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Angaben zur Veröffentlichung / Publication details:

Hein, J., Martin Daumiller, S. Janke, Markus Dresel, and Oliver Dickhäuser. 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.

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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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.

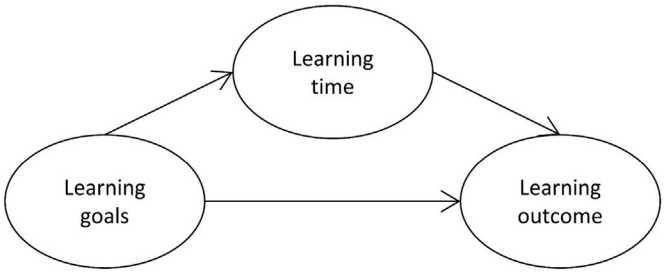

Fig. 1. Proposed mediation model for both domains, teaching and research.

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.

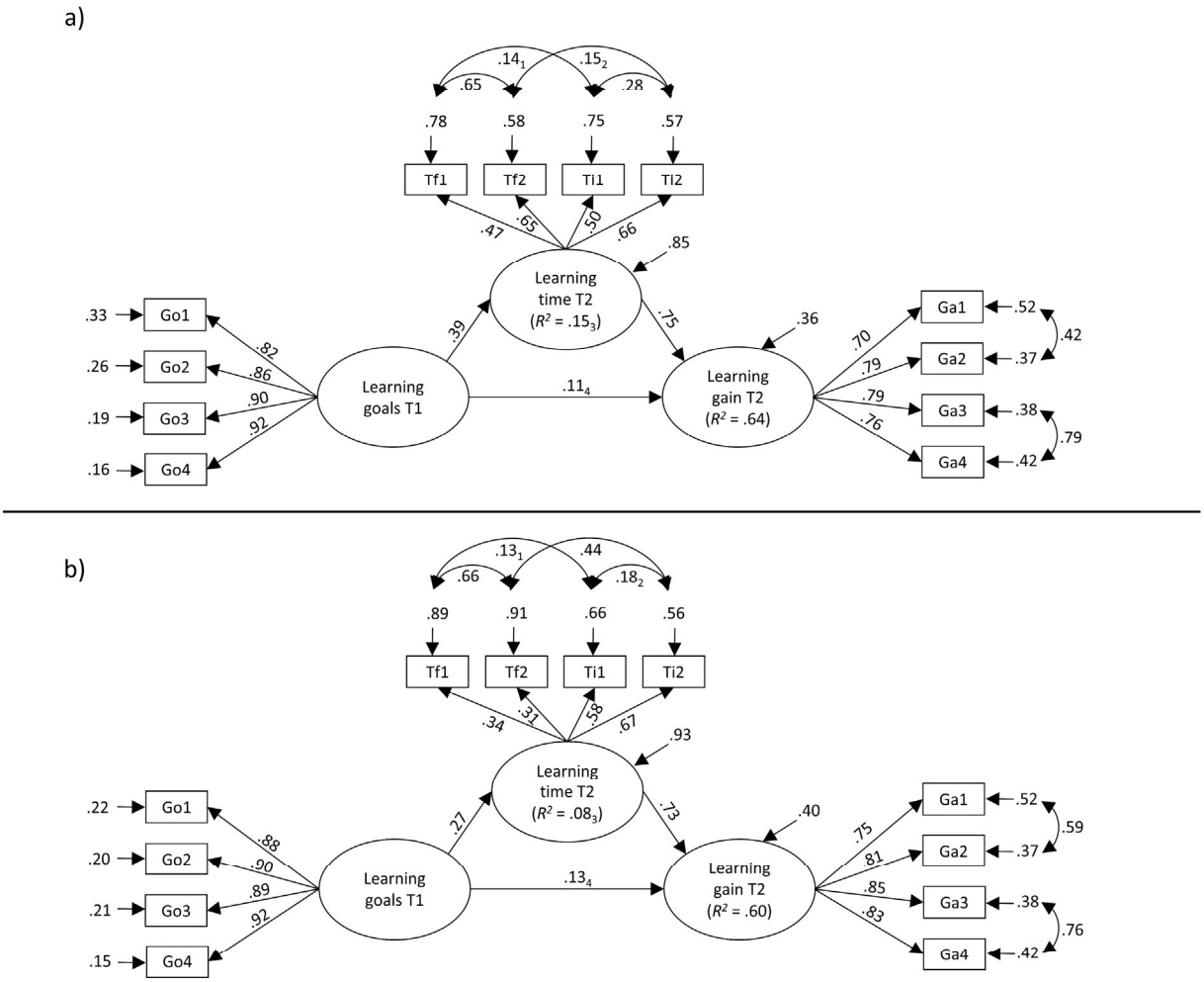

Fig. 2. Results for the structural equation model of the mediation effect in teaching (*a*) and research (*b*). All paths in teaching (*a*) were statistically significant with $p < .001$ except the marked path $_1$: $p = .007$, path $_2$: $p = .022$, path $_3$: $p = .003$, and path $_4$: $p = .129$. 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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