ORIGINAL PAPER

Informal Learning in Business Internships in Higher Education – Findings from a Diary Study

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Abstract

Internships offer the opportunity to gain experience and skills by working in organisations or to establish a professional network, and there is empirical evidence of the positive effects of practical experience in higher education. However, there are only a few studies on the characteristics of workplace tasks that facilitate learning during internships. In this paper, we address this research gap by conducting a diary study to examine students' work tasks at the beginning and end of an eight-week business internship period, their perceptions of the tasks, and the influence of task characteristics on self-perceived learning. Analyses of approximately 2,000 work tasks documented by 51 students show that the frequencies of different work tasks did not differ substantially between the first and last week of the business internship. At both times of data collection, many students were engaged in organisational routine and administrative tasks, especially those with a domain-specific focus. However, the values for the assessment of task characteristics (such as challenge/difficulty) were higher at the beginning of the internship than towards the end. Causal analyses revealed that task characteristics such as novelty or feedback (from colleagues or supervisors) were positive predictors of self-perceived learning during both weeks, whereas the predictive power of other task features changed. For example, help received (from colleagues or supervisors) was a significant predictor in the first week of the internship but not in the last; the opposite was the case for autonomy. From these results, we derive implications for both future research and the active design of internships in the higher education context.

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Introduction

It has been argued that internships in higher education (HE) have several positive effects for students, employers, and higher education institutions (for a review in the context of business internships, see Vélez & Giner, 2015). Internships offer the opportunity to gain experience and skills by working in organisations or to establish a professional network (Goller et al., 2020; Stewart, 2021; Zopiatis, 2007). They also enable participants to apply their theoretical knowledge from the classroom to a real workplace and hence bridge the gap between theory and practice (Ambrose & Poklop, 2015; Zopiatis, 2007). Empirical studies indicate that students in HE develop their job-specific skills (e.g., Chen et al., 2011; Nghia & My Duyen, 2018), social skills (e.g., Chen et al., 2011; Losekoot et al., 2018; Nghia & My Duyen, 2018; Zehr & Korte, 2020), work-readiness (e.g., Kapareliotis et al., 2019) and employability (e.g., Jackson & Bridgstock, 2021; Jackson & Tomlinson, 2022) through work experience. While there is evidence of the overall positive effects of HE internships for students, micro-level research on which workplace characteristics are particularly conducive to learning during internships is scarce (Goller et al., 2020). However, in order for supervisors to select and sequence appropriate activities and thus make the most of the opportunities offered by internships (e.g., in the course of designing a workplace curriculum, Billett, 1999, 2006), such knowledge is essential.

Moreover, when researching the effects of work characteristics on learning in the workplace, retrospective self-reported data based on surveys or interviews are often subject to bias due to the nature of informal learning (Rausch et al., 2022). Much of the everyday learning in the workplace is an unnoticed by-product of working (Eraut, 2004; Marsick & Watkins, 1990; Watkins & Marsick, 2023), and therefore remains partly unconscious and difficult to remember. We addressed the outlined research gap and methodological challenges by using diaries during the first and last week of an eight-week internship. With this approach, we first aimed to gain insights into the work tasks students are assigned during their placement (RQ 1). Besides this, we focus on students' perceptions of task characteristics. Therefore, several task characteristics such as autonomy, challenge/difficulty or self-perceived learning were considered (RQ 2). In a third analytical step, the effect of different task characteristics on self-perceived learning was examined (RQ 3). To answer the research questions, the information provided by the students in their work diaries at the beginning and end of the internship is used and compared.

First, we address the theoretical background of the study and outline the state of research. In the method section, we provide information on the sample, the procedure of data collection and both qualitative and quantitative data analysis. The following results section is organised along the three research questions. The final section includes a discussion of the main findings, the limitations of our study, and addresses implications for internship design as well as future research.

Theoretical Background

Internships as a Measure of Work-Integrated Education

There is a great variety of measures that provide practical experience in HE. A classification proposed by Jackson and Tomlinson (2022, see Fig. 1) focuses on activities that enhance employability in the HE context and distinguishes three categories:

Extra-curricular activities (beyond degree requirements; not administered by universities),
Co-curricular activities (not formally part of study program; administered by universities), and
Curriculum-based activities (formally embedded into studies; for-credit).

Curriculum-based activities, which are the focus of this study, comprise measures such as student exchanges, study tours, or work-integrated learning (WIL) (Jackson & Tomlinson, 2022). WIL can be seen as an "umbrella term for a range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum" (Patrick et al., 2008, p. iv) and can be integrated into degree programs in various ways, such as internships (for other forms such as cooperative education or sandwich programs, see Cooper et al., 2010). Cooper et al., (2010, p. 38) outline characteristics of internships as a WIL format: Internships extend over a long period of time and can be paid or unpaid. They are supervised by more experienced practitioners and they must be part of a course of study and earned as credits to be classified as a WIL format.[1] However, using WIL to describe the provision of experiential (tertiary) education programmes can be misleading: Billett (2019, 2024) therefore suggests using the term work-integrated education to refer to the provision of experiences in work and educational settings, sometimes with deliberate efforts to integrate them. He argues that work-integrated learning actually refers to individual learning and personal processes of how students construct and build knowledge from what they experience. We follow this line of argument and continue to use the term work-integrated education to refer to the integration of workplace-based experiences into higher education.

Internships as arrangements for performing work within businesses or organisations are associated with goals such as gaining experience, skills and contacts (Stewart, 2021). Findings from empirical studies analysing the impact of participation in (business) internships indicate mainly positive effects, including enhanced student employability, increased job-related and social skills (e.g., Knouse & Fontenot, 2008; Vélez & Giner, 2015). In their review, Dressler and Keeling (2011) distinguish between academic benefits (e.g., improved capacity to reflect), personal benefits (e.g., increased autonomy), career benefits (e.g., increased employment opportunities), and work-skill development benefits (e.g., increased competence). While WIE

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[1] Accordingly, not all variants of internships can be categorised as curriculum-based (e.g., Jackson, 2018; Maertz et al., 2014; Schubarth et al., 2016).
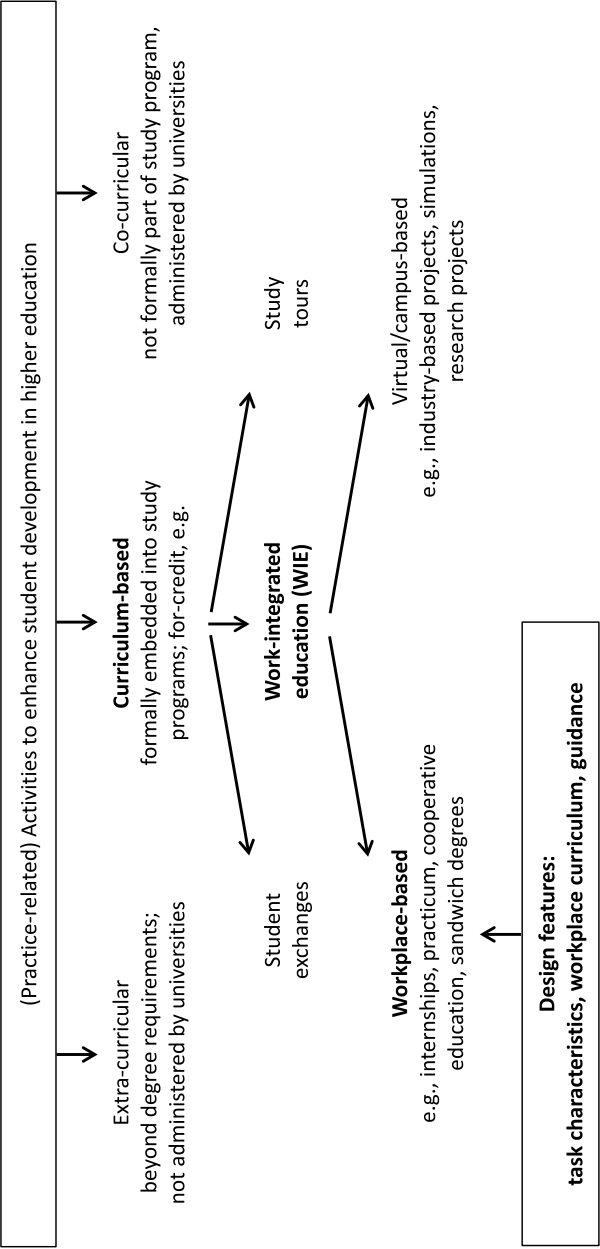
Fig. 1 Work-Integrated Education (WIE) for Enhancing Student Development in the HE Context (Aspects Relevant to the Paper are in Bold)

refs to the organisational embedding of practical experiences in academic contexts (see above), the perspective of workplace learning research focuses the antecedents, processes, and products of informal learning processes in the workplace (Tynjälä, 2013).

Informal Learning as Part of Work-integrated Education

While internships in the context of WIE are considered as a formal part of study programs, much of workplace learning (in internships) itself is rather informal. Workplace learning (learning processes) can be categorised based on the *level of formalisation*, its *intention*, and the *level of consciousness*, although the strands of argument are not without overlap.

A widely used classification in workplace learning research is the distinction between informal and formal learning, which can be seen as the ends of a continuum of formality (rather than two distinct types) (e.g., Eraut, 2004). Characteristics of the informal end are implicit, unintended, opportunistic, and unstructured learning and the absence of an instructor (Eraut, 2004, p. 250), while (rather) formal learning activities are usually institutionalised, classroom based and highly structured (Marsick & Watkins, 1990; see also Eraut, 2000, 2004; Manuti et al., 2015; Marsick & Watkins, 1990). Billett (2013) criticises the use of levels of formality to categorise learning through practice for a number of reasons. For example, he points out that the term 'informal' suggests a lack of structure and organisation, which is not the case for most workplace learning. Instead, workplace experiences are shaped by workplace norms and practices, and this structuring is central to the potential of workplaces as learning environments (p. 131). While acknowledging this argument and the prevalence of structures in the workplace, we continue to refer to informal learning activities in this article because the learning processes focused on in the article share several of the characteristics outlined in Eraut's (2004) underpinning, for example, as the learning processes addressed are not purposefully structured or accompanied (e.g., by an instructor or a colleague).

A line of argument that has been used especially in the German VET context highlights the construct *intention* (of an activity) as a criterion for differentiation between learning and working activities. Work-related learning activities tend to be self-directed and are aimed at developing one's own competences, i.e., acquiring knowledge, skills and abilities to cope with future work activities. Work-related activities, on the other hand, are environment-orientated and are aimed at coping with current work requirements (Achtenhagen et al., 1992; Dulisch, 1994; Kell, 1989). In practice, however, there is often an overlap or oscillation between learning and working (Kell, 1989). Work situations and activities, while often not associated with learning at first glance, are potentially of relevance to learning. For example, Billett (1999, 2011a) emphasises that learning occurs in everyday work activities such as observing or listening. Therefore, although work processes are directed toward work goals, they bring about an intended or unintended, conscious or unconscious, positive or negative change in the acting person (Rausch & Schley, 2015). In his typology of informal learning, Eraut (2004) also uses *intention* as a criterion

for differentiation, but also considers different *levels of consciousness*: *Deliberative learning* includes deliberate learning, which is linked to a learning goal and time, as well as engagement in deliberative activities such as planning and problem solving. *Reactive learning* is also intended, but takes place directly in the context of an action (with little time to think) (p. 250). The third form is labelled as *implicit learning*, which Reber (1993, p. 5) defines as "the acquisition of knowledge that takes place largely independently of conscious attempts to learn and largely in the absence of explicit knowledge about what was acquired". Rather unconscious learning processes are also referred to as *incidental learning*. Marsick and Watkins (1990, p. 12) define incidental (as a subcategory of informal learning) as a by-product of another activity (such as task accomplishment, trial-and-error experimentation, or even formal learning) which almost always takes place in everyday experience, with people not always conscious of their learning. While implicit and incidental learning are often used synonymously, some researchers refer to differences between the terms: For example, Kelly (2012, p. 1517) points out that in incidental learning, knowledge acquisition occurs unconsciously, but unlike implicit learning, this knowledge does not remain largely inaccessible to conscious awareness (for more details on this distinction, see Marsick et al., 2006). However, awareness of one's learning is thought to improve learning and reach more/better learning outcomes in the future. One possibility to (partly) become aware of unconscious learning processes is reflection (Simons, 2012). Here, it is helpful if people can reflect on their learning (processes) in relation to concrete situations/outcomes (Eraut, 2000).

Altogether, much of the learning within internships – the focus of this paper – is likely to be placed at the informal end of the continuum (formalisation), is mainly environment-oriented and is aimed at coping with current work demands (intention). Regarding the third classification criterion, it seems plausible that learning during the work tasks was both unconscious and conscious (level of awareness), but awareness may have been promoted by reflection when reporting the tasks and their criteria in the diaries.

Work Task Characteristics Fostering Learning

Work activities and interactions with inherent characteristics that support learning can be referred to as pedagogically rich activities (Billett & Noble, 2020). As outlined by Rausch (2013), there are several characteristics of (work) tasks that can be understood in terms of educationally rich activities and are considered significant for learning in the workplace. In some approaches, work task characteristics are also referred to as job characteristics (e.g., Hackman & Oldham, 1976; Karasek, 1998; McKnight et al., 2009). Parker (2014, 2017), on the other hand, refers to the concept of work design, which is concerned with the content and organisation of work tasks, activities, relationships and responsibilities (Parker, 2014, p. 662) and includes similar aspects to those included in overviews of work task or job characteristics. This seems plausible, as Parker (2017) points out that the terms job/work characteristics are commonly used to describe work design.

Some frameworks further distinguish between different dimensions of work (design) characteristics. In the Work Design Questionnaire (WDQ), Morgeson and Humphrey (2006) differentiate between task characteristics (which primarily relate to how the work itself is done; e.g., autonomy), knowledge characteristics (knowledge, skills, abilities required to do a job; e.g., complexity of the job) and social characteristics (extent to which a job provides opportunities for guidance/advice and support/help from others; e.g., social support). Other listings do not further subdivide the included characteristics (e.g., Parker, 2017 or Rausch, 2013). In the following sections of the paper, we will restrict ourselves to task characteristics as a collective term for the characteristics of work tasks, which includes both task characteristics in a narrow sense (task characteristics in the WDQ) and in a broader sense (knowledge and social characteristics in the WDQ).

Work tasks differ in the extent to which they require and trigger reflection and learning. Overall, work tasks "constitute the micro-level interface between the organisation and the individual and, therefore, are the most important variables in daily work" (Rausch, 2013, p. 59). Hence, they determine the opportunities to learn in the workplace (Gijbels et al., 2012, p. 54). The effects of task characteristics on learning have been discussed in models on workplace learning. The *demand-control model* (or *job strain model*) was originally developed to predict mental strain but is also frequently used to explain (workplace) learning (Karasek, 1979, 1998). According to the (job) demand-control model, jobs/tasks are conducive to learning when workers engage in highly demanding tasks (job demands) that also offer sufficient degrees of freedom (job control). The extended *demand-control-support model* by Johnson and Hall (1988) added social support as an additional dimension. Other models dealing with the influence of task characteristics on workplace learning include the *job characteristics model* (JCM; Hackman & Oldham, 1976), the Work Design Growth Model (Parker, 2017), a meta-synopsis summarising several theoretical and empirical works by Rausch (2013) or the Work Design Questionnaire (WDQ) (Morgeson & Humphrey, 2006). In order to provide a better picture of the different (work) task characteristics, a table comparing the outlined models is provided below (Table 1).

Several studies at different educational stages and in various domains support the importance of task characteristics for workplace learning processes (e.g., Brodsky et al., 2019; Froehlich et al., 2019; Goller et al., 2020; Rausch, 2013). For some task characteristics, results show similar tendencies: For example, feedback or support/assistance from others are significant positive predictors of learning potential in several studies (e.g., Brodsky et al., 2019; Froehlich et al., 2019; Rausch 2013). In the case of characteristics such as the novelty of a task, results differ (significant positive predictor in a study by Rausch, 2013, insignificant in a similar study by Brodsky et al., 2019). In their review of the relationship between learning antecedents (various task characteristics), learning processes (e.g., meta-cognitive processes), and learning consequences, Wielenga-Meijer et al. (2010) found both direct (e.g., positive relationship between feedback frequency and learning consequences) and mediated effects (e.g., the relationship between autonomy and learning consequences is mediated by motivational processes) of task characteristics on learning

Table 1 Overview of Conceptualisations of Work Task Characteristics

Job Demands-Control (- Support) Model (Johnson & Hall, 1988; Karasek, 1979)	Job Characteristics Model (Hackman & Oldham, 1976)	Work Design Growth Model (Parker, 2017)	Meta-Synopsis (Rausch, 2013)	Work Design Questionnaire (Morgeson & Humphrey, 2006)
Job Demand	Skill Variety	Job Control/Autonomy	Challenge	Autonomy (TC)
Job Control	Task Identity	Job Challenge/Complexity	Scope of Action	Task Variety (TC)
Social Support	Task Significance	Moderate Demands	Variety	Task Significance (TC)
	Autonomy	Task Identity	Interaction	Task Identity (TC)
	Feedback	Task Variety	Task Identity	Job Complexity (KC)
		Job Feedback	Significance	Information Processing (KC)
		Social Support/Social Contact	Feedback	Problem Solving (KC)
		Contact with Beneficiaries	Time Flexibility	Skill Variety (KC)
		Other Work Characteristics	Transparency	Specialisation (KC)
			Absence of Interruptions	Social Support (SC)
				Interdependence (SC)
				Interaction Outside the Organization (SC)
				Feedback from Others (SC)

TC Task Characteristics, *KC* Knowledge Characteristics, *SC* Social Characteristics. As it is not directly related to specific work tasks, we did not include the Contextual Characteristics (CC) dimension from the Work Design Questionnaire

consequences.[2] Since work tasks are defined subjectively depending on the person who takes them on (Rausch, 2013, p. 58), the perception of task characteristics may also vary from person to person. For instance, the perceived challenge associated with a work task may be related to a person's previous educational and work experiences.

Workplace Curricula and Guidance

A workplace curriculum describes the sequencing of work tasks within the learning trajectory of novices. In educational settings, a curriculum is an "interrelated set of plans and experiences which a student completes under the guidance of the school" (Marsh, 1997/2016; Marsh & Stafford, 1988; Marsh & Willis, 2007). From a workplace learning perspective, curricula can emphasise teaching or learning: While teaching curricula are designed for the instruction of newcomers, learning curricula consist of situated opportunities for the improvisational development of new practices (Lave, 1990, as cited in Lave & Wenger-Trayner, 1991, p. 97). Learning curricula can be seen as a means of organising and enacting learning experiences in practice settings such as workplaces (Billett, 2011b, p. 17) and "define, when and how novices are confronted with new tasks and activities at work" (Goller et al., 2019, p. 69). Billett (2016) emphasises that workplace curricula include arranging access to workplace experience in order to progressively secure the skills to practise effectively. Such pathways usually start with tasks where the consequences of making errors are not serious and continue with tasks where the consequences of errors are more severe (p. 128). Three different types of (workplace) curricula can be distinguished: The *intended* (what is intended to occur), the *enacted* (what actually happens when a curriculum is enacted), and the *experienced* curriculum (what learners experience, interpret, and learn as a result of the enactment) (Billett, 2006). While an ideal intended curriculum comprises both pathways towards full participation (within a social practice as a learning outcome) and the support that is required for learning, the enacted and experienced curricula are not necessarily congruent with it. For example, the intended learning content may not be adequately translated into the practical context (enacted curriculum) due to workplace constraints (Billett, 2006). In many workplaces, it is not necessary to consciously organise the overall structure of a learning curriculum, as it may already exist. Nevertheless, it might be worthwhile to outline the pathway to make sure that it is explicit and understood and also try to make its progression more structured (Billett, 2011b, pp. 26–27). Goller et al. (2019) stated that workplace curricula can be very specific to particular work domains and the specific circumstances of a certain job (and underlines this by summarising central workplace curricula studies). Therefore, the authors argue that it is important to empirically investigate whether curricula exist for different domains and how they are structured.

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[2] As the authors mention, in many cases, the direction of the effects could not be clearly established due to the chosen research designs. Consequently, this problem also carries over to the review.

The individual characteristics of newcomers and skilled colleagues also shape the curriculum. On the part of the newcomers, work agency (in the sense of the "ability and tendency to make intentional decisions, initiate actions based on those decisions, and exercise control over the self and the environment in work-related contexts", Goller, 2017, p. 87) plays an important role. While some students (relatively) new to a workplace may be more passive, others may engage in challenging activities earlier and more deliberately. In an interview study on expertise development in the workplace, German sales experts referred to these behaviours as 'jumping in at the deep end' (Köhler & Rausch, 2022). Skilled colleagues who guide newcomers differ in the extent to which they assign challenging tasks and provide guidance in terms of explanations before, assistance during, and feedback after task completion. They often experience time pressure and need to balance their own work obligations with guiding newcomers (Rausch, 2011). Intuitively, they often sequence the experiences of the learners similarly to (more pedagogically reasoned) practices within educational settings (Billett, 2006). Typically, the initial guidance decreases over time as described by the concepts of scaffolding and fading (Collins et al., 1989; Mikkonen et al., 2017). The investment on the part of skilled workers is based on a conscious or unconscious cost–benefit trade-off because after an initial investment in guidance, the newcomer's contribution to the department's workflows pays off. A typical approach of minimising effort by setting challenging tasks without proper guidance is perceived by novices as being 'thrown in at the deep end' but can nevertheless prove effective in retrospect (Rausch et al., 2022). It seems plausible that supervisors who have personally experienced intensive supervision in the course of their professional career, e.g., as part of their training, feel more committed and are therefore more willing to pass this on to new trainees and interns. However, it also seems plausible that less time is invested in the supervision of trainees who have only been with the company for a relatively short time.

Based on theoretical frameworks and prior research on informal learning in the workplace, the influences of task characteristics including perceived guidance during tasks and the sequencing of tasks within workplace curricula, we conducted a diary study with business students in higher education. A semi-standardised diary was used to collect data on task characteristics, received guidance and self-perceived learning during the first and the last week of an eight-week business internship. The following research questions are addressed below:

RQ1: What tasks are students entrusted with at the beginning and the end of an eight-week internship? (= enacted curriculum)
RQ2: How do students perceive the tasks at the beginning and the end of the internship? (= experienced curriculum)
RQ3: Which task characteristics predict self-perceived learning from a work task?

Method

Sample

The study focuses on informal learning during curriculum-based internships in HE. The sample consists of Business Education students (Bachelor of Science) from a German university, most of whom had just completed the fourth semester of the program. As part of their academic curriculum, students are required to complete a module that combines an academic lecture with a company internship of at least eight weeks. Due to the overall focus of the degree program, many students complete their internship in Human Resource departments. In their internship reports, participants can choose from several research approaches to collect data on workplace learning during their internship, one option being to participate in a diary study focusing on work tasks. The participants are requested to record three to six typical work tasks each day during their first and last week of the internship.

Data for the present study were collected in two consecutive academic years. A total of 51 students documented 1,984 tasks, distributed roughly evenly between the first and last week of the internship. Of the 51 participating students, 37 were female and 14 were male. While most students completed their internship primarily on-site at the internship company, some participants worked primarily from home or did not provide specific information regarding their work location.

Procedure

To collect data in situ, we used standardised diaries (Rausch, 2014; Rausch et al., 2022). Students were asked to document[3] three to six work tasks during the first five as well as during the last five working days of the internship, resulting in a total of approximately 50 recorded tasks. Since the focus of the study is on incidental learning from the students' own work tasks, participants were requested to only record work tasks and to not include activities such as instructions given by others or passive observations of colleagues. Each entry in the diary had to relate to exactly one task, which could last from a few minutes to several hours. Additionally, students were asked to select the work tasks in a way that provides a representative picture of their working day.

The diary is structured as follows: After providing some information about the date, time and duration of the task, participants describe the task in a short free text and rate several task characteristics on a four-point Likert-scale from 0 (=disagree) to 3 (=agree). The following items were included in the work diary:

– *Novelty* (Item: "The task was new to me"),
– *Explanation received* (Item: "The task was explained to me in detail in advance"),

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[3] In this study, the primary purpose of the diary was to serve as a data collection method. In addition, (learning) diaries can be used to reflect on learning processes (e.g., Gläser-Zikuda & Hascher, 2007). Therefore, the diaries used in this study may also have promoted reflection among the surveyed students.

- *Finding out for oneself* (Item: "I had to find out for myself how to accomplish the task"),
- *Challenge/Difficulty* (Item: "The task was challenging for me"),
- *Autonomy* (Item: "I had a lot of autonomy while working on the task"),
- *Help received* (Item: "I received help while working on this task"),
- *Feedback received* (Item: "I received feedback on this task"),
- *Error* (Item: "I made mistakes while working on the task"),
- *Self-perceived* Learning (Item: "In this specific task, I was able to learn something.")

Of these task characteristics, *Help received* and *Feedback received* refer to the guidance students received during the internship. Self-perceived learning is the dependent variable in the analysis of RQ 3.

Data Analysis

Qualitative Data Analysis

Based on the task descriptions, the work tasks were categorised in a content analysis. Table 2 shows the work task categories, which were developed based on prior studies (Brodsky et al., 2019; Keck, 1999; Rausch, 2013). The catalogue comprises nine different task categories and 'other tasks'.

A total of 1,984 documented student work tasks are included in the data analysis. Two independent coders assessed 220 work task records (> 10 per cent) of the students to address inter-rater reliability. A Cohen´s kappa coefficient (κ) of 0.84 indicates an almost perfect (Landis & Koch, 1977, p. 165) agreement. The remaining 1,764 work tasks were coded by a single rater.

Quantitative Data Analysis

The dataset showed less than 2 percent missing data for all variables, suggesting imputation. The Little test indicated that the data did not meet the missing completely at random (MCAR) condition. Since we assumed that the data were missing at random (MAR), the expectation–maximisation (EM) algorithm was used for data imputation as a recommended approach for the MAR condition (Hair et al., 2019).

To learn more about how work tasks differ between the beginning and the end of the internship (RQ1; enacted curriculum), the relative frequencies of the different work task categories in the first and the last week of the internship were calculated. When investigating the perceived work task characteristics (RQ2; experienced curriculum) and explaining the perceived learning by task characteristics (RQ3), the multilevel structure of the data had to be considered since the diary records are nested within individuals. In such cases, either econometricians' panel data models (Croissant & Millo, 2019) or their counterparts in the form of mixed models can be used (see Croissant & Millo, 2008, for details on the similarities and differences between these two approaches). In the following, we

Table 2 Work Task Categories

Category	Description	Examples
1. **Organisational routine and administrative tasks without a domain-specific focus**	This refers to activities that are performed every day and/or activities in the context of administration. Activities in this category do not require domain-specific knowledge, knowledge of service/product creation or domain-specific tools (such as specific software) of the employer. In addition, there is no contact with customers	● Mail/postal service, ● internal appointment management, ● preparing meeting rooms, ● copying, sorting, and filing activities, ● converting a PowerPoint file to a PDF
2. **Organisational routine and administrative tasks with a domain-specific focus**	This refers to activities that are performed every day and/or activities in the context of administration. In contrast to category 1, these activities require domain-specific knowledge and/or knowledge of service/product creation and/or domain-specific tools (such as specific software) of the employer. As with category 1, activities in this category do not involve contact with customers. For example, the writing of acceptances and rejections of job applications should not be recorded in this category, but in category 5	● Posting goods receipt, ● recording and updating customer data, ● screening of applications (according to specific selection criteria)
3. **Creation/production with low autonomy**	This refers to activities in which students create documents, media, and/or products in accordance with extensive instructions from colleagues or supervisors—i.e., with low autonomy. Creating a document that focuses on reviewing or checking data (e.g., completing a checklist) is assigned to category 7	● Creating a presentation according to specifications (e.g., updating an existing presentation)
4. **Creation/production with high autonomy**	This refers to activities in which students create documents, media, and/or products with high autonomy. This category also includes creating/producing activities in which the colleagues or supervisors only issue an instruction, but the students are (largely) free to choose how to proceed with the instruction. In practice, the drafts/results are presumably then often still checked by others	● Creating social media posts according to one's own ideas, ● designing salerooms, ● creating presentations without specific specifications

Table 2 (continued)

Category	Description	Examples
5. **Interactions with people and organizations external to the company: Low autonomy**	This refers to activities involving simple and predominantly standardised communication/interaction with external persons and organisations (e.g., customers, suppliers, banks, or applicants). Activities in this category are characterised by little autonomy in (the form of) communication, no or little preparation, and/or short duration	● Accepting and rejecting applications, ● providing and obtaining standard information, ● external appointment management
6. **Interactions with people and organisations external to the company: High autonomy**	This refers to activities that involve extensive communication/interaction—both written and verbal—with external persons and organisations (e.g., customers, suppliers, banks, or applicants). Activities in this category are characterised by a high degree of autonomy in (the form of) communication, intensive preparation and/or a longer duration	● Conduct job interviews, ● conduct (customer) advisory, sales, or complaint discussions with customers
7. **Audit and control tasks**	This refers to activities around auditing and/or controlling data/documents. Activities in this category require that a specific target state is represented (for example, the state: correct/wrong)	● Compare offers and invoices, ● control production lists
8. **Research activities with domain-specific focus**	This refers to research instructed by colleagues or supervisors (no own research for university purposes)	● Research information about competitors, ● search for potential new suppliers, ● research statistics
9. **Active participation in internal meetings**	This refers to activities in which something is presented to colleagues and/or superiors. Passive participation in meetings or single (verbal) contributions do not count as this type of activity and should be recorded under category 10	● Presentation of company-related data, ● presentation of internal projects
10. **Other tasks**	This refers to all activities that cannot be assigned to any of the other defined task types	

report the application and findings of the (econometricians') panel data analysis. To compare means between the first and last week (RQ2), we specified models in which the week of data collection (as the only explanatory variable) was coded as a dummy variable (first week = 0, last week = 1). To address RQ3, we analysed the influence of several task characteristics on self-perceived learning. In the first step, we specified both fixed- and random-effects models. In order to examine which model fits better to our data, we ran the Hausman test for both models (first and last week) (Hausman, 1978). The tests showed for one model that the individual error terms are correlated with the regressors (= endogeneity). In these cases, the use of fixed-effects models is recommended (Greene, 2020). To test for serial correlation of the errors in fixed-effects panel models, we conducted both the Breusch-Godfrey test (Breusch, 1978; Godfrey, 1978; Wooldridge, 2010) and the Wooldridge test (Wooldridge, 2010), both indicating the presence of serial correlation. Using the Breusch-Pagan test (Breusch & Pagan, 1979), we examined the presence of heteroskedasticity, which was also present in the data. In response to that, heteroskedasticity-consistent estimators HC0-HC4 can be used (see for example White, 1980; Zeileis, 2004). We applied the HC4 estimator proposed by Cribari-Neto and da Silva (2011). To control for serial correlation, we followed the method proposed by Arellano (1987). The panel data analyses were conducted with the R packages plm (Croissant & Millo, 2008; Croissant et al., 2022) and lmtest (Hothorn et al., 2022; Zeileis & Hothorn, 2002). To interpret the results for RQ2, we calculated the effect size Cohen's d (using the pooled data). According to Cohen (1988), $d = 0.20$ represents a small, $d = 0.50$ a medium, and $d = 0.80$ a large effect.

Results

RQ 1: Changes in Work Tasks During the Course of the Internship (= Enacted Curriculum)

The relative frequencies of the work tasks (Table 3) indicate that *Organisational routine and administrative tasks* – both with a domain-specific focus (first week: 34.8%, last week: 35.3%) and without a domain-specific focus (first week: 15.5%, last week: 18.4%) – are the most frequent work tasks at the beginning and at the end of the internship. The relative frequency of the two categories increased slightly. Another five categories occurred quite similarly often, with about 10 per cent each: *Interactions with people and organisations external to the company (with low autonomy), Creation/production* (with low autonomy), *Audit and control tasks, Creation/production* (with high autonomy), and *Research activities with domain-specific focus*. Altogether, the relative frequencies changed only slightly between the beginning and end of the internship. The largest (relative) changes were found for *Audit and control tasks* and *research activities*. *Active participation in internal meetings* as well as *Interactions with people and organisations external to the company* with a high autonomy occurred very rarely.

Table 3 Students' Tasks During the First and Last Week of their Internship

Task	First Week	Last Week	Change in Percentage Points
1. Organisational routine and administrative tasks without a domain-specific focus	15.5%	18.4%	+ 2.9
2. Organisational routine and administrative tasks with a domain-specific focus	34.8%	35.3%	+ 0.5
3. Creation/production with low autonomy	8.3%	9.3%	+ 1.0
4. Creation/production with high autonomy	9.3%	8.9%	- 0.4
5. Interactions with people and organisations external to the company: Low autonomy	9.3%	9.5%	+ 0.2
6. Interactions with people and organisations external to the company: High autonomy	0.0%	0.9%	+ 0.9
7. Audit and control tasks	11.3%	9.0%	- 2.3
8.Research activities with domain-specific focus	10.4%	7.5%	- 2.9
9. Active participation in internal meetings	1.1%	1.2%	+ 0.1

n_1 (first week) = 936, n_2 (last week) = 1,048, percentages calculated without considering the category "10. Other tasks"

Table 4 Comparison of the Task Perception Between the Beginning and End of the Internship

	First Week of Internship		Last Week of Internship		t	p	Cohen´s d
	M	*SD*	*M*	*SD*			
Novelty	1.92	1.14	.97	1.11	-11.58	<.001	-.85
Explanation received	1.75	1.10	1.11	1.12	-6.66	<.001	-.58
Finding out for oneself	1.35	1.11	1.44	1.19	0.76	n. s	.08
Challenge/difficulty	1.45	1.02	1.06	1.02	-5.80	<.001	-.38
Autonomy	1.14	1.18	1.24	1.18	1.89	n. s	.09
Help received	1.16	1.06	.70	.96	-6.61	<.001	-.46
Feedback received	1.88	1.17	1.44	1.24	-5.02	<.001	-.36
Error	.56	.77	.28	.58	-5.53	<.001	-.41
Self-perceived learning	2.06	1.02	1.60	1.17	-6.40	<.001	-.42

Example item (Finding out for oneself): I had to find out for myself how to accomplish the task

Scale: 0 (=disagree), 1 (=rather disagree), 2 (=rather agree), 3 (=agree), n. s.=not significant,

n_1 (first week)=936, n_2 (last week)=1,048, t=t-values based on panel regressions (fixed-effects models) in which weeks were coded as dummy variables (first week: 0; last week: 1), d=effect size Cohen´s d

RQ 2: Perception of Work Task Characteristics During the Course of the Internship (=Experienced Curriculum)

The comparison between the two measurement points reveals that the students´ evaluation of most task characteristics is lower at the end of the internship. This is especially true for *Novelty*, *Explanation,* and *Help*. Mean comparisons led to significant results ($p < 0.001$) for other characteristics such as *Challenge/difficulty*, *Feedback*, *Error,* and self-perceived *Learning*. There are only two exceptions to this tendency: *Finding out for oneself* and *Autonomy*, which slightly increase, although not on a significant level. The results including the effect sizes are displayed in Table 4.

RQ 3: Predictors of Self-Perceived Learning from a Work Task

To answer RQ 3, we calculated Spearman's rank correlations (as the item-related data was not normally distributed) (Table 5). The analyses show plausible correlations and similar results for the first and the last week. For instance, *Challenge/difficulty* is positively correlated with *Error* and there are negative correlations between *Explanation* and *Finding out for oneself*.

Futhermore, we conducted two fixed effects panel models,[4] each for the first and the last week of the internships (Table 6). Findings show that several task characteristics predict student *Learning* in both weeks. These include *Novelty*, *Challenge/difficulty*, *Explanation,* and *Feedback*. In other cases, the findings differ between the two weeks. While *Autonomy* does not predict learning in the first week of the

[4] For control purposes, we also specified mixed models. The results were very similar to the panel data analysis reported here.

Table 5 Correlations Between Task Characteristics and Learning

	1		2		3		4		5		6		7		8	
	t_0	t_1	t_0	t_1	t_0	t_1	t_0	t_1	t_0	t_1	t_0	t_1	t_0	t_1	t_0	t_1
1. Novelty																
2. Explanation received	.37**	.48**														
3. Figure out procedure	.01	.08**	-.42**	-.23**												
4. Challenge/difficulty	.43**	.51**	.26**	.36**	.14**	.13**										
5. Autonomy	-.05	.15**	-.14**	-.05	.32**	.23**	.22**	.25**								
6. Help received	.37**	.31**	.47**	.40**	-.17**	-0.05	.33**	.42**	-.03	.02						
7. Feedback received	.16**	.29**	.30**	.40**	-.06	-.14**	.37**	.42**	.15**	.09**	.34**	.36**				
8. Error	.18**	.19**	.24**	.23**	-.03	.11**	.41**	.38**	.04	.09**	.37**	.35**	.30**	.27**		
9. Self-perceived learning	.43**	.49**	.36**	.34**	-.13**	.03	.43**	.55**	-.04	.16**	.39**	.40**	.26**	.34**	.23**	.22**

Spearman rank correlation (two-tailed), ** $p < 0.01$; t_0: First week of the internship; t_1 = Last week of the internship

Table 6 Predictors of Self-perceived Learning in the Workplace

Predictor	First Week of Internship			Last Week of Internship		
	Estimate	SE	p	Estimate	SE	p
Novelty	.19	.04	< .001	.27	.05	< .001
Explanation received	.11	.05	< .05	.16	.05	< .001
Figure out procedure	-.06	.04	n. s	.04	.05	n. s
Challenge/difficulty	.24	.04	< .001	.28	.04	< .001
Autonomy	.03	.04	n. s	.14	.06	< .05
Help received	.11	.04	< .01	.02	.04	n. s
Feedback received	.10	.04	< .05	.07	.03	< .05
Error	.04	.04	n. s	-.07	.05	n. s
R^2 (adjusted R^2)	.36 (.32)			.37 (.33)		

n. s. not significant, n_1 (first week) = 936, n_2 (last week) = 1,048

internship, it does in the last week. The opposite is true for *Help*, which predicts learning at the beginning of the internship, but less so at the end of the internship. *Finding out for oneself* is not a significant predictor in both weeks. The task characteristics explain 32 percent (first week), respectively 33 percent (last week) of the variance in perceived *learning*.

Discussion

This study investigates students´ work tasks (RQ1), their perception of work task characteristics (RQ2), and the influence of work task characteristics on self-perceived learning from a task (RQ3) – each at the beginning and end of an eight-week business internship. A diary study was conducted to overcome the limitations of retrospective data collection. To answer RQ1 regarding the enacted curriculum, we developed a task catalogue consisting of ten task categories (including *other tasks*) and then coded the 1,984 recorded work tasks based on a content analysis of free-text descriptions. The analysis revealed that the frequencies of the different task types included in the catalogue do not differ much between the first and the last week of the business internship. In both weeks, many students dealt with *Organisational routine and administrative tasks*, especially those with a domain-specific focus (e.g., recording and updating customer data). Further task categories, each of which represents approx. 10% of the work tasks, include *Creation/production with low autonomy* (e.g., creating presentations according to specific specifications) and *Creation/production with high autonomy* (e.g., creating presentations without specific specifications), *Research activities*, *Interactions with people and organisations external to the company* (low autonomy), and *Audit and control tasks*. Other task types occurred rarely. Regarding the concept of workplace curricula (e.g., Billett, 2016; Goller et al., 2019), it is surprising that there were only minor changes in the shares of work tasks throughout the course of the internships. One possible

explanation for this finding could be that interns are only temporarily employed in a company and certain types of tasks are only entrusted to people with longer-term employment (e.g., apprentices). Moreover, the duration of the internships is only eight weeks in most cases; this could prevent workplace supervisors from 'investing in the interns' by successively assigning them to more difficult task types that require an ongoing scaffolding.

Regarding RQ2, we found that the perceived task characteristics changed over the course of the internship, unlike the task types. Task characteristics such as *Novelty* or *Challenge/difficulty* decreased significantly between the first and the last week. Similarly, the perceived *Help* and/or *Feedback* students received in relation to their work tasks also decreased. However, the results also suggest that, although not significantly, students have a somewhat higher degree of *Autonomy* at the end of the internship and take an increasingly self-directed approach (*Finding out for oneself*). This suggests that scaffolding and fading (e.g., Mikkonen et al., 2017) are used in the guidance process.

Concerning the influence of task characteristics on perceived learning from a task (RQ3), *Novelty*, *Challenge*, and *Feedback* proved to be important factors in both weeks of the diary study. While *Help received* is a significant predictor of learning in the first but not in the last week of the internship, the reverse is true for autonomy, which is not a significant predictor in the first but in the last week. This suggests the effectiveness of scaffolding and fading: scaffolding in terms of help is important at the beginning while fading in terms of increasing autonomy is important at the end of the internship. Some of these findings are in line with other diary studies, for instance, the importance of *Feedback* for learning. However, other variables such as *Challenge/difficulty* have not proven to be significant predictors in earlier diary studies (Brodsky et al., 2019; Rausch, 2013). This suggests that not only can work tasks change over time (see workplace curricula), but the significance of task characteristics that promote learning can also evolve over time. When relating the findings to theoretical models such as the *demand-control-support model* (Johnson & Hall, 1988; Karasek, 1979), findings from our study indicate an especially high importance of the dimensions of job demands (*Challenge/difficulty*), and job support (*Feedback* or *Help*), but are more ambiguous regarding the control component (*Finding out for oneself* and *Autonomy*).

Limitations

One limitation of our study is that it was affected by the COVID-19 pandemic. Although most of the internships in the study were (primarily) attendance-based, the pandemic may have affected office staffing. Hence, there might have been fewer colleagues on site to supervise the interns. Further limitations concern data collection. Although data collection took place close to the learning processes using the diary method, the data is still based on students´ self-reports. Besides, data on task characteristics and self-perceived learning was assessed by using single-item measures. While the work diaries trigger a reflection on workplace learning, students may, in part, still not be aware of their learning processes. Conversely, however, triggering

reflection on workplace learning by using diaries may also have fostered learning to some extent. In addition, we were only able to study a limited period of the internship: the first week and the last week of an eight-week internship. Therefore, it was not possible to examine detailed developments over the entire internship period. Moreover, the focus on the very first and the very last week might introduce particular biases due to onboarding processes or proximity to the end of the internship.

Implications and Future Research

In many cases, student learning in (business) internships is considered to have positive effects on students' competencies and employability. Our findings on task types and task characteristics that promote student learning can help mentors and supervisors to further improve the sequencing and structuring of work tasks during the internship. For instance, the task types do not vary significantly between the beginning and the end of the internship, while the perceived difficulty of the activities is rated significantly lower by students at the end of the internship than at the beginning. Against the background that the difficulty of an activity is a highly significant predictor of perceived learning, it would therefore be advisable to gradually increase the difficulty of work tasks during the placement. However, such planning and development of the intended curriculum would require additional time from mentors and supervisors, which would pay off more the longer the placement lasts.

To learn more about the impact of task characteristics on student learning, longitudinal data collection, preferably over the entire duration of the internships, should be beneficial. Furthermore, possible biases in investigating the first and the last week should be regarded. In a replication study, we will investigate the second and the penultimate week. In addition, possible effects of the different domains of internships should be considered. It seems plausible that task characteristics conducive to learning might differ not only over time but also across different occupations, trades, departments, and so forth. Differences between working on-site or remotely should also be investigated. Even after the end of the pandemic, in many back-office departments, remote work has become more frequent. This will also be considered in the envisaged replication study.

Declarations

Ethics Approval and Consent to Participate The participants provided written informed consent.

Consent for Publication Furthermore, we confirm that this manuscript has not been previously published and is not currently under consideration by any other journal.

Competing Interests The authors have no financial or non-financial interests to disclose.

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