain (for gain only regarding the types of expertise). The residual correlations varied between $r = 0.14$ and $r = 0.79$. We did not relocate any indicators or modify the structural model, thus ensuring a deductive approach to hypothesis testing. The Chi^2-difference tests were significant for a reduction of the models regarding residual correlations (model in teaching: χ^2 (6, $N = 705$) = 115.280, $p < .001$ in research: χ^2 (6, $N = 705$) = 206.961, $p < .001$). Therefore, we kept the residual correlations for learning time and learning gain to sustain the model fit of the specified structural equation models (SEMs).

To test our hypotheses, we estimated one structural equation model per domain (teaching and research) including the following regressions (see electronic Supplement 3 for the structural equations of the estimated models). To test the assumed directed positive associations with self-reported learning gain, we regressed self-reported learning gain at T2 on learning goals at T1 (*Hypothesis 1*) and on the invested learning time at T2 (*Hypothesis 3*). We regressed learning time at T2 on current learning goals at T1 to test the assumed directed positive association with learning time (*Hypothesis 2*). We estimated the indirect effect of learning goals in order to specify the mediation model via learning time (*Hypothesis 4*). We report the standardized model parameters and Cohen's *d*[6] in the results. Cohen (1988) gives the following intervals for the interpretation of *d*: 0.2 to 0.5: small effect; 0.5 to 0.8: medium effect; 0.8 and higher: strong effects.

To determine the model fit, we used χ^2, Comparative Fit Index (CFI), Tucker Lewis Index (TLI) and Root Mean Square Error of Approximation (RMSEA) as fit indices. The Chi-square value of model fit increases with an increasing sample size and is based on the assumption of multivariate normality (Schermelleh-Engel, Moosbrugger, & Müller, 2003). That is why it is often significant in large samples such as our sample of 705 university scholars. We used the following values as absolute criteria for the model fit: CFI and TLI values greater than 0.97; and RMSEA values below 0.05 constituted a good fit (Schermelleh-Engel et al., 2003).

We included all possible data in the analyses and used a Full Information Maximum Likelihood approach (FIML), which increases the power of the data analysis and reduces the impact of bias by including all available information for model estimation (Enders, 2010). We included the results of analyses using listwise deletion in the electronic Supplement File 4 to ensure the comparability of the results.[7]

3. Results

3.1. Preliminary analyses

The descriptive statistics and correlations are reported in the Table 1 (see electronic Supplement 5 for information on the item distribution). In our study, the internal consistencies of the university scholars' measurements were satisfactory. University scholars had high means for learning goals in the teaching and research domains. The learning goals in the teaching and research domains correlated moderately. They reported a medium-sized learning gain in both domains. The learning gains in the teaching and research domains correlated significantly. Learning goals in teaching correlated significantly with learning time and learning gain in the teaching domain, but not with learning time or learning gain in the research domain. Learning goals in research correlated significantly with learning time and learning gain within the research domain, but not with learning time or learning gain in the teaching domain. The learning times in the teaching and research domains correlated moderately. The learning times correlated with the corresponding learning gains, but not with the learning gain of the other domain. All correlations were positive.

3.2. Model test for teaching

To test the hypotheses in the teaching domain, we regressed self-reported learning gain on learning time (*Hypothesis 3a*) and on previous learning goals (*Hypothesis 1a*) in a SEM and expected positive associations. Learning time was regressed on previous learning goals to test if learning goals predict invested learning time (*Hypothesis 2a*). We expected learning time to mediate the positive association of learning goals and future learning gain in teaching (*Hypothesis 4a*). The model fitted the data well ($\chi^2 = 139.48$, df = 45, $p < .001$; CFI = 0.99, TLI = 0.98, RMSEA = 0.06). As expected, we found positive associations of learning goals with learning time (*Hypothesis 2a*) and learning gain (*Hypothesis 3a*; see Fig. 2a for standardized model results).

As proposed in *Hypotheses 1a,* university scholars' teaching-related learning goals at the first measurement occasion significantly predicted ($p < .001$) self-reported learning gain in the teaching domain at the second measurement occasion with a strong total effect of $\beta = 0.40$ ($SE = 0.05$, $d = 0.87$). Learning goals had no significant direct statistical effect on future learning gain, when learning time was included as mediator ($\beta = 0.11$, $SE = 0.07$, $p = .129$). Learning time mediated the positive association of learning goals and self-reported learning gain in the teaching domain (medium indirect effect: $\beta = 0.30$, $SE = 0.06$, $p < .001$, $d = 0.63$, *Hypothesis 4a*). Learning goals and learning time explained 64.0% of the variance of self-reported learning gain at the second measurement occasion ($p < .001$).

3.3. Model test for research

To test the hypotheses in the research domain, we specified the same model as for the teaching domain, but this time under consideration of research-specific variables (i.e., research-related learning goals, learning time invested in research-related learning activities, and self-reported learning gain in the research domain). In the research domain, the proposed SEM fitted the data well ($\chi^2 = 107.90$, $df = 45$, $p < .001$; CFI = 0.99, TLI = 0.98, RMSEA = 0.05). As expected, we found positive links of learning goals and learning time (*Hypothesis 2b*) and of learning time and self-reported learning gain (*Hypothesis 3b*) in research (see Fig. 2b for standardized model results).

University scholars' research-related learning goals at the first measurement occasion significantly predicted ($p < .001$) self-reported learning gain in the research domain at the second measurement occasion with a medium sized total effect of $\beta = 0.33$ ($SE = 0.05$, $d = 0.70$, *Hypothesis 1b*). That means if university scholars' research-related learning goals increased by one standard deviation, their self-reported learning gain would increase by 0.33 standard deviations (total effect). Learning goals had no significant direct statistical effect on future learning gain in the research domain left, if the indirect statistical effect of learning time was considered (direct effect: $\beta = 0.13$, $SE = 0.08$, $p = .099$). Learning time mediated the positive association of learning goals and self-reported learning gain in the research domain (small indirect effect: $\beta = 0.20$, $SE = 0.07$, $p = .006$, $d = 0.41$, *Hypothesis 4b*). An increase in learning goals by one standard deviation would result in a rise of 0.20 standard deviations in self-reported learning gain via time. The results are in line with our expectations. Learning goals and learning time explained 60.2% of the variance of self-reported learning gain at the second measurement occasion in research ($p < .001$).

[6] We calculated Cohen's d (Cohen, 1988; Lenhard & Lenhard, 2016) under the assumption that the best equation for estimating correlation coefficients from standardized regression coefficients in the interval − 0.50 to 0.50 is $r = \beta$ (Peterson & Brown, 2005).

[7] There was only one substantial difference between the results of analyses applying listwise deletion and analyses, in which we applied the FIML procedure. Overall, the result pattern was robust. However, the direct path between learning goals and self-reported learning gain remained statistically significant for the research domain with the reduced sample but not in the analysis with the full sample. This association was still rather small in its magnitude and we still find a relevant significant indirect effect.

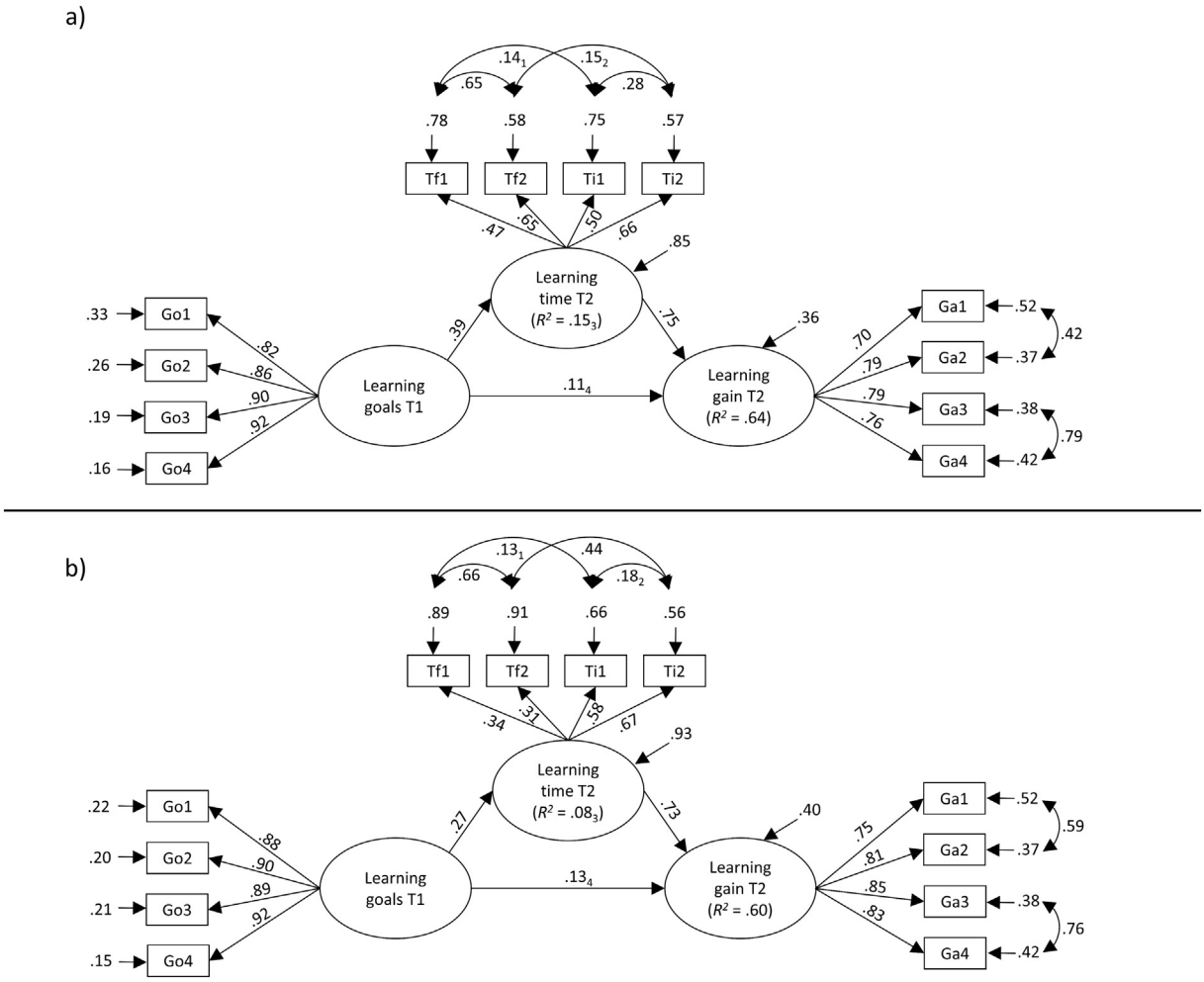

Fig. 2. Results for the structural equation model of the mediation effect in teaching (*a*) and research (*b*). All paths in teaching (*a*) were statistically significant with $p < .001$ except the marked path $_1$: $p = .007$, path $_2$: $p = .022$, path $_3$: $p = .003$, and path $_4$: $p = .129$. All paths in research (*b*) were significant on a high significance level ($p < .001$) except the marked path $_1$: $p = .011$, $_2$: $p = .069$ $_3$: $p = .104$ and path $_4$: $p = .099$. Go_{1-4} represent the items indicating learning goals; Tf_{1-2} and Ti_{1-2} represent the items indicating formal and informal learning time; Ga_{1-4} represent the items indicating learning gain as learning outcome.

4. Discussion

In the presented study, we used data of a prospective correlational study to investigate whether learning time mediates the association between learning goals and learning gain. We measured learning goals six months prior to invested learning time and learning gain. We hypothesized that learning goals would be positively associated with learning time that university scholars invested in their own professional development, in terms of formal and informal activities. In addition, we expected learning goals to positively relate to the self-reported learning gain in the same learning phase. Furthermore, we assumed that invested learning time would be positively associated with the self-reported learning gain of university scholars, because university scholars are free to manage their time (Menges & Austin, 2001). The strengths of our study include a representative sample of university scholars and the prospective correlational study design. We found empirical evidence for our hypotheses in a sample of 705 university scholars. The statistical results supported most hypotheses in the teaching and research domains.

Overall, the sampled university scholars reported a strong pursuit of learning goals for both domains, as indicated by high means compared to the scale midpoint. We found that learning goals were positively associated with learning time that university scholars invested in their own professional development. Our results are consistent with prior findings in samples of school teachers which support a positive association between learning goals and the participation in formal or informal learning activities (Nitsche, Dickhäuser, Dresel, & Fasching, 2013; Nitsche, Dickhäuser, Fasching, & Dresel, 2013). Consistent with prior findings (e.g. Payne et al., 2007), we found that learning goals were associated with (self-reported) learning gains. Furthermore, higher time investment in learning activities was positively associated with higher self-reported learning gain in the same learning phase in both work domains. Consistent with earlier research results, this connection was found for persons in different learning environments (e.g., various disciplines). Our study showed that the learning time of university scholars in a mixed sample with different ages and expertise levels – ranging from doctoral students (23 years old) to university scholars shortly before retirement (68 years old) – were positively associated with self-reported learning gain, as an indicator of the learning outcome. Moreover, university scholars' learning time mediated the positive link of learning goals and self-reported learning gain. Learning goals had a positive small to medium sized indirect statistical effect on future learning gain in the teaching and research domains. Thus, time invested in learning activities at work might be a mechanism, which has the potential to explain the "why" of the relationship between university scholars' learning goals and self-reported learning gain in the self-regulated learning process. Our postulated mediation model explained a substantial amount of variance in the outcome variable self-reported learning gain, although it considered only two variables as predictors without autoregressive paths in both domains. Furthermore,

we were able to show that the association between learning goals and learning gain is context-dependent as learning goals for teaching were merely associated with learning gain in the teaching domain, whereas learning goals for research were associated with learning gain in the research domain.

It is noteworthy, that the amount of explained variance in learning time was not significant in the research domain albeit the fact that we found a significant positive association between learning goals and learning time. There are several possible reasons for this unexpected result: The long time frame of half a year between the two measurement occasions might have led to an underestimation of the associations in both domains. Furthermore, the restrictions of range in research-related variables such as learning time (due to the ordinal scaling) and learning goals (due to the high means compared to the scale midpoint) could also be an explanation for an underestimation of the explained variance. If these are the reasons for the missing significance in the amount of explained variance of the learning time, future studies might find a practical relevant association of learning goals and learning time in the research domain. An alternative explanation might be that learning occurs in different ways in the contexts of teaching and research at university scholars' work. Descriptively the associations of learning goals and learning time are weaker within the research domain compared to the teaching domain. This could mean that an uninvestigated variable moderates whether learning goals are associated with learning time in a work domain, which should be investigated further in future research. Because the amount of explained variance in the learning time was not significant in the research domain, the practical relevance of the mediation in the research domain remains unclear. Therefore, our theoretical and practical implications only relate to the indirect link within the teaching domain.

4.1. Theoretical and practical implications

Our empirical findings support some theoretical assumptions of the component model of self-regulated learning by Schmitz and Wiese (2006). Not only is motivation from the pre-actional phase (learning goals) associated with learning quantity in the actional phase (time for learning activities, at least in the teaching domain), but learning quantity was also associated with the learning outcome in the post-actional phase (self-reported learning gain, in both domains). The mediation model has the potential to explain partly how learning goals work. Time spent on learning activities at work links learning goals and the self-reported learning gain of university scholars at least in the teaching domain (results are less clear for the research domain as the explained variance of learning time is non-significant). However, it is too early to interpret this as definite proof for the postulated mechanism as learning time and learning gain have been assessed at the same time point.

The observed medium to strong direct associations of learning goals and self-reported learning gain in both domains as well as the medium-sized indirect effect in the teaching domain are of high practical relevance, especially given that restriction of range in some measures might have even led to an underestimation of the actual strength of associations. The study results imply that multiple factors seem to improve the learning outcomes of university scholars in everyday life, such as learning goals and learning time. This is important because learning activities play a big role in university scholars' working life and university scholars spend a lot of time developing their competences further. When university scholars report to pursue the goal of further developing their competences, they also report spending more time on learning activities in teaching as well as enhancing their competences to a stronger degree in teaching and research.

One starting point for interventions might be to improve university scholars' learning goals if they are not high from the start. The university scholars in our sample generally reported high means compared to the scale midpoint and thereby very strong learning goals for the research and teaching domains. On an individual level, university scholars could learn different methods in training programs to strengthen their learning goals. Although, our prospective correlational design cannot sufficiently account for causality, earlier experimental findings generally highlight that inducing learning goals can have impact on learning gain (Dickhäuser, Buch, & Dickhäuser, 2011). It has to be noted, however, that these findings are derived from studies on students and that further studies in university scholars are paramount to foster our understanding on the impact of learning goal centered interventions in this population. Enhancing autonomy at work might be a further starting point to promote learning goals on an occupational level because perceived autonomy has been shown to be associated with the learning goal orientation of teaching personnel (see Janke, Nitsche, & Dickhäuser, 2015). University scholars could be encouraged to decide which training courses they want to participate in to enhance their professional skills because meaningful freedom of choice enhances autonomy (Agran, Storey, & Krupp, 2010; Katz & Assor, 2007).

Furthermore, time for learning was positively associated with self-reported learning gain in research and teaching. If university scholars could devote more time to their professional development, they could probably learn more, thus enhancing preparation for their classes and research projects. The continuous development of university scholars' professional and methodological knowledge and competences is a precondition for high-quality education and, in turn, for the learning success of university students (Biggs & Tang, 2011). However, most university scholars still acquire their competences through teaching practice without any professional instruction (Esdar et al., 2016) and devote little time to formal learning activities in teaching. We recommend that university scholars participate in appropriate workshops and further training more frequently. Informal learning activities such as help-seeking behavior, exchange with other experts, and reading can be associated with a stronger learning outcome and are therefore recommended.

It is important to acknowledge that we cannot transfer the mediation in teaching to university scholars working in environments without the autonomy to manage their time at work in a self-determined manner, when we consider the findings of Nitsche, Dickhäuser, Dresel, and Fasching (2013) for a sample of teachers in primary- and secondary-school education. University scholars need to be able to pursue their learning goals in a self-determined manner. Otherwise, we cannot expect their learning goals to influence actual professional learning behavior.

4.2. Limitations and strengths

We have done everything we can to ensure representativeness of our sample for the population of German university scholars in terms of demographics (age, sex and proportion of professors). The random sample included university scholars working in research and teaching domains in different divisions and varied with regard to their highest academic grade. In addition, the sample's gender distribution was comparable to that of the population of German university scholars. The diversity of the sample is a major strength of the study and allows us to draw conclusions for the population of German university scholars. However, we cannot perfectly rule out that other psychological variables may have caused non-response bias in the data. It is possible that especially those university scholars participated who were interested in self-reflection and, thus, characterized by a strong learning goal striving. Nevertheless, it is impossible to compare characteristics of those university scholars who have not answered any questionnaire with those who have done so. Such a bias would likely merely impair the magnitude of the observed variables and if it influenced the magnitude of the correlations only through a restriction of range. This in turn, leads to the conclusion that non-response bias more likely results in an under- than in an over-estimation of the observed associations. We furthermore, relied on ordinal data for measuring learning time, which

may also have led to a restriction of range with regard to the indirect statistical effect.

Furthermore, we conducted this study on the mediation in Germany alone, which means that it is unsure whether our findings can be replicated to other cultural contexts. However, prior studies have shown links between learning goals, learning time, and actual learning in other nations as the United States (e.g., meta-analysis by Payne et al., 2007; study in the United States by Hurtz & Williams, 2009). While these studies have not investigated the proposed mediation, the underlying bivariate associations were not cultural-dependent. Therefore, the mediation effect in teaching might be found in populations from other countries and other systems of higher education. Nevertheless, future research needs to confirm the mediation effect of learning time in teaching as mechanisms behind the relationship between learning goals and learning outcome in other nations empirically to ensure generalizability to different higher-education systems in various cultures.

Another limitation of the results lies in the operationalization of the learning outcome. Because the recruited sample was representative of university scholars from different divisions and universities, it was not possible to include an objective measure of learning outcome or an external assessment. Therefore, a subjective self-report scale was used to measure the learning gain of university scholars. Self-report measures do not necessarily assess only how much university scholars develop their competences, but also how they individually perceive their learning gain. Therefore, one way of interpreting the results might be to view self-reported learning gain of university scholars as a subjectively biased approximation of the actual learning outcome. Both self-reported learning gain and learning time in the last half year were reported retrospectively, which might be biased through cognitive memory. Given the large sample size, the time span of the prospective correlational study, and the fact that participants were located all over Germany, we could not implement observer ratings or event sampling methods economically to obtain objective data. In the absence of such objective measures, the estimated effect sizes of the relationships between university scholars' work-related learning goals, time invested in learning activities, and actual self-reported learning gain might rather present an approximation than an exact estimation. However, this approximation can be used as a starting point for future research on this relationship.

Moreover, it is a severe limitation, that temporal ordering of learning time and learning gain is not possible as those constructs were measured at the same time with the same method. Thus, associations of learning time and learning gain are mere correlations and cannot be interpreted as causal effects. This is true even though there is theoretical support for the assumed direction of the association as models of self-regulated learning have suggested that the learning result (here learning gain) is a function of the engagement in learning actions (here indicated as invested learning time; Schmitz & Wiese, 2006). A potential single source bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) further limits the interpretation of our results as it could have led to an overestimation of the correlation of learning time and self-reported learning gain and thereby of the mediation. Thus, future studies should investigate the proposed mediation further by measuring learning time after learning goals but prior to self-reported learning gain with multiple methods to further advance our understanding of the causality behind the associations that we have presented and weaken the influence of a possible single source bias.

Furthermore, the component model of self-regulated learning by Schmitz and Wiese (2006) can offer alternative explanations for the mechanism behind the positive association of learning goals and learning gain. More specifically, learning gain is supposedly determined by multiple factors during the actional phase (e.g., quantitative learning, self-monitoring in the process, quality of learning, and volitional strategies). The amount of time invested in learning is only one of these factors that could be affected by learning goals. The learning goals of university scholars could also translate into deeper learning through using high quality learning strategies (see Elliot, McGregor, & Gable, 1999), which could also partly explain the positive link of learning goals and learning. Thus, it might be fruitful to consider additional process variables in future research to get a deeper insight into the mechanisms that facilitate university scholars' professional learning in teaching and research.

4.3. Future directions

Our research is a first step toward understanding the mechanisms underlying the positive link of learning goals and the learning outcomes of university scholars in higher education. Learning time seems to be an important mediator for the association of learning goals and self-reported learning gain in teaching. To analyze the process of self-regulated learning in university scholars more detailed and to come to a conclusion with regard to the relative importance of learning time among other potential mediators, future research should consider further theoretically plausible process variables. According to the component model of self-regulated learning (Schmitz & Wiese, 2006), qualitative learning behavior (learning strategies), self-monitoring in the learning process, and volitional strategies are possible additional process variables linking learning goals to learning outcomes.

Future research could use an open-ended question to assess learning time or a shorter period of time between the measurement occasions to clarify the question, whether there is a practical relevant mediation effect in the research domain or not. For future (experimental) research, it would also be interesting to use more objective measures to assess learning time and learning (e.g. observer ratings, competence tests). It would also be interesting to consider alternative ways to assess learning time: Actual learning time per day could be assessed with an experience-sampling method to obtain data that is not biased by long-term memory effects (Scollon, Prieto, & Diener, 2009). Thereby, researchers could ask university scholars on a daily basis how much time they spend on explicit formal and informal activities (e.g., reading articles), or professors could rate how much time their academic staff spend on formal learning activities. Such more objective measures and observer ratings might further enhance the accuracy of the observed effect sizes and reduce a possible impact of the single source bias. Nevertheless, there is a substantial overlap between the memory and reality of participants in different studies (see Scollon et al., 2009).

5. Conclusion

The present study provides a new insight into understanding how learning goals work. We analyzed learning time devoted to professional development as a mechanism behind the relationship between learning goals and learning outcome. In a representative sample of German university scholars, learning time mediated the positive link of learning goals and future self-reported learning gain in teaching. Learning goals and learning time were positively associated with university scholars' self-reported learning gain in research. Future research could benefit from the investigation of objective indicators for the learning behavior and learning gain. Encouraging university scholars to pursue their learning goals and invest time in their own professional development could have positive consequences on self-reported learning gain. Future training programs for university scholars might consider these variables as good starting points for increasing learning in the research and teaching domains, which is of utmost importance for the quality of teaching and research in universities.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.lindif.2019.04.002.

Acknowledgements

This work was supported by the German Research Foundation (Deutsche Forschungsgemeinschaft - DFG) Grant DI 929/5-1 awarded

to Oliver Dickhäuser and Grant DR 454/8-1 awarded to Markus Dresel. We would like to thank Christoph Thiesen, Susanne Bücker, and Amanda Habbershaw for language corrections.

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Learning and Individual Differences 83–84 (2020) 101937

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

No learning without autonomy? Moderators of the association between university instructors' learning goals and learning time in the teaching-related learning process

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ARTICLE INFO

Keywords:
Learning goals
Learning time
Workload
Autonomy in teaching
University instructors

ABSTRACT

In this study, we investigate general workload and teaching-related autonomy as moderators in the relationship between learning (approach/avoidance) goals and learning time in university instructors. Specifically, we expected stronger associations as a function of lower workload and higher autonomy. Additionally, we assumed that learning time mediates the relationship between learning goals and learning gains. A sample of 107 German university instructors reported their current learning goals, autonomy, weekly invested learning time, and workload during the first four weeks of a semester, and finally, their learning gains. Structural equation modelling revealed no evidence for learning time as a mediator between learning approach goals and self-reported learning gains. However, learning time did mediate the positive association between learning avoidance goals and self-reported learning gains. As expected, teaching-related autonomy moderated the positive link of learning avoidance goals and invested learning time. Contrary to our expectations, general workload did not moderate this association.

1. Introduction

The professional development of university instructors is a prerequisite for student learning through high quality teaching (Biggs & Tang, 2011). However, recent research reviews have shown that it can be difficult to ensure that teaching professionals engage in and profit from learning at work (Kennedy, 2016). Models of self-regulated learning (Schmitz & Wiese, 2006; Zimmerman, 2000) suggest that motivation (which can be described by learners' goals) may be of central importance for the facilitation of this learning process. In line with this, research indicates that personal learning goals (i.e., the striving to expand one's competencies) are consistently associated with engagement in activities for professional development within teaching professionals (e.g., Diethert et al., 2015; Fritzsche & Daumiller, 2018; Nitsche et al., 2013). Nevertheless, studies investigating the professional development of university instructors and school teachers have primarily focused on direct relations between learning goals and learning behavior. To explain more complex associations such as the varying strength between learning goals and learning results (Payne et al., 2007), we aim to explore under which conditions learning goals translate into learning behavior (moderation processes) and which mechanisms can explain the uncovered relationships (mediation processes). Based on self-regulated learning models (Schmitz & Wiese, 2006; Zimmerman, 2000), we propose that learning goals influence learning results via learning behavior (as indicated by learning time; see also Hein et al., 2019) under the condition that the individual has the necessary resources and is not limited by having too many job demands to engage in learning activities (e.g., higher autonomy, lower workload). To understand why we postulate these relationships, it is first necessary to elaborate further on the nature of the association between learning goals and learning behavior.

1.1. Learning goals as motivational prerequisites of learning time

Learning goals are a specific type of achievement goals, meaning that they are future-focused cognitive representations of competence-related results or end states (here: aspired competence development) that an individual is committed to either avoid or approach (Dweck & Leggett, 1988; Hulleman et al., 2010; Nicholls, 1984). Learning goals refer to an intrapersonal standard for evaluating own competence based

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https://doi.org/10.1016/j.lindif.2020.101937
Received 11 February 2020; Received in revised form 3 August 2020; Accepted 7 September 2020

on one's own development (Daumiller, Dickhäuser et al., 2019). A fundamental aspect for the differentiation of achievement goals constitutes the approach (striving to reach certain results or end states) and avoidance (striving to avoid certain results or end states) valence of goals (Elliot & McGregor, 2001). Previous research on university instructors' achievement goals further differentiate learning goals into *learning approach goals* (actively striving towards development and growth of own competences) and *learning avoidance goals* (striving to avoid not developing own competencies to the fullest extent; Daumiller, Dickhäuser et al., 2019). In a qualitative interview study, most university instructors spontaneously named self-related learning approach goals and a single university instructor also named learning avoidance goals as important aspects of their motivation at work (Daumiller et al., 2015). Consequently, learning approach and avoidance goals seem to be relevant for instructors' goal pursuit. According to its definition, learning approach goals should orient instructors' actions towards competence development, while learning avoidance goals might also promote a focus on the necessity of competence development.

The meta-analysis of Payne et al. (2007) highlighted the positive relationship between learning approach goals and adult learning results. In contrast, learning avoidance goals have rarely been investigated, as the natural occurrence of learning avoidance goals in achievement situations is controversially discussed (Cury et al., 2006; Hulleman et al., 2010). Nevertheless, this achievement goal class may be more prevalent in university instructors given that they are older than young students and might strive to a higher degree to avoid falling behind in their professional development (de Lange et al., 2010; Ebner et al., 2006). Adding to this, certain characteristics of this selective group, such as being highly educated and typically having gained professional knowledge and competencies in their studies prior to employment, also highlight the potential importance of this goal class for the context of university instructors' professional learning.

Consequently, we expect that learning avoidance goals may additionally be linked to learning gains as they too facilitate a personal focus on the necessity of competence development. Additionally, we see a substantial research gap regarding explanations on *how* learning (approach and avoidance) goals actually facilitate learning gains and *when* relationships between learning goals and learning gains emerge (Payne et al., 2007). In other words, it is important to identify mediators that explain the relationship and moderators that specify the consequences of learning goals. Once again, the models of self-regulated learning (Schmitz & Wiese, 2006; Zimmerman, 2000) can be highly instrumental in identifying such mediators and moderators.

1.2. Learning time as a mediator in the self-regulated learning process

According to the component model of self-regulated learning, learning behavior (e.g., learning quantity indicated by learning time) mediates the effects of motivation (e.g., learning goals) on learning results (Schmitz & Wiese, 2006). In this regard, learning goals might facilitate learning gains within higher education instructors through learning activities at the workplace. To be conceptually clear, in the current study, we consider the amount of time instructors actively engage in all learning activities (formal and informal) at work, in which university instructors acquire new competences for their work or improve existing ones as learning time (analogous to the definition of student learning time; Fisher et al., 1981). It is important to distinguish between learning time which is an indicator for the behavior of learning through engagement in learning activities, and possible learning results (e.g., increasing knowledge).

Prior research has indeed shown that learning approach goals are closely tied to learning behaviors in a variety of contexts (Hein et al., 2019; Choi & Jacobs, 2011; Diethert et al., 2015). Learning approach goals have been linked to the intended and actual use of competence-promoting further formal training as well as informal learning behaviors (Cerasoli et al., 2018; Diethert et al., 2015; Fritzsche & Daumiller, 2018). Moreover, learning approach goals are the only achievement goals that are consistently associated with engagement in learning activities in teaching professionals (e.g., Daumiller et al., 2020). To the best of our knowledge, only one study has found that the association between learning goals and learning time could explain the relationship between learning goals and learning gains (within a sample of 705 university instructors; Hein et al., 2019). However, the informative value of this research may be limited as the mediator and the outcome variables were assessed at the same time point, and learning time was assessed retrospectively under the condition of a long recall interval.

Moreover, the aforementioned study did not consider learning avoidance goals as a potential antecedent of learning time. We want to overcome this weakness by also investigating whether learning avoidance goals are linked to learning gains via learning behavior. This is theoretically plausible, as learning avoidance goals might also motivate university instructors to engage in learning activities, which can be instrumental for maintaining competence development.

1.3. Autonomy and workload as moderators in the self-regulated learning process

We posit that whether or not learning goals facilitate learning within university instructors may depend on job characteristics of their work in higher education. Specifically, autonomy in teaching might facilitate the learning process, while external pressure through work strain may be detrimental to it.

Regarding autonomy in teaching, we assume that motivation is more important for guiding learning behavior if individuals have the opportunity to freely decide how to conduct their teaching-related tasks and shape the teaching process. If this is not the case, it becomes more difficult to further develop and refine teaching procedures, and there may be less room for motivated action (Köller et al., 2001; Nitsche et al., 2013). The degree to which university instructors experience autonomy at work (freedom to choose between different options regarding one's goals and actions; Deci & Ryan, 2002) is subject to temporal change depending on deadlines and other restricting factors (Janke & Dickhäuser, 2018). The same is likely true for more specific autonomy in teaching. Fluctuations in autonomy in teaching can be expected to determine the degree to which university instructors are able to act on their learning goals. Under conditions of lower autonomy in teaching, the ability of university instructors to act on their learning goals should be reduced. As a result, we expect that perceived autonomy moderates the strength of the association between learning goals and learning time in the teaching-related learning process.

While we consider autonomy in teaching as a domain-specific moderator for the association between learning goals and learning time, we consider general workload as a moderator on a more general work-related level. Due to the multiple demands of different work tasks including teaching, research, and administration (Esdar et al., 2016), as well as time pressures stemming from deadlines (Janke & Dickhäuser, 2018), university instructors might also experience a conflict of resources when it comes to distributing their time across work domains. Thus, when the demands of research and administration are high, this could limit their ability to invest time into learning in teaching. In line with the component model of self-regulated learning (Schmitz & Wiese, 2006), we assume that university instructors have less leeway to pursue their own learning goals under such conditions of more experienced workload. Consequently, learning goals should have a weaker effect on learning time when university instructors experience higher workloads.

1.4. Present research

In the following study, we aim to investigate the relationships between university instructors' learning goals and their learning gains in the teaching domain. Thereby, we postulated that both learning approach and learning avoidance goals are positively associated with

learning gains. Furthermore, we wanted to shed light on the question of *how* and *when* learning (approach and avoidance) goals facilitate effects on learning gains. More specifically, we aimed to replicate learning time (as proxy for learning behavior) as a mediator of the positive association between learning approach goals and learning gains (first shown by Hein et al., 2019), while also providing preliminary evidence that learning avoidance goals are positively linked to learning gains through learning time. For this purpose, we used a longitudinal correlational design to qualify temporal ordering and address methodological limitations of prior research. Furthermore, we propose perceived autonomy in teaching and subjective workload as possible moderators in the learning process that explain *when* learning (approach and avoidance) goals predict the time invested in teaching-related learning activities at work. We expected that perceived autonomy in teaching would enhance the association between learning (approach and avoidance) goals with learning time, whereas subjective workload would weaken this relationship. Furthermore, autonomy in teaching and workload could also be antecedents of learning behavior at work (e.g., de Groot et al., 2012). Thus, we also explored direct associations of autonomy in teaching and workload with this variable.

2. Material and methods

2.1. Sample

We conducted a micro-longitudinal study including 107 instructors employed at two universities in Germany (49% female, age: 40.85 years on average, *Min* = 23, *Max* = 66, *SD* = 10.62 years) over the time span of five weeks. All of them had at least one course in the semester of participation. The participants had an average of 9.49 years of teaching experience (*Min* = 0, *Max* = 30, *SD* = 7.88) and reported working an average of 17.05 h per week on all teaching activities including the time spent teaching, the preparation, and the follow-up work after their courses (*Min* = 3, *Max* = 54, *SD* = 10.38). They were employed in a wide array of disciplines. Most participants worked in the social sciences (31.6%), followed by educational sciences (19.3%), as well as the humanities (12%). Furthermore, minor groups of participants were working in the natural sciences (5.5%) as well as in law (3.7%). The other participants omitted information concerning their discipline (27.1%). The sample consisted of doctoral candidates (37.4%), postdocs (32.7%) and full professors (19.4%); 13.1% did not report their academic status. It is important to note that doctoral candidates are predominantly members of the academic staff (and not students) at German universities, and therefore take on tasks in research, teaching, and administration in the same way as other university instructors.

2.2. Procedure

This study was conducted at two medium-sized public universities in Germany (with around 10,000 to 20,000 students) in the years 2017/2018. We invited instructors of both universities through university-wide advertisements (i.e., flyer) as well as through direct inquiries via mail. Overall, 120 university instructors registered for study participation (response rate around 5%[1]), 107 instructors participated in at least one of the time points (participation rate: 89%). The participation in this study was voluntary for all instructors. The participants received an additional teaching evaluation in the mid of the semester with weekly student feedback and a book on didactic methods in higher education as incentives. We assured the participants that their answers would remain confidential and would only be used for scientific purposes.[2]

The study consisted of two parts: First, the participants answered a baseline questionnaire one week before the semester started. Additionally, the participants answered a short questionnaire weekly over the first five weeks of the semester (in total, 477 weekly measurement occasions, *M* = 4.46 weekly measurements per participant, *SD* = 0.93). The baseline questionnaire included questions concerning demographics, the predictor variables (teaching-related learning approach and learning avoidance goals) as well as perceived autonomy in teaching. Regarding the weekly measures, participants reported the time they spent engaging in teaching-related learning activities as well as their perceived workload within the last week during the first four measuring points. In the fifth week, participants rated their perceived teaching-related learning gains within the last five weeks. Participants answered the paper-pencil questionnaires at the same time every week.[3,4] The weekly paper-pencil questionnaires were delivered in person by the study authors and research assistants. The weekly measurement of learning time was implemented to limit bias through a long recall interval and achieve a more reliable measure of invested learning time, as this information should be more easily accessible on weekly bases.

2.3. Instruments

One important difference between the baseline questionnaire (learning goals in teaching, autonomy in teaching) and the weekly assessments (learning time in teaching, subjective workload at work) was that we used short scales with a low number of items for the latter because this is the best way to capture current experiences (see also Goetz et al., 2016). For internal consistencies, we reported McDonalds' Omega (Green & Yang, 2015) for all scales that consisted of more than two items. We used the Spearman–Brown coefficient to assess reliability for the scales of the weekly questionnaire, if the scale or subscale consisted of two items only (as recommended by Eisinga et al., 2013).

2.3.1. Learning goals in teaching

To assess university instructors' current learning goals in teaching, we used a well-validated questionnaire (Daumiller, Dickhäuser et al., 2019). We assessed university scholars' learning goals with regard to their current teaching activities using the item stem "*In my current teaching activities…*". The scales assessing learning approach and avoidance goals were based on four items each (e.g., learning approach goals: "*…I want to constantly improve my competences*", and learning avoidance goals: "*…it is important to me to avoid having my competences not develop further*", see Electronic Supplement A for item wording). All items were answered on Likert-type scales ranging from 1 (*do not agree at all*) to 8 (*agree completely*). The internal consistencies were ω = 0.93 for learning approach goals and ω = 0.85 for learning avoidance goals. We used the average score across the four items as an indicator for

[1] The response rate is only a conservative approximation, as it entails the number of individuals willing to participate in the study in relation to all employed instructors at both universities at the time the study was conducted. It is not clear if all instructors had been reached by the advertisement measures.

[2] The study was conducted in full accordance with Ethical Guidelines of the German Association of Psychologies (DGPs) and the American Psychological Association (APA). At the time the data was acquired, it was neither customary at the respective university, nor at most other German universities, to seek ethics approval for survey studies on motivation and self-ascribed learning. The study exclusively makes use of anonymous questionnaires. We had no reasons to assume that our survey would induce any negative states in the participants.

[3] This study used the data of a larger micro-longitudinal study (Daumiller, Hein et al., 2019), in which we also assessed further constructs. Here, we report only on the aspects of the study that are relevant for our specific hypotheses and analyses. There is no overlap in sample or measures compared to previously published studies.

[4] University instructors could participate with more than one course. However, because we were not interested in aspects of specific courses, we randomly selected the data of one course per instructor for our analyses when the participants had participated with more than one course.

learning approach and learning avoidance goals.

2.3.2. Perceived autonomy in teaching

The scale measuring perceived autonomy in teaching was based on a German version of the balanced measure of psychological needs (Sheldon & Schüler, 2011) and captures the teaching-related autonomy which instructors generally experience in teaching. The six-item scale contained three positively and three negatively worded items (the latter items were recoded when calculating the average teaching-related autonomy score across the items). The wording of the items was slightly adapted to refer more closely to the teaching context of the university instructors. Therefore, we added an item stem ("*In my teaching…*") and changed item wording into present tense (sample item: "*In my teaching… I am free to do things my way.*"). All items were answered on Likert-type scales ranging from 1 (*do not agree at all*) to 8 (*agree completely*). The internal consistency was $\omega = 0.72$.

2.3.3. Subjective workload

We used two adapted items of the work overload subscale of a validated German questionnaire (Schulz et al., 2004) to measure subjective workload. University instructors were asked to report how often they experienced different signs of work overload within the last week. The scale consisted of two items (items: "*Times when I have too many obligations to fulfill*", "*Times when my work is over my head*"; $\rho = 0.73$–0.82 within the four measurement points). All items were measured with a Likert-type scale ranging from 1 (*never*) to 8 (*very often*). The average scores across both items per week correlated highly between the four measurement points ($r = 0.60$–$0.90, p < .001$). As an indicator for subjective workload, we used the average score of the two items across the four measurement occasions.

2.3.4. Learning time in teaching

To measure learning time, we assessed the time that instructors invested in learning activities on a weekly basis. We adapted a validated instrument to assess this weekly learning time for teaching (Daumiller, 2018). Since learning activities in teaching can be directed to enhance professional competencies for the next class or methodological-didactical competencies in teaching, we asked for the weekly learning times concerning both competence domains separately to ensure that participants think about and include both relevant content aspects of the construct. University instructors reported how many hours they had invested in learning time within the past week using two open format questions (namely: "*How much time did you spend last week to expand your professional/methodological competence in the field of teaching?")*. For clarification, we included examples of professional competences (e.g., *expert knowledge, knowledge about scholarly debates*) and methodological-didactical competences (e.g., *effective planning of seminars, appropriate teaching methods*) in the question. The sums of learning times per week correlated highly between the four weeks ($r = 0.48$–0.92, $p < .001$). As an indicator for learning time, we summed the two reported learning times per week and calculated the average score across the four weeks. Thus, our indicator represents the average weekly learning time in hours.

2.3.5. Learning gains in teaching

In order to measure the learning result for the teaching contexts, we adapted a validated scale (Daumiller, 2018). We asked the participants to what extent they had enhanced their professional competence (e.g., "*To what extent have you enhanced your professional competence for teaching?*") and methodological competence (e.g., "*To what extent have you increased your didactical-methodological knowledge for teaching?*") in the last five weeks at the fifth weekly measurement occasion. The scale consisted of four items in total with two items per domain (professional and methodological competence). The items were answered on Likert-type scales ranging from 1 (*not at all*) to 8 (*extensively*). The internal consistency was $\omega = 0.87$. We used the mean value across the four items as a measure for learning gains.

2.4. Analyses

We conducted structural equation models with manifest scores using Mplus Version 7 (Muthén & Muthén, 1998–2012) to investigate our research questions. Before the analyses, we excluded outliers for the open-ended measures of learning time. According to Osborne and Overbay (2004), regression results are sensitive to outliers and correlations are more accurate if outliers are removed. Four participants were excluded due to their reported average learning time being outside of a 99% CI (Cut off point: $Z = |2.68|$). All four excluded participants reported extremely high average learning times (above 40 h per week). In addition, we excluded one participant that had missing values on all model relevant variables. This resulted in a sample size of $N = 102$ for the analyses.[5]

Furthermore, we verified whether the data and model met the requirements for structural equation modelling. In order to determine whether the given sample size was appropriate for manifest structural equation modelling of single moderation and mediation models with three variables each (predictor, mediator/moderator and outcome); we calculated a ratio of the estimated parameters to the sample size of 1:10 as recommended by Bentler and Chou (1987). The distribution of data violated the assumptions of normal distribution in Kolmogorov-Smirnov tests for most variables (learning approach and avoidance goals, invested learning time, and subjective workload) and consequently, the assumptions of multivariate normality. Therefore, we used a maximum likelihood estimator with robust standard errors (MLR), which is robust to non-normality.

A handful of participants did not answer the baseline questionnaire before the semester started (8.2%). Additionally, 1% of participants did not provide information regarding learning avoidance goals (with a maximum of 2% missing data on the item level). There was no additional missing data for learning approach goals or perceived autonomy in teaching. On the construct level, no data was missing for learning time and subjective workload, but 19.5% of the data was missing for the learning gains construct, as this construct was only measured once in the fifth weekly questionnaire. We used a Full Information Maximum Likelihood approach (FIML) to include all available information for model estimations, which increases the power of the data analysis and reduces the impact of bias due to missing data (Enders, 2010).

2.4.1. Mediation analyses

We estimated separate manifest structural equation models for the mediation and moderation hypotheses. In the base models, we tested whether the relationship between learning goals and learning gains was mediated via learning time (indirect effect). We tested this mediation for learning approach and learning avoidance goals separately (resulting in two mediation models). Both mediation models were fully saturated.

2.4.2. Moderation analyses

In the subsequent models, we examined whether perceived autonomy in teaching or subjective workload moderated the relationship between learning goals and learning time. These models were also calculated for learning approach and learning avoidance goals as well as for both moderators separately (resulting in four moderation models). In all moderation analyses, we used linear interaction terms to

[5] We also conducted analyses with the full sample before outliers were removed to investigate the robustness of our results. Descriptive results, bivariate correlations and mediation analyses were mostly robust. However, some of the moderation effects changed slightly, which should not be overinterpreted given the nature of the outliers representing very unrealistic time spans. See Electronic Supplement B for the results of the additional analyses.

Table 1
Descriptive statistics and correlations between university instructors' learning approach and avoidance goals, learning time, self-reported learning gains, perceived autonomy, and subjective workload.

	Min	*Max*	*M*	*SD*	*Skew*	*N*	[1]	[2]	[3]	[4]	[5]
[1] Learning approach goals (T0)	2.50	8.00	6.61	1.42	−1.12	92					
[2] Learning avoidance goals (T0)	1.00	8.00	5.85	1.68	−0.72	91	**0.58**				
							< .001				
[3] Learning time (T1–4)	0.00	39.75	6.44	6.82	2.28	100	0.03	**0.27**			
							.708	< .001			
[4] Learning gains (T5)	1.00	8.00	4.38	1.64	−0.01	84	**0.25**	**0.46**	**0.37**		
							.020	< .001	< .001		
[5] Perceived autonomy (T0)	2.50	7.67	6.01	0.99	−0.71	92	0.12	0.03	0.16	0.12	
							.376	.726	.096	.314	
[6] Subjective workload (T1–4)	1.00	8.00	5.10	1.86	−0.54	102	**−0.20**	−0.17	0.00	−0.16	−0.19
							.017	.052	.976	.099	.053

Notes. Min = Minimal; *Max* = Maximum; *M* = Mean; *SD* = Standard deviation; T0 = Measurement in the baseline questionnaire; T1–4 = Measurement in the first four weeks of the semester; T5 = Measurement in the fifth week of the semester. Significant correlations are printed in boldface and levels of significance are reported under the correlations (N = 102). The reported characteristics of situational measures have been aggregated over the weekly measures as indicated by T1–4. The theoretical range of all constructs except for learning time was *Min* = 1 to *Max* = 8. The zero-order correlations are derived from a saturated base model in which undirected paths between all variables were freed.

indicate the interaction between learning goals and moderators (after grand mean centering both variables). We then regressed learning time on the respective goal, the moderator, and the linear interaction term. We allowed for correlations between the predictors in the moderation models, as correlations between learning approach (or avoidance) goals and the moderators (perceived autonomy in teaching or subjective workload), as well as the interactions, are theoretically reasonable. All moderation models were fully saturated.

3. Results

The descriptive statistics and the correlations of all variables are reported in Table 1.[6] While learning approach goals at the baseline measure only correlated positively with later self-reported learning gains, learning avoidance goals were positively associated with later invested learning time and self-reported learning gains.

3.1. Learning time as mediator in the learning process

Standardized path coefficients of the mediation models for learning approach and avoidance goals are depicted in Fig. 1.

3.1.1. Mediation model for learning approach goals

As expected, learning approach goals and learning time were positively associated with later self-reported learning gains in teaching. However, learning approach goals were not a statistically significant predictor of the invested learning time in the first four weeks of the semester. The positive association of learning approach goals and self-reported learning gains in teaching (total effect: β = 0.29, SE = 0.10, p = .002) was not mediated by learning time (indirect effect: β = 0.01, SE = 0.03, p = .366, 90% CI [−0.04, 0.06]). The mediation model explained 19% of the variance in self-reported learning gains (p < .05), but did not explain variance in the invested learning time.

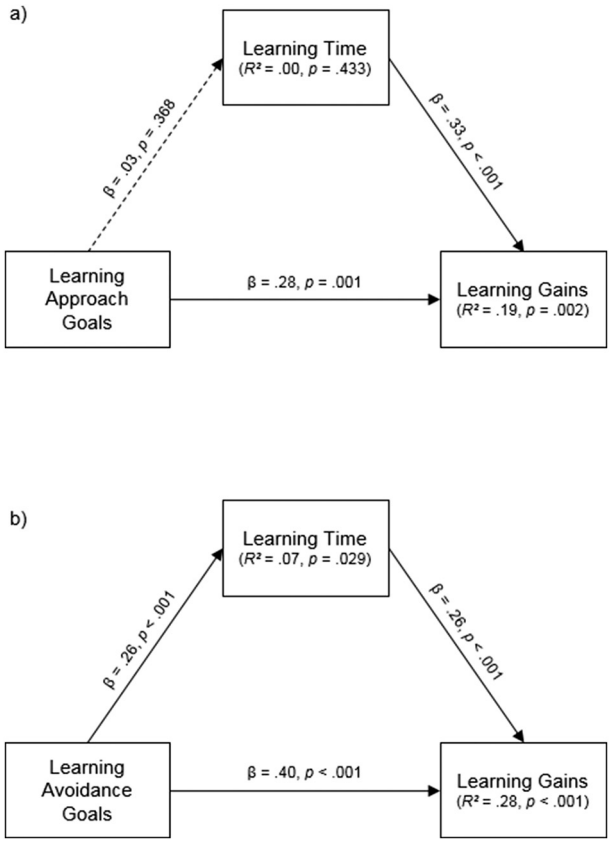

Fig. 1. Results of the structural equation models for the mediation effects of a) learning approach goals and b) learning avoidance goals.

3.1.2. Mediation model for learning avoidance goals

Learning avoidance goals were positively associated with learning time and self-reported learning gains in teaching. As expected, learning time was a statistically significant mediator of the positive association between learning avoidance goals and self-reported learning gains (total effect: β = 0.47, SE = 0.09, p < .001; indirect effect: β = 0.07, p = .009, SE = 0.03, 90% CI [0.02, 0.11]). The mediation model with learning avoidance goals explained 7% of the variance in the average invested learning time per week (p < .05) and a substantial amount of variance 28% in self-reported learning gains (p < .001).

[6] In our sample, a multifactorial ANOVA for all model relevant variables was conducted to ensure comparability of the three subgroups (doctoral students, post-docs, full professors). Overall, the three groups revealed no significant differences (*Wilks* λ = 0.77; F(12,132) = 1.51; p = .126). See Electronic Supplement C for the sub group specific descriptive statistics. In addition, we explored whether the association of learning goals and learning time vary between the three groups and regarding the differences in teaching commitments. No additional moderation analyses reached levels of significance (see Electronic Supplement D for the results). All three groups seem comparable regarding the analysed constructs and the link between learning goals and learning time.

Table 2
Results of the moderation effects of university instructors' learning approach and avoidance goals with perceived autonomy or subjective workload on learning time.

	Model 1			Model 2			Model 3			Model 4		
R^2	$R^2 = 0.04$, $p = .164$			$R^2 = 0.01$, $p = .300$			$R^2 = 0.12$, $p = .034$			$R^2 = 0.08$, $p = .051$		
	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*
Learning approach goals	0.04	0.10	.357	−0.01	0.10	.456						
Learning avoidance goals							**0.18**	0.07	.007	**0.24**	0.08	.001
Perceived autonomy	0.17	0.10	.084				0.19	0.10	.069			
Subjective workload				−0.04	0.15	.809				−0.01	0.13	.969
Interaction	0.11	0.07	.072	0.13	0.12	.142	**0.19**	0.10	.025	0.13	0.09	.070

Notes. β = standardized regression coefficient; *SE* = standard error; *p* = one-tailed level of significance (however, two-tailed levels are reported for direct exploratory effects of autonomy and workload). The reported interaction effect always describes the interaction of the predictor variables that are contained in the model. Significant effects ($p < .05$) are printed in boldface. In the moderation models, we allowed for correlations between predictor variables, which varied between −0.24 and 0.12 in Model 1, −0.20 and 0.29 in Model 2, −0.17 and 0.37 in Model 3, −0.18 and 0.40 in Model 4.

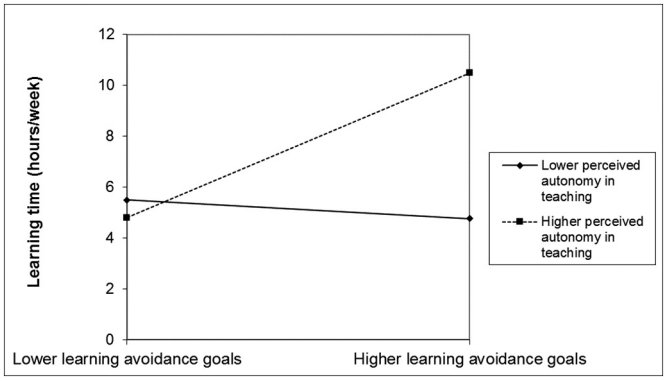

Fig. 2. Simple slope plot as a visualization of the interaction effect of learning avoidance goals and perceived autonomy in teaching. Note: The plot reflects the association for individuals 1 SD below ($M = 5.02$) and above ($M = 7.00$) the average perceived teaching-related autonomy score to illustrate the nature of the linear interaction term. Compared to the scales midpoint, the depicted individuals still reported rather high autonomy scores.

3.2. Perceived autonomy in teaching and subjective workload as possible moderators

The strength of perceived autonomy in teaching did not explain the strength of the positive association between learning approach goals and the invested learning time (see Table 2). Nevertheless, the interaction effect of perceived autonomy in teaching and learning approach goals pointed descriptively in the expected direction. A statistically significant moderation effect of perceived autonomy in teaching was found for the positive association between learning avoidance goals and invested learning time in the expected direction. In other words, the higher the perceived autonomy in teaching, the stronger the positive link between learning avoidance goals and invested learning time (see Fig. 2). In contrast to our expectation that the strength of subjective workload should weaken the positive association between learning approach/avoidance goals and learning time, we did not find a statistically significant interaction effect of subjective workload and learning approach or avoidance goals on invested learning time. Moreover, we did not find statistically significant direct associations of the moderators with learning time.

4. Discussion

In the present micro-longitudinal study, we investigated how and when learning approach and learning avoidance goals predict university instructors' learning behavior (indicated by weekly learning time) and its results (indicated by self-reported learning gains). Our study advances research on the impact of learning goals from a methodological perspective, as we used situated measures for learning time and a research design that allowed for prospective analyses through the temporal ordering of the variables (learning goals, learning time, and learning gains). In contrast, prior research often measured learning time retrospectively alongside predictor variables or criteria (Hein et al., 2019; Fritzsche & Daumiller, 2018), which might have led to an overestimation of the effects. In our study, we found that both learning approach and learning avoidance goals explained substantial amounts of variance in self-reported learning gains, which was in line with our assumptions and prior research on learning approach goals (Hein et al., 2019; Payne et al., 2007). We also tried to replicate learning time as a mediator of the positive association between learning approach goals and learning results in the self-regulated learning process. We found this mediation effect for learning avoidance goals but surprisingly, not for learning approach goals, which would have been in line with prior research on the subject matter (Hein et al., 2019). Furthermore, we investigated whether learning goals translate into learning time to a higher degree under the conditions of lower workload at work and higher autonomy in teaching. However, it was only found that perceived autonomy in teaching had a statistically significant effect in that the positive association between learning avoidance goals and invested learning time was strengthened. More specifically, the higher university instructors perceived their autonomy in teaching to be, the stronger was the association between learning avoidance goals and the time invested in learning. Although the moderation effect of perceived autonomy in teaching did not statistically significantly moderate the link of learning approach goals and invested learning time, the regression coefficient indicated the expected positive direction. We did not obtain any of the expected moderation effects for workload.

Our research highlights the close connection between learning goals and learning gains. Consistent with prior research, we found that learning approach goals facilitate learning gains. Nevertheless, we did not find that this association was partly due to impact of learning approach goals on learning behavior (here: invested learning time), which would have been in line with prior research on university instructors' learning goals (Hein et al., 2019). One possible explanation for this missing association may be that we assessed learning time with a situated measure in the limited time span of the four weeks at the beginning of the semester instead of additionally including a time span within the term break. During the semester, university instructors might feel pressured to invest most of their resources into facilitating a learning climate in their new courses and carrying out proper teaching, which should translate to increased workload in the teaching domain (as indicated by the high mean regarding workload in our study). In turn, this could imply that the investigated period was not optimal for uncovering effects of learning approach goals on invested learning time. Learning approach goals might be more relevant for guiding learning behavior during the lecture free time, which may explain

inconsistencies with results from prior studies. The period of assessment (e.g., within the semester or term break) should be considered in further research as a variable that might influence instructors' motivation and the impact it has on the learning process. Finding such effects could provide important knowledge about the role that contextual variables have in influencing the impact of university instructors' learning goals.

Additionally, this could also explain why learning avoidance goals were more closely associated with invested learning time and self-reported learning gains than learning approach goals in our sample. University instructors with strong learning avoidance goals may be especially pressured by the fear of missing out on potential learning opportunities in times of pressure, which could translate into compensatory actions (such as engaging in learning activities). Strong learning avoidance goals might also buffer the expected moderating effect of workload, while learning approach goals would not lead to compensating actions in times of pressure. Overall, our study provides critical insight into the importance of learning avoidance goals for the learning process. Previous studies often neglected learning avoidance goals as a potential predictive achievement goal class. In contrast, we found that invested learning time mediated the positive association between learning avoidance goals and self-reported learning gains. Thus, in our sample, learning avoidance goals were found to be an important indication that weekly learning time at work can be motivated through the need to maintain competence development. Our results underline the relevance of learning avoidance goals for the population of university instructors (e.g., Daumiller et al., 2016; Daumiller, Dickhäuser et al., 2019).

While we did not find the association between learning goals and invested learning time to be moderated by workload, we did find a moderation effect between perceived autonomy in teaching and learning avoidance goals. Furthermore, we argue that autonomy might be more crucial in other working contexts, since our research suggests that university instructors tend to work under conditions of rather high autonomy (as expressed by the rather high means regarding perceived autonomy in teaching). It is plausible that perceived autonomy has stronger effects on the association between learning goals and learning times in working contexts that are characterized by higher external pressures.

4.1. Practical and theoretical implications

Given that it is difficult to ensure that teaching professionals engage in learning at work (Kennedy, 2016), research that sheds light on antecedents can provide relevant practical implications. To this end, our study looked into learning goals as antecedents of learning behavior. Learning (avoidance) goals might be considered as a relevant concept in the development of further trainings and future interventional studies with university instructors. Moreover, our findings concerning a positive association between learning time and later self-reported learning gains indicate that university instructors may benefit from frequently participating in learning activities in teaching. Moreover, as perceived autonomy in teaching strengthened the positive association between learning avoidance goals and invested learning times, it might be useful to maintain and foster university instructors' teaching-related autonomy (e.g., self-determined time management, choice of course topic, or methods of instruction).

Our empirical findings support some assumptions of the theories in which our hypotheses were grounded. In regard to models of self-regulated learning, motivation (in form of learning approach and avoidance goals) was associated with the learning results (later self-reported learning gains). Furthermore, the quantitative learning behavior (learning time) mediated the association of motivation (only in form of learning avoidance goals) and learning results (later self-reported learning gains). However, it is too early to interpret these findings as a definite proof for the postulated mechanism as learning time and learning gains have been assessed by self-report measures and the mediation effect of learning approach goals was not replicated within this study.

4.2. Limitations and future directions

Despite the strengths of the present study, some limitations need to be considered. Firstly, the complexity of our research design limited our research to a select set of two universities and required a strong commitment from the participating instructors, resulting in a low response rate and a restricted sample size. Consequently, our sample does not constitute a representative sample. Our results might be influenced by characteristics of the work environment at the set of universities. It is of high interest to take contextual variables of universities into account to gain a deeper understanding of the influence on the learning process in future studies. Furthermore, we cannot rule out self-selection bias as we might have only reached university instructors who were highly motivated regarding teaching (as indicated by high means in learning goals in our sample). The teaching-related incentives might have strengthened a self-selection bias in our sample. This restriction of range in the predictor variable (learning goals in teaching) might have led to an underestimation of the population effect size in our sample of university instructors (Sackett & Yang, 2000). Thus, we see the presented results as a potentially conservative estimation of the underlying relationships. In addition, the impaired power due to the small sample size weakened our ability to detect smaller effects which might be important. Thus, it remains important that future research aims to replicate our findings in a wider range of contexts to facilitate the necessary power to investigate both small effects and potential contextual moderators.

While we have advanced the operationalization of learning time, we believe that the operationalization of learning results could still be improved. Due to restrictions in design (multiple universities and different departments), it was not possible to include an objective measurement of learning results that would have been valid for all participants. Therefore, a subjective self-report scale was used to measure the learning gains of university instructors, which only represents an approximation of actual learning gains. Thus, associations with this variable also resemble approximations rather than exact estimates. This approximation can serve as a starting point for future research on this relationship. Nevertheless, the robustness of the relationship between learning goals and learning gains (Payne et al., 2007) makes us confident that similar results would emerge when applying different measures of learning effectiveness.

It is important to note that our study with university instructors did not experimentally manipulate learning goals, learning time, or moderator variables. Therefore, our results cannot be interpreted as causal proof, but might represent temporal trends. For this reason, further (experimental) studies on the population of university instructors are important to advance our understanding of the causal impact of learning goal, learning time, or autonomy centered interventions.

A further limitation constitutes that all constructs were measured with the same method, more precisely, self-report-scales. While our longitudinal approach may weaken assimilation effects and, thus, single source bias (Podsakoff et al., 2003), we cannot rule out the influence of such a bias completely. Thus, future research needs to rely on multiple measurement methods more strongly, including objective measures of learning time and learning gains to further advance our understanding of the associations that we have presented.

Finally, models of self-regulated learning allow for further speculation on how individual differences in observed variables might affect the observed associations between learning goals and learning gains. For instance, it is possible that goal commitment further mediates the association between learning goals and learning gains (Klein & Lee, 2006). In addition personality traits such as conscientiousness, which enable individuals to commit to their initial goal even in times of high distress, might be considered as an additional predictor of learning behavior and learning gains (Klein & Lee, 2006). Learning goals may

also facilitate effects on learning gains through variables aside from learning time, such as the choice of high quality learning strategies (see Elliot et al., 1999). After all, learning gains are determined by multiple variables (e.g., quantitative learning, self-monitoring, quality of learning, and volitional strategies) rather than single variables. This assumption is supported by models of self-regulated learning. Furthermore, the amount of variance in learning gains that was not explained within our study may be interpreted as a hint that learning gains are caused by multiple predictor and process variables. Some of these variables might be prone to influences of personal goals, while others are influenced by other factors. We consider our research as a first step towards a more distinguished understanding of self-regulated learning of university instructors. Future studies should supplement this line of research by examining additional mediators and moderators of the association between learning goals and learning gains, as well as antecedents beyond learning goals. Such investigations could also allow for deeper insights through the use of multi-faceted measures for learning behavior that are not limited to learning time.

5. Conclusion

The present study provides new insights into the associations between university instructors' learning (approach and avoidance) goals with learning gains. Our results support three notions: First, learning approach and avoidance goals are associated with later reported learning gains. Second, learning time at least partly mediates the association between learning avoidance goals and learning gains. Third, perceived autonomy in teaching facilitates the association between learning avoidance goals and invested learning time, and in turn, the professional development of university instructors. In sum, continuing research into the mechanisms behind the association of learning approach and especially learning avoidance goals with learning gains is a worthwhile endeavor. Understanding the impact of professional motivation of higher education instructors and relevant constraints is crucial in fostering learning behavior (indicated by learning time) and its results in higher education.

Acknowledgments

The research reported in this article was supported by the German Research Foundation (Deutsche Forschungsgemeinschaft - DFG) Grant DI 929/5-1 awarded to Oliver Dickhäuser and Grant DR 454/8-1 awarded to Markus Dresel. We would like to thank Raven Sarah Lydia Rinas for language corrections.

Appendix A to D. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.lindif.2020.101937.

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Higher Education Instructors' Usage of and Learning From Student Evaluations of Teaching – Do Achievement Goals Matter?

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Identifying what motivates and hinders higher education instructors in their self-regulated learning from student evaluations of teaching (SETs) is important for improving future teaching and facilitating student learning. According to models of self-regulated learning, we propose a model for the usage of SETs as a learning situation. In a longitudinal study, we investigate the associations between achievement goals and the usage of and learning from SETs in the context of higher education. In total, 407 higher education instructors (46.4% female; 38.60 years on average) with teaching commitments in Germany or Austria reported their achievement goals in an online survey. Out of these participants, 152 instructors voluntarily conducted SET(s) and subsequently reported their intentions to act on the feedback and improve future teaching in a short survey. Using structural equation modelling, we found, in line with our hypotheses, that learning avoidance, appearance approach, and appearance avoidance goals predicted whether instructors voluntarily conducted SET(s). As expected, learning approach and (avoidance) goals were positively associated with intentions to act on received SET-results and improve future teaching. These findings support our hypotheses, are in line with assumptions of self-regulated learning models, and highlight the importance of achievement goals for instructors' voluntary usage of and intended learning from SET(s). To facilitate instructors' learning from SET-results, our study constitutes a first step for future intervention studies to build on. Future researchers and practitioners might support instructors' professional learning by encouraging them to reflect on their SET-results.

Keywords: Achievement Goals, Instructors, Professional Learning, Student Evaluations of Teaching, Higher Education.

THIS PAPER IS ACCEPTED FOR PUBLICATION IN FRONTIERS IN PSYCHOLOGY.
Please cite the original article that will be available open-access after publication via its DOI
(https://doi.org/10.3389/fpsyg.2021.652093).

Student evaluations of teaching (SETs) are used in a wide range of universities and higher education institutions as a tool to provide valuable feedback to instructors (Marsh & Roche, 1993; Wagenaar, 1995; Zhao & Gallant, 2012) and serve the purpose of improving teaching quality (Nowakowski & Hannover, 2015). The implementation of SETs can improve teaching effectiveness (Serin, 2019), especially if the feedback given in the SETs is complemented by external consultation (Marsh, 1984; Marsh & Roche, 1993). Nevertheless, the impact of SETs likely depends on instructors' willingness to use and process student feedback for the development of their teaching (Kember et al., 2002). From our view, instructors should have a proactive role in generating and using feedback, similar to assumptions regarding students (see Molloy & Boud, 2013; Boud & Molloy, 2013). Therefore, we raise the question of what individual characteristics might prevent instructors from using SETs for the improvement of their teaching. To this end, little research has been conducted thus far concerning how instructors process SET-results (Nowakowski & Hannover, 2015) or the factors that trigger their intentions to learn from and act on SET-results and improve their teaching behavior. Such research is important as instructors need to actively engage with feedback in the form of SETs by interpreting and internalizing the given information to develop their teaching (as discussed for the use of external feedback to enhance performance in school students, see Nicol & Macfarlane-Dick, 2006; Ivanic et al., 2000). This active engagement in SETs that represents a self-regulated

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learning process mandates motivation, which resonates well with the emerging evidence that university instructors' achievement goals for teaching are associated with their engagement in professional learning (Daumiller, Rinas, Olden, et al., 2021). Particularly, learning goals (i.e., striving to develop professional competencies) predict professional learning (Diethert et al., 2015; Hein et al., 2019, 2020, see also Nitsche et al., 2013 for school teachers). Here, we propose a model that might explain why and how university instructors' teaching-related achievement goals are important predictors for the use of SETs, processing of SET-results, and intentions to improve teaching.

1.1 Achievement Goals as Antecedents of Learning With and From SETs

Achievement goals are future-focused cognitive representations of competence-related results or end states that an individual is committed to either approach or avoid (Hulleman et al., 2010; Payne et al., 2007). In line with prior research in the teaching domain, we distinguish between learning approach (focus on developing competence), learning avoidance (focus on avoiding not developing own competencies to the fullest extent), performance approach (focus on being perceived as competent), performance avoidance (focus on avoiding appearing incompetent), and work avoidance (focus on effort reduction by engaging in tasks with as little effort as possible) goals (see Butler, 2014; Butler & Shibaz, 2008; Daumiller et al., 2019; Retelsdorf et al., 2010). Although research investigating higher education instructors' achievement goals is still a young field of research (Daumiller et al., 2020), there is first evidence that higher education instructors' achievement goals guide their behavior (e.g., teaching quality and professional development) and predict emotions as well as cognitions (Daumiller et al., 2019; Diethert et al., 2015; Hein et al., 2019; Janke & Dickhäuser, 2018; Rinas et al., 2020).

Regarding the usage and processing of SETs, achievement goals may act as a lens that filters the perception of students' feedback as a potential asset or obstacle for goal striving (in line with Kaplan & Maehr, 2007; Nicol & Macfarlane-Dick, 2006). Consequently, achievement goals might explain how instructors interpret the feedback situation (e.g., as a learning opportunity, an opportunity to appear competent, a risk of appearing incompetent, or an effort that could be reduced) and how they profit from student feedback. This impact of achievement goals could occur in different phases of the self-regulated learning process. Even if SETs are typically mandatory at higher education institutions, instructors still need to process the SETs on their own and use the results to evaluate potential effects of their goal striving.

Models of self-regulated learning differentiate between pre-action (forethought), action (performance), and post-action (reflection) phases of the learning process (e.g., Schmitz & Wiese, 2006; Zimmerman, 2000). In our study, we focus on voluntarily conducted SETs to include all phases of the learning process. In the pre-action phase, instructors' motivation determines the initiation of the learning activity by deciding and planning to conduct voluntary SETs. Here, it seems particularly important whether or not instructors see SETs as beneficial tools for their goal striving. During the action phase, instructors process the SET-results and likely need to interpret how these results align with their own achievement goals to draw relevant conclusions for their teaching (Butler & Winne, 1995; Nicol & Macfarlane-Dick, 2006). Finally, in the post-action phase, instructors reflect on what they have learned and form intentions about how to further improve their teaching in a way that helps them to reach their achievement goals. These intentions concerning the SET-results may eventually lead to changes in actual teaching behavior, and in turn, teaching quality (in line with the theory of planned behavior, Achtziger & Gollwitzer, 2018; Ajzen, 1991). Prior research supports this association between intentions and behaviors (Hurtz & Williams, 2009; Webb & Sheeran, 2006). In the following section, we will discuss how achievement goals impact the different phases of self-regulated learning, as the learning result is dependent upon on instructors' engagement (and motivation) in each of these phases (Schmitz & Wiese, 2006; Zimmerman, 2000).

1.2 Different Types of Achievement Goals and Learning From SETs

Learning approach goals facilitate the active search for learning opportunities, which is critical for the development of competencies. Indeed, prior studies have shown that learning approach goals are closely tied to actual and intended engagement regarding formal and informal learning behaviors in a variety of contexts (Cerasoli et al., 2018; Choi & Jacobs, 2011; Diethert et al., 2015; Nitsche et al., 2013). More specifically,

learning approach goals (a component of mastery goals) are positively associated with the intention to participate in formal trainings of employees in academia (see Diethert et al., 2015; Fritzsche & Daumiller, 2018), and teachers' intentions to implement new curriculum (Gorozidis & Papaioannou, 2011) in the pre-action phase. In addition, learning approach goals are related to engagement within formal professional training courses (action phase, see Daumiller, Rinas, Olden, et al., 2021), school teachers' help-seeking behavior (action phase, see Butler, 2007; Dickhäuser et al., 2007), school teachers' asking for feedback and reflection (action and post-action phases, Runhaar et al., 2010), as well as with learning results in adult samples (post-action phase, Payne et al., 2007). As such, we assume that learning approach goals will have a beneficial impact on all steps of self-regulated learning. For SETs, this means that we can assume that learning approach goals are associated with instructors' willingness to conduct SETs (and ask their students for feedback), their effort to process the feedback, their intentions to act on SET-results, as well as their intention to improve future teaching. While learning avoidance goals have sparked scientific debate about their relevance for learning processes (Cury et al., 2006; Hulleman et al., 2010), prior research has suggested that they may be beneficial for instructors' teaching and professional learning (Daumiller et al., 2019; Hein et al., 2020). We consider it to be a distinct possibility that the striving to avoid missing a learning opportunity could enhance instructors' vigor to voluntarily conduct SET(s) (in the pre-action phase), process students' SET-results (in the action phase), and derive further intentions to act on the SET-results and improve future teaching (in the post-action phase).

Asking students for feedback through SETs does not only constitute a learning situation, but also a performance situation for instructors. Specifically, we assume that SETs may help instructors to comprehend whether they appear competent in the eyes of their students (appearance is a core component of instructors' performance goals, see Daumiller et al., 2019)[1]. Performance approach goals can be seen as a preference to attain favorable judgments of teaching-related competence which is grounded in high competence expectancies, whereas performance avoidance goals might be interpreted as a preference to avoid unfavorable judgments (Elliot & Church, 1997). This means that performance approach goals could motivate instructors to engage in SETs to receive praise, whereas performance avoidance goals could motivate them to abstain from using SETs, given the danger of receiving self-diminishing feedback. Empirical studies support this assumption in samples of school teachers, as performance approach goals have been associated with positive perceptions of help-seeking (Nitsche et al., 2011), and performance avoidance goals have been related to negative perceptions of help-seeking and avoidance of help (Butler, 2007; Dickhäuser et al., 2007; Nitsche et al., 2011). In sum, we consider both performance approach and avoidance goals as predictors for the initiation of the learning process (pre-action phase). However, we do not have directed hypotheses regarding the association of performance goals and the processing of SET-results (action phase). In addition, we do not expect performance goals to facilitate further intentions to act on SET-results or intentions to improve teaching (post-action phase), congruent with prior research on adult learning and teachers' intentions (Gorozidis & Papaioannou, 2011; Payne et al., 2007).

Finally, a negative association between work avoidance goals and learning from SETs is highly plausible. Since all necessary steps for using SETs and learning from their results can be considered to be effortful in nature, teaching-related work avoidance goals should be detrimental for the whole learning process. In line with this assumption, empirical studies with school teachers suggest that work avoidance goals are associated with a lower number of attended training workshops (Nitsche et al., 2013), the perception of help-seeking as effortful and preference for expedient help seeking (Butler, 2007; Dickhäuser et al., 2007), less engagement, and less self-reported learning gains of higher education instructors in professional training courses (Daumiller, Rinas, Olden, et al., 2021) in the action and post-action phases.

[1] Since SETs contain students' reports regarding their perception of instructors' competencies, we assume that especially the appearance component of performance goals is relevant for predicting the use of SETs. Consequently, we focus on the appearance component of performance goals within our study. We did not consider normative goals, as these goals should be relevant when instructors have the clear possibility to compare their results with colleagues (e.g., in a situation with mandatory SETs), which was not the case in our study on voluntary conducted SETs. In addition, possible associations between task goals and professional learning are not clear from a theoretical perspective (Daumiller & Dresel, 2020).

1.3 Mediation Processes in Self-Regulated Learning From SETs

Following models of self-regulated learning (Schmitz & Wiese, 2006; Zimmerman, 1990), we assume that the impact that motivation (here, in form of achievement goals) has on early phases of the learning process also impacts the later phases. In other words, if achievement goals hinder instructors to engage in SETs, they cannot process SETs in the first place. Moreover, if instructors invest more effort to process SETs, they should also find more possibilities to improve future teaching and might be more willing to act on the processed SET-results. While it is trivial that the lack of student feedback in the form of SETs directly corresponds to being unable to process students' feedback, the association between processing and derived intentions should be further tested. We expect such mediation processes to be important for the impact of learning goals, which are meant to provide the necessary motivation to develop intentions based on the information in the SETs. Moreover, the maladaptive impact of work avoidance goals on intentions to act on SET-results and to improve future teaching might be mediated through an insufficient processing of SET-results. We do not expect such mediation processes for performance goals.

Prior research supports the existence of mediation processes alongside the assumption of models of self-regulated learning. In student samples, positive associations between motivation and performance have been mediated by engagement using video hits as an objective, quantitative measure in massive open online courses (Barba et al., 2016). Student teachers' acquisition of pedagogical knowledge (post-action phase) has also been found to depend on the usage of learning opportunities in the action phase (Watson et al., 2018). For instructors specifically, studies have shown that learning engagement (in the form of intensity and elaboration) mediates the associations between learning approach goals/work avoidance goals and learning gains within professional training courses (Daumiller, Rinas, Olden, et al., 2021). Self-reported learning time for formal and informal leaning activities has also been found to mediate the positive associations of learning (approach/avoidance) goals with self-reported learning results (Hein et al., 2019, 2020). Moreover, learning goals have been positively and work avoidance goals negatively related to observed attention (Kücherer et al, 2020). However, the informative value of prior research on this mediation process within samples of instructors may be limited by the same method bias, as most constructs were assessed by self-report-measures. In our research, we thereby want to show that mediation processes which bridge different phases of self-regulated learning exist by using objective indicators of the learning activity to overcome these methodological limitations in research on instructors' professional learning.

1.4 Moderators of the Impact of Achievement Goals on Learning From SETs

The validity of SETs is strongly debated within the literature and, as such, also among higher education instructors (Hornstein, 2017; Marsh, 1984; Spooren & Mortelmans, 2006). As a result, instructors may differ in their beliefs about SETs to be appropriate measures of teaching quality that can be used as tools to advance their teaching or not. Such beliefs may thereby influence whether instructors voluntarily use SETs. Beliefs can be seen as conditional knowledge that can be interpreted as if-then rules (Butler & Winne, 1995). If instructors believe in the validity of SETs, then they should be more likely to rely on them, as they consider students' feedback to constitute valid and realistic information about their teaching quality. However, if instructors believe that students cannot assess teaching quality, then they will not ask students for their opinion on their performance in class in the first place. Besides direct effects on SET-usage, we also assume that instructors' beliefs in the validity of SETs may moderate effects of achievement goals. Specifically, SETs can only be seen as learning opportunities if instructors believe in the validity of student evaluations. Therefore, the positive link between learning goals and the use of SETs should be stronger given these validity beliefs. If, however, SETs are not seen as valid judgments, learning goals should not affect the decision to ask students for feedback.

Additionally, instructors may differ in the degree of psychological threat that they experience from negative feedback. This could have direct, negative effects on the likelihood of using SETs, and at the same time, might also moderate the impact of learning goals. If the general experience of threat through negative feedback is strong, this might hinder instructors from pursuing their learning goals by asking their students for feedback, as this situation entails the possibility of attaining negative judgments. This may especially be the case when considering that instructors could use other learning opportunities to improve their teaching and pursue their learning goals (e.g., formal learning opportunities

such as didactical courses). To sum up, the general experienced threat through negative feedback might weaken the link between learning goals and the behavior of asking students for feedback.

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1.5 Present Research

We aim to shed light on whether and how instructors' achievement goals impact learning from SETs during different phases of self-regulatory learning (pre-action phase = decision to use and conduct SETs; action phase = processing of SETs; post-action phase = intentions to act on SET-results and improve future teaching; see Figure 1) in a longitudinal online study. Regarding the pre-action phase, we assumed that learning approach, learning avoidance, and performance approach goals positively predict whether instructors conduct voluntary SETs. In contrast, we assumed that performance avoidance and work avoidance goals negatively predict whether university instructors conduct SETs voluntarily. Furthermore, we expected that the strength of the association between learning goals and the usage of SETs is moderated by beliefs in the validity of SETs and the degree to which negative feedback is experienced as threatening. More precisely, the more instructors perceive SETs as valid measures of teaching quality and the less they feel threatened by negative feedback in general, the stronger the associations should be. Besides these moderation effects, we also assumed that beliefs in the validity of SETs positively predict, and generally experiencing threat after negative feedback negatively predict voluntary use of SETs directly.

Focusing on the later learning phases, we assumed that both learning approach and learning avoidance goals positively predict the time spent processing student feedback (as an objective measure of effort) in the action phase as well as intentions to act on SET-results and improve future teaching in the post-action phase. In contrast, we expected work avoidance goals to negatively predict these variables. We also expected that the time spent processing student feedback would mediate the associations between learning approach/avoidance and work avoidance goals and the postulated post-action phase outcome variables (intentions to act on SET-results and improve teaching). As differences in the amount and content of feedback might also impact processing time and intentions to act on SET results and improve future teaching, this should be controlled for in studies in natural settings.

To ensure that the observed relations are robust for differences in the quantity and quality of SETs, we considered teaching quality, number of students, and number of questions in the SETs as control variables. In an experimental study, instructors believed in the validity and trustworthiness of the results to a stronger extent if the participation rate of students in the processed SET-results was higher (Nowakowski & Hannover, 2015). Consequently, instructors might correctly interpret students' feedback as invalid information if the participation rate is very low, and thereby spend less time on it. In addition, SETs deliver more information to process if the number of students who answer the evaluation survey is higher (e.g., due to more open qualitative comments by students), or if the number of questions within the evaluation survey increases (e.g., if instructors add their own questions). We assume that the number of students is positively associated with the time it takes to process student feedback and both intentions regarding SET-results (as validity and quantity of feedback increases with the number of students). Moreover, positive and negative feedback can be beneficial for subsequent learning (Hattie & Timperley, 2007). Instructors could react to poor ratings of teaching quality in different ways (e.g., avoid processing the results to maintain self-worth, or examining the results more closely as step towards improvement). As it is not clear how teaching quality affects the later learning process, we explore the associations of this control variable with

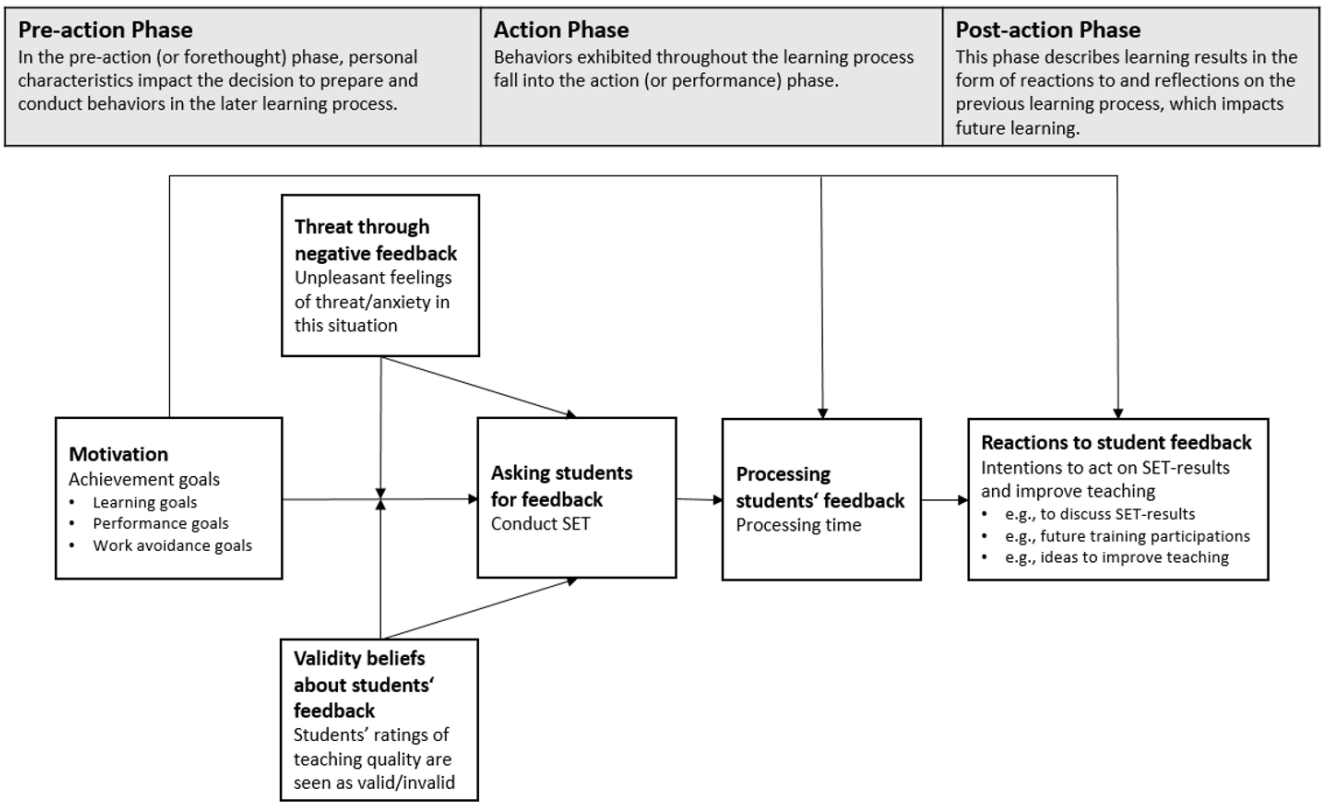

Figure 1. Proposed model for the voluntary usage of SETs as a learning situation.

the subsequent steps in the learning process (for processing time as well as intentions to act on SET-results and improve teaching).

2. Material and Methods

We conducted a longitudinal study[2] to investigate our research questions. In this study, we used data from an online open-access website (https://www.lehr-evaluation-online.de/) that allowed instructors to administer SETs for their courses. We used a mixture of self-reports (e.g., achievement goals, intentions to act on SET-results and improve future teaching) and objective behavioral data (e.g., conducting voluntary SETs with the online tool, time spent processing the SETs) to investigate how achievement goals impact the different phases of self-regulated learning from SETs.

2.1 Procedure

The open-access platform was designed for the purposes of this study (Janke et al. 2020) and advertised at 21 higher education institutions in Germany and Austria through direct mail inquiries (total reach = 18,084 instructors). The professional contexts in higher education institutions in Germany and Austria share many (structural) similarities[3]. The participation in this

[2] This study was part of an overarching three-semester longitudinal study, in which we assessed further constructs. Subsamples of this dataset have already been used to examine research questions concerning the associations of achievement goals and faculty members' discrete emotions (Rinas et al., 2020), burnout and teaching quality in the shift from face-to-face to online teaching (Daumiller, Rinas, Hein, et al., 2021), self-efficacy and students' emotions (Daumiller, Janke, et al., 2021), and to describe and promote the online tool for evaluations (Janke et al, 2020). The core focus of the present study, namely analyzing the interplay of achievement goals with the instructors' learning process regarding SETs, has not yet been addressed in any of the previously published manuscripts.

[3] Higher education institutions in Germany and Austria can be categorized as integrated systems (Kwiek & Antonowicz, 2013) as the academic staff take on tasks in both research and teaching. The academics in both countries spend most hours (on average) on research-related activities (41% of the working hours in Germany and 39% in Austria, Kwiek & Antonowicz, 2013). In both countries, the proportion of temporary positions is high (see Huisman et al., 2002 for details on junior academics' temporary contracts in Europe),

study was voluntary for all instructors. After registering, all participants were asked to answer a baseline questionnaire. After finishing this baseline questionnaire, participants were prompted to register their courses for SETs within the online platform. Instructors voluntarily used this option. The instructors were allowed to evaluate as many courses as they wanted and could also use the evaluation tool after the first semester of study participation. In contrast to our study design, SETs in German-speaking countries are typically administered by the higher education institutions where participation is usually mandatory, and these mandatory SETs are often not linked to immediate consequences within the higher education institution. However, SETs are an important feedback tool, and are relevant for later job applications and tenure. Nevertheless, next to mandatory SETs, instructors are allowed to additionally conduct voluntary SETs that can also be used for later job applications. To administer the SETs themselves, we used a well-validated scale (SEEQ; Marsh, 1982) in our study. Access to the questionnaire was given to the students via codes that were either distributed via mail or printed out by the instructors. After the evaluation, the SET-results were presented to the instructors online in our study. We advised them to process the results of the SETs for the first time when they had sufficient time to so. Immediately after processing the SET-results online, instructors were invited to answer a short questionnaire on their intentions regarding SET-results (intentions to act and intentions to improve teaching). After participating in the short questionnaire or after the study participation in the longitudinal study ended, instructors additionally received the SET-results as PDF files via E-mail for personal storage and future applications. The data of the two questionnaires and the anonymized data derived from the platform was matched using electronically generated codes. We assured the participants that their answers would remain confidential and would only be used for scientific purposes. The instructors received incentives for their participation in every questionnaire (choice between a direct monetary reward or a donation to a charity; 5 Euro [approx. 6 US $ at that time] was offered per questionnaire).

2.2 Sample

Overall, 796 instructors (412 male, 372 female, 12 diverse) registered for the online platform by the end of March 2020[4] (response rate around 4%), while 458 of these instructors finished the first questionnaire (participation rate: 57%). We deleted the data of 16 instructors who did not assert that we could use their data for research purposes, and excluded one instructor who had no code for matching the data. We excluded another 34 participants who did not report a teaching commitment for at least one course within the semester of study participation from our analyses, as they did not have the opportunity to evaluate a course, which was a requirement for the study.

This resulted in a net sample of 407 Austrian and German higher education instructors (52.6% male, 46.4% female, 1.0% diverse; average age: 38.60 years, *Min* = 20 years, *Max* = 75 years, *SD* = 10.21 years) with baseline data and teaching commitment. The instructors had an average of 8.91 years of teaching experience (*Min* = 0, *Max* = 42, *SD* = 8.38, 0.2% missing data). They were employed in a wide array of disciplines, mostly in universities (94.8%) but also in universities of applied sciences (2.0%), universities of cooperative education (0.2%), colleges of arts and music (1.7%), and colleges of public administration (0.7%, 0.5% missing data). The instructors reported their highest level of education (1.0% with bachelor degree, 39.8% with masters' degree, 44% with PhD, 15.2% with habilitation, no missing data). As one of the formal qualifications to teach in German or Austrian higher education institutions, instructors need to have a degree higher than the students. The sample consisted of higher education instructors in diverse employment situations including 67.1% in temporary positions and 27.5% in permanent positions (5.4% missing data); 33.8% doctoral candidates (32.4% academic staff pursuing a PhD, 0.7% master graduates with scholarships pursuing a PhD, 0.7% masters graduates pursuing a PhD next to working outside of higher

junior academics work under precarious conditions (Gallas, 2018), doctoral candidates conduct teaching (Kwiek & Antonowicz, 2013), and the proportion of doctoral candidates and post-doc positions within the academic staff is high. In addition, the same language is spoken in both countries, and there is significant fluctuation of academic staff between both countries. As the higher education systems and instructors of both countries share common features (see Supplementary Material 1 for results of invariance analyses on the predictor variables in this study), we consider instructors from both countries as equally suitable to be included in our sample.

[4] As end of March 2020 constitutes the end of the first semester of study participation for all instructors, we retrieved our data then. Later data cannot be used to test the hypotheses presented within this study, as this data might be biased by the sudden shift to digital teaching as a reaction to the COVID-19 pandemic.

education institutions), 28.5% post-docs (academic staff pursuing a habilitation), 18.4% professors (2.2% junior/assistant professors, 16.2% full professors), 17% of the sample reporting additional teaching assignments for one semester (which can be granted to internal and external individuals in higher education institutions with at least a master's degree). The sample of 407 instructors reported to spend on average 36.3 % of their working time on teaching, 41.7 % of their time on research and 21.8 % of their time on administration. The reported percentage of working time spent on teaching-related activities did not differ remarkably across doctoral candidates, post-docs, and professors (32.8% to 34.3%). It is important to note that doctoral candidates are predominantly members of the academic staff in Germany and Austria, and therefore take on tasks in research, teaching, and administration comparable to other instructors in higher education.

Out of the net sample of 407 instructors, 152 instructors conducted at least one voluntary evaluation within the same semester. These instructors participated with 171 courses overall (N = 1672 students, 30.2% male, 61.5% female, 3.9% missing data, mainly bachelor students with 36.5% in their first year, 26.6% in their second year, 18.0% in their third year of study, 14.5% in later study years). In Mann-Whitney-U-Tests, the subsample of 152 instructors (50.0% male, 49.3% female, 0.7% diverse; average age: 38.68 years, Min = 20 years, Max = 65 years, SD = 10.24 years) who conducted at least one SET did not differ significantly in age (U = 19097.50, Z = –.114, p = .909), academic status (U = 18774.50, Z = –.574, p = .566), or teaching experience (U = 18659.50, Z = –.565, p = .572) compared to instructors who did not conduct SET(s).

2.3 Measures

2.3.1 Baseline Questionnaire

Achievement Goals in Teaching. Higher education instructors reported their current teaching-related achievement goals with a well-validated questionnaire (Daumiller et al., 2019). All items used the item stem "In my current teaching activities…". We assessed instructors' learning approach (e.g., "…I want to constantly improve my competences"; ω = .93), learning avoidance (e.g., "…it is important to me to avoid having my competences not develop further"; ω = .90), performance (appearance) approach (e.g., "…I want to be perceived as competent"; ω = .90), performance (appearance) avoidance (e.g., "…I want to avoid being perceived as incompetent"; ω = .94), and work avoidance goals (e.g., "…I want to have as little to do as possible"; ω = .95) with four items each.[5] We focus on the appearance component of performance goals and thereby use the terms appearance approach and appearance avoidance goals in the manuscript from here on. All items were answered on Likert-type scales ranging from 1 (*do not agree at all*) to 8 (*agree completely*). We used confirmatory factor analyses to ensure the reliability and structure of these five goal types (χ^2 = 453.5, CFI = .94, TLI = .92, RMSEA = .07, SRMR = .05).

Beliefs in the Validity of SETs. We used a slightly adapted scale measuring beliefs in the validity of SETs (Nowakowski & Hannover, 2015) to assess how strongly instructors believe that students can capture teaching quality in general (e.g. "I believe that students are able to realistically assess the teaching quality of a course.", ω = .84). All five items were answered on Likert-type scales ranging from 1 (*do not agree at all*) to 5 (*agree completely*). The five-item scale contained four positively and one negatively worded item (the latter item was recoded when calculating the average score across the items). High scores represent positive beliefs in the validity of SETs and imply that instructors are convinced that student evaluations are valid indicators of teaching quality. Confirmatory factor analyses also speak to the reliability and structure of this scale (χ^2 = 454.6, CFI = .99, TLI = .98, RMSEA = .04, SRMR = .02).

General Experienced Threat Through Negative Feedback. To assess instructors' general experienced threat through negative feedback, we used a threat subscale of a well-validated questionnaire (Gaab, 2009) that refers to threat experience within concrete situations. The concrete situation needs to be described before displaying the items. We specified the concrete situation by asking the instructors how they feel when they receive negative feedback about their teaching from students or colleagues with four items (e.g., "Negative feedback is

[5] We assessed further goals that can be distinguished in instructors according to previous literature (Daumiller et al., 2019). However, as we had no hypotheses for these further differentiated goals, we do not report on them within this paper. Exploratory analyses on associations of further achievement goals and the outcome variables of this study (conducting voluntary SETs, processing time, intentions to act, and intention to improve teaching) are depicted in the Supplementary Material 2. There were no statistically significant associations in latent correlation models.

very unpleasant for me."; ω = .76). All four were measured with a Likert-type scale ranging from 1 (*completely wrong*) to 6 (*entirely true*). The four-item scale contained two positively and two negatively worded items (the latter items were recoded before calculating the average score). High scores represent stronger experienced threat through negative feedback. Confirmatory factor analyses further confirm the reliability and structure of the scale on threat through negative feedback (χ^2 = 305.1, CFI = .99, TLI = .95, RMSEA = .08, SRMR = .01).

2.3.2 Behavioral Data (Derived from the SET-Platform)

Conducting Voluntary SETs. To assess whether instructors conducted at least one SET within one course within six months after answering the baseline questionnaire, this information was coded as a dichotomous variable ranging from 0 (no course evaluated) to 1 (at least one course evaluated). A total of 152 of 407 instructors conducted an evaluation of at least one course with the provided online tool, and thereby 37% of the instructors that reported a current teaching commitment.

Processing Time Regarding SET-results. The processing time, more precisely, the time that instructors had left the evaluation results open online (in the displayed tab in their browser) before starting the second questionnaire, was tracked as log data within the system measured in milliseconds. This measure accurately indicates the time that the SET-results[6] were viewed for. To facilitate interpretation of the time stamps, we converted the data from milliseconds into minutes. Furthermore, we identified outliers which could indicate that instructors had left the tab window open while being away from their desk or doing other tasks. Specifically, we replaced extremely high processing times (above 2 hours) for 19 participants with -99 (*missing values*). Participants that did not process the SET-results online before data was retrieved were treated as missing data '-99'. The processing times ranged between 0.15 minutes and 31.17 minutes for processing the results online.

2.3.3 Second Questionnaire (Filled out Immediately After Processing the SET)

Intentions to act. We used a slightly adapted German self-report scale (Nowakowski & Hannover, 2015) as a *quantitative measure* for the *intentions to act* on SET-results. The self-report scale captures the intentions to discuss the concrete SET-results with students and colleagues, to make changes in future courses, and participate in didactical trainings with six items (e.g., "Based on this feedback I will make concrete changes to my course."; ω = .65). All six items were answered on Likert-type scales ranging from 1 (*do not agree at all*) to 5 (*agree completely*). Confirmatory factor analyses further confirm the reliability and structure of the quantitative measure of intentions to act on SETs (χ^2 = 97.1, CFI = .90, TLI = .83, RMSEA = .08, SRMR = .06). The answers to one single item were recoded, so that high scores consistently represent stronger intentions to act on the SET-results.

Intentions to improve teaching. We used one open-ended question as a *qualitative measure* for *intentions to improve teaching*. Specifically, we asked the instructors "How will you improve your course in the next semester based on the provided feedback? Please make suggestions". Two independent raters assessed how many distinct concrete ideas for improving their teaching the instructors reported within their answers. Precisely formulated ideas for concrete changes to improve future teaching and globally formulated ideas were counted (coding options: 0 = no ideas formulated; –99 = missing values due to non-participation in the second questionnaire). If instructors tried to reach one purpose by several precise changes, all diverse purposes were counted. The two raters agreed in 87.6% of their judgements (Cohens κ = .93). We used the average score across both ratings regarding the absolute number of distinct concrete ideas for future improvements of teaching as a qualitative measure for the intentions to improve teaching. High scores represent stronger reported intentions to improve teaching.

2.3.4 Control Variables

Employment situation/Permanent position. The instructors reported whether they were employed in a temporary (0) or permanent contract (1).

[6] The SET-results consisted of quantitative and qualitative student feedback. The scale scores for the SEEQ scales (e.g., learning/value or group interaction), single items on student background characteristics (e.g., prior subject interest), and open comments by students (e.g., what they liked and what can be improved within the evaluated course) were presented online. Mean scores of the scales of the SEEQ and distribution charts for the student background characteristics were displayed to summarize quantitative feedback, while the single comments of students on open answers were listed under the questions.

Academic status. The instructors reported their academic status as doctoral candidates (1), post-docs (2), or professors (3) in a close ended question. Three dichotomous variables regarding the academic status were entered as control variables in the later analyses (‘0’ concrete status not applicable, ‘1’ concrete status applicable).

Low teaching quality. For teaching quality, we used a single item of the SEEQ (Marsh, 1982; Marsh, 1984) that is meant to indicate overall teaching quality. To elaborate, the students were asked to assign an overall grade to the course ranging from 1 (*very good*) to 5 *(poorly*) with low grades indicating good teaching (German grading system). The German grading system was applied, as the students are familiar with this system. However, this implies that high scores represent low teaching quality within a course. As instructors were free to evaluate multiple courses—we used the average score across the SET(s) instructors conducted within one semester after the baseline questionnaire before answering the short questionnaire.

Number of students. The average score of students participating in the first SET(s) was calculated within one semester before answering the short questionnaire, which was used for further analyses.

Number of courses. The number of evaluated courses within one semester before answering the short questionnaire was used for further analyses to control for differences in the quantity of students’ feedback.

Number of additional questions. As instructors could enter additional questions to the student survey within the online evaluation system, we counted the number of additional questions per instructor for the included courses to control for different amounts of information instructors received within their SET-results.

2.4 Analyses

Not all instructors who were theoretically able to use the platform for evaluations (indicated by reported teaching commitments) chose to conduct SET(s), as this was a voluntary option. For this reason, we carried out separate analyses for predicting the initiation of learning from SETs by using the platform to conduct SET(s) (pre-action phase of self-regulated learning) with the full sample and for the later learning process (action and post-action phase of self-regulated learning) with the reduced sample. We conducted structural equation models for our main analyses with manifest scores using Mplus Version 8.5 (Muthén & Muthén, 2017). We used the maximum likelihood estimator with robust standard errors (MLR) and the weighted least squares means and variance (WLSMV)-adjusted estimator (for analyses with categorical outcomes), which are robust to multivariate non-normality because our data violated the assumption of normal distribution in Kolmogorov-Smirnov tests for all variables (with the exception of the intentions to act). We log transformed the processing time because the time data violated the assumption of normal distribution. We report standardized parameter estimates for better interpretability of all findings. Standardized parameters reflect how many standard deviations an outcome variable changes per standard deviation increase in the predictor variable. For regression coefficients, when we had directed hypotheses, we reported one-tailed levels of significance.

2.4.1 Missing Values

We had no missing values on any variables assessed in the baseline questionnaire. However, out of the 152 instructors who conducted SET(s), only 132 also answered the short questionnaire (13.1% missing data regarding intentions to act on SET-results and improve teaching). As we coded the processing time for 19 participants as missing data due to outliers with very high viewing times (see above), we had in total 17.1 % missing data regarding processing time. Finally, some participants had missing values on the indicator for teaching quality for all students that had participated in the SETs (1.3% missing data). We used a full information maximum likelihood approach (FIML) to handle missing data and include all available information for model estimations. This method increases the power of the data analysis and reduces the impact of bias due to missing data (Enders, 2010).

2.4.2 Pre-analyses

To ensure the comparability of the diverse sample subgroups regarding their employment situation (temporary or permanent position) and academic status (doctoral candidates, post-docs, and professors) multivariate ANOVAs were conducted. The multivariate ANOVAs are reported in the results section.

2.4.3 Pre-Action Phase to Action Phase of Self-regulated Learning (N = 407)

We estimated bivariate and multivariate models to assess whether achievement goals predicted if the instructors voluntarily conducted SET(s) using the net sample

(N = 407). In these models, latent factors were estimated for the predictor variables (achievement goals, beliefs in the validity of SETs, and general experienced threat through negative feedback). In the first multivariate model, we regressed whether instructors had conducted SET(s) voluntarily as a dichotomous measure on instructors' achievement goals and the two moderator variables (main effects). In the subsequent model, we added the control variables (employment situation and academic status) to test for the robustness of the results. In both multivariate models, we allowed for correlations between all predictor variables. In addition, we allowed for residual correlations of items with similar wordings between the approach and avoidance items of achievement goals. We included residual correlations between negatively worded items of experienced threat.

Considering categorical outcomes using the WLSMV-adjusted estimator was only possible in manifest interaction analyses, we calculated manifest models to examine, whether beliefs in the validity of SETs and general experienced threat through negative feedback moderated the relationship between learning (approach and avoidance) goals and the behavior of conducting voluntary SETs. The moderation models were estimated for both moderators and learning goals separately (resulting in four moderation models). We allowed for correlations between all predictor variables (including interaction terms) in all interaction models. The moderation models were fully saturated (Raykov et al., 2013).

2.4.4 Pre-Action to Action and Post-Action Phase of Self-regulated Learning (N = 152)

We estimated a latent structural equation model to test the mediation hypotheses regarding intentions to act and improve teaching based on the subsample (N = 152) for each achievement goal type, if correlational results suggested a possible mediation effect. In the mediation models, we estimated the specified latent factors for the considered achievement goals and the variable interaction to act on the SET-results on the manifest item scores per construct. More precisely, we regressed both learning outcomes of the post-action phase (intentions to act and improve teaching) on the relevant achievement goal of the pre-action phase (learning approach or avoidance goals or work avoidance goals), on the indicator for the action phase (processing time) and on four control variables (low teaching quality, number of students, number of courses, additional questions) to control for quantitative and qualitative differences in the feedback instructors received within the SET-results. Additionally, processing time was regressed on the achievement goals and the above mentioned control variables. Indirect effects of the single achievement goals via processing time on both outcome variables were calculated in these models. We allowed for correlations of the outcome variables (intentions to act and improve teaching) and correlations between all predictor variables (achievement goals and control variables).

2.4.5 Model Fit

Because χ^2 is overly sensitive for small deviations in large samples (Chen, 2007; for an overview see Putnick & Bornstein, 2016), absolute fit indices are reported. We used the Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) as fit indices to determine the model fit. Absolute fit indices for CFI and TLI values greater than 0.90 (Hu & Bentler, 1999); and RMSEA values below 0.08, and SRMR values below 0.10 constitute an acceptable fit (for a comparison, Schermelleh-Engel et al., 2003).

3. Results

The descriptive statistics and correlations are reported in Table 1. Multivariate ANOVAs overall revealed statistically significant mean differences in the model-relevant predictor variables of the pre-action phase that were assessed in the baseline questionnaire (N = 407) regarding the instructors' employment situation (temporary or permanent position; Wilks $\lambda = 0.94$; $F[7,377] = 3.70$; $p = .001$), and their academic status (doctoral candidates, post-docs, and professors; Wilks $\lambda = 0.93$; $F[14,634] = 1.81$ $p = .033$). Instructors employed at temporary or permanent positions differed statistically significantly in their general experienced threat through negative feedback ($F[1,383] = 14.71$, $p < .001$). The strength of work avoidance goals differed statistically significant for instructors with different academic statuses ($F[2,323] = 5.70$, $p = .004$).

Table 1. *Descriptive Statistics for all Variables and Correlations.*

	Min/Max	*M(SD)*	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
[1] Learning approach goals	1/8	6.96(1.16) /6.92(1.14)		**.52** <.001	**.22** <.001	.03 .567	**–.27** <.001	**.16** <.001	.06 .249	–.03 .601	–	–	–	–	–	–
[2] Learning avoidance goals	1/8	6.18(1.74) /6.43 (1.60)	**.44** <.001		**.18** <.001	**.25** <.001	**–.17** <.001	**.11** .010	.06 .222	**.14** .027	–	–	–	–	–	–
[3] Appearance approach goals	1/8	6.01(1.48) /6.12(1.37)	**.21** .008	.08 .365		**.59** <.001	**.10** .035	**.15** .001	**.19** <.001	.07 .286	–	–	–	–	–	–
[4] Appearance avoidance goals	1/8	6.03(1.94) /6.07(1.87)	–.03 .712	**.19** .029	**.55** <.001		**.21** <.001	.04 .382	**.26** <.001	.02 .774	–	–	–	–	–	–
[5] Work avoidance goals	1/8	2.80(1.77) /2.78(1.75)	**–.41** <.001	**–.27** .002	.13 .076	**.19** .007		–.07 .141	.02 .763	–.01 .870	–	–	–	–	–	–
[6] Validity beliefs regarding SETs	1/5	3.55(0.73) /3.58(0.75)	.17 .157	.17 .075	**.18** .021	.14 .075	–.11 .231		**–.12** .016	.04 .559	–	–	–	–	–	–
[7] Experienced threat	1/6	2.92(1.06) /2.97(1.07)	–.01 .849	.03 .720	**.21** .011	**.33** <.001	.08 .333	–.08 .302		.05 .456	–	–	–	–	–	–
[8] Conducting voluntary SET(s)	0/1	n/a	–	–	–	–	–	–	–		–	–	–	–	–	–
[9] Processing time in minutes	0/31	4.26(4.21)	.07 .330	.10 .218	.01 .952	**.20** .007	–.02 .845	.05 .529	.08 .359	–		–	–	–	–	–
[10] Intentions to act	1/5	2.94(0.78)	**.33** <.001	**.20** .018	.07 .368	–.09 .307	–.13 .131	.01 .918	–.13 .102	–	.15 .054		–	–	–	–
[11] Intentions to improve teaching"	0/5	1.34(1.08)	**.23** .006	–.01 .942	.13 .066	.02 .781	.01 .964	.07 .408	–.02 .751	–	**.22** .014	**.45** <.001		–	–	–
[12] Low teaching quality	1/5	1.87(0.56)	–.17 .082	–.09 .298	**–.17** .022	–.04 .660	.06 .465	**–.19** .010	–.03 .711	–	.15 .054	.11 .224	–.01 .897		–	–
[13] Number of courses	1/4	1.12(0.43)	.02 .775	.01 .874	.04 .695	.06 .294	–.00 .988	.02 .874	.11 .238	–	.02 .740	–.01 .875	–.15 .011	.03 .656		–
[14] Number of students	1/45	10.05(8.27)	.09 .272	.05 .595	–.05 .599	–.04 .623	–.06 .531	.10 .123	**–.20** .003	–	**.39** <.001	**.24** <.001	**.29** <.001	.01 .898	**–.10** .012	
[15] Additional questions	0/15	0.91(2.20)	–.03 .608	.02 .767	–.09 .318	–.04 .633	.02 .776	.08 .280	**–.09** .259	–	.19 .058	.04 .622	**.20** .007	–.07 .260	–.02 .514	.25 .070

Notes. Min = Minimal (rounded); *Max* = Maximum (rounded); *M* = Mean; *SD* = Standard deviation. Descriptive characteristics are reported for the fullest available sample (*N* = 407 for [1] to [8]; *N* = 152 for [9] to [15]). After the dash [/], mean values and standard deviations for the subsample of instructors who conducted SET(s) are additionally reported (for the constructs [1] to [7]). The zero-order correlations are derived from two saturated base models in which undirected paths between all included variables were freed. The correlations under the diagonal are for the subsample (*N* =152) of instructors who evaluated (estimator: MLR), while the correlations above the diagonal are for the net sample of instructors with teaching commitments from the baseline questionnaire (*N* = 407). The zero-order correlations are derived from two saturated base models in which undirected paths between all variables were freed. Significant correlations (p <.05) are printed in boldface and two-tailed levels of significance are reported under the correlations.

Overall, the analyses revealed no statistically significant mean differences in the model-relevant predictor variables that were assessed within the SET-tool and short questionnaire for the subsamples of instructors (N = 152), who conducted SET(s) regarding their employment situation (Wilks $\lambda = 0.91$; $F[7,107] = 1.57$; p = .153) or their academic status (Wilks $\lambda = 0.80$; $F[14,176] = 1.45$ p = .136). See Supplementary Material 3 for the subgroup specific descriptive statistics.

Because multivariate ANOVAs partly revealed significant group differences in the predictor variables, we additionally controlled for instructors' employment situation and/or academic status in the following structural equation models that included either threat through negative feedback or work avoidance goals.

3.1 Pre-Action Phase to Action Phase of Self-Regulated Learning (N = 407)

As expected, we found positive associations between learning avoidance goals and voluntarily conducted SET(s) in our sample of higher education instructors (see Table 1). In multivariate analyses, this association was robust even when we controlled for the other achievement goals (see Table 2, Model 1) as well as further control variables regarding the employment situation and academic status (see Table 2, Model 2). In addition, our results confirmed our hypotheses concerning associations of appearance (approach/avoidance) goals and voluntarily conducted SET(s) in the multivariate analyses. However, we found no statistically significant associations for the learning approach and work avoidance goals or the moderator variables, neither in bivariate nor in multivariate analyses. Nevertheless, the bivariate associations of conducting voluntary SET(s) and work avoidance goals pointed descriptively in the expected direction. Achievement goals and the moderators only explained a significant proportion of the variance in later voluntarily conducted SET(s) in the multivariate model that controlled for the instructors' employment situation and academic status (R^2 = .09, p = .041). Moreover, we did not find any statistically significant moderation effects in the additional models on the supposedly relevant interactions of beliefs in the validity of SETs and general experienced threat in light of negative feedback with learning goals (see Table 3).

Table 2. *Results of the Latent SEMs for Associations with Later Voluntary Conducted SET(s).*

	Bivariate Models			Multivariate Model 1			Multivariate Model 2		
	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*
Learning approach goals	–.04	0.06	.705	–.27	0.09	.998	–.27	0.10	.998
Learning avoidance goals	**.15**	0.07	.013	**.31**	0.10	.001	**.31**	0.10	.001
Appearance approach goals	.08	0.07	.131	**.17**	0.10	.038	**.16**	0.10	.048
Appearance avoidance goals	.02	0.07	.614	**–.18**	0.10	.035	**–.19**	0.10	.026
Work avoidance goals	–.01	0.07	.429	–.01	0.07	.454	.00	0.07	.504
Validity beliefs	.05	0.07	.261	.04	0.07	.302	.04	0.07	.293
Experienced threat	.05	0.07	.754	.05	0.08	.742	.08	0.09	.811
Permanent position (CV)	.04	0.07	.577	–	–	–	.12	0.09	.193
Doctoral candidates (CV)	.04	0.06	.574	–	–	–	.07	0.09	.462
Post-docs (CV)	.01	0.06	.878	–	–	–	.02	0.09	.791
Professors (CV)	–.05	0.06	.424	–	–	–	–.10	0.09	.238
R^2		n/a		R^2 = .07, p = .064			R^2 = .08, p = .043		

Notes. N = 407; β = standardized regression coefficient; *SE* = standard error; p = one-tailed level of significance (two-tailed level of significance for control variables; CV = control variable. Significant effects (p <.05) are printed in boldface. The achievement goals and investigated moderators (experienced threat and validity beliefs) are modelled as latent variables in all reported models. The correlations of predictor variables and error variances varied between –.29 and .63 in Model 1; and between –.45 and .62 in Model 2. The model fit the data sufficiently well (for Model 1: CFI = .90, TLI = .89, RMSEA = .04, SRMR = .04; for Model 2: CFI = .95, TLI = .94, RMSEA = .03, SRMR = .04).

Table 3. *Results of the Manifest Moderation Analyses.*

	Model 1			Model 2			Model 3			Model 4		
	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*	β	*SE*	*p*
Learning approach goals	–.04	0.07	.710	–.04	0.06	.734	–	–	–	–	–	–
Learning avoidance goals	–	–	–	–	–	–	**.15**	0.06	.011	**.14**	0.06	.017
Validity beliefs	.04	0.06	.252	–	–	–	.03	0.06	.329	–	–	–
Experienced threat	–	–	–	.06	0.06	.815	–	–	–	.04	0.06	.729
Interaction	.00	0.06	.492	–.08	0.06	.097	.07	0.06	.137	–.02	0.06	.405
R^2	R^2 = .00, *p* = .667			R^2 = .01, *p* = .431			R^2 = .03, *p* = .217			R^2 = .02, *p* = .245		

Notes. $N = 407$; β = standardized regression coefficient; *SE* = standard error; *p* = one-tailed level of significance. The reported interaction effect always describes the interaction of the predictor variables that are contained in the model. Significant effects ($p < .05$) are printed in boldface. In the moderation models, we allowed for correlations of predictor variables, which varied between –.38 and .16 in Model 1, –.04 and .09 in Model 2, –.15 and .11 in Model 3, –.12 and .06 in Model 4.

3.2 Pre-Action Phase to Action and Post-Action Phase of Self-Regulated Learning (N = 152)

Figure 2 a) for learning approach goals and b) for learning avoidance goals depict the significant standardized path coefficients derived from the structural equation models on later learning phases. The models adequately fit the data (for learning approach goals: CFI = .93, TLI = .90, RMSEA = .06, SRMR = .05; for learning avoidance goals: CFI = .97, TLI = .96, RMSEA = .03, SRMR = .05). Since work avoidance goals were not significantly associated with processing time, intentions to act, or intentions improve teaching (see Table 1), we did not conduct mediation analyses on this goal type. The multivariate mediation models for learning approach and avoidance goals explained substantial amounts of variance for indicators of the action (20% of processing time) and post-action phases (21% to 32% of intentions to act and 14% to 18% of intentions to improve teaching).

Learning (approach and avoidance) goals were not statistically significantly associated with processing time in the multivariate or bivariate models. As expected, learning approach and avoidance goals positively predicted later reported intentions to act on the SET-results in bivariate and multivariate analyses. However, only learning approach goals were positively associated with the number of intentions to improve teaching. The bivariate positive relation of processing time and intentions to improve teaching did not emerge when controlling for effects of the learning goals and further control variables in the multivariate models. Moreover, we found no indirect effects of the suspected achievement goals via processing time on intentions regarding SET-results (neither for intentions to act nor for intentions to improve teaching). The indirect link of learning goals and intentions to act on the SET-results could not be found for learning approach goals (β = –.00, *SE* = .01, *p* = .604) or learning avoidance goals (β = –.00, *SE* = .01, *p* < .567). Congruently, no indirect effects of the learning goals on the intentions to improve teaching were statistically significant (learning approach goals: β = .01, *SE* = .01, *p* < .204; learning avoidance goals: β = .01, *SE* = .01, *p* = .164).

Interestingly, teaching quality was positively associated with processing time and intentions to act on the SET-results (in both models). This means that the worse the teaching quality was rated, the more time it took instructors to process the results and the higher their intentions were to act on the results they processed. In addition, the more students participated in the SET, the more time instructors needed to process the results (in both models), the stronger the intentions to act on the SET-results were (in both models), and the higher the number of intentions to improve future teaching (only in one model). Moreover, the number of courses instructors evaluated was negatively associated with the number of intentions to improve teaching (in both models).

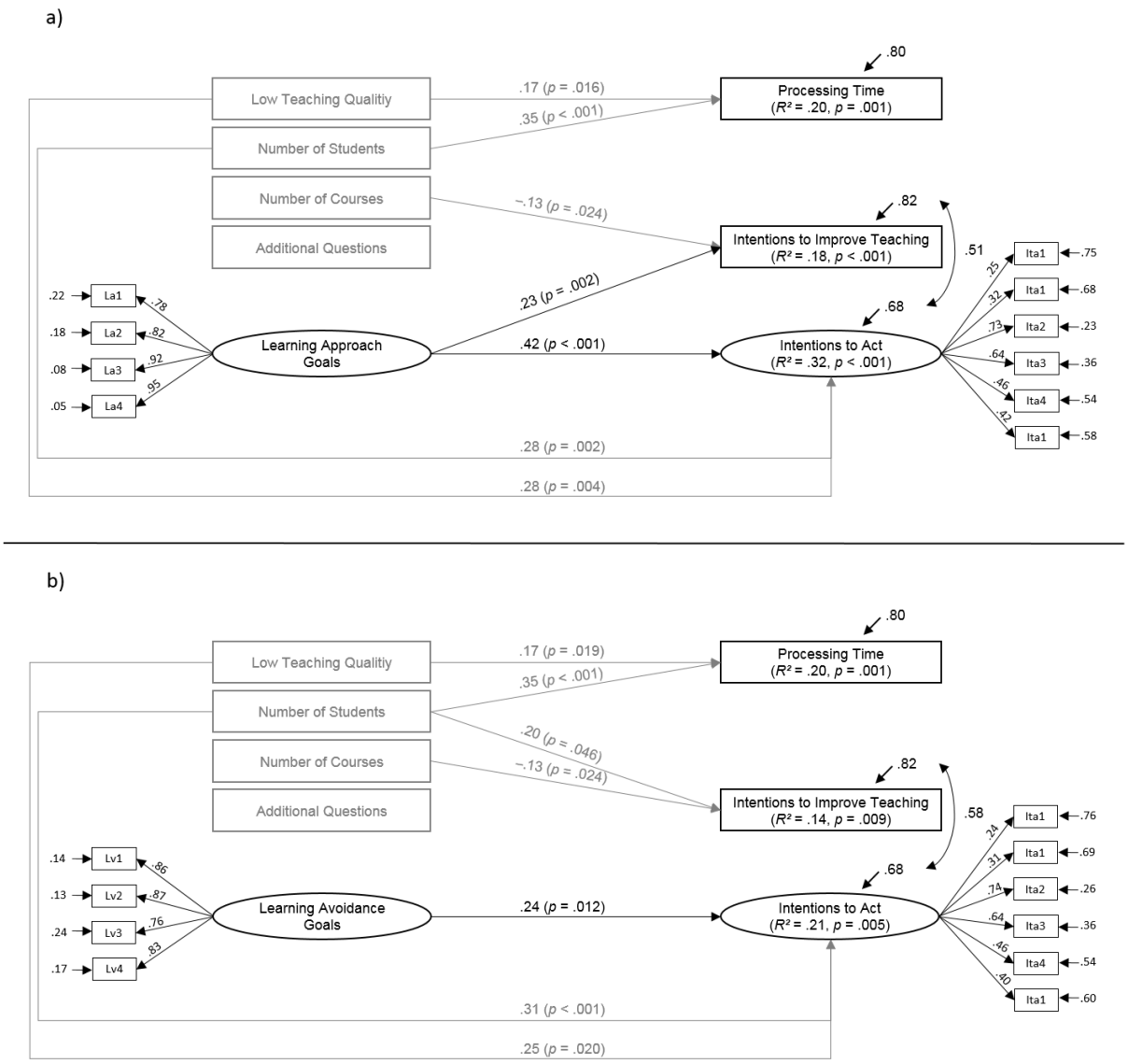

Figure 2. Results of the mediation models for the associations between learning approach/avoidance goals and intentions to act on SET-results and improve teaching via processing time (N = 152). Only statistically significant paths are depicted (p < .05). One-tailed significance levels are reported for directed hypotheses (depicted in black); two-tailed levels of significant are reported for the associations with control variables (depicted in grey). The correlations between the predictor variables varied between –.36 and .74 in Model a) and between –.10 and .25 in Model b).

4. Discussion

In our longitudinal field study, we aimed to investigate whether and how achievement goals predict self-regulated learning with SETs within university instructors. We found that especially learning avoidance goals, but also appearance approach and avoidance goals, predicted the instructors' behavior to voluntarily conduct SET(s). We found no effects for the other achievement goals or any moderation processes through beliefs in the validity of SETs or experienced threat concerning negative feedback on the behavior to voluntarily conduct SET(s). In contrast, learning approach goals predicted later self-reported intentions to act on SET-results and improve future teaching, while learning avoidance goals were only associated with later reported intentions to act on SET-results. Contrary to our initial assumptions, the positive associations of learn-

ing approach/avoidance goals and instructors' intentions were not mediated by their processing time of SET-results.

4.1 Theoretical Implications

Our study advances research on learning from SET-results, as we proposed a model that explains what motivates instructors to voluntarily use student evaluations of teaching and learn from these results. Such a model is desperately needed, as the impact of SETs depends on instructors' openness to student feedback and their willingness to engage with the evaluation results (Kember et al., 2002). In line with models of self-regulated learning, we found that instructors' achievement goals predicted necessary learning steps during the pre-action phase (conducting voluntary SETs), the action phase (processing of SETs), and the post-action phase (intentions to act on SET-results and improve teaching). We do not claim that our theoretical framework on motivated usage of SETs and processing exhaustingly describes all processes that lead instructors to conduct and learn from SETs, as substantial proportions of variance on the criteria are not yet explained. However, we provide a foundation for further research on the subject matter. In this regard, our results underline the crucial importance of learning goals as facilitators of self-regulated learning in- and outside of higher education (Daumiller, Rinas, Olden, et al., 2021; Diethert et al., 2015; Hein et al., 2019, 2020; Nitsche et al., 2013).

From a methodological perspective, we contribute to the literature by using behavioral measures such as the actual use of voluntary SETs and processing time to investigate how instructors use SET(s). This results in more realistic estimations of the predictive power of achievement goals than when only relying on self-report measures. This advancement, however, comes with the caveat that we only found small associations of achievement goals with the behavioral indicator of conducting voluntary SET(s), and no associations with processing time (except for an unexpected correlation with appearance avoidance goals). One possible explanation for this pattern of results is that processing time itself might be limited in its reliability and validity, as there could be multiple reasons that lead instructors to keep the tab with the SET-results open (aside from looking at them). In contrast, we found empirical evidence for associations between achievement goals and the voluntary use of SETs in our study. However, it is noteworthy that the amount of explained variance in the objective outcome variable, voluntary conducted SET(s), was only significant when controlling for instructors' employment situation and academic status. Thereby, the practical relevance of the associations in the pre-action phase is unclear and should be further investigated in future studies. To find even a small association of teaching-related achievement goals and voluntarily conducting SET(s) as a behavioral measure, is highly interesting. To this end, the amount of explained variance in conducting voluntary SET(s) having not been significant in the model including the achievement goals without further control variables as predictors may have been due to a very small effect. The sample size might have limited the power to detect such a small effect. Moreover, the constructs are operationalized on different levels, because we assessed general teaching-related achievement goals instead of concrete SET-related goals.

Our design allows for temporal ordering of most of the variables (achievement goals, voluntary conducted SETs, processing time for SETs-results and intentions regarding SET-results) and thereby prospective analyses. This helps us to gather an even more cohesive picture about the learning process and to distinguish different phases in line with models of self-regulated learning. The depicted process underlines the validity of such models. Without deciding to use SETs and conducting them, instructors have no chance to interpret the results or to form intentions to act on SET-results and improve future teaching. Despite a lack of predictive power when additionally considering achievement goals, we found that processing time was indeed predictive of the number of derived ideas to further one's teaching in bivariate analyses. This clearly speaks to the notion that the processes in the action phase may also be important for post-action reflection processes.

Finally, our results strengthen the claim of the predictive power of learning approach goals for self-regulated learning processes, congruent with prior research on instructors' professional learning (Daumiller, Rinas, Olden, et al., 2021; Hein et al., 2019). In our study, learning approach goals predicted later intentions to act on SET-results and intentions to improve teaching that were based on concrete SETs. This study improved the measure of the outcome variable of the post-action phase compared to prior research by including both quantitative and qualitative measures of intentions. The connection between learners' motivation in the pre-action phase and their intentions formulated in the post-action phase remained robust when controlling for processing time (action phase), low teaching quality, and

indicators of the amount of received information. Consequently, the results support the importance of learning goals in the self-regulated learning process of higher education instructors.

4.2 Implications for Educational Practices

Research that sheds light on antecedents of learning from SET-results and the learning process can provide relevant practical implications. As such, fostering learning (approach) goals might be helpful for promoting self-reported learning from higher education instructors' SETs. Achievement goals of students could be activated by using instructions that emphasize the importance of learning and improvement and by evaluating performance on the basis of changes over time (Elliot & Harackiewicz, 1996; Elliott & Dweck, 1988). This might also be possible for higher education instructors if the quality management includes information that activates learning goals in their communication directly before providing instructors with their SET-results. In addition, the possibility to strengthen learning approach goals in academics by workplace interventions has been discussed in previous literature (Janke & Dickhäuser, 2018). However, as instructors already report high learning approach goals (compared to the midpoint of the scale) and SETs are mostly mandatory in higher education institutions in Germany and further nations (pre-action phase), it might be beneficial to support instructors in the following steps of the learning process (action and post-action phase) to improve professional learning from SETs in educational practice. To support instructors in building intentions in the post-action phase of the learning process, didactical courses might promote *intentions to act* on SETs for further improvement (e.g. by explaining possibilities and advantages to discuss SET-results with colleagues and students, consider changes in future courses, and participate in further relevant didactical trainings). Instead of only informing instructors about the SETs in higher education institutions, *intentions to improve teaching* might be promoted by encouraging instructors to reflect on their SET-results with a short qualitative survey on their goals for future teaching, which they should complete after processing the SETs. To facilitate instructors' reflections, they could think about different questions concerning their SETs (e.g., what do they learn from the SETs? What do they want to improve in their future teaching and how could they do that?). However, our study does not provide evidence for the causality of the identified associations or the consequences of intentions to act on SET-results and intentions to improve future teaching for later quality of teaching. For these reasons, practical ideas need to be tested in intervention studies before they can be implemented into higher education systems.

4.3 Limitations and Future Directions

Against our hypotheses, we did not find work avoidance goals (or appearance goals in bivariate analyses) to predict taking part in voluntary SET(s). This could, however, be a direct effect of our acquisition strategy that relied on the willingness of instructors to participate in a study where they were meant to interact with SETs. This in itself is a motivated action and instructors with low or suboptimal motivation may have been less likely to participate in the study, limiting our ability to detect effects of this goal type. The observed means for achievement goals speak to this direction: Learning approach goals were descriptively slightly stronger, while appearance avoidance goals were slightly weaker within our sample compared to previous research with less extensive study designs (e.g. compared to a cross-sectional study by Daumiller et al., 2019). Therefore, it could be highly beneficial to investigate the process of learning from SET-results in a less pre-selected sample of instructors in future research through applying more economic study designs. Such a study design may replicate and advance our findings, for example, by questioning university instructors at the beginning of their semester about motivational variables, beliefs, and fears and then measuring relevant outcome variables after they processed their mandatory SETs (rather than additionally asking for them to complete voluntary SETs). Additionally, context characteristics could have impacted the instructors' decisions to voluntarily conduct SETs (e.g., whether they also had to conduct mandatory SETs in the semester of study participation or not). The evaluation context would also be unified in the above mentioned study, in so far as all instructors would only conduct mandatory evaluations.

Although we tried to prevent biases in processing times by encouraging instructors to look at the results only when they had enough time to process them, by excluding times in which another tab in the browser was viewed, and by excluding participants with unreasonably high processing times, we cannot rule out completely that instructors kept the tab with the SET-results open for other reasons besides looking at them (e.g., leaving the desktop open while getting a coffee). For

this reason, the indicator for processing time might be limited in its reliability and validity. This concern in regard to the validity of log data is in line with research on university students which did not find statistically significant associations between self-reported engagement and objective log data in an online learning system (Henrie et al., 2018). Nevertheless, the results of our study at least partially support the validity of this measure, as processing time was associated with possible predictors and outcomes in meaningful ways. In particular, it took the instructors longer to process the results if more students participated and if the teaching quality was rated worse. Moreover, processing time was significantly correlated with the intentions to improve teaching. Future studies that aim to use this objective measure could improve the reliability of processing time further and thereby the estimation of respective associations by letting the instructors process the SET-results under more controlled conditions (e.g., observation).

Furthermore, due to the natural setting of the study, instructors could evaluate their courses in an online tool, and in single courses only one student participated in the students' evaluation of teaching. Unfortunately, we could not prevent low student participation rates (despite reminders to the instructors to share the invitations with their students and direct reminders to the students when possible). As the validity of SET(s) rises with the participation rate and instructors use this information for the interpretation of SET-results (Nowakowski & Hannover, 2015), the low student participation rate might limit the interpretation of the findings in that the average processing times might underestimate the real amount of time that it takes instructors to process SET-results. To reduce the impact of this variation in our findings, we controlled for the number of students that participated in the course evaluation within the mediation analyses. However, it might be fruitful for future research to take further steps to prevent low response rates in SETs into account (e.g., by additionally asking for in-class evaluations or investigating the processing of obligatory SET-results).

In our study, we mostly focused on the learning process at the beginning rather than on the future learning result. Due to the complex sample (different countries, multiple universities, and different departments), we did not have access to additional objective measures of teaching advancement besides self-reported intentions to improve future teaching. In future research, this limitation could be overcome by focusing on instructors' concrete goals to improve future teaching based on SETs and assessing their goal attainment in subsequent semesters by self-ratings and external ratings of students or colleagues.

Finally, our results indicate temporal trends, however, they cannot tackle the question of causality, which calls for further experimental studies. In such studies, it would be interesting to investigate how researchers perceive and interact with SETs depending on prior induced achievement goals. In a naturalistic design, the instructors could be briefed to bring their own SETs, while a less extensive solution could be to provide them with vignettes of fictional SETs.

Feedback theories and models of self-regulated learning provide frameworks to look into instructors' learning from student feedback in future research. Research on student learning provides evidence that the least complex feedback was beneficial for learners in terms of efficiency and learning outcomes (Kulhavy et al., 1985). As the complexity of SET-results is quite high, reducing the complexity of SETs or helping to interpret complex student feedback might be beneficial for instructors' learning outcomes. This would be of high interest for future research and of practical significance for how to provide SET-results in the evaluation process in higher education institutions. Furthermore, future research could focus on reasons and concrete goals to use SETs to predict the usage of SET(s) and learning from its results.

5. Conclusion

The present study provides new insights into higher education instructors' voluntary usage and learning from student evaluations of teaching. Our results suggest that especially learning goals play an important role in predicting whether instructors voluntarily conduct SETs as well as their intentions to act on the SETs and improve future teaching. Understanding the impact of professional motivation of higher education instructors on the processing and voluntary use of SETs is crucial in fostering instructors' professional development in teaching. All in all, the ideas presented in this article provide the foundation for future research on instructors' learning from SET-results with the goal of advising higher

education institutions, instructors, and quality management on how to support instructors in seeing SETs as valuable learning opportunities.

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Note: This is a pre-copyedited, author-produced PDF of an article accepted for publication in Frontiers in Psychology. The final edited article will be available, upon publication, via its DOI (https://doi.org/10.3389/fpsyg.2021.652093). A published abstract (https://www.frontiersin.org/articles/10.3389/fpsyg.2021.652093/abstract) and a preprint version (https://psyarxiv.com/mt8rw) of this article are currently available.

Acknowledgements: The research reported in this article was supported by the German Research Foundation (Deutsche Forschungsgemeinschaft - DFG) Grant DI 929/5-1 awarded to Oliver Dickhäuser and Grant DR 454/8-1 awarded to Markus Dresel. We would like to thank Jan Siebert and Hannes Kohlsaat for their technical support in our study.

Original publication:
Hein, J., Janke, S., Rinas, R., Daumiller, M., Dresel, M., & Dickhäuser, O. (2021). Higher education instructors' usage of and learning from student evaluations of teaching – Do achievement goals matter? *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2021.652093.