

Subjective Perceptions of the Teaching–Research Nexus and
Occupational Stress at Universities

Subjektive Vereinbarkeit von Forschung und Lehre als Bedingung
des Belastungserlebens an der Universität

Daumiller, M. & Dresel, M. (Universität Augsburg)

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Abstract

The duality of research and teaching is fundamental for university systems; however, it is often experienced as stressful. A study with 819 university scholars points to the importance of subjective perceptions of the teaching–research nexus. Such views could be differentiated in perceived integration (e.g., research is part of teaching) and perceived synergy (e.g., research enriches teaching). Structural equation modelling indicated that only perceived synergy was associated with reduced occupational stress.

Keywords: teaching; research; teaching–research nexus; beliefs; occupational stress

Zusammenfassung

Die Dualität von Forschung und Lehre wird als konstitutiv für das System Universität postuliert, häufig jedoch als belastend erlebt. Eine Studie mit 819 Wissenschaftler(inne)n verweist auf die Bedeutsamkeit der subjektiv wahrgenommenen Vereinbarkeit von Forschung und Lehre. Hierbei ließ sich die wahrgenommene wechselseitige Verortung (z. B. Forschung als Teil von Lehre) von der wahrgenommenen Synergie (z. B. Forschung bereichert Lehre) unterscheiden. Ergebnisse eines Strukturgleichungsmodells indizierten, dass (nur) die wahrgenommene Synergie von Forschung und Lehre mit reduziertem Belastungserleben zusammenhing.

Schlagwörter: Lehre; Forschung; Vereinbarkeit; Überzeugungen; Belastungserleben

Subjective Perceptions of the Teaching–Research Nexus and Occupational Stress at Universities

The nexus between research and teaching is often the defining element of a university. However, a comparative study of national higher education systems by Schimank and Winnes (2000) showed that many have developed a post-Humboldtian pattern of the relationship between research and teaching. Even in Germany, Humboldt's home country, tasks traditionally considered core in a university context are partially decoupled, whereby research and teaching are subjected to different financing logics. Furthermore, there is increasing pressure to fix university roles to be primarily (or entirely) teacher-based, or primarily (or entirely) research-based. While teaching is considered an integral element of academic work, scientists often assign greater importance to research (Smeby, 1998), in that it is considered central to prestige and the allocation of temporal and financial resources (Esdar, Gorges, Kloke, Krücken, & Wild, 2011; Esdar, Gorges, & Wild, 2012; Jacob & Teichler, 2011).

It has often been pointed out that the composition of the responsibilities of university scholars regarding teaching *and* (or *versus*) research is a source of conflict due to the multitude of different tasks the two domains require (Del Rey, 2001; Fox, 1992; Hattie & Marsh, 1996). It can also be assumed that this is particularly relevant to the stress experienced by academics, especially in times of increasing student numbers and pressure to achieve in the context of the academic labor market. For example in a study of Jaksztat, Preßler and Briedis (2012), doctoral students, who also teach, reported experiencing higher stress levels than those without a teaching commitment, and 43% of those who terminate their doctoral studies attributed it to the high workloads inherent in the scientific system. Analogous to the importance of the subjective assumptions held by school teachers on topics related to their professional practice for their professional activities and experiences, it seems that subjective perceptions of the teaching–research nexus may also be decisive for the stress experiences of university scholars (Meier & Schimank, 2009; Schaeper, 1997). Occupational stress ensues as an immediate result of

assessing one's occupational situation, in the sense of a comparison between the actual and target states, and is associated with different occupational behaviors (e.g., different teaching practices). As such, subjective perceptions of the teaching–research nexus may—among other aspects, such as staff exposure to high numbers of students, time invested in various activities, or demographic variables (Lackritz, 2004, Watts & Robertson, 2011)—play an important protective (or risk) function for the development and/or internalization of occupational stress experiences.

However, the teaching–research nexus should not be considered in the context of a “tired old teaching vs. research debate” (Boyer, 1990, p. xii), but rather looked at in a more differentiated manner. To this end, in the present study we focused on subjective perceptions of the teaching–research nexus that differentiate in regard to the perceived integration and synergy of both domains, so as to investigate connections with stress experiences reported by university scholars.

Theoretical Background

Subjective Perceptions of the Teaching–Research Nexus

Humboldt's perspective of research and teaching maintains that, ideally, the university is a place of permanent public exchange among all those involved in the scientific process, by teaching in a way that the inquiring view of the topic at hand always remains clear (Brinckmann, Garcia, Gruschka, Lenhardt, & Zur Lippe, 2002), and that students learn to acquire, examine and develop knowledge with the attitude of a researcher (Binder & Hewel, 1980). Humboldt's ideal, in other words, means that researchers are also teachers and that teachers are also researchers, and that these two areas support and encourage one another. Apart from this conception of research and teaching in the Humboldtian sense (Webster, 1986), more differentiated subjective perceptions of the nexus of these two domains have been suggested which can be regarded from multiple perspectives (Locke, 2005; Marsh & Hattie, 2002): On a superordinate level, a differentiation can be made with regard to perceived integration (teaching

is part of research and/or research is part of teaching), and synergy (teaching enriches research and/or research enriches teaching).

Perceptions of the Integration of Research and Teaching. A meta-analysis conducted by Hattie and Marsh (1996) suggests that in many research works, a close link between research and teaching is assumed, while some studies also postulate a decoupled relationship between the two fields. Accordingly, it is to be expected that divergent perspectives on the integration of research and teaching are also present on the level of individual scholars.

On the one hand, the dialectic connection between research and teaching is a defining element of the self-image of universities (Schimank & Winnes, 2000). It can be assumed that university activities in either domain (both of which have a focus on the pursuit of knowledge accumulation) will result in an overlap between the two domains. Regardless of their potential impact on one another, research may thus be perceived as a part of teaching (e.g., academia as an educational apparatus) and/or teaching as a part of research (e.g., dissemination of research findings, supervision of research students).

On the other hand, it can also be argued that this integration often can't de facto be realized (e.g., particularly specialized research can mostly not be the subject of general teaching; Sample, 1972), the two areas function in different ways (dissimilar principles and reward systems; Marsh, 1987; Ramsden & Moses, 1992), and in practice only few opportunities for simultaneous applications exist (Barnett, 1992; Fox, 1992; Light, 1974). Therefore, one may assume that not all university scholars accept the premise that the two domains are highly integrated (Fach, 2012). Also supporting this argument, on a more general level, is that the time available for research is often negatively related to the time invested in teaching (Hattie & Marsh, 1996; Olsen & Simmons, 1996) and that there is evidence that a higher teaching load reduces research output (Fox, 1992). Apart from this, research performance and teaching performance are not—as is often assumed—negatively associated with one another (Hattie & Marsh, 1996; Marsh & Hattie, 2002).

Perceptions of the Synergy of Research and Teaching. Marsh and Hattie (2002) summarize numerous arguments for the mutual benefit of research and teaching by explaining how research activity can have a positive impact on one's teaching and, conversely, how teaching can have a positive impact on research. Corresponding arguments are often articulated in interview studies (e.g., Coate et al., 2001, Esdar, Gorges, & Wild, 2013), which indicate that such perceptions are also present on a personal level with regard to individual scholars.

It is argued that concurrent research ensures that—unlike textbooks that are never quite up-to-date with contemporary research—instructors are aware of the most up-to-date knowledge and methodologies while accustomed to dealing with information both critically and proactively. Furthermore, their research activity and interest has the potential to inspire and motivate students. In addition, it can be argued that practicing researchers are in a particularly good position to provide students with a critical view of empirical evidence and that instructors who also conduct research in the field are also often appreciated to a greater extent by undergraduate students (Coate et al., 2001, Marsh & Hattie, 2002).

Additionally, it is reasoned that teaching encourages researchers to place their own research questions in the perspective of a larger whole, while preparing specific learning content may help to identify and close gaps in one's own knowledge. In addition, the presentation of one's own research results can have a motivating function, and help researchers to clearly formulate their research findings. University scholars also reported, in interviews, that discussions with students have helped to refine and advance their own research ideas, and can result in the development of new ideas for research (Coate et al., 2001, Esdar, Gorges, & Wild, 2013).

Significance of Subjective Perceptions of the Teaching–Research Nexus. Just as there are different perspectives on the teaching–research nexus in the literature, it can be assumed that this also applies on the individual level of the university scholars themselves, and

that they differ from one another in their subjective perceptions of the teaching–research nexus. From a psychological perspective, it stands to reason that these perceptions influence their interpretations of situational information during academic work (e.g., in regard to existing constraints and opportunities) and are thus relevant for their professional experiences and behaviors. However, only very few empirical papers have been published on this topic.

In an interview study conducted by Neumann (1992), Australian academics were asked to share their views on research and teaching. These views were distinguished with regard to the perceived synergy between the two domains. The results indicated that the interviewees assessed the extent of synergy between research and teaching differently, and named different modes of action (e.g., directly through direct communication of current research findings, or indirectly via stimulation by young, intelligent people). In summary, this reinforces the importance of such subjective perceptions, which “may be a more powerful influence on behaviors than 'reality'” (Neumann, 1992, p. 169).

In an online study, Jucks and Hillbrink (2017) asked 63 German doctoral students in the field of psychology, by means of the open question “Research and teaching are for me ...”, to provide information on their perceptions of the teaching–research nexus. The results indicate that, in addition to commonality and dissimilarity (i.e., perceived integration), about one-third of the answers described the enrichment of research and teaching (i.e., perceived synergy).

Also, Coate, Barnett, and Williams (2001) analyzed the perceived relationships between teaching and research by conducting semi-structured interviews with department heads and academic staff in eight higher education institutions in the UK. The perceptions of the teaching–research nexus that were identified in this study can again be distinguished with regard to integration or synergy. As for the latter, Coate et al. (2001) found that one should distinguish between whether teaching influences research, or research influences teaching. The importance of the directions of these relationships can also be seen in other works, for instance, the comparative research project “The Changing Academic Profession” (CAP) focused

specifically on the extent to which scholars believed that their research activities reinforced their teaching (Teichler, 2014).

Therefore, it can be assumed that the perceived teaching–research nexus can be differentiated in terms of the integration and synergy of research and teaching, while additionally their direction should be specified (e.g., teaching enriches research, research enriches teaching). At this point it is important to note that, in this study, we are only considering perceptions of positive valence. The studies conducted by Jucks and Hillbrink (2017), as well as Coate et al. (2001), also identified negatively perceived relationships, e.g., regarding their dissimilarity or negative effects of teaching on research. It can well be assumed that such effects are present in ordinary, commonplace university activities, for example, due to the double burden of teaching and research combined with the shortage of resources (such as time). In the present work, however, general beliefs pertaining to the teaching–research nexus at large are in the foreground, and not their specific, day-to-day implementation.

Thus, we focus the perceived teaching–research nexus on the general perceptions of scholars regarding integration (research is part of teaching, teaching is part of research) and synergy (research enhances teaching, teaching enhances research). It can be assumed that there are inter-individual differences with regard to the perceived extent of these aspects, and that these are relevant for both experiences encountered and behaviors exhibited at universities. In this regard, the experience of occupational stress seems particularly relevant, as the interconnection between research and teaching is often experienced as exhausting.

Occupational Stress Experience

Stress experiences in the professional arena are commonly associated with the term “burnout”. This term was first used in the 1970s to describe a state of physiological and psychological stress (colloquially referred to as “burnout”) in human service occupations (Freudenberger, 1974). Maslach and Leiter (2008) postulate a continuum with the poles: a positive way of handling work situations (Engagement), and a negative way of handling work

situations (Burnout). Accordingly, for each individual, a greater or lesser degree of burnout is assumed to exist—and the original, diagnostic burnout term appears to be inappropriate. In order to circumvent the terminological blurring of the stress condition and the chronic illness, this paper refers to the experience of occupational stress instead of burnout (which is consistent with many other works in the field such as Abele & Candova, 2007).

Occupational stress experience is constituted by subjective perceptions of reactions to objective stress factors and subsumes psychological, physical, and mental aspects, which can be categorized into the following dimensions (Maslach, Jackson, & Leiter, 1996): *emotional exhaustion* (feeling depleted and no longer interested in one's occupation); *cynicism/depersonalization* (a general feeling of dissociation or distance towards work); and *reduced personal accomplishment* (experiencing limited performance and a reduced meaningfulness of one's work).

For university scholars, the experience of occupational stress appears to be particularly significant: “University teachers are likely candidates for burnout because of their relationships with large numbers of students, staff, and administrators” (Blix, Cruise, Mitchell, & Blix, 1994, p. 159). In addition to teaching, occupational stress is also prevalent in the research domain. This was evident in a study conducted by Singh, Mishra, and Kim (1998) with 328 researchers working at a mid-sized university in the United States, which uncovered, on average, quite high levels of stress. In addition, occupational stress appears to be a variable of considerable weight, among other things, because it makes a substantial contribution to the decision of whether or not to remain in the university system (Jaksztat, Preßler, & Briedis, 2012).

It can be assumed that the experience of occupational stress is a general factor that feeds, in particular, on the professional experience in the two domains of teaching and research—whereby an open question is the extent to which subjective perceptions of the teaching–research nexus affect stress experiences.

Connections between Subjective Perceptions of the Teaching–Research Nexus and Occupational Stress Experiences

Regarding the potentially conflicting relationship between research and teaching, and analogous to the importance of subjective beliefs of school teachers for their stress experience (E. Schmitz, 1996, G. Schmitz, 2001), it can be assumed that subjective perceptions of the teaching–research nexus are significant for the stress experience of university scholars. Individuals who believe that research and teaching are closely related to one another could find the two activities to be more meaningful and thus less burdensome—especially when conflicting tasks must be completed, or in periods when demands on their time are high (for example, at the beginning or end of a semester). In contrast, scholars who find research and teaching not to be related could be experiencing more conflicting goals (which are likely to adversely affect stress experiences) in terms of their activities in both domains (Esdar et al., 2011).

The first indications of a relationship between subjective perceptions of the teaching–research nexus and occupational stress were provided by interview case studies published by Meier and Schimank (2009). When asked about the interplay between research and teaching in the context of adjusting to fundamental changes in university administrative policies, some interviewees expressed increases in stress experiences due to the (subjectively perceived) incompatibility of the two domains. Also, findings in a standardized interview study reported by Schaeper (1997) refer to the importance of such perceptions. Based on these findings, a quantitative sub-study using single items derived from the interview study indicated that perceived synergy (“teaching stimulates research”) was positively associated with “joy of teaching” and negatively associated with “teaching as a burden”. However, the other direction (e.g., “research stimulates teaching”) has not yet been investigated.

Summary and Research Questions

In summary, it can be said that there is often a gap between the ideal state and current practice for university research and teaching. Contrary to Humboldt's conception, research and

teaching are also often different fields of work in Germany, and do not necessarily enrich one another, particularly since university scholars are confronted with a multitude of tasks and expectations that need to be managed (Teichler, 2014).

As the previous statements have demonstrated, it is likely that a negative relationship exists between subjective perceptions of a strong teaching–research nexus and occupational stress experienced by university scholars. It is also particularly important to pursue this in a strict manner (including a theoretically sound separation of integration and synergy), as this can contribute to the identification of possible protective factors for occupational stress, and help to better understand professional experience and behavior at universities.

Based on the theoretical and empirical arguments presented, the following hypothesis is put forward: *The higher the perceived strength of the teaching–research nexus, the lower the experienced occupational stress.* In addition, it will be tested whether these perceptions can, as assumed, be distinguished in regard to integration and synergy, and whether these two aspects are of different relevance to stress experiences.

Method

In order to answer these research questions, data from a larger, longitudinal study (Daumiller, 2018) were analyzed.

Sample

We used all data of the first measurement point, containing answers of 819 university scholars who participated in the study (on average 38.6 years old; $SD = 10.6$; 54.7% male; 21.3% full professors, 64.3% with Ph.D.). The response rate was 67%. Analyses of the data showed no systematic distortions in the final sample, and comparisons with the overall population indicated that this data base can be regarded as representative of the German university system with respect to age, gender, and academic status (Daumiller, 2018). At the time of the study, all participants were active in research and teaching at public universities in Germany in twelve different fields (English/American Studies, Biology, Business Administration,

Chemistry, Educational Science, German Studies, Mathematics, Pharmacy, Political Science, Romance Studies, Athletic Studies, Economics) and had an average teaching load of 5.9 ($SD = 4.8$) hours per week for the current semester. They reported spending an average of 23.1 hours ($SD = 12.2$) on research activities per week, and investing 15.1 hours ($SD = 8.4$) per week in teaching.

Measurements

In a paper-and-pencil questionnaire distributed by post, the participants were asked about their subjective perceptions of the teaching–research nexus and their experiences with occupational stress. Participation in the study was encouraged with the use of incentives.

Subjective Perceptions of the Teaching–Research Nexus. Since no instrument to measure subjective perceptions of the teaching–research nexus existed, a corresponding instrument was developed and validated in a separate pilot study. To this end, several experts were consulted in the formulation, and iterative development, of item pools that were constructed for the two theoretically and empirically derived aspects with two sub-facets each (research is part of teaching, teaching is part of research, research enriches teaching, teaching enriches research). These items were formulated by systematically considering the delineated theoretical basis and operationalizations of related constructs (e.g., Schaeper, 1997), while incorporating symmetrical formulations for each of the two sub-facets (i.e., within integration and synergy). The resulting items were examined in a study involving a total of 937 university scholars (Daumiller, 2018), from which a random subsample ($n = 300$) was used for a quantitative analysis of the (1) data distribution and number of missing items, (2) means and standard deviations of the items, (3) factor structure, (4) item-total correlations, and (5) internal consistencies, while coverage of the entire content spectrum, and symmetry between the items and the sub-aspects, was insured. Subsequently, the resulting measuring instrument was validated using the remaining data set ($n = 637$). These analyses also confirmed the postulated structure, with small to medium correlations between the distinguished aspects ($\rho = .32-.55$).

The resulting measuring instrument (see Appendix 1) was used in the current study. It distinguishes among the following four aspects of integration and synergy: research is part of teaching (e.g., “Research also has a place in teaching”; 3 items; $\omega = .88$), teaching is part of research (e.g., “Teaching also has a place in research”; 3 items; $\omega = .92$), research enriches teaching (e.g., “Being active in research contributes to good teaching”; 3 items; $\omega = .81$), and teaching enriches research (e.g., “Being active in teaching contributes to good research”; 3 items; $\omega = .90$). The participants were asked to assess, in general, how much they agreed with these basic statements on the relationship between research and teaching in their subject on a Likert-type scale ranging from 1 (*not true at all*) to 8 (*completely true*).

Occupational Stress Experiences. Most of the international and national research literature on occupational stress experience is rooted in the approach by Maslach, Schaufeli, and Leiter (2001), which is particularly established with regard to assessing the stress experiences of school teachers (e.g., Tönjes & Dickhäuser, 2009). A revised version of the Maslach Burnout Inventory (MBI), pertaining to general occupational groups, has been established in the German language (MBI-GS-D; Büssing & Glaser, 1999), and seems effective for assessing the occupational stress experiences of university scholars. This instrument was slightly modified (so as to fit to the university context). It separates the experience of occupational stress into emotional exhaustion (e.g., “I feel used up at the end of the workday”; 5 items; $\omega = .88$), cynicism/depersonalization (e.g., “I have become less enthusiastic about my work.”; 5 items; $\omega = .85$), and reduced personal accomplishment (e.g., “In my opinion, I am good at my job”; 6 items; $\omega = .84$). The items on the scale representing reduced personal accomplishment are reversely formulated, and were recoded for the analyses, so that high values reflect strong perceptions of a lack of performance. The respondents were asked to first think about the job they currently have at the university, and then to estimate, along a Likert-type scale ranging from 1 (*never*) to 8 (*very often*), how often in the previous six months they had experienced the aspects presented. For the estimation of structural equation models, we

used two item parcels for each of the three subscales using the item-to-construct method (this approach is preferable to using items as indicators since it reduces the amount of error in complex model estimations; Little, Rhemtulla, Gibson, & Schoemann, 2013).

Results

Overall, there were very few missing values (< 1.3% for each item). These were imputed model-based using the expectation-maximization algorithm (Peugh & Enders, 2004).

Structure of Subjective Perceptions of the Teaching–Research Nexus

To answer the research questions, multiple models were estimated to confirm the structure of the subjective perceptions of the teaching–research nexus. Specifically, comparisons were made between (a) a one-factorial model, (b) a two-factorial model that differentiated between integration and synergy, (c) a four-factorial model that differentiated among all four aspects, and (d) a four-factorial model with two second order factors (integration and synergy). All models (including the ones that are subsequently reported) were estimated using the Mplus software package (Muthén & Muthén, 2014) using the *MLR*-estimator in order to control for non-normal data distribution (Yuan & Bentler, 2000). Following the recommendations by Hooper, Coughlan, and Mullen (2008), χ^2 and SRMR were used as absolute fit indices, TLI as a relative fit index that also adjusts for parsimony, and RMSEA and CFI as noncentrality-based indices. Latent variables were standardized by setting their means to 0 and variances to 1.

+++ insert Table 1 about here +++

A comparison of the estimated models indicated that both the one-factorial and the two-factorial models did not sufficiently describe the data (see Table 1). A satisfactory fit to the data could only be obtained by differentiating among the four factors “research is part of teaching”, “teaching is part of research”, “research enriches teaching”, and “teaching enriches research”. A comparison with the model that additionally included the two second-order factors (integration and synergy) revealed that the more restrictive model described the data only negligibly more

poorly, and is therefore preferable ($\Delta\text{CFI} = .006$, $\Delta\text{RMSEA} = .004$ are considerably below the recommended cut-off values of $\Delta\text{CFI} = .02$ and $\Delta\text{RMSEA} = .015$; Chen, 2007).

+++ insert Table 2 about here +++

Descriptive Results

In line with these findings, the descriptive results (see Table 2) indicated that within each of the two sub-factors, integration and synergy, there were higher correlations (.57–.58) than between them (.29–.38). Furthermore, large variances were observed, which suggests that there are significant interindividual differences among university scholars in terms of their subjective perceptions of the teaching–research nexus. On average, the scholars surveyed were more convinced that research is a part of teaching than the other way around, $t(df = 819) = 20.7$, $p < .001$, Cohen's $d = 0.73$, and that research enriches teaching rather than vice versa, $t(df = 819) = 20.7$, $p < .001$, $d = 0.94$.

As for occupational stress experiences, rather low means and theory-compliant correlation patterns were found for the three sub-aspects ($|\rho| = .39$ –.59, see Table 2).

In regard to different groups of university scholars, the analyses indicated that older scholars as well as full professors reported slightly stronger perceptions of the teaching–research nexus (especially in regard to the integration of teaching and research) and slightly reduced occupational stress experiences. There were no differences between males and females. Also, time spent on research was not associated with these variables, but time spent on teaching accompanied slightly stronger perceptions of the teaching–research nexus.

+++ insert Figure 1 about here +++

Relationships with Occupational Stress

Building on these results, a structural equation model was estimated to analyze the relationships between the subjective perceptions of the teaching–research nexus (based on the model including second-order factors) and stress experience (see Figure 1).

This model fit the data well ($df = 121$, $\chi^2 = 271.7$, $CFI = .98$, $TLI = .97$, $RMSEA = .04$, $SRMR = .03$), and indicated that the factor of perceived synergy was (negatively) associated with occupational stress experiences, while no significant associations were found between perceived integration and occupational stress ($\beta < .04$, $p > .48$). This model explained a substantial amount of the variance of emotional exhaustion ($R^2 = .13$), depersonalization/cynicism ($R^2 = .18$), and reduced personal accomplishment ($R^2 = .21$).¹

Discussion

The present study investigated the relationships between the subjective perceptions of the teaching–research nexus and experiences of occupational stress among university scholars. Specifically, we tested the extent to which these perceptions can be separated regarding perceived integration of, and perceived synergy between, the two domains, and whether these are of differential relevance for the experience of occupational stress. Strengths of the present work include the extensive data set collected with a broad sample; the specific, quantitative assessment of the subjective perceptions of the teaching–research nexus; as well as the analyses conducted at the latent level (accounting for measurement errors).

Confirmatory factor analyses confirmed that in regard to subjective perceptions of the teaching–research nexus, four aspects can be separated from one another: (I1) research is part of teaching, (I2) teaching is part of research, (S1) research enriches teaching, and (S2) teaching enriches research, and can be adequately represented with a model including two second order factors, namely (I) integration and (S) synergy. This is consistent with the presented theoretical arguments describing the ways in which the two domains could be interlinked with one another. Essentially, this is also in accord with the works published by Neumann (1992), Coate et al. (2001), as well as Jucks and Hillbrink (2017). Moreover, it extends the current state of research by demonstrating a clear separation between the two types of perceptions. Our findings suggest that future research should assess not just one, but both aspects. To this end, it may be

important—in terms of content validity—to consider the exact directions as sub-facets; however, our findings indicate that it is above all the distinction between integration and synergy that is relevant. As already mentioned, due to resource scarcities and the dual burden of managing both research and teaching responsibilities, in the daily routine negative perceptions of the teaching–research nexus are also plausible. These were not investigated in the present work. In future studies, however, it may be beneficial to also examine these to enable a better understanding of experience and behavior in the context of common university activities: In addition to the general perceptions that were discussed in the present work (for which we assume no negative characteristics), it could thus be worthwhile to also consider perceptions in terms of everyday implementation of research and teaching (whereby both positive and negative perceptions are plausible).

At the same time, the descriptive results (high means and much variance) indicate that the respondents likely assume a rather close general connection between research and teaching, but that there are significant inter-individual discrepancies. These appear suitable to explain the differences in experiences and behavior of university scholars. Also, the differences in mean values observed confirm, as might be expected, that the scholars were more likely to consider research not only to be a part of teaching but also an aspect that enriches teaching, rather than the other way around. This is presumably because the respondents are generally more likely to be aware of methods to directly implement this option (e.g., research-oriented teaching). Furthermore, our results indicated that different groups of scholars also vary in their perceptions of the teaching–research nexus. While the identified effects were rather small, they might serve as an indication that it is only through experience and opportunities that strong connections between research and teaching can be experienced and perceived (as seen in the associations with age and academic status, as well as time spent on teaching).

An open question concerns the stability or volatility of these perceptions. From theories developed in the field of organizational behavior on how beliefs are susceptible to influence, we

can deduce that subjective perceptions of the teaching–research nexus may be passed along in the context of the scientific socialization process, and as such may be a rather stable construct (see Becker, 2012). It also seems apparent that academic disciplines (and related viewpoints on how knowledge is generated), as well as different types of institutions (with different degrees of emphasis on teaching and research, for example, at vocational colleges), influence one’s perception of the relationship between research and teaching (as well as analogous differences regarding approaches to teaching, e.g., Lindblom-Ylänne, Trigwell, Nevgi, & Ashwin, 2006). However, on the other hand, it can also be assumed that the perceptions are, at least in part, a direct result of one’s occupational activities (for example, the use of research-based learning as a teaching method could make one more likely to develop and adopt the conviction that research can also be a part of teaching). For future research, therefore, it would be advisable to investigate the genesis of these perceptions of the teaching–research nexus and to determine their stability. To this end, as discussed earlier, it may be particularly beneficial to distinguish between general perceptions and perceptions in regard to everyday implementations. This may also help to clarify the theoretical integration of these constructs; after all, they possibly have the conceptual standing and stability of implicit theories (e.g., Spinath & Stiensmeier-Pelster, 2001), and thus could be understood in terms of this larger theoretical field. In that regard, a particularly exciting investigative question would also be to consider how the perceptions of the teaching–research nexus are related to actual behavior (e.g., belief-behavior gap).

Concerning the relationships with the three facets of occupational stress, the results pointed out that primarily perceived synergy, i.e., the assumption that research and teaching invigorate one another, is associated with lower experiences of stress, while integration is not. The conviction that the two domains are parts of one another is, therefore, not sufficient, rather a reduced experience of occupational stress necessitates a perceived mutual enrichment between research and teaching. To explain these findings, it makes sense to bear in mind that occupational stress is in part always the result of an evaluation of a current situation (among

others, in terms of its usefulness). Thus, it stands to reason that particularly the perception that an activity is meaningful, not only for itself (or the corresponding domain), but also for other areas of one's own profession, leads to a current (objectively stressful) situation being subjectively perceived as less troublesome. Apart from that, it can be assumed that academic activity at a university as a whole, when combined with high perceived synergy, is experienced—in line with the findings reported by Schaeper (1997)—more positively, which could in turn be connected to lower experiences of occupational stress. In direct contrast, it can be assumed that perceived integration does not exert an influence on affective experiences, since it only comprises an evaluation of the localization of the two domains that is free of value and function. Thus, it seems that (only) perceived synergy can operate as a protective factor against the occupational conflicts and stress associated with combining teaching and research in a single position (Del Rey, 2001; Fox, 1992; Hattie & Marsh, 1996). However, the bivariate correlations found for perceived integration could indicate that integration is fundamentally necessary in order for synergy to be perceived. Therefore, it seems worthwhile for future research to more closely investigate the interaction between these two constructs.

Despite the numerous strengths of the study, some limitations must be considered when interpreting the results: The cross-sectional design of the study does not allow one to draw causal conclusions, but is restricted to statements about associations (although it seems theoretically reasonable to assume that the subjective perceptions of the teaching–research nexus influences occupational stress). Since all measurements are self-reported, it also needs to be borne in mind that the answers could be biased, e.g., due to social desirability (even though the MBI is a standard measure for assessing stress experiences and subjectively perceived constructs are, by definition, to be assessed via self-reports).

Although more research is needed to completely understand the implications that subjective perceptions of the teaching–research nexus hold in detail, first practical implications can already be inferred. Since (a) perceived synergy functions as a protective factor against

occupational stress, and it can be assumed that (b) practical actions themselves have an impact on the subjective perceptions of the teaching–research nexus, it may be appropriate, for example, to promote the use of instructional methods such as *research-based teaching* in which both domains are addressed synergistically. Furthermore, it seems appropriate to at least support strategies for the active production of synergy between these domains (e.g., considering how one can use their own research to benefit their teaching practices). Specifically, this could, for instance, be implemented in further education courses, where instructors learn educational methods for teaching university undergraduates. It would be interesting to see whether only an improvement of perceived synergy by actual structural changes contributes to a reduction in occupational stress experiences or whether a subjective reinterpretation of the work situation would also suffice.

Looking forward, a viable approach might also be to add additional variables to explain differences in occupational stress experience (and to investigate the mechanisms underlying the effects of the subjective perceptions or possible belief-behavior gaps). To this end, a promising, potential mediator may be the individual motivation of university scholars (e.g., Daumiller, Dickhäuser, & Dresel, 2018). For example, it has been reported that favorable motivation (e.g., in the sense of a strong preference for learning goals) protects the individual from experiencing stress (Tönjes & Dickhäuser, 2009) and is at the same time dependent on subjective beliefs (Dweck, 1996). Thus, it is then conceivable that the perceived synergy of research and teaching could lead to a particularly favorable motivation in both domains, which in turn protects against the formation of feelings of occupational stress.

In summary, the results depicted here emphasize the relevance of subjective perceptions of the teaching–research nexus. These can be separated in terms of perceived integration (teaching is part of research, research is part of teaching) and synergy (teaching enriches research, research enriches teaching). It seems that only perceived synergy is related to occupational stress experienced by university scholars (for all three sub-facets of the MBI).

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Footnotes

¹ A model in which we additionally included age, gender, status group (Ph.D., yes or no; Full professor, yes or no), time per week spent teaching, and time per week spent on research as covariates also described the data satisfactorily ($df = 199$, $\chi^2 = 486.7$, CFI = .97, TLI = .96, RMSEA = .04, SRMR = .03), and yielded very similar results.

Appendix

Complete Instrument used to Assess the Subjective Perceptions of the Teaching–Research Nexus

	<i>M</i>	<i>SD</i>	Min	Max	Skew	ω / r_{it}
Research is part of teaching (perceived integration)	6.01	1.84	1.00	8.00	−0.80	.88
“Research also has its place in teaching [Forschung hat auch ihren Platz in der Lehre].”	6.55	1.63	1.00	8.00	−1.02	.69
“Research is also a part of teaching [Forschung ist auch ein Teil der Lehre].”	6.01	1.86	1.00	8.00	−0.82	.82
“Research is a component of teaching [Forschung ist Bestandteil der Lehre].”	5.59	2.03	1.00	8.00	−0.55	.76
Teaching is part of research (perceived integration)	4.56	2.15	1.00	8.00	0.09	.91
“Teaching also has its place in research [Lehre hat auch ihren Platz in der Forschung].”	4.93	2.10	1.00	8.00	−0.83	.76
“Teaching is also a part of research [Lehre ist auch ein Teil der Forschung].”	4.55	2.16	1.00	8.00	0.53	.86
“Teaching is a component of research [Lehre ist Bestandteil der Forschung].”	4.21	2.21	1.00	8.00	0.12	.80
Research enriches teaching (perceived synergy)	6.74	1.56	1.00	8.00	−0.92	.80
“Teaching benefits from one’s own research [Lehre profitiert von eigener Forschung].”	7.15	1.27	1.00	8.00	−1.10	.73
“One’s own research stimulates teaching [Eigene Forschung stimuliert die Lehre].”	6.88	1.47	1.00	8.00	−0.95	.73
“Being active in research contributes to good teaching [In der Forschung aktiv zu sein, trägt zu guter Lehre bei].”	6.19	1.89	1.00	8.00	−0.74	.67
Teaching enriches Research (perceived synergy)	5.17	2.03	1.00	8.00	−0.26	.90
“Research benefits from one’s own teaching [Forschung profitiert von eigener Lehre].”	5.45	1.98	1.00	8.00	−0.48	.81
“One’s own teaching stimulates research [Eigene Lehre stimuliert die Forschung].”	5.25	2.04	1.00	8.00	−0.37	.83
“Being active in teaching contributes to good research [In der Lehre aktiv zu sein, trägt zu guter Forschung bei].”	4.82	2.14	1.00	8.00	−0.10	.77

Note. $N=819$. ω / r_{it} specifies Mc Donald’s Omega at the subscale level and item-total correlations at the item level. Item texts are a translation of the original German items and are not yet validated in the English-speaking context, original German items in squared brackets. Written instructions: “The following concerns the general relationship between research and teaching in your field. How much do you agree with the following basic statements? When answering, please think of your subject.” To be answered using a Likert-type scale ranging from 1 (*not true at all*) to 8 (*completely true*).