Tertiary Education and Management (2024) 30:1–16
https://doi.org/10.1007/s11233-023-09129-8

ORIGINAL PAPER

Students' experiences of the research-teaching nexus

Nikos Macheridis[1] · Annika Fjelkner Pihl[2] · Alexander Paulsson[1] · Håkan Pihl[2]

Received: 10 June 2020 / Accepted: 24 September 2023 / Published online: 14 October 2023

Abstract
Students experience the research-teaching nexus differently as they progress through their first three years of undergraduate study depending on the discipline. The question is if students, within the same discipline, experience the nexus differently depending on the profile of the institution where they study. The present study explored students' experiences of the research-teaching nexus (RT-nexus) during their undergraduate studies at one research-intensive and one teaching-intensive university. A survey ($n = 340$) was distributed among business students at two Swedish universities. One finding is that students from both universities reported on a progression in how they experience the nexus, and in learning outcomes. Students also rated what teachers do and what they themselves do higher, than what their peers do. The main gap between students from the two universities was that students from the research-intensive university generally perceived a stronger connection between teaching and research than did students from the teaching-intensive university. They also to a higher extent found that a close connection between research and teaching in their education would be important to them in their future work life, whereas students from the teaching-intensive university were more unsure.

Keywords Research-teaching nexus · Higher education · Teaching–research relationship · University teachers · University students

Introduction

The research-teaching nexus (RT-nexus) is central to higher education. However, the concept can be interpreted in various ways, involve a variety of phenomena, and be practiced differently (Brew, 2012; Lightfoot & Piotukh, 2015; Tight, 2016; Visser-Wijnveen et al., 2010). Research exploring the causal relationship between the two also indicates that it can be beneficial for teaching and research, but the relation is not evident (Marsh & Hattie, 2002; Tight, 2016; Verburgh et al., 2007).

A review concluded that, while few dispute the RT-nexus on a global level, how it manifests itself on a local level has to be further explored (Tight, 2016). Research investigating the

✉ Annika Fjelkner Pihl
annika.fjelkner@hkr.se

[1] Lund University, Lund, Sweden

[2] Kristianstad University, Kristianstad, Sweden

nexus on a local level has mostly focused on the perspective of teachers (Brew, 2012; Robertson & Bond, 2005) rather than the students' perspective, although the number of studies investigating students' experiences of the nexus from a student perspective is increasing (e.g., Elken & Wollscheid, 2016; Elsen et al., 2009; Griffioen, 2020; Gros et al., 2020; Lindsay et al., 2002; Neumann, 1994; Tight, 2016; Vereijken et al., 2018; Visser-Wijnveen et al., 2016).

The present study aims to explore students' experiences of the nexus along two dimensions. More recent studies have tended to treat students as a homogenous group, irrespective of their years of study (Lindsay et al., 2002). The few studies that have investigated how students' experience change over time have tended to compare undergraduate, graduate, and post-graduate levels across different disciplines (e.g., Griffioen, 2020; Neumann, 1994; Visser-Wijnveen et al., 2012). Results indicate differences in experiences between students from different disciplines (Griffioen, 2020), wherefore it is relevant to further explore the progression within levels within specific disciplines.

Furthermore, students' experiences of the nexus have mainly been explored in research-intensive universities (Gros et al., 2020; Griffiths, 2004; Marsh & Hattie, 2002; Neumann, 1994; Visser-Wijnveen et al., 2010). However, the academic landscape contains a variety of higher education institutions, and it is reasonable to assume that students experience the nexus differently depending on type of institution. Even if a higher degree of research intensiveness is assumed to indicate quality (Geschwind & Broström, 2015), all universities are both teaching and research oriented. What differs is the ratio between teaching and research and the proximity to an active research environment, but how does this influence students' experiences? The present study aims to add knowledge to this body of literature by exploring how undergraduate students, within the same discipline but from two kinds of academic institutions, one research-intensive and one teaching-intensive university, experience the research-teaching nexus.

Students and the research-teaching nexus

The RT-nexus can be described on a global level and a local, tangible and intangible level (Neumann, 1992). At the global level, the nexus is manifested in institutional policies and regulations. The tangible level refers to the communication of advanced knowledge, recent facts and research skills to students, for example in the lecture material presented to students. The intangible nexus level relates to the development of an approach and attitude toward knowledge among, and the provision of a stimulating milieu for, academics. In practice, the nexus operates simultaneously on these levels (Neumann, 1994).

At the global policy level, there is normally strong belief in the advantages of the RT-nexus. This is illustrated by government policies – i.e., in The Swedish Higher Education Act (1992:1434), which stipulates that higher education institutions shall ensure a close link between research, courses and study programs – and reproduced in policy documents throughout universities, university faculties and departments. One way to describe this is to say that the relation between research and teaching is hierarchical, that is, the content of teaching is based on research (Gottlieb & Keith, 1997; Macheridis et al., 2020).

Teachers also commonly believe that there is a positive relation between research and teaching, meaning that quality research spills over to quality teaching, and vice versa (Marsh & Hattie, 2002; Robertson & Bond, 2005; Elsen et al., 2009; Reid & Gardner, 2020). However, the relation is not evident. There are at least three ways in which research and teaching can relate to each other. They can be (i) complementary and contribute to each other, (ii) independent with little or no integration, or (iii) antagonistic, such that research

is given priority over teaching, or vice versa (Elken & Wollscheid, 2016; Marsh & Hattie, 2002). The outcome depends on how the nexus is implemented at the tangible and intangible local level. Here, students' experiences become important, and what students learn about research may not overlap with what teachers think students learn, because many students understand research as being quite separate from their education (Buckley, 2011).

Students' experiences of the nexus can be understood as context dependent, that is, related to what students learn about research, varying with educational level, and affected by the teacher's involvement in research. First, the context can be national and international (Gottlieb & Keith, 1997; Turner et al., 2008). It includes aspects such as the nature of the discipline (Neumann, 1992; Visser-Wijnveed et al., 2012); study discipline (Griffioen, 2020; Lightfoot & Piotukh, 2015); the type of institution (Gottlieb & Keith, 1997; Healey, 2005; Turner et al., 2008); the degree of research-orientation among faculty (Gottlieb & Keith, 1997; Griffioen, 2020; Lindsay et al., 2002); the level and purpose of the module (Neumann, 1992); students' expectations, ability and motivation (Neumann, 1992); and opportunities for teacher-student interaction (Neumann, 1994; Visser-Wijnveed et al., 2012). The students' experiences of the nexus also depend on other contextual aspects, such as the workload, the characteristics of teachers, social requirements, and whether they prefer teaching to research, and so on (Elken & Wollscheid, 2016; Marsh & Hattie, 2002; Trautwein & Bosse, 2017).

Second, students experience research through the subject they are studying (Griffioen, 2020; Reid & Gardner, 2020; Vereijken et al., 2020). They learn about research findings, as well as research processes and how to do research; they learn how to become researchers (Turner et al., 2008). Students also experience the RT-nexus through learning about the teaching and learning process itself (Griffiths, 2004). Hence, the experience of the nexus depends on whether the focus is on research content or research processes (Healey, 2005; Elken & Wollscheid, 2016), or on learning processes (Elsen et al., 2009).

Third, students experience the nexus in different ways depending on their level of study (Clark & Hordosy, 2019; Neumann, 1994; Reid & Gardner, 2020; Trautwein and Bosse, 2017; Visser-Wijnveen et al., 2016). Students at the ungraduated level, especially those in introductory courses, may experience the nexus more through research findings, while at the advanced level, students become more process-oriented, as they are expected to acquire a scientific attitude and develop critical thinking (Macheridis et al., 2020). However, students also seem to experience different kinds of ambiguity at different levels. Undergraduate students feel excluded from direct involvement in research, while graduate or advanced-level students think that research impact teaching negatively, and that it lacks relevance (Lindsay et al., 2002).

Fourth, some studies have indicated that students become aware of the nexus primarily through the research conducted by their teachers (Healey et al., 2010; Neumann, 1994; Visser-Wijnveen et al., 2012). Here, students associate benefits with the nexus, that is, teachers being enthusiastic about their research. Students also appreciate a 'critical questioning approach' where teachers discuss their research findings. One disadvantage is that teachers who do research may be less available, as they divide their attention and time between teaching and research (Healey et al., 2010; Lindsay et al., 2002; Vereijken et al., 2020; Visser-Wijnveen et al., 2016).

Finally, most students follow an educational program, for example and undergraduate three-year program, yet few studies explore students' experiences across the length of their program. Spronken-Smith et al. (2014) and Griffoen (2020) concluded that students became more aware and engaged in research as they progress through their study programs. At the same time, Griffioen (2020) found that undergraduate students of different

study years had different experiences of the research-teaching nexus depending on study program and how disciplinary differences shaped those experiences.

In sum, many studies have suggested that students' experiences of the nexus are context dependent, that their experiences are related to what they learn about research, and that their experiences are shaped by their teachers' involvement in research practice. Students experience the nexus differently as they progress through their first three years of undergraduate study depending on the discipline. The question is if students, within the same discipline, experience the nexus differently depending on the profile of the institution where they study. The research question guiding the present study is twofold: First, how do students in different years of education at the undergraduate level experience the research-teaching nexus? Second, how does this difference play out in two different contexts, one research-intensive and one teaching-intensive university?

Methodology and research design

Context

Surveys were distributed through the business programs at two universities in Sweden. The teaching-intensive university is a younger, regional university focusing mainly on undergraduate education. The research-intensive university is one of the oldest and largest research universities in the country, and it has about five times as many students as the teaching-intensive university in question.

Business programs are offered at both universities, and there are great similarities between them. First, course content is highly standardized; students study similar subjects the first two years and then specialize. Second, higher education in Sweden is publicly funded and the per capita resources for education are the same at both universities. Students study free of charge.

Where the two universities differ is first regarding research funding. A larger share of the turnover at the research-intensive university is research funding, whereas the same figure for the teaching-intensive university is much lower (cf. Turner et al., 2008). Second, the composition of enrolled students differs between the universities. The research-intensive university has a larger share of students with an academic background and relatively higher grade point average (GPA) from upper secondary school. In contrast, students at the teaching-intensive university more often come from non-academic backgrounds and have a lower GPA. Third, a higher share of faculty at the research-intensive university has a PhD or higher research qualifications.

The questionnaire

The questionnaire is based on the literature review as well as on our own research on how teachers interpret and practice the RT-nexus (Macheridis et al., 2020). The questionnaire was tested on colleagues and then on four randomly chosen students.

Introduction of the questionnaire informed respondents about the Swedish Higher Education Ordinance (1993:100), which stipulates that higher education institutions shall ensure the existence of close links between research and teaching (Swedish Higher Education Ordinance Act, Ch. 1, Section 3). The questionnaire opened with questions about the university

(research- or teaching-intensive) and the year of study (year 1–3). These were the only two categories explored to avoid response fatigue (Cohen et al., 2008).

The questionnaire included six questions about how students experience the research and teaching nexus (presented in the Results section) during their studies. Question 3 measured to what extent students perceive they have taken part in RT related teaching activities in their education program. Questions 4–6 concerned students' perception of what teachers do to link teaching and research through for example talking about their own research, and to what extent they perceive they have taken part in RT related peer activities. Finally, question 6 explores how students perceive their own ambition and motivation contribute to linking research and teaching.

Question 7 was based on The Swedish Higher Education Act (SFS 1992:1434), and the degree objectives for a bachelor's degree (Ch. 1, Section 8), which are divided into the three categories: knowledge and understanding, skills and abilities, and judgments and approaches. These categories are included as they are related to what Neumann (1994) explain as the intangible level of the RT-nexus for students. The items were measured on a scale from 1 (do not agree) to 5 (totally agree). The final question (Question 8) was a yes/no question exploring whether students find the nexus relevant to their future work life.

Scales were created for each question. All scales, example items and reliability measures are presented in Table 1. The Cronbach alpha coefficients range between 0.742 and 0.845, indicating reliable internal consistency (Cohen et al., 2008).

Procedure

Data collection took place at the end of the spring semester of 2018. Included in the sample were undergraduate business students at both universities during their first, second and third year of education. For undergraduate students in their first and second years, the paper questionnaire was distributed in class. Because third-year students were working on their bachelor's theses during the second half of the spring semester, data collection was performed when students met with their supervisors.

Students were informed of the aim of the study, that all responses would be anonymous, that participation was voluntary and that they could choose to terminate their participation at any time. Each paper questionnaire was given a unique bar code, used later for scanning, and digitalizing of the questionnaires.

Analysis

Answers were compiled in EvaSys. To analyze the relationship between responses and university/year, one-way analysis of variance (ANOVA) tests were performed. Bonferroni post-hoc tests were also performed to determine differences between groups. An Independent samples t-test was used to explore the difference in responses between universities. A Chi-square test was used for question 8. Differences were considered statistically significant if $p < 0.05$. SPSS was used for all analyses.

Results

The number of students completing the questionnaire was distributed between the universities and year of education as displayed in Table 2, ranging from 42 to 71 students per year and university.

Table 1 All scales, statistics, and examples

Question/scale	No. of items	*M*	*SD*	α	Example items*
Teaching activities	7	3.38	0.64	0.742	I learn about research through reading scientific articles
Teacher actions	4	2.86	0.86	0.769	My teacher uses examples from own research to explain and illustrate
Peer activities	4	2.27	0.87	0.821	Students critically discuss research results together
Personal motivation	2	3.38	0.96	0.766	My own level of ambition determines how well teaching and research are integrated
Teaching effect on development of *knowledge & understanding*	4	3.75	0.81	0.827	I have become better at understanding the content in the course literature
Teaching effect on the development of *skills & abilities*	5	3.75	0.76	0.845	I have become better at identifying and formulating problems
Teaching effect on development of *judgment & approach*	4	3.89	0.76	0.842	I have become better at changing perspectives

*Note: translated from Swedish

Table 2 Sample characteristics

	University		
Year	Teaching-intensive	Research-intensive	Σ
1	55	59	114
2	71	42	113
3	66	47	113
Σ	192	148	340

Table 3 Partial loss for scales & Q8

Scales	*n*	Partial loss (%)	Table in text
Teaching	307	10	4
Teachers	321	6	4
Peers	321	6	4
Ego	328	3	4
Knowledge & understanding	310	9	5
Skills & abilities	318	6	5
Judgment & approach	315	7	5
Q8	309	10	6 & 7

The use of scanned paper surveys led to a partial loss of responses. For a full presentation of loss of responses per scale and for Question 8 see Table 3. Because the loss was partial and not systematic, there is less risk of bias affecting the results (Pallant, 2013).

Students' experiences of the implementation of the research-teaching nexus

This section reports on how students experienced the research-teaching nexus was manifested in their study programs on different levels, in the program, by teachers, by their peers and by the students themselves. The tables in the following section summarize the scales *between years* by university and report on Statistical differences in the responses *between universities* are presented in the text at the end of each section.

RT related teaching activities

Overall, students at both universities increasingly saw a link between teaching and research the further along they were in their studies (Teaching in Table 4). In the teaching university, differences were significant at the $p < 0.001$ level in scale scores between the three years: F (2, 169) = 17.24, $p < 0.001$. There were significant differences in the mean score for year 1 ($M = 2.91$) and year 2 ($M = 3.40$) and 3 ($M = 3.63$) respectively, but not between year 2 and 3.

In the research university, differences were significant at the $p < 0.01$ level in scale scores between groups: F (2, 132) = 5.89, p = 0.004. There were significant differences in the mean score between year 1 ($M = 3.27$) and year 3 ($M = 3.65$).

Table 4 How students perceive the link between teaching and research scales 1–4

Scale		Teaching-intensive		Research-intensive	
	Year	*M (SD)*	*F*	*M(SD)*	*F*
1) Teaching	**1****	2.91 (0.66)		3.27 (0.60)	
	2	3.40 (0.64)	17.24 ***	3.40 (0.45)	5.89**
	3	3.64 (0.64)		3.65 (0.52)	
2) Teacher	**1****	2.57 (0.90)		3.00 (0.74)	
	2	3.00 (0.91)	3.19*	2.74 (0.75)	3.05*
	3*	2.79 (0.90)		3.14 (0.78)	
3) Peers	1	2.19 (0.97)		2.26 (0.84)	
	2	2.15 (0.82)	1.26	2.23 (0.72)	0.44
	3	2.39 (0.99)		2.38 (0.75)	
4) Ego	1	3.17 (0.98)		3.39 (0.99)	
n = 328	2	3.25 (1.01)	3.36*	3.24 (0.92)	2.97
	3	3.60 (0.94)		3.69 (0.76)	

[a]Significant differences between HEIs/year are indicated in the *year column* with asterisk and bold. Significant differences in each HEI are indicated with asterisks on the F-values; further distinctions of differences between the different years are indicated with brackets and asterisks to the right of the *M (SD)* columns; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Between universities, there was a significant difference between responses between students in the first year on this scale. Students from the research-intensive university in the first year perceived the link between teaching and research to a higher extent than did students from the teaching university ($M = 2.91$; $M = 3.27$; t (98) = -2.884, $p = 0.005$).

RT related teacher activities

Overall, students at both universities in the third year to a higher extent perceived that teachers linked teaching and research (see Table 4). In the teaching university, differences were significant at the $p < 0.05$ level in scale scores between the three years: F (2, 177) = 3.19, $p = 0.044$. There were significant differences in the mean scores for year 1($M = 2.57$) and year 2 ($M = 3.00$). Year 3 scored lower than year 2 ($M = 2.79$) on this scale.

In the research university, differences were also significant at the $p < 0.05$ level in scale scores between the three years: F (2, 138) = 3.05, p = 0.05. There were significant

differences in the mean score between year 2 ($M = 2.74$) and year 3 ($M = 3.14$), but not between year 1 and 3. Year 2 scored lower than year 1 ($M = 3.00$) on this scale.

Between universities there were significant differences in the mean scales scores year 1 and year 3. An independent-samples t-test indicated that students in year 1 at the research university to a higher extent perceive that teachers link teaching and research ($M = 3.00$) than do students at the teaching university ($M = 2.57$; t (95.04) = -2.669, $p = 0.009$). This was also true for students in the third year: ($M = 3.14$; $M = 2.79$: t (107) = -2.147, $p = 0.034$).

RT related peer activities

Regarding what peers do to link teaching and research, there was little difference between years in both universities. Scores were low, between 2.15 and 2.39 (Students in Table 4) and although the mean scores for this scale increased slightly in year 3, there were no significant differences between the difference years. The fact that the scores were lower than in the previous questions (all below 2.5), may indicate that students perceived that the cooperation and discussions with peers in relation to the nexus were less prevalent or obvious to the students than RT related teaching activities or teachers' actions. *Between universities*, there were no significant differences between responses.

Own motivation

Students at the teaching university experience their own ambition and motivation played a role in the link between research and teaching (Ego in Table 4) to a larger extent each year. Differences were significant at the $p < 0.05$ level in scale scores between years: F (2, 181) = 3.36, p = 0.037, where students in year 3 (M = 3.60) scored slightly higher than students in year 1 (M = 3.17), but the post-hoc test indicated a non-significant p-value of 0.060 between the two years. That is there is a tendency for a significant difference. At the research-intensive university, there were no significant difference between years. *Between universities*, there were no significant differences between responses.

Student perception of development of learning outcomes

Student responses regarding the development of learning outcomes related to the RT-nexus are summarized in Table 5.

At the teaching university, regarding *knowledge and understanding*, differences were significant at the $p < 0.05$ level in scale scores between the three years: F (2, 176) = 4.67, $p < 0.05$. The greatest difference was between years 1–2 ($M = 3.54$; $M = 3.98$). At the research university differences in scores were also significant: F (2, 135) = 5.11, p = 0.007). Means differed significantly between both year 1 ($M = 3.58$) and year 3; $M = 4.01$), and year 2 ($M = 3.51$) and 3.

Between universities, there were significant differences in mean scores for the scale knowledge development in year 2, where students at the teaching-intensive university had a higher mean score for the scale knowledge & understanding ($M = 3.98$) than did students in the research-intensive university ($M = 3.51$; t (90.1) = 3.278, $p < 0.001$).

Regarding *skills and abilities* (Table 5) there were significant differences in scale scores between years: F (2, 177) = 14.41, $p < 0.001$). The greatest increase took place

Table 5 How students perceive development of learning outcomes, scales 5–7

Scale		Teaching-intensive		Research-intensive	
	Year	*M (SD)*	*F*	*M(SD)*	*F*
5) Knowledge	1	3.54 (0.77)	4.67*	3.58 (0.93)	5.11**
	2* 3**	3.98 (0.80)		3.51 (0.65)	
		3.80 (0.78)		4.01 (0.75)	
6) Skills & abilities	1	3.32 (0.75)	14.41***	3.49 (1.00)	17.38***
	2	3.81 (0.65)		3.59 (0.53)	
	3**	3.99 (0.64)		4.30 (0.43)	
7) Judgment & approach	1	3.48 (0.73)	9.90***	3.74 (0.95)	7.56**
	2	4.00 (0.54)		3.84 (0.67)	
	3**	3.98 (0.80)		4.31 (0.52)	

[a]Significant differences between HEIs/year are indicated in the *year column* with asterisk and bold. Significant differences in each HEI are indicated with asterisks on the F-values; further distinctions of differences between the different years are indicated with brackets and asterisks to the right of the *M (SD)* columns; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

between years 1($M = 3.32$) and 2 ($M = 3.81$; differences in mean between years 1–3 ($M = 3.99$) were also significant but not so between year 2–3. At the research university differences in scores were also significant, F (2, 135) = 17.38, $p < 0.001$). The differences were significant between years 1 ($M = 3.49$) and 3 ($M = 4.30$), and 2 ($M = 3.59$) and 3, but not between years 1–2.

Between universities, there were significant differences in year 3, where students at the research-intensive university had a higher mean score on that scale than did students from the teaching-intensive university ($M = 4.30$; $M = 3.99$; t (105.0) = -2.995, $p = 0.003$).

Regarding *judgement and approach*, students from both universities perceived a positive development (Table 5). In the teaching-intensive university scale scores were significantly different: F (2, 177) = 9.90, $p < 0.001$. A post-hoc test indicated differences in responses were significant between year 1 ($M = 3.48$) and 2 ($M = 4.00$), and 1–3 ($M = 3.98$), but not between years 2–3. At the research-intensive university, scale scores were overall higher than at the teaching university. Differences between years were significant: F (2, 132) = 7.56, $p = 0.001$). Mean score differences were significant between year 1 ($M = 3.74$) and year 3 ($M = 4.31$) and between years 2 ($M = 3.84$) and 3 but not years 1–2.

Between universities, there were significant differences in year 3, where students at the research-intensive university had a higher mean score on that scale than did students from the teaching-intensive university ($M = 4.31$; $M = 3.98$; t (105) = -2.644, $p = 0.009$).

Do you think that a close relation between research and teaching in your program will be important in your future work life?

Q8 was analyzed using Chi-square tests for independence which indicated that at the teaching-intensive university, there was a significant difference in answers between years

Table 6 Q8: Importance of the RT nexus for future work life, teaching-intensive university

Year of education	1	2	3	Total
Yes (%)	26 (51.0)	31 (46.3)	16 (25.8)	73 (40.6)
No (%)	1 (2.0)	10 (14.9)	15 (24.2)	26 (14.4)
Unsure (%)	24 (47.0)	26 (38.8)	31 (50.0)	81 (45.0)
Total (%, within year)	51 (28.3)	67 (37.2)	62 (34.4)	180 (100)

Table 7 Q8: Importance of the RT nexus for future work life, research-intensive university

Year of education	1	2	3	Total
Yes (%)	35 (72.9)	23 (63.9)	28 (65.1)	86 (67.7)
No (%)	1 (2.1)	3 (8.3)	1 (2.3)	5 (3.9)
Unsure (%)	12 (25.0)	10 (27.8)	14 (32.6)	36 (28.3)
Total (%. within year)	48 (37.8)	36 (28.3)	43 (33.9)	127 (100)

(Table 6). Students seemed to become increasingly unsure of the relevance of the RT-nexus, with 74% of students negative or unsure the third year; (X^2 (15.79, 4) = 0.003).

In contrast, students at the research university (Table 7) gave equally high ratings on a close link between research and teaching all three years. The rate of unsure students increased slightly across the years. However, there was no statistical difference in responses across years; (X^2 (3.25, 4) = 0.518).

Between universities, there was a significant difference between the means for the two universities at the $p < 0.001$ level; (X^2 (25.200, 2) < 0.001). Students in all three years at the research-intensive university to a higher extent found that a close relation between research and teaching in their education would be important for them in their future work life.

Discussion

The results reveal five overarching patterns. First, students at both universities expressed an increase in how they experienced the research-teaching nexus between year 1 and 3. Although the relation between the scales were not fully explored, a tentative conclusion is that students' experiences developed in tandem with intangible aspects such as enhanced knowledge and understanding, competence and skills development, judgement and approach. This suggests that there is a progression in how the nexus is experienced by undergraduate students at both research-intensive and teaching-intensive universities, like the progression between levels earlier observed.

A second pattern reveals a systematic gap between students at the two universities on the two scales *Teacher* and *Teaching*. Students in the first year at the research-intensive university consistently scored higher than did students in the first year at the teaching-intensive university. This difference appears to prevail in their third and final year in the *Teaching* scale. There are different possible explanations for this. The gap may depend on differences between faculties or student groups. The faculty at the research-intensive university can be more closely connected to research, and many studies have indicated that students' experiences of the RT-nexus are affected by teachers who are active

researchers (Healey et al., 2010; Visser-Wijnveen et al., 2010). This is in line with the present results, where students in both year 1 and 3 at the research university to a higher extent found that teachers link teaching and research, for example that they use examples from their own research to a higher extent. Students who are aware of the research being conducted by the teacher might also be more likely to be involved in research (Healey et al., 2010).

Students at the research-intensive university rated their research-related competences and skills higher than did students at the teaching-intensive university (see Table 4), mainly in the third year. They also perceived that a close link between teaching and research was more valuable to their future work life (Tables 5 and 6). This difference may be explained by that teachers at the research-intensive university are more involved in research and convey this to students. In contrast, teachers at the teaching-intensive university may be more teaching or professionally oriented. However, these possible differences are not explored here.

Another possible explanation for the gap between the two universities is that students at the teaching-intensive university come from non-academic backgrounds to a larger extent. They may have a lower pre-understanding and lower expectations concerning their studies when it comes to a connection to research; thus, they may be less likely to perceive the nexus. They may also have a more instrumental approach to their studies where their main goal is to find suitable employment. This attitude could possibly explain how students from the two universities rate the importance of the RT-nexus in their education, and its importance for their future work life (Tables 5 and 6). One surprising result is that a *diminishing* number of students in the teaching-intensive university thought the RT-nexus would be important for their future work life. This may indicate that there is a socioeconomic bias in how students experience the nexus.

A third pattern has to do with paths of progression. At the teaching-intensive university, there was a *year-2-effect*, where there was a significant increase in the mean scores of student responses between the first and second years on all three scales, *Knowledge*, *Skills & abilities*, and *Judgement & approach*. At the research-intensive university, no such pattern was discernable. In contrast, significant differences in means between years at the research-intensive university were mostly between years 1 and 3.

There are different possible explanations for this phenomenon. At the teaching-intensive university, teachers may have adapted the education to the level of their students (lower GPAs and larger share of students from non-academic backgrounds). The finding that students reported an increase in their experience of the nexus in the second year may be explained by a cohort effect, and in this case also differences in course curricula. For example, at the teaching-intensive university research is more explicitly introduced into the program in the second year. Perhaps there is also not the same difference in level between the first and the second year at the research-intensive university, as teachers do not have to adapt courses to the same extent. The *year-2-effect* may also possibly be explained by a more general phenomenon. Students with high GPAs and from academic backgrounds may enter higher education with more pre-understanding of the nexus; thus, they may be more receptive of expressions of the RT-nexus in the first year than are students at the teaching-intensive university.

A fourth pattern concerns a possible difference between the tangible and intangible dimensions of the RT-nexus, as described by Neumann (1992). In contrast to Neumann (1992), the present results indicated that students rated a progression in both the tangible connections and the intangible ones already early on in their studies. This could be interpreted as that students perceived their education had not only focused on the communication of knowledge, facts and research skills, but also on the development of judgement and

approach, or a critical attitude towards knowledge and knowledge production. One explanation could be that often course syllabi include clear learning objectives regarding all three levels, knowledge & understanding, skills & abilities and judgment & approach as stipulated by an amendment in 2006 to the Swedish Higher Education Act (SFS 1992:1434).

A fifth pattern is that students did not see that peer related activities contributed to linking research and teaching to the same extent as did their own motivation and ambition, or the teachers' practice. Here, there might be room for pedagogical improvement in the form of encouraging peer learning or teaching activities that encourage students to discuss research and research methods as well as to reflect on their learning. This perspective on the RT-nexus has rarely been discussed in the literature. Thus, the present study offers a more comprehensive picture of students' understandings not only of how teachers practice the nexus and how students perceive their own contribution, but also of how they perceive interactions with their peers in relation to the RT-nexus.

Conclusion

Few would dispute the notion that there should be a close link between research and teaching on a global level. However, what this means in practice on a local level is more ambiguous, and needs to be further investigated (Tight, 2016). Studies on a local level focus mostly on teachers and on research-intensive universities. Progression is normally studied between undergraduate and graduate levels. Previous research has also noted differences between different disciplines. The present study contributes insights into how students at two different types of universities within a specific discipline experience the research-teaching nexus during their first three years of study.

One conclusion is that students at both universities show a progression in their experience of the nexus. If you compare the results from year 1 and year 3, students experience the nexus more the further along they come in their studies. Both the tangible side and the intangible side are experienced by students as they progress.

Another conclusion is that overall students at the research-intensive university rate their experience of the RT-nexus higher than do students at the teaching-intensive university. This is a surprising result, as the course modules and literature in the two business programs largely overlap. One possible explanation is that the experience of the nexus among students is influenced by the research activity among teachers. For example, at the research-intensive university, students expressed that teachers discuss their own research more, which may add a personal dimension to the impression of the nexus. However, the result could also indicate an *à priori* difference between the two groups of students. Students from the research-intensive university are more likely to have an academic background and, possibly, more research-oriented pre-understandings already upon entering their studies. Students from the teaching-intensive university to some extent come from another socioeconomic background and may be more anxious and have a more work-oriented attitude towards their studies. This question would be valuable to explore further.

A further conclusion related to the above discussion and the fact that students from the teaching university to a higher extent doubted the usefulness of the nexus to their future work life pinpoints a problem in higher education which needs to be further discussed. Has higher education for the professions, in some countries such as Sweden, become over academized and lost its relevance for the professions? Or do we have to improve our teaching methods regarding the nexus when it comes to involving and

reaching new student groups in the wake of calls for widening participation? Perhaps there is a call for both measures? Either way, this issue needs to be further discussed.

Finally, what students themselves and teachers do regarding RT-nexus related activities is rated higher by the students than questions regarding what their peers do. One implication for practice is that there is space to create more collaboration and exchange between students, for example through teaching activities in the form of seminar discussions and group assignments that stimulate discussion about research among students, as well as create awareness of the benefits to learning and understanding of such actives.

Limitations & future research

The present study has certain limitations, and the results obtained must be interpreted with caution. First, although it is a comparative study between students at a research-intensive and a teaching-intensive university, the study was limited to an ad-hoc study based on a small sample of business students. Second, the results are based on student self-ratings rather than observations of actual teaching/expressions of the research-teaching nexus; thus, the results portray students' experiences and perceptions rather than the actual manifestation of the nexus in the teaching at the two universities.

Third, the results may be influenced by a cohort effect and may thus be biased in that regard. We study six groups of between 42 and 71 students. These are rather small cohorts leading to that results identified may be caused by issues in specific cohorts rather than the progression in year of study. For example, students in the second year at the teaching-intensive university may have completed the questionnaire during a course they tended to like, while students at the research-intensive university may have completed it during a course they tended to dislike. A future longitudinal study could study the progression of the same cohort throughout their undergraduate study.

Previous research has identified differences in experiences between students from different disciplines (Griffioen, 2020), wherefore we deemed it relevant to further explore the progression within levels within one specific discipline. To what extent the results are specific to this discipline is not studied. Future research could explore progression in the experience of the research-teaching nexus in undergraduate programs from different disciplines and with more respondents to see if the same patterns were to be found. The impact of socioeconomic background on how students experience the nexus could also be further explored.

Funding Open access funding provided by Kristianstad University.

Data Availability Data available from the corresponding author upon request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

References

Brew, A. (2012). Teaching and research: New relationships and their implications to inquiry-based teaching and learning in higher education. *Higher Education Research & Development, 31*(1), 101–114. https://doi.org/10.1080/07294360.2012.642844

Buckley, C. A. (2011). Student and staff perceptions of the research-teaching nexus. *Innovation in Education and Teaching International, 48*(3), 313–322. https://doi.org/10.1080/14703297.2011.593707

Clark, T., & Hordósy, R. (2019). Undergraduate experiences of the research/teaching nexus across the whole student life cycle. *Teaching in Higher Education, 24*(3), 412–427. https://doi.org/10.1080/13562517.2018.1544123

Cohen, L., Manion, L., & Morrisson, K. (2008). *Research Methods in Education*. Routledge.

Elken, M., & Wollscheid, S. (2016). *The relationship between research and education: Typologies and indicators: A literature review*. Nordic Institute for Studies in Innovation, research and Education (NIFU).

Elsen, M., Visser-Wijnveen, G. J., van der Rijst, R. M., & van Driel, J. H. (2009). How to strengthen the connection between Research and Teaching in Undergraduate University Education. *Higher Education Quarterly, 63*(1), 64–85. https://doi.org/10.1111/j.1468-2273.2008.00411.x

Geschwind, L., & Broström, A. (2015). Managing the teaching-research nexus: Ideals and practice in research-oriented universities. *Higher Education Research & Development, 34*(1), 60–73. https://doi.org/10.1080/07294360.2014.934332

Gottlieb, E., & Keith, B. (1997). The academic research-teaching nexus in eight advanced-industrialized countries. *Higher Education, 34*(3), 397–419. https://doi.org/10.1023/A:1003028023964

Griffioen, D. M. E. (2020). Differences in student´s experiences of research involvement: Study years and disciplines compered. *Journal of Higher and Further Education, 44*(4), 454–466. https://doi.org/10.1080/0309877X.2019.1579894

Griffiths, R. (2004). Knowledge production and the research-teaching nexus: The case of the built environment disciplines. *Studies in Higher Education, 29*(6), 709–726. https://doi.org/10.1080/03075070420000287212

Gros, B., Viader, M., Cornet, A., Martínez, M., Palés, J., & Sancho, M. (2020). The research-teaching nexus and its influences on student learning. *International Journal of Higher Education, 9*(3), 109–119. https://doi.org/10.5430/ijhe.v9n3p109

Healey, M. (2005). Linking research and teaching exploring disciplinary spaces and the role of inquiry-based learning. In R. Barnett (Ed.), *Reshaping the university: New relationships between research, scholarship and teaching* (pp. 67–78). Open University Press.

Healey, M., Jordan, F., Pell, B., & Short, C. (2010). The research-teaching nexus: A case study of students´ awareness, experiences and perceptions of research. *Innovations in Education and Teaching International, 47*(2), 235–246. https://doi.org/10.1080/14703291003718968

Lightfoot, S., & Piotukh, V. (2015). The research-teaching Nexus in politics and International Relations in the UK: A survey of practices and attitudes. *Politics, 35*(1), 99–110. https://doi.org/10.1111/1467-9256.12045

Lindsay, R., Breen, R., & Jenkins, A. (2002). Academic research and teaching quality: The views of undergraduate and postgraduate students. *Studies in Higher Education, 27*(3), 309–327. https://doi.org/10.1080/03075070220000699

Macheridis, N., Paulsson, A., & Pihl, H. (2020). The Humboldtian ideal meets employability? University teachers and the teaching–research relationship in marketized higher education. *Industry and Higher Education, 34*(5), 303–311. https://doi.org/10.1177/0950422219898371

Marsh, H. W., & Hattie, J. (2002). The relation between Research Productivity and Teaching Effectiveness: Complementary, antagonistic, or independent constructs? *The Journal of Higher Education, 73*(5), 603–641. https://doi.org/10.1080/00221546.2002.11777170

Neumann, R. (1992). Perceptions of the teaching-research nexus: A framework for analysis. *Higher Education, 23*(2), 159–171. https://doi.org/10.1007/BF00143643

Neumann, R. (1994). The teaching-research Nexus: Applying a framework to university students learning experiences. *European Journal of Education, 29*(3), 323–338. https://doi.org/10.2307/1503744

Pallant, J. (2013). *SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS* (5th ed.).). Open University Press.

Reid, J. W., & Gardner, G. E. (2020). Navigating tensions of research and teaching: Biology graduate students' perceptions of the research-teaching nexus within ecological contexts. *CBE-Life Sciences Education, 19*(3), 1–16. https://doi.org/10.1187/cbe.19-11-0218

Robertson, J., & Bond, C. (2005). The research/teaching relation: A view from the edge. *Higher Education, 50*(3), 509–535. https://doi.org/10.1007/s10734-004-6365-x

Spronken-Smith, R., Mirosa, R., & Darrou, M. (2014). Learning is an endless journey for anyone': Undergraduate awareness, experiences and perceptions of the research culture in a research-intensive

university. *Higher Education Research and Development, 33*(2), 355–371. https://doi.org/10.1080/07294360.2013.832169

The Swedish Higher Education Act (SFS 1992:1434). The Swedish Council for Higher Education. https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/hogskolelag-19921434_sfs-1992-1434. Accessed 21 Jan 2021

The Swedish Higher Education Ordinance (1993:100). The Swedish Council for Higher Education. https://www.uhr.se/en/start/laws-and-regulations/Laws-and-regulations/The-Higher-Education-Ordinance/

Tight, M. (2016). Examining the research/teaching nexus. *European Journal of Higher Education, 6*(4), 293–311. https://doi.org/10.1080/21568235.2016.1224674

Trautwein, C., & Bosse, E. (2017). The first year in higher education-critical requirements from the student perspective. *Higher Education, 73*(3), 371–387. https://doi.org/10.1007/s10734-016-0098-5

Turner, N., Wuetherick, B., & Healey, M. (2008). International perspectives on student awareness, experiences and perceptions of research: Implications for academic developers in implementing research-based teaching and learning. *International Journal for Academic Development, 13*(3), 199–211. https://doi.org/10.1080/13601440802242333

Verburgh, A., Elen, J., & Lindblom-Ylämne, S. (2007). Investigating the myth of the relationship between teaching and research in higher education: A review of empirical research. *Studies in Philosophy and Education, 26*(5), 449–465. https://doi.org/10.1007/s11217-007-9055-1

Vereijken, M. W. C., van der Rijst, R. M., Van Driel, J. H., & Dekker, F. W. (2018). Student learning outcomes, perceptions and beliefs in the context of strengthening research integration into the first year of medical school. *Advances in Health Sciences Education, 23*(2), 371–385. https://doi.org/10.1007/s10459-017-9803-0

Vereijken, M. W. C., van der Rijst, R. M., Van Driel, J. H., & Dekker, F. W. (2020). Authentic research practices throughout the curriculum in undergraduate medical education: Student beliefs and perceptions. *Innovations in Education and Teaching International, 57*(5), 532–542. https://doi.org/10.1080/14703297.2019.1674680

Visser-Wijnveen, G. J., van Driel, J. H., van der Rijst, R. M., Verloop, N., & Visser, A. (2010). The ideal research-teaching nexus in the eyes of academics: Building profiles. *Higher Education Research & Development, 29*(2), 195–210. https://doi.org/10.1080/07294360903532016

Visser-Wijnveen, G. J., van Driel, J. H., van der Rijst, R. M., Visser, A., & Verloop, N. (2012). Relating academics' ways of integrating research and teaching with their students' perceptions. *Studies in Higher Education, 37*(2), 219–234. https://doi.org/10.1080/03075079.2010.536913

Visser-Wijnveen, G. J., van der Rijst, R. M., & van Driel, J. H. (2016). A questionnaire to capture students' perceptions of research integration into their courses. *Higher Education, 71*(4), 473–488. https://doi.org/10.1007/s10734-015-9918-2