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QUALITY OF PRACTICAL TRAINING PHASES AS A PART OF DUAL STUDY PROGRAMMES FROM THE STUDENTS' PERSPECTIVE – RESULTS OF A LONG-TERM STUDY FROM GERMANY

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Abstract

The practical training phases in cooperating companies and institutions are an important part of dual study programmes, enabling students to develop professional knowledge and skills. The quality of these phases and their influence on student satisfaction have been examined repeatedly in annual student surveys at Baden-Wuerttemberg Cooperative State University (DHBW). The surveys analysed quality aspects and their correlations with satisfaction with the dual study programme. Current findings show clear differences between fields of study: students from technical and economics programmes rate the practical phases more positively than students from social work and health programmes. Across all fields, the integration of theory and practice is rated comparatively negatively, while professional training and integration into operational processes are rated particularly positively. High-quality supervision and intensive support are identified as key factors associated with satisfaction. Professional fit, knowledge transfer, and collegial exchange show strong correlations with satisfaction, whereas material conditions and time management are less influential. Students who are dissatisfied with the quality of practical training are more likely to consider changing or dropping out, whereas satisfied students more often plan to work for their training company in the long term. Overall, the results highlight the importance of intensive support, improved integration of theory and practice, and the creation of learning spaces for increasing satisfaction and retaining students in the long term.

1 Introduction

In dual study programmes, practical training phases within cooperating companies and institutions are a central element of the curriculum. In this learning setting, students should not only acquire subject-specific knowledge but also develop operational experience and job-related skills. At the same time, the university, as the quality assurance authority, is responsible for ensuring that the learning topics covered in the practical training phases correspond to the requirements of an

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academic degree programme and that the tasks appropriately complement the theoretical learning content (Arens-Fischer & Dinkelborg 2020; DGB Bundesvorstand 2019). The practical tasks and activities must therefore be appropriate to academic learning in terms of content and didactics and must complement it in a meaningful way (Gerstung-Jungherr & Deuer 2025a).

For these reasons, the quality of practical training phases should be examined systematically. Student surveys are a useful tool for examining how dual students evaluate various aspects of their practical training phases. Using student surveys conducted as part of a long-term study at Baden-Württemberg Cooperative State University (DHBW), this article examines how students rate various quality indicators. The research project entitled "Academic progress in a dual study programme - important steps, criteria for success, and obstacles during studies at DHBW" has now been running for 10 years and students' assessment of the quality of practical training have already been examined in several survey waves (Deuer & Meyer 2024, Deuer & Meyer 2020, further information at www.dhbw.de/studie).

First, we examine how dual students evaluate their practical training phases in companies and to what extent their evaluations correspond to their general satisfaction with the practical training phases. In addition to satisfaction with the practical phases, it is relevant to examine the extent to which assessments of practical training quality are associated with other aspects of the study programme. Therefore, in a second step, we analyse whether there are correlations between evaluations of the practical training phases and general satisfaction with the dual study programme (e.g., intentions to switch study programmes, tendency to drop out). It is also relevant to examine whether evaluations of the quality of the practical phases are associated with willingness to work for the cooperating companies and institutions after graduation.

2 Theoretical framework and previous analyses of practical training quality in the DHBW long-term study

2.1 The central importance of practical training phases in dual study programmes

Dual study programmes have their roots in the German vocational training tradition, which is strongly influenced by the idea of combining theoretical knowledge and practical training. While the classic dual training system - a combination of work experience and vocational school - had long been internationally recognised as a successful model, dual study programmes emerged much later, in the 1970s. In Baden-Wuerttemberg, the first cooperative study programmes were founded at that time to give companies the opportunity to train qualified specialists and skilled workers in a practice-oriented manner (Deuer & Träger 2015). The business community was seeking an alternative to purely academic programmes, which were often perceived as insufficiently practice-oriented, while the demands placed on skilled workers were increasing. Dual study programmes were intended to close this gap.

Over time, the concept was further developed and expanded to other federal states in Germany. With the Bologna reform and the transition to bachelor's and master's degrees, some vocational academies were converted into state-recognised universities - a key step that upgraded the status of dual study programmes and made them more comparable nationally and internationally. Today, numerous universities and cooperating companies or institutions offer a wide range of dual study programmes, spanning technical and economic disciplines as well as social services, health, and media.

Dual study programmes are highly important for companies and society. For companies, they represent a strategic opportunity to attract well-trained young talent at an early stage, as these students are already familiar with the company's structures, processes, and values. Company loyalty is high, post-graduation training periods are short, and graduates possess a rare and attractive combination of scientific skills and practical experience (Arens-Fischer & Dinkelborg 2020; Arens-Fischer et al. 2016; Krone 2023). For students, dual study programmes offer a clear career focus, financial security through remuneration, and strong entry-level opportunities after graduation. In addition, dual study programmes strengthen Germany's competitiveness as a business location by offering a training system that bridges the gap between academia and industry. It forms an important

basis for innovation, technological progress, and securing qualified skilled workers - aspects that are becoming increasingly important in an international comparison. Thus, dual study programmes have developed from a regional model into a recognised educational pathway, both in Germany and internationally (Krone 2023; Ertl 2020; Wild & Alvarez 2020).

The practical training phases are a central part of the dual study programme curriculum. They are purposefully designed to combine the university learning environment with a systematic, practice-based workplace learning environment. The integration of these two learning areas is a fundamental structural principle of dual study programmes (Gerstung-Jungherr & Deuer 2025a; DGB-Jugend 2023; Krone 2023), and it is only through the planned integration of theory and practice that the special added value of this educational model emerges. In cooperating companies and institutions, students gain direct insight into work processes, organisational structures, and professional routines. This is not just about getting to know the activities involved, but about gradually growing into professional roles and areas of responsibility. The practical experience developed in this context is of central importance for later professional competence, as it extends far beyond theoretical knowledge: it includes situational judgement, communication and problem-solving skills, teamwork, and an understanding of institutional processes and decision-making procedures (Arens-Fischer & Dinkelborg 2020; Arens-Fischer et al. 2016).

At the same time, the university has overall responsibility as the quality assurance authority. It must ensure that the learning content addressed during the practical training phases meets the requirements of an academic degree programme. This means that the tasks assigned in the company cannot be arbitrary but must be linked to the theoretical content of the study programme in a meaningful way in terms of content and didactics. The practical phases should not replace the academic content, but rather supplement and deepen it, so that a coherent and scientifically based learning process emerges. As Gerstung-Jungherr and Deuer (2025a) emphasise, practical training activities must therefore be proportionate to academic requirements and meaningfully expand on them. Tasks that are too easy, purely administrative, or unrelated to the subject matter do not meet this requirement, nor do activities that would overwhelm students without a theoretical knowledge base (see also Arens-Fischer & Dinkelborg 2020; DGB-Jugend 2023, Krone 2023).

The university assumes a moderating role here: it defines learning objectives, supports practical training with reflection and transfer tasks, and regularly checks whether the practical training phases actually generate the intended educational added value. This establishes a dialogue between the company and the university, in which both sides contribute to the development of the students' skills. Overall, the practical phases are therefore not merely an organisational element but a pedagogically and didactically designed core component of the dual study programme. They enable students to acquire professional skills, facilitate close integration of theory and practice, and increase the quality and attractiveness of this study model. Furthermore, the interplay of knowledge- and practice-oriented activities helps students broaden their skills, which again demonstrates the importance of quality assurance at universities and companies (Arens-Fischer & Dinkelborg 2020; Arens-Fischer et al. 2016).

2.2 The challenge of measuring the quality of practical training phases

The construct of practical training quality has been repeatedly analysed in the annual student surveys conducted at DHBW over the past 10 years. Various item batteries were used, some of which were based on proven instruments. For the first time, student assessment of practical training quality was measured in the 2016 student survey using six items on the integration of theory and practice as a key indicator of practical quality (Deuer & Wild 2017). In the 2020 student survey, a more comprehensive inventory for the integration of theory and practice was developed by constructing three item batteries for each of the three dimensions: institutional integration, organisational integration, and content integration (Gerstung & Deuer 2021). However, since the concept of practical training quality encompasses not only the integration of theory and practice, but also other aspects such as social integration, the transparency of operational structures, the diversity of tasks, and the quality of supervision by those responsible in companies and institutions, the 2022 student survey ultimately used the "Mannheim Inventory for Recording Operational Training

Situations" (MIZEBA) in a version adapted and further developed for dual study programmes (Hettler et al. 2022). Finally, in the 2024 student survey, an even more complex construct was operationalised, based on items from the IAQ student survey (Krone et al. 2019, Gerstung-Jungherr & Deuer 2025b). The questionnaire comprises four dimensions, which are presented in more detail in section 3 (see also Figure 1). The 2025 student survey also included additional questions on the operationalisation of the quality of supervision in practical training. These items are presented in section 4.

2.3 Correlations between students' assessments of practical training quality and satisfaction with the study programme, doubts or the tendency to drop out

In addition to the examination of students' ratings of various dimensions of practical training quality, it is also of interest if there are correlations between these ratings and satisfaction with the practical training phases. Furthermore, it is also of interest to see to what extent the perceived quality of practical training could also influence satisfaction with the whole dual study programme. This satisfaction can be operationalised, for example, with questions about the intention to change the course of study and/or the practical training location, or the tendency to drop out. This question will be explored in conclusion in this section.

Indications of the importance of practical training quality for overall satisfaction with the dual study programme have already been found in earlier data analyses of our long-term research project:

Rahn et al. (2020) analysed data from a survey of university dropouts at DHBW from different student cohorts (n=902; 2013-2017 cohorts) regarding their reasons for dropping out. Cluster analysis was used to identify three types of dropouts ("burdened," "overwhelmed," and "disappointed"). In addition, 11 dropouts were interviewed in qualitative depth interviews about their reasons for dropping out. The analysis shows that the dropouts were by no means only students who dropped out due to the level of demand and poor performance ("overwhelmed"). A significant proportion of the reasons for dropping out also related to various stress factors during their studies ("burdened") and dissatisfaction with the dual study programme and its framework conditions ("disappointed"). The latter group is interesting because these are students who achieved good grades in their studies. However, their dissatisfaction was only partly related to the university; in many cases, dissatisfaction with the company was a trigger for doubts about their studies and dropouts. For these students, the practical training phases were most frequently cited as the reason for dropping out in comparison to the other two groups. The qualitative case studies describe the example of a female student whose decision to drop out of university was influenced by insufficient support during her practical training and a lack of challenging tasks.

In an evaluation of data from the 2020 student survey (response rate: n=4,717), Rahn et al. (2022) analysed the relationship between students' perceptions of the quality of practical training and various items relating to satisfaction with their studies (e.g., satisfaction with the practical training placement, intentions to change the course of study and/or the practical training location, and tendency to drop out). The assessment of practical training quality was measured based on previous operationalisation attempts on the topics of theory-practice integration and quality of practical training phases from previous student surveys as part of the DHBW project (Deuer & Wild 2017; Gerstung & Deuer 2021a, 2021b). The integration of theory and practice, the quality of supervision and support for students in the practical training phases, and the competence of the supervisor were taken into account in a total of 15 individual items. These were combined into an index (practical training quality). Together with other variables relating to satisfaction with the course of study, a cluster analysis was then carried out. The result of which was two clusters that differed in terms of the perception of practical training quality, intentions to change practice location or study subject, and the tendency to drop out. The correlations found can be described as follows: the higher the perceived practical training quality, the lower the intention to change and the tendency to drop out. The authors were also able to show that dissatisfied students reported a lower work-life balance than satisfied (Rahn et al. 2022, p. 10ff.).

3 Methodology

This article presents findings from the DHBW research project concerning evaluations of practical training quality, with a focus on the 2024 student survey. Data from the 2024 survey were used to analyse students' assessments of practical training quality using German school grades across four dimensions (supervision and assistance, integration of theory and practice, practical tasks and learning opportunities, and framework conditions and networks). In addition, we examined the correlation between this assessment and satisfaction with the practical training phase. Finally, we also compared satisfied students with dissatisfied students in terms of doubts about their studies and their tendency to drop out. To reinforce the robustness of these findings, data from the 2025 student survey was additionally used to examine the differences between satisfied and dissatisfied students.

For our analyses, we used univariate, bivariate, and multivariate analysis methods. Univariate analyses were used to measure the practical training quality. Bivariate analyses were performed to investigate the relationship between the assessment of practice quality and satisfaction with the practice phases. Multivariate analyses were used to compare satisfied and dissatisfied students.

To analyse the students' evaluations of practical training quality, we used data from the 2024 online survey of bachelor's students. The survey was conducted in June and July 2024. A total of 29,768 bachelor's students (population) were invited to take part in the survey. A total of n=4,444 students started the questionnaire; of these, n=2,741 completed the survey in full. This represents a response rate of 9.2% of the population. The quality of the practical learning location was examined from the students' perspective (see also Hettler et al. 2022). The items used for this purpose were taken from the 2015 IAQ student survey (Krone et al. 2019), which represents a broad spectrum of relevant quality dimensions of the practical training phases (see also Gerstung-Jungherr & Deuer 2025b). A total of thirteen characteristics were considered, which can be assigned to a framework model with four categories (see Figure 1).

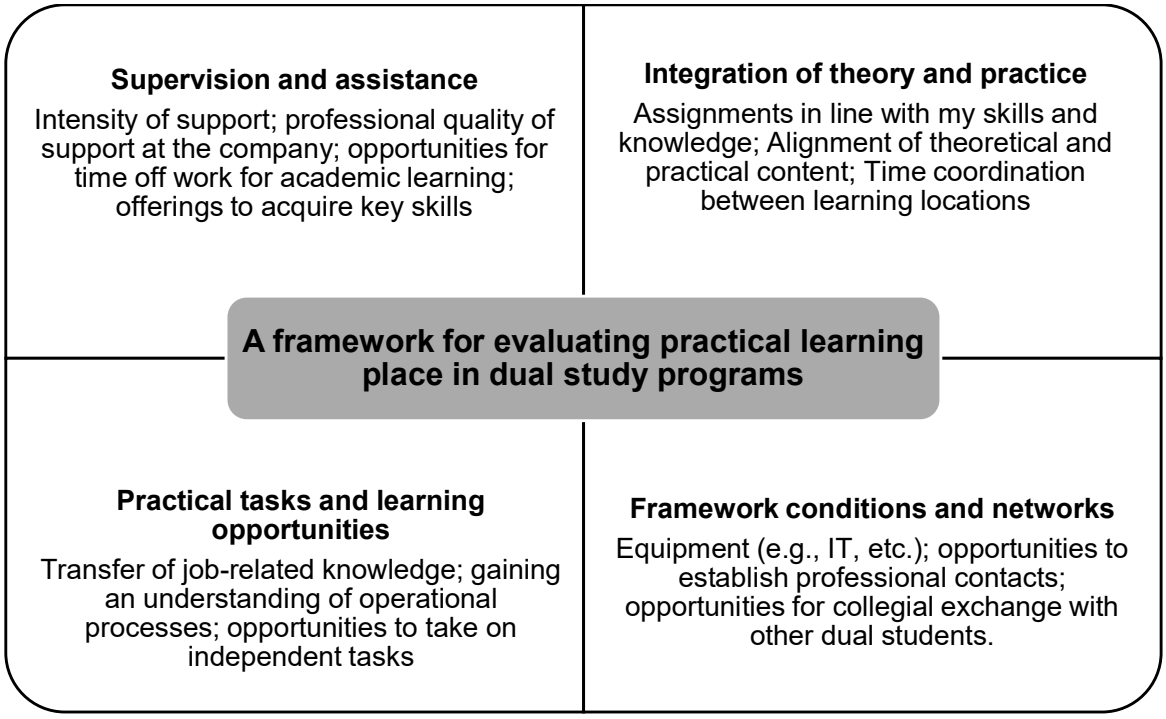


Figure 1. A framework model for evaluating the practical learning location (based on Krone et al., 2019)

The dual students were asked to rate these 13 aspects of the practical training phases using German school grades (scale 1-6; in the German school grading system, 1 is the best grade and 6 is the worst grade). This rating by students is subjective and context-dependent, but it provides

authentic information about the perceived quality of the practical training because it reflects the perspective of the dual students in a simple and understandable way.

In a second step, Pearson correlation analyses were used to analyze possible correlations between the thirteen practical training quality aspects and satisfaction with the practical training phases. The relevant question was: "Overall, how satisfied are you with the practical training phases in your study program?" Students rated this item on a scale from 1 ("dissatisfied") to 4 ("satisfied"). In addition to these correlations between practical training quality and satisfaction with the practical training phases, we also analysed if there are correlations between the perceived quality of practical training and satisfaction with the whole dual study programme (third step). We used a hierarchical cluster analysis for this purpose. However, the cluster analysis was not used exploratorily. Instead, we wanted to use this analysis to form two groups: satisfied and dissatisfied students. For this reason, the number of clusters was set a priori at two. The decision to preset two clusters is based on pragmatic considerations. To make differences as visible as possible, it makes sense to separate only two dichotomous groups. This allows a comparison of mean values between two groups, whereas three or more groups might not show these differences clearly. Furthermore, earlier analyses in which a cluster analysis was used exploratively had already indicated that there are two clusters: satisfied and unsatisfied (Rahn et al. 2022). With these two clusters, we then examined correlations between the assessment of practical quality and satisfaction with the dual study programme, for example the intention to change the course of study and/or the practical training location, or the tendency to drop out.

For the first three steps, we used data from the 2024 student survey. In a final step, we then used the new data from the 2025 student survey to validate the results of the cluster analyses with new data. In this cluster analysis more items were included to measure practice quality (see section 4.3).

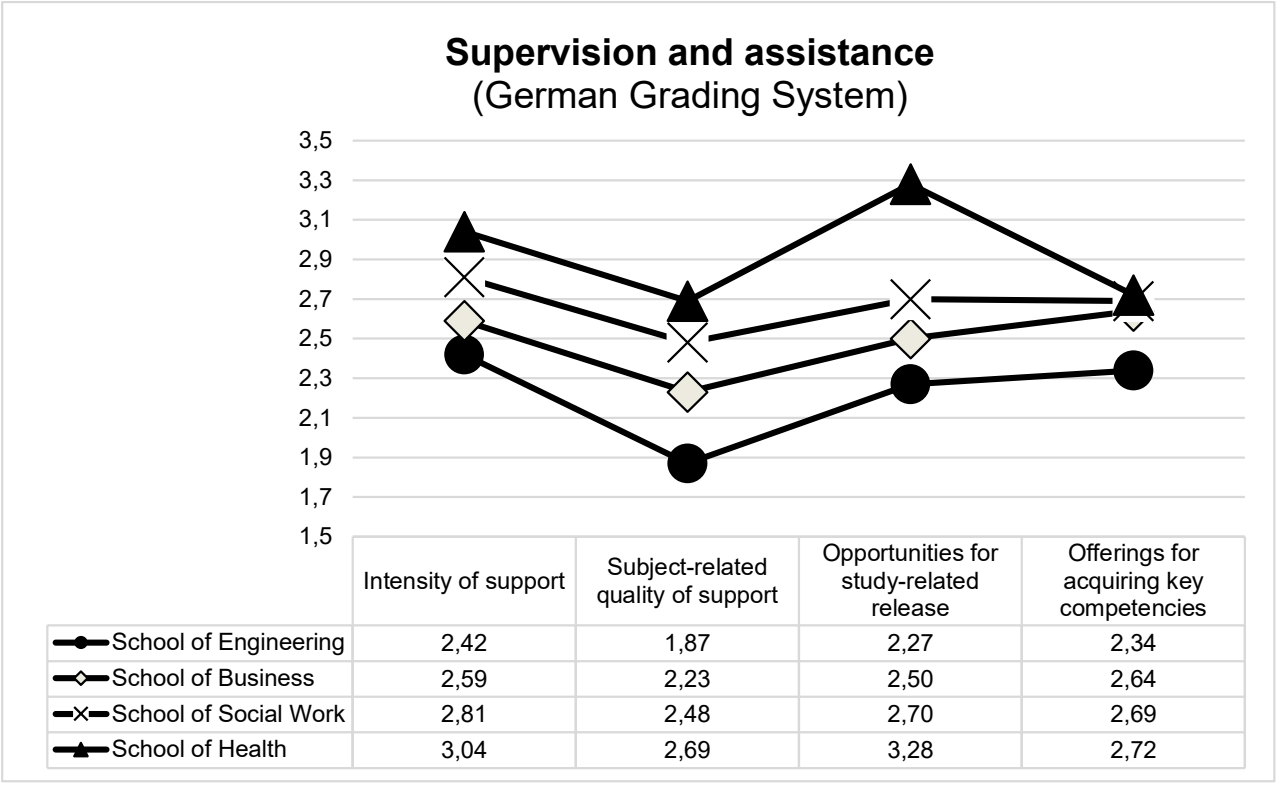
4 Results

First, descriptive findings on students' assessments of practical training quality are presented (univariate analyses). To assess practical training quality, we used German school grades and asked the students to evaluate quality using four different dimensions (supervision and support, linking theory and practice, practical tasks and learning opportunities, and framework conditions and networks). This assessment was also differentiated according to field of study. Furthermore, correlations between the assessment of practical training quality and satisfaction with the practical training phases were analysed (bivariate analyses). In a third step, a cluster analysis was used to form two groups based on the four dimensions mentioned above for assessing the quality of practical training in school grades as grouping variables: students who tended to rate practical training quality positively and students who tended to criticise practical training quality (multivariate analyses). These two groups were then compared in terms of their satisfaction with the dual study programme itself. To substantiate the robustness of the findings, a similar group comparison was also carried out using data from the 2025 student survey. Although other items relating to practical quality were used here, this group comparison also shows similar findings.

4.1 Univariate analyses: Measuring students' evaluation of practical training quality

4.1.1 Supervision and assistance

The first category includes aspects that describe the quality of supervision and personal support provided to dual students. An intensive and professionally sound level of support is essential in order to provide students with guidance, promote their individual strengths, and assist them in overcoming challenges. Organisational support, such as release time for study-related learning, also plays a key role in enabling students to connect their studies successfully with practical experience. Opportunities to acquire key competencies expand their professional knowledge through skills such as teamwork, communication, and time management. The associated criteria are therefore: intensity of support, subject-related quality of support, opportunities for study-related release, and offerings to acquire key competencies.



	Intensity of support	Subject-related quality of support	Opportunities for study-related release	Offerings for acquiring key competencies
School of Engineering	2,42	1,87	2,27	2,34
School of Business	2,59	2,23	2,50	2,64
School of Social Work	2,81	2,48	2,70	2,69
School of Health	3,04	2,69	3,28	2,72

Figure 2. Perceived supervision and assistance during the practical phases

In terms of support intensity, the field of engineering achieved the best rating with an average score of 2.42, followed by economics (2.59) and social work (2.81). The lowest rating was given to the subject area of health (3.04). The subject-related quality of support is rated most positively by all fields of study. Here, the field of engineering is clearly ahead of the other fields with an average score of 1.87. Economics (2.23), social work (2.48), and health (2.69), on the other hand, receive slightly lower ratings.

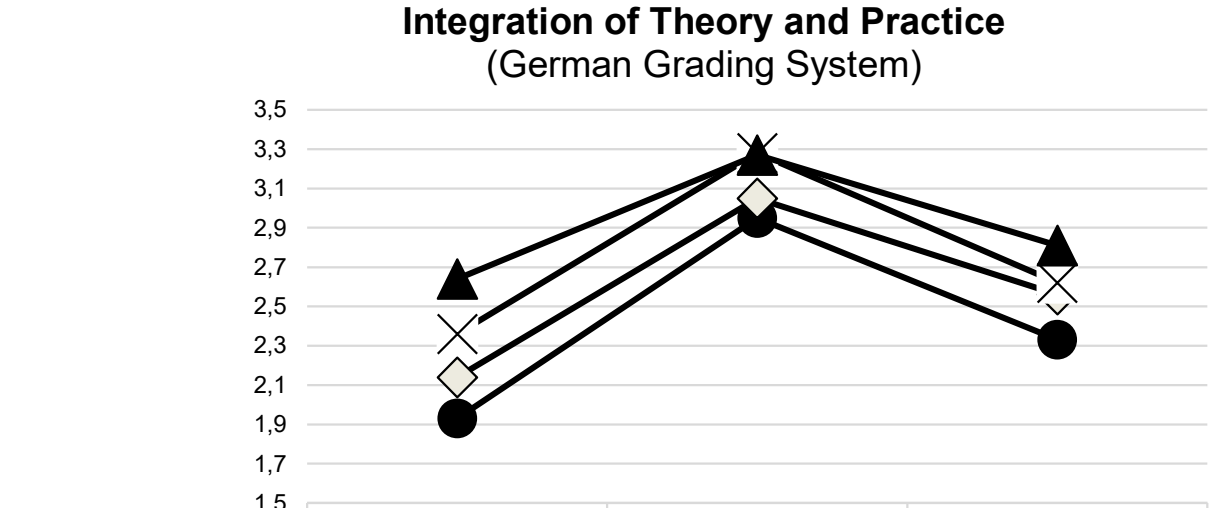
There are significant differences in the opportunities for time off for study-related learning. The field of engineering (2.27) also leads in this aspect, followed by the fields of economics (2.50) and social work (2.70). The field of health falls significantly behind with a score of 3.28. In contrast, there are fewer differences between the fields of study when it comes to offerings for acquiring key competencies. The ratings here range from 2.34 (engineering) to 2.72 (health).

In summary, students in technical degree programmes rate their practical phases most highly across all characteristics surveyed. This indicates comparatively clearly structured supervision processes in this field of study. In contrast, the weaker ratings in the health sector are striking, particularly with reference to the intensity of supervision and opportunities for time off for study-related learning. Possible explanations for this could be a higher workload for those responsible for training and less systematic training and supervision structures in healthcare institutions. Another factor might be that dual study programmes are still relatively new in this segment and therefore lack the necessary experience and systematic structures.

4.1.2 Integration of theory and practice

The integration of theory and practice is at the heart of dual study programmes. This category describes how well the learning environments at the university and the company are coordinated. Close coordination between the two areas in terms of content and timing enables students to be qualified not only academically, but also in terms of practical and application-oriented skills. It is also important that the tasks in the company correspond to the skills and academic knowledge of the students in order to achieve learning and application effects. The associated criteria are:

assignments in line with my skills and knowledge; alignment of theoretical and practical content; time coordination between learning locations.



	Time coordination between learning locations	Alignment of theoretical and practical content	Assignments in line with my skills and knowledge
School of Engineering	1,93	2,95	2,33
School of Business	2,14	3,05	2,56
School of Social Work	2,36	3,28	2,62
School of Health	2,64	3,27	2,81

Figure 3. Perceived integration of theory and practice during the practical phases

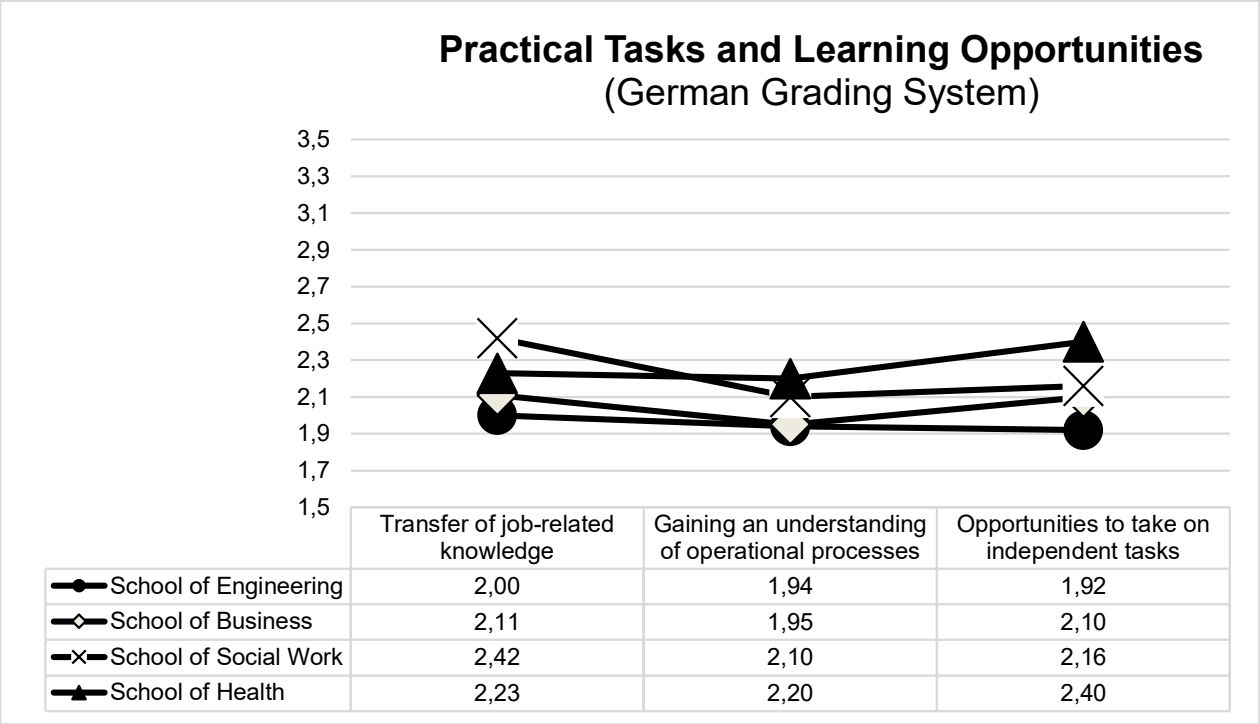
In terms of coordination between learning places (e.g., with regard to exam dates), the subject area of engineering achieved the best ratings with an average score of 1.93. The subject areas of economics (2.14) and social work (2.36) received average ratings, while the subject area of health received the lowest rating with 2.64. The highest numerical grades overall were given for the alignment of theoretical and practical content, indicating the lowest level of satisfaction within this category. The ratings range from 2.95 in the field of engineering to 3.28 in the field of social work. With regard to the aspect of assignments in line with students' own skills and knowledge, the ratings are also mainly in the "satisfactory" range. Here, too, the field of engineering received the best rating at 2.33, followed by economics (2.56), social work (2.62), and health (2.81).

In this category, it is evident that, from the students' perspective, the time coordination between the university and its practice partners works well overall, especially in the engineering field. This indicates established structures and clear communication processes. However, students are less satisfied with the integration of theory and practice in terms of content. Here, the ratings for all fields of study range from just below to slightly above 3.0, which indicates moderate satisfaction. The use of students' own skills and academic knowledge is also mainly rated in the middle range. Students in the fields of health and social services feel less that they are being employed in accordance with their level of qualification than students in technical degree programmes. Possible reasons for this may be structural, such as standardised activities or fewer creative opportunities in certain fields of practice.

4.1.3 Practical training tasks and learning opportunities

The category "Practical Tasks and Learning Opportunities" describes the learning opportunities that arise through work activities in the company. Insight into operational processes gives students a comprehensive understanding of how the company or institution works and how different processes are connected. At the same time, the teaching of professional knowledge is the

basis for their professional development. Opportunities to take on independent tasks are particularly valuable, as they promote independence and a sense of responsibility and prepare students for future professional challenges. The associated criteria are: transfer of job-related knowledge; gaining an understanding of operational processes; opportunities to take on independent tasks.



	Transfer of job-related knowledge	Gaining an understanding of operational processes	Opportunities to take on independent tasks
School of Engineering	2,00	1,94	1,92
School of Business	2,11	1,95	2,10
School of Social Work	2,42	2,10	2,16
School of Health	2,23	2,20	2,40

Figure 4. Perceived practical tasks and learning opportunities during the practical phases

In terms of transfer of job-related knowledge, the area of engineering leads with an average grade of 2.00, followed by the areas of economics (2.11), health (2.23), and social work (2.42). Opportunities to take on independent tasks were rated very positively overall. Students from the fields of technology and economics rate this just below 2.0, while those from the fields of social work and health rate it slightly above. The ratings are also consistently good when it comes to opportunities to take on independent tasks. The field of engineering achieved the best rating here with 1.92, followed by economics (2.1) and social work (2.16). The field of health (2.4) followed some way behind. Engineering received the strongest ratings across all three aspects.

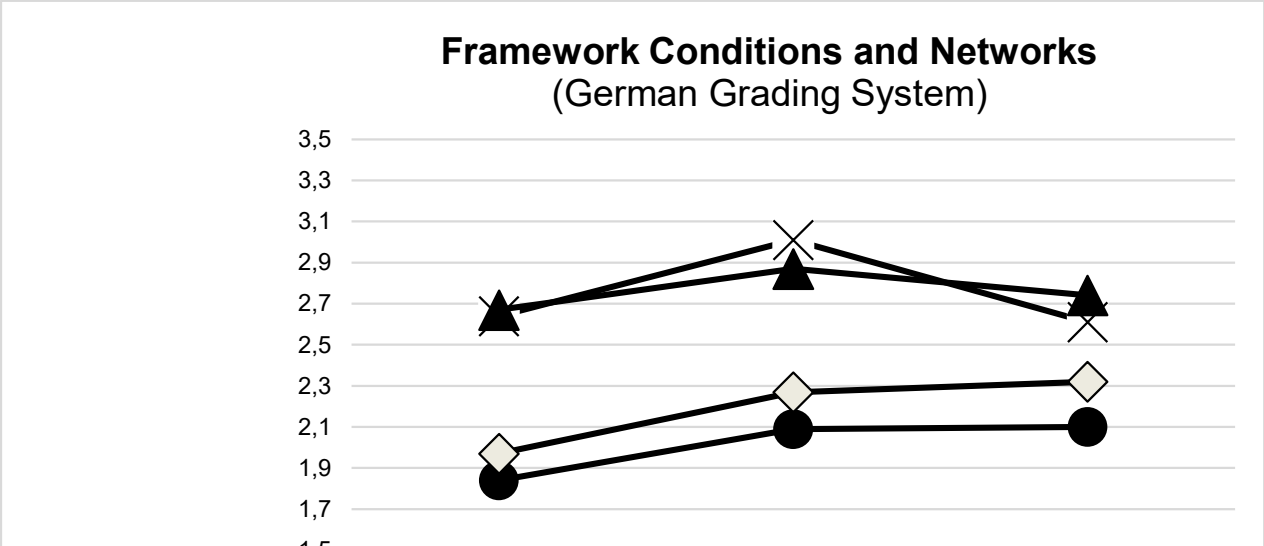
The results in this category are more positive overall than in the areas considered previously. This suggests that the practical training phases work well, particularly in terms of professional qualification and practical integration. It is particularly notable that all ratings are between 1.92 and 2.42, i.e., in the upper satisfaction range. This observation suggests that students are successfully integrated into company structures and processes.

The slightly better scores in the field of engineering may be related to the fact that there are traditionally well-defined training structures (often in the form of training workshops) and students are often involved in production tasks and projects at an early stage.

4.1.4 Framework conditions and networks

A supportive working environment and the establishment of professional networks are key conditions that significantly influence the success of practical training phases. The availability of appropriate equipment - such as required technology or well-equipped workstations - not only facilitates daily work but also creates favourable conditions for efficient and practical learning. In addition, opportunities for networking offer valuable social and professional benefits. Such networks can be an important basis for further career development by providing professional support, informal

exchange, and potential career prospects. The results in this category are based on the following criteria: equipment (e.g., IT, technology, workstations), opportunities to establish professional contacts, and opportunities for collegial exchange with other dual students.



	Equipment (e.g., IT)	Opportunities for collegial exchange	Opportunities to establish professional contacts
School of Engineering	1,84	2,09	2,10
School of Business	1,97	2,27	2,32
School of Social Work	2,64	3,01	2,61
School of Health	2,67	2,87	2,74

Figure 5. Perceived framework conditions and networks in the practical phases

In terms of equipment (e.g., IT, technology, workplace, work equipment), the area of engineering achieved the best ratings with an average grade of 1.84. The area of economics also received a very positive rating of 1.97. In comparison, the areas of social work (2.64) and health (2.67) performed significantly worse, indicating a less well-equipped working environment in these areas. Overall, the opportunities for collegial exchange with other dual students were rated somewhat more reservedly. While the fields of study engineering (2.09) and economics (2.27) are in the good to satisfactory range, social work (3.01) and health (2.87) show significantly lower satisfaction ratings. A similar picture emerges when it comes to opportunities to establish professional contacts. Here, too, the field of engineering achieved the best rating with 2.10, followed by economics (2.32), social work (2.61), and health (2.74). These results suggest that the practical phases in the fields of engineering and economics offer better conditions for networking and exchange than social work and health.

The evaluations in this category show that the material and structural conditions vary significantly between the four different areas of study. In the technical and economic fields of study in particular, students clearly benefit from well-equipped workstations and a professional infrastructure. This is reflected in the very positive ratings. In the fields of social work and health, however, the ratings are significantly lower. This suggests that, in these fields of practice, less technical equipment or fewer standardised workstations may often be available.

There are also clear differences between the fields of study in terms of collegial exchange and establishing contact with relevant actors. Students in the fields of engineering and economics report comparatively good opportunities to build networks and exchange professional knowledge. In contrast, students in the fields of social work and health care seem to be less involved in student networks. Possible reasons for this are likely to be structural factors, such as greater isolation in smaller institutions or shiftwork, which can make continuous exchange difficult.

4.2 Bivariate Analyses: Correlations between the rating of practical training quality and satisfaction with the practical training phases

In a second step, Pearson correlation analyses were used to analyse correlations between the 13 aspects of practical training quality and satisfaction with the practical training phases. The results show consistently significant negative correlations, which can be attributed to the fact that lower values on the scales (i.e., better school grades) express higher satisfaction. Thus, stronger negative correlations indicate a closer positive relationship between the respective quality characteristic and satisfaction.

The strongest correlations are visible in the characteristics of support intensity and professional quality of support ($r = -0.49$, $p < 0.01$ in each case). The correlations with the teaching of professional knowledge, with learning about operational processes, with deployment in line with students' own abilities and knowledge, and with the correspondence between theory and practice are also clearly pronounced ($r = -0.43$, $p < 0.01$ in each case).

Somewhat weaker but still significant correlations were found for opportunities for collegial exchange ($r = -0.41$, $p < 0.01$), opportunities to establish career-relevant contacts ($r = -0.36$, $p < 0.01$), and opportunities to learn key skills ($r = -0.35$, $p < 0.01$). The correlations with opportunities to take on independent tasks ($r = -0.32$, $p < 0.01$), time off for study-related learning ($r = -0.27$, $p < 0.01$), equipment ($r = -0.26$, $p < 0.01$), and coordination of schedules between learning places ($r = -0.25$, $p < 0.01$) are comparatively lower, but remain statistically significant.

Overall, this analysis shows that quality features in the area of support and professional integration have the strongest correlations with satisfaction levels. General conditions - such as equipment or time coordination - also showed significant correlations, but these were less pronounced.

4.3 Multivariate Analyses: Correlations between ratings of practical training quality and satisfaction with the dual study programme

Previous findings from DHBW-wide student surveys illustrate that there appears to be a correlation between students' perceptions of practical training quality and overall satisfaction with dual study programmes (see section 2.3). This finding should therefore be validated again using data from the 2024 student survey, using the four-dimensional construct of practical training quality with 13 individual items described in section 3. As described above, this evaluation of practical training quality was rated using a German school grading scale (1-6).

To enable group comparisons, a hierarchical cluster analysis (Ward method) was used, including all 13 aspects. In this case, however, a two-cluster solution was preset. The intention was to separate satisfied from dissatisfied individuals. The two-cluster solution was then used to identify any differences in mean values. The overall index of practical training quality, satisfaction with practical training supervision, the propensity to change the subject of study, the propensity to change the practical training location, and the propensity to drop out were used. Table 1 shows the differences in mean values.

Table 1. Mean differences between dissatisfied and satisfied students (2024 student survey, n=1,991)

	Practical training quality (school grades 1-6) (index)**	Satisfaction with practical training support (scale 1=low to 7=high) (index)**	Tendency to change subject of study (scale 1=low to 4=high)**	Tendency to change practical training location (scale 1=low to 4=high)**	Tendency to drop out of study programme (scale 1=low to 4=high)*
Dissatisfied (n=711)	3,3	4,7	2,0	2,3	2,3
Satisfied (n=1,280)	1,9	6,1	1,8	1,4	2,1
Total (1,991)	2,3	5,6	1,8	1,7	2,1

* significant at p<0.05
** significant at p<0.001

Overall, these findings confirm that students who are dissatisfied with the quality of practical training in their company are also more likely to change their practical training placement and slightly more likely to change their field of study or drop out. There is also a relatively major difference in terms of satisfaction with practical training supervision, which in turn highlights the key importance that supervisors and mentors can have during practical training phases.

Since data from the 2025 student survey is now also available, a further group comparison is possible, analogous to the approach used for the 2024 student survey (two-cluster solution). However, since the role and importance of practical supervision were a particular focus of the 2025 survey, additional items beyond the 13 aspects described in section 3 were used to operationalise practical training quality, with a specific focus on supervision. The total number of these additional items in the 2025 survey is 18. The quality of practical supervision was measured using 11 items (scale 1=does not apply at all to 7=applies completely):

- My practical supervisors ...
  - ... give me recognition after I have completed a difficult task.
  - ... take time for me when I have questions.
  - ... assign me challenging tasks.
  - ... give me access to all the information I need (e.g., computer systems, databases).
  - ... help me find solutions to problems.
  - ... encourage me to tackle new tasks.
  - ... let me know how well I am doing my job.
  - ... promote my professional development through constructive criticism.
- My practical supervisors have a high level of professional competence.
- My practical supervisors are able to explain complex content to me in an understandable way.
- My practical supervisors are informed about the system and rules of the dual study programme.

In addition, seven further items relating to the quality of practical training phases were used (scale 1=does not apply at all to 7=applies completely):

- During the practical training phases, I can apply the theoretical content learned during the study phases at university.
- The area of application and task planning in the practical operation are coordinated with the learning content of the related study phases.
- The practical supervisors regularly explain how practical professional activities are linked to academic theories/methods.

- Measures are taken to...
  - ... help me understand the organisational structure of my practical training company.
  - ... make it clear to me how my area of work fits into the overall operation.
  - ... inform me about the areas of work and tasks of my colleagues.
  - ... illustrate to me how my work contributes to the overall performance of my work area.

However, the group comparison based on a cluster analysis (two clusters: dissatisfied versus satisfied) shows similar findings for these items. In this case, too, dissatisfied students also have a higher intention to change their internship placement (Table 2, right columns). This survey also asked further questions regarding satisfaction with the study programme, the practical training company, and the DHBW (Table 2, left columns). These questions also show clear and significant differences: dissatisfied students would be less likely to choose the same degree programme and the same practical training company again. The mean values also differ when it comes to the question of whether students would choose the DHBW again. However, the differences here are not statistically significant.

There are also differences between satisfied and dissatisfied students when it comes to their intentions to change (change of study subject, cooperating company) and drop out tendency.

Table 2. Mean differences between dissatisfied and satisfied students (2025 student survey, n=2,092)

		If I could start over again...					
	Practical training quality (scale 1-7) (index)**	... I would choose the same study programme again (scale 1=strongly disagree to 7=strongly agree)**	... I would choose the same practical training company (scale 1 = strongly disagree to 7 = strongly agree)**	...I would choose DHBW again (scale 1=strongly disagree to 7=strongly agree)	Tendency to change the subject of study (scale 1=low to 4=high)*	Tendency to change the practical training location (scale 1=low to 4=high)**	Tendency to drop out of study programme (scale 1=low to 4=high)*
Dissatisfied (n=414)	3,3	4,7	3,5	4,9	1,9	2,5	2,1
Satisfied (n=1678)	5,0	5,3	5,8	6,0	1,7	1,5	2,0
Total (n=2092)	4,6	5,2	5,3	5,8	1,7	1,7	2,0

* significant at p<0.05
** significant at p<0.001

Figure 6 shows that this correlation is ultimately reflected in the fact that dissatisfied students tend not to want to continue working at their current company after completing their studies. Only about 15% of dissatisfied students planned to stay at their company in the long term after completing their study programme. In the satisfied group, this proportion is much higher. Almost half of them would work there after completing their studies.

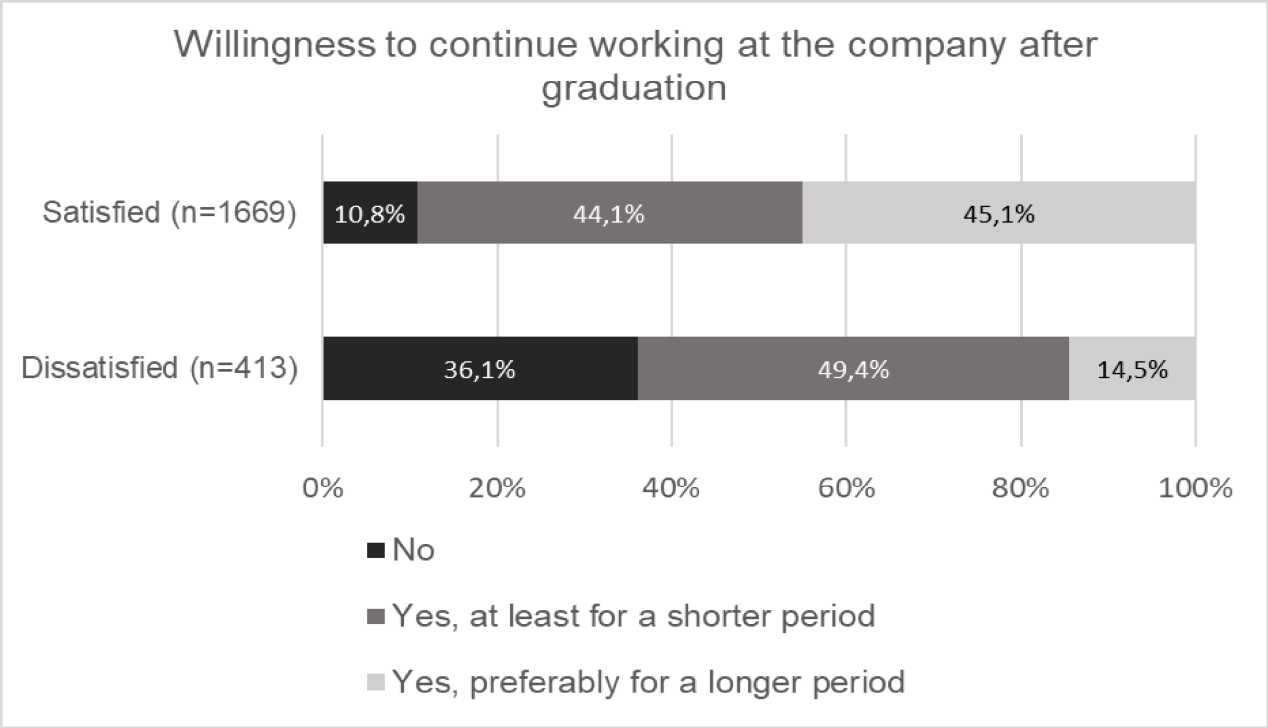


Figure 6. Correlation between rating of practical training quality and willingness to work at the cooperating company after graduation.

In this respect, the perceived quality of practical training also plays an important role in staff retention; after all, companies and institutions invest considerable financial resources in dual students on the basis of contractually agreed salary payments.

5 Discussion and conclusions

The results of the student survey from 2024 show a mostly positive picture of the practical training phases, but there are clear differences between the different areas of study. The field of engineering received the highest ratings overall. This indicates well-established practical training structures and a tailored design of the practical training phases in this area. The correlation analyses show that all practical training quality characteristics are significantly related to satisfaction with the practical training experience. These correlations are particularly strong in terms of the intensity of supervision and the professional quality of supervision, which are therefore key factors influencing a positive perception of the practical training phases.

The chosen methodological approach of measuring the quality of practical training phases using German school grades is associated with a number of limitations that must be critically considered. On the one hand, these are subjective assessments that may be influenced by individual expectations, personal experiences, and situational conditions. Students do not exclusively evaluate objective quality characteristics, but always their personal experience of the practical training. Nevertheless, school grades are a low-threshold and easily understandable instrument that enables a differentiated assessment of perceived quality from the students' perspective. The supplementary correlation analysis with overall satisfaction also shows that the assessments are systematic and plausible: characteristics that are particularly important in conceptual terms - such as the quality of supervision or the connection between theory and practice - show the strongest correlations with satisfaction. Overall, despite certain limitations, the chosen survey method provides a reliable basis for assessing perceived practical training quality. At the same time, it provides clear approaches for the further development of the dual practical training phases, especially in areas closely related to student satisfaction.

Furthermore, a comparison between students who generally rated the practical training phases more negatively and those who rated them more positively showed differences in satisfaction with the dual study programme itself, reflected in differences in mean values for intentions to switch study programmes and propensity to drop out. However, these differences are particularly pronounced when it comes to satisfaction with the practical training placement. Unsurprisingly, satisfied students are also more likely to say that they can imagine working at the respective training institution on a long-term basis after completing their studies. One limitation of our evaluation, however, is that the quality of practical training examined does not allow for any well-founded conclusions to be drawn about the actual skills acquired by the students. This correlation could be examined in more detail in future studies.

The results provide a basis for several recommendations: In addition to strengthening the quality of support and improving the integration of theory and practice, it is particularly important to actively create learning and development spaces in companies and to promote exchange and networking structures. The companies are called upon to implement these standards on site, ensure quality supervision, and create targeted learning opportunities that meet academic requirements. The desire for more intensive exchange between the two learning locations was expressed several times in another survey of companies conducted in 2025. In addition, the need for student participation is pointed out in the academic literature (Arens-Fischer & Dinkelborg 2020; DGB-Jugend 2023; DGB Bundesvorstand 2019; Krone 2023).

Such efforts are also worthwhile because they increase the likelihood that students want to continue working at their cooperating companies and institutions after completing their studies. Given the trend towards a shortage of skilled workers, such investments are also investments in the future of companies and institutions. Accordingly, universities and cooperating institutions should agree on a corresponding quality initiative.

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