Longitudinal Analysis of School-Workplace Cooperation in Vocational Training

Exploring Time-Invariant and Time-Varying Predictors

Beifang Ma & Esther Winther

Abstract *School-workplace cooperation is a unique research field within the dual training system, where trainees' subjective experience of this cooperation is crucial for investigating training quality. In this study, we tracked 458 industrial administrative assistant trainees throughout their entire training period and modeled changes in their experience of one organizational and two pedagogical dimensions of school-workplace cooperation over time and across individual trainees. Using a Latent Growth Model (LGM), we included both time-invariant and time-varying predictors to explain the growth dynamics of these dimensions of trainees' experience of school-workplace cooperation. The results show that all three dimensions have unique growth dynamics over time and across individual trainees. The way predictors influence their growth also differs significantly from each other. Among the dimensions, the practical relevance of school learning shows a decline and is the most sensitive to predictors. The integration of specialized knowledge has seen an increase but can rarely be explained by factors included in this study. The transparency and organization of training dimension has remained relatively stable.*

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Keywords *school-workplace cooperation, Latent Growth Model (LGM), time-invariant predictors, time-varying predictors*

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1 Introduction

In countries with prevalent dual vocational education and training (VET) systems, such as Germany, Switzerland, and Austria, the distribution of learning sites between companies and vocational schools characterizes the uniqueness of VET. This dual structure opens up a crucial and irreplaceable research area that significantly differs from research in general education systems. Unlike general education, which typically focuses on school-based learning, dual VET systems uniquely combine two distinct learning sites—companies and vocational schools. This not only requires organizational cooperation between these sites but also necessitates the integration of practical, workplace-based training with theoretical education. This distinctive context allows for the study of how educational and vocational institutions collaborate, how knowledge is transferred between schools and workplaces, and how these elements contribute to the development of students' professional competencies.

The term "site" here implies more than a mere temporal or spatial separation, but rather emphasizes the pedagogical functions they fulfill in the learning process (Tippelt & Reich-Claassen, 2010; Bundesinstitut für Berufsbildung [BIBB], 2017). This characteristic of allocating pedagogical functions to distinct learning sites—companies providing practical on-the-job skills and schools delivering theoretical education—and integrating these components is closely associated with the concept of cooperation. Unlike coordination, where tasks and processes are merely aligned but carried out independently, cooperation in VET means that the tasks and processes cannot be executed without the involvement of both partners (Buschfeld, 1994, pp. 126–127). This cooperation between training companies and vocational schools in VET is defined as organizationally working together, always based on pedagogical principles (Pätzold, 2003). Accordingly, school-workplace cooperation in Germany within the dual apprenticeship system can be concreted as the organizational and pedagogical collaboration (Sekretariat der Kultusministerkonferenz, 2018, p. 33). The pedagogical guiding principle of school-workplace cooperation is the integration of theoretical knowledge with the practical skills of the learned profession and the reflection on this connection (Marwede & Stolley, 2012, p. 5). This integration and reflection have been operationalized by Aprea and Sappa (2015) as bidirectional transfer processes of boundary-crossing skills.

In addition to studies on factors affecting school-workplace cooperation in VET, particularly within German-speaking research and focusing on the dual apprenticeship system in Germany, some studies investigate this cooperation from institutional aspects (e.g., Aprea & Sappa, 2015). Several other studies explore the subjective perspective of trainees (e.g., Wenner, 2022; Berger, 1999). In the research field of general education, the significance of students' subjective perception has been increasingly confirmed, as students' school experience significantly impacts their school-related outcomes (Thapa et al., 2013). For VET research, this underscores the importance of identifying specific aspects of the trainees' experience that can be controlled, to some extent, through training policies, procedures, and practices. Also, VET research suggests that the trainees' subjective perception of the training reality is particularly crucial for investigating training quality (Heinz, 1991; Jungkunz, 1995; Lempert, 1998).

Findings about factors influencing trainees' perceived school-workplace cooperation in the context of the German-speaking VET system show a heterogeneous and unclear picture. Beicht et al. (2009) and Ebbinghaus (2016) have empirically confirmed that the perceived training quality in smaller companies generally lags behind that of larger companies. Although this is not direct evidence about school-workplace cooperation, empirical findings suggest that apprentices who rate the quality of their training highly also perceive better coordination between learning sites (Berger, 1999). This indicates that company size may influence trainees' perception of school-workplace cooperation. Interestingly, this assumed relationship between company size and perceived school-workplace cooperation was not confirmed by Wenner (2022). Furthermore, the level of prior educational attainment correlates with perception of school-workplace cooperation (Berger, 1999). It implies that the higher the educational attainment of the apprentices, the poorer their evaluation of school-workplace cooperation. However, this assumed correlation between prior educational attainment and perceived school-workplace cooperation was not statistically significant in Wenner's (2022) study. Moreover, the degree of digitization in vocational training increasingly plays a role in school-workplace cooperation (BIBB, 2021). This relationship is confirmed by Freiling and Saidi (2022) using qualitative methods. Risius and Meinhard (2021) also investigated how digitization in VET influences the subjectively perceived school-workplace cooperation, but from the perspective of trainers.

Special research interest has been drawn to the impact of the COVID-19 pandemic, which significantly influenced the global educational system at multiple levels, especially during 2019–2021. This crisis is an issue that should not be ignored in educational research investigating students' school-related experiences during this period. Vocational schools were affected by times of complete closures during the 2019/2020 and 2020/2021 school years in Germany. While the impact of the closure of general education schools was extensively discussed in the media, the area of dual vocational training has received little attention, despite the significant disruptions caused by the pandemic. The Industrie- und Handelskammer (IHK, Chamber of Industry and Commerce) midterm exams were canceled without replacement, central vocational final exams were postponed, and both company-based and school-based learning processes had to quickly adapt to the current conditions to maintain training programs and goals, ensuring a qualified professional certification. Freiling et al. (2022) analyzed the impact of this pedagogical crisis on school-workplace cooperation in German VET using qualitative interviews and descriptive statistics. Their study indicates the necessity of considering COVID-19 pandemic-related predictors when explaining school-workplace cooperation.

While these earlier studies delving into school-workplace cooperation of the German-speaking VET system are insightful, there are several areas for optimization. Firstly, some studies focus on training quality and treat school-workplace cooperation only as a subdimension (e.g., Beicht et al., 2009; Ebbinghaus, 2016). Consequently, the explanatory power of predictors identified for training quality on school-workplace cooperation is unclear. Secondly, some studies use qualitative methods and achieve exploratory results (e.g., Freiling et al., 2022; Freiling & Saidi, 2022). While qualitative studies are primarily exploratory, it is sensible to use quantitative methods to further verify and quantify these results. Thirdly, previous studies investigating the factors

affecting trainees' perceptions of school-workplace cooperation have often treated it as a single, uniform construct (e.g., Wenner, 2022). This is despite the existence of theoretical frameworks suggesting the heterogeneity of school-workplace cooperation. One reason for this discrepancy might be that these theoretical frameworks are not specifically tailored to trainees' subjective perceptions of school-workplace cooperation. Consequently, some dimensions may not be assessable from trainees' perspectives (e.g., formal communication strategies between schools and training companies as discussed by Aprea & Sappa, 2015). Nonetheless, these theoretical works still indicate that the construct of school-workplace cooperation is not uniform. Fourthly, focusing on the studies investigating trainees' experience of school-workplace cooperation, there is a lack of longitudinal research methods. One of the foundational goals of contemporary educational research is to systematically construct a reliable and valid understanding of the trajectories of students' school-related outcomes. To achieve this, longitudinal studies have long been essential and are becoming increasingly prevalent in empirical research focusing on the development of students' school-related outcomes. Employing a longitudinal design is crucial for both the outcome and explanatory variables. For the outcome variable, a longitudinal design can track changes in the perception of school-workplace cooperation throughout the training period, thus providing a comprehensive understanding of how these perceptions evolve over time and the factors influencing these changes. For explanatory variables, a longitudinal design allows the categorization of predictors into time-invariant predictors, which differ among individuals but remain constant over time (e.g., gender, school-entrance age, and migration background), and time-varying predictors, which differ among individuals and change over time (e.g., trainees' self-evaluation or experiences during the COVID-19 crisis). Thus, employing a longitudinal design enables a more nuanced analysis of how different types of predictors influence school-workplace cooperation over time, providing a deeper and more accurate understanding of these dynamics.

The presented study aims to close these research gaps by employing longitudinal data collected throughout the entire training course. To observe the growth of different dimensions of trainees' experiences with school-workplace cooperation across both training years and individual trainees, we used a latent growth model (section 3.3). To provide a more valid and comprehensive prediction of trainees' experience of school-workplace cooperation, we consider both person-specific time-invariant predictors and the concurrent impact of person-time-specific characteristics. Given that this study was conducted during the pandemic period, we specifically include the effect of corona measures taken by training institutes, rather than ignoring it. By extending the growth curve model to incorporate time-varying covariates, we aim to monitor and explore how these dynamic factors influence trainees' experiences, including their perceptions of school-workplace cooperation.

The study focuses on the vocational training program for *Industriekaufleute* (Industrial Management Assistants), a popular apprenticeship occupation in Germany's dual system (Statistisches Bundesamt, 2023). This program prepares trainees for a broad range of roles in various sectors, including manufacturing, service industries, trade, logistics, finance, and healthcare (BIBB, 2021). Trainees in this program typically work in departments such as accounting, human resources, marketing, logistics, and

procurement, gaining essential skills in business operations, financial management, and organizational processes. Upon completion of their training, they are equipped to work in administrative and management positions within companies across different industries (BIBB, 2021; Industrie- und Handelskammer [IHK], 2022).

The *Industriekaufleute* apprenticeship typically lasts for three years and is structured around the dual system, which combines practical, on-the-job training in companies with instruction in vocational schools (Deissinger, 2015; Cedefop, 2024). The program's curriculum includes financial accounting, cost control, human resources management, procurement, and logistic, as well as communication skills and business law. The training aims to provide a holistic understanding of business operations, preparing trainees for future management or specialized administrative roles (BIBB, 2021). Trainees spend three to four days a week at their companies and one to two days in vocational schools, where they receive theoretical instruction that supports their practical training. This combination of work-based learning and classroom education is designed to help trainees apply theoretical knowledge to real-world business scenarios, thus enhancing their professional competence and readiness for the workforce (Kultusministerkonferenz [KMK], 2021).

2 Research Question and Operationalization

The research question of the presented study is how the organizational and pedagogical dimensions of subjective perception of school-workplace cooperation change throughout the entire training course across individual trainees, and how do time-invariant and time-varying factors influence trainees' perceptions of school-workplace cooperation throughout their vocational training both at the organizational and pedagogical level? This research question encapsulates the core of the study, emphasizing both the static (time-invariant) and dynamic (time-varying) elements that we are examining in relation to school-workplace cooperation.

The trainees' perceptions of school-workplace cooperation are operationalized as practical relevance of school learning, integration of specialized knowledge and transparency and organization of training. While the first two dimensions focus on the school-workplace cooperation at pedagogical level, the last dimension addresses the cooperation at the organizational level. The dimension practical relevance of school learning evaluates the extent to which vocational schools provide specialized knowledge that is directly applicable to the trainees' work in the company. It focuses on how the school reinforces practical skills with theoretical background information and helps students understand the connection between classroom content and workplace practices. The dimension integration of specialized knowledge measures how well the knowledge and skills acquired in vocational school are integrated and applied in the workplace. It assesses the alignment between the curriculum taught in school and the practical tasks performed in the company. Both pedagogical dimensions highlight bidirectional transfer processes of boundary-crossing skills (Aprea & Sappa, 2015), while the first dimension (Practical Relevance of School Learning) is concerned with the immediate application of school knowledge to daily work tasks, the second dimension (Integration

of Specialized Knowledge) emphasizes the deeper theoretical support and specialized insights that vocational school provides to enhance practical skills and understanding in the workplace. The organizational dimension (Transparency and Organization of Training) assesses the clarity and systematic organization of the training process between school and training company from the trainee's perspective.

The focus on the practical relevance of school learning and the integration of specialized knowledge gained in school is driven by two key considerations. First, since the ultimate goal of vocational education is to prepare trainees for careers in companies, it is essential to assess how school-based knowledge and skills are applied in the workplace. The emphasis lies on ensuring that the school-based education aligns with and supports the trainees' long-term professional development in their future roles at the company. Conversely, evaluating how company-based skills influence school learning would shift the focus from workplace readiness to school-based education, which is not the primary aim of vocational training. Second, although these dimensions are formulated to assess the relevance and integration of school-based learning, they inherently imply an interactive relationship between the two learning environments. The concepts of "relevance" and "integration" inherently suggest a bidirectional dynamic, as they depend on the connection between theoretical knowledge from school and its practical application in the workplace. Therefore, these dimensions capture the cooperation between school and company as a mutually reinforcing process, rather than a unilateral flow of knowledge. By focusing on these dimensions, the study aims to evaluate how well vocational schools and companies collaborate to provide trainees with the comprehensive skills needed for their professional careers, ensuring the practical applicability of their education in real-world contexts. However, we recognize that the quality of company-based training is equally important in evaluating overall cooperation. The dimension of transparency and organization of training was included to address the collaboration between school and workplace from an organizational perspective, ensuring the coordination between both learning environments.

Time-invariant predictors include at first the size of the training company. In addition to the number of employees, as tested by Beicht et al. (2009) and Ebbinghaus (2016), we also considered the size of the city in which the training company is located. Regarding the time-invariant predictor of prior educational attainment, we aim to gain better insight into the previously inconsistent findings concerning the relationship between trainees' perceptions of school-workplace cooperation and their level of prior educational attainment (Berger, 1999; Wenner, 2022). Therefore, we included the highest school leaving certificate as indicator of prior educational attainment and extended the scope of educational level to incorporate the average grade on the final school report as a time-invariant predictor, and the trainees' expected grades. Notably, trainees' expected grades are treated as a time-varying predictor, assumed to be a dynamic indicator of prior educational attainment. Trainees continuously adjust their expected grades based on their prior attainment throughout their training. In addition to trainees' expected grades, we also integrated their experiences with the measures implemented by companies and schools to address the challenges posed by the COVID-19 crisis as a crucial time-varying predictor (Freiling et al., 2022). The digitalization level of their training is treated as a time-invariant predictor, serving as a contextual factor. We utilize the spoken lan-

guage at home as an indicator of migration background. Additionally, we include variables such as entrance vocational training age and gender. While these variables have not been previously studied or confirmed as predictors of perception of school-workplace cooperation, they have been empirically confirmed to influence trainees' dropout behavior (BIBB, 2022; Lange, 2020). Table 1 summarized all time-varying and time-invariant predictors.

Table 1: Overview of Predictor Types

Predictors	Type*	Time Point of Measurement
Age (short for entrance vocational training age)	TIP	T0
Gender	TIP	T0
Language (short for the spoken language at home)	TIP	T0
Company size (short for the number of employees of the training company)	TIP	T0
City size (short for the size of the city in which the training company is located)	TIP	T0
Digital level (short for the trainees' evaluation of the digitalization level of their training)	TIP	T0
Educational level (short for trainees' level of prior educational attainment before entering their current training)	TIP	T0
Prior grade (short for trainees' final grades from their prior educational attainment before entering their current training)	TIP	T0
Expected grade (short for trainees' expected grades during their training)	TVP	T0,T1,T2
Corona measures (short for trainees' experiences with the measures implemented by companies and schools to address the challenges posed by the COVID-19 crisis)	TVP	T1,T2
* TIP: short for time-invariant predictor; TVP: short for time-varying predictor		

T0, T1, and T2 correspond to the first, second, and third training years, representing key phases in the trainees' development. These timeframes are part of a longitudinal design that tracks the trainees' experiences over the entire training period, from the beginning of the apprenticeship (T0) through the midpoint (T1) to the completion of their training (T2). This design reflects the full change trajectories of trainees' perceptions of school-workplace cooperation. By capturing data at these three distinct points, we are able to observe how trainees' perceptions evolve throughout their training. In the early stages (T0), trainees are more focused on school-based learning, while by the final stage (T2), they have had significant workplace experience and are better able to assess the integration of theoretical knowledge with practical application. This longitudinal approach allows for a detailed examination of the dynamic interplay between school-based and

workplace-based learning and provides a comprehensive view of how perceptions shift over time.

3 Methods

3.1 Sample

Data was gathered in autumn 2019 (T0), autumn 2020 (T1), and autumn 2021 (T2). The dataset comprises 458 trainees training to become industrial management assistants who completed the survey at all three stages. In the sample, 64 % of the trainees were female, which is consistent with the statistical population (58.4 % female; Bundesinstitut für Berufsbildung [BIBB], 2020). The average age at T0 was 19.66 years (ranging from 15 to 31 years), nearly identical to the average age (19.7 years) of the statistical population at the beginning of training (BIBB, 2020). Most trainees live in families where only German is spoken (75.9 %).

3.2 Instrument

Outcome variable trainees' experience of school-workplace cooperation encompasses three dimensions: practical relevance of school learning (four items), integration of specialized knowledge (three items), and transparency and organization of training (three items). All three dimensions were measured on five-level Likert scales (0 = strongly disagree; 4 = completely agree) at T0, T1, and T2.

All TIPs were measured at T0. The educational level comprises four levels of German school leaving certificates obtained from different school types: *Hauptschulabschluss* (below a secondary school level), *Mittlere Reife* (corresponding to a secondary school certificate), *Fachhochschulreife* (enabling advanced technical college studies), and *allgemeine Hochschulreife* (allowing university studies). The scale level of digitalization assesses the integration of digital tools and platforms in the trainees' learning environment on a five-level Likert scale (0 = strongly disagree; 4 = completely agree). It includes three items on the use of electronic documentation, video archiving, and networked communication, providing an overview of how digital methods enhance vocational training processes. For more information about TIPs see Appendix Table A1.

The TVP expected grade, collected at T0, T1, and T2, was measured on a scale ranging from 1.0-1.5 (highest) to 3.1-3.5 (lowest), capturing trainees' anticipated academic performance throughout their training. Soon after the onset of the pandemic, at T1 and T2, we included a five-level Likert single-item-scale to assess trainees' satisfaction with the compensatory measures implemented by companies and schools during the pandemic.

3.3 Analytical Procedure

The latent growth model (LGM) is used to analyze items across time in longitudinal studies, where the researcher is interested in modeling and assessing growth trajectories. In this study, we aim to model the trajectory of trainees' experience of school-workplace co-

operation among a cohort of industrial management assistants throughout their vocational training. Unlike other longitudinal data analyses that model trajectories by pooling all individuals within the sample, a special characteristic of LGM is its ability to represent the variance of individual trajectories around these group means. For example, panel regression estimates the mean intercept (i.e., starting point) and mean slope (i.e., rate of change) that jointly define the underlying trajectory for the entire sample. In contrast, LGMs estimate the between-person variability in the individual intercepts and slopes. Additionally, LGM approaches are highly flexible in terms of the inclusion of time-invariant (TIPs) and time-varying predictors (TVPs). TIPs can be incorporated to predict the growth factors, such as the random variability in starting point and rate of change. This directly evaluates hypotheses about whether individual characteristics (e.g., gender and school entrance age) are predictive of higher or lower starting points or steeper or less steep rates of change over time (Curran et.al., 2004; Curran et al., 2010). While TIPs directly predict the growth factors (Bollen & Curran, as cited in Curran et al., 2010), whereas TVPs directly predict the repeated measures while controlling for the influence of the growth factors (Bollen & Curran, as cited in Curran et al., 2010). For example, in this study, we analyzed the individual trajectories of changes in trainees' experience of school-workplace cooperation throughout their training. Rather than attributing the variability around the best-fit line for individual trajectories at each time point to unexplained random errors, we propose that part of these residuals might be attributed to occurrences during specific times, such as trainees' expectations of their goal grades or the impacts of the COVID-19 pandemic.

4 Results

4.1 Preliminary Analysis: Scale Statistics

Firstly, we checked the reliabilities of all scales comprising more than two items. The detailed results are listed in Appendix Table A2. The Cronbach's alpha of the scale measuring Practical Relevance of School Learning at three time points ranges from 0.72 to 0.79, indicating good internal consistency. The Cronbach's alpha of the scale measuring Integration of Specialized Knowledge at three time points ranges from 0.66 to 0.79, reflecting acceptable to good internal consistency. The Cronbach's alpha of the scale measuring Transparency and Organization of Training at three time points ranges from 0.64 to 0.67. While this is lower than the commonly accepted threshold for psychological scales, it is still considered acceptable for non-psychological scales, where lower reliabilities are more tolerable due to the complex and multifaceted nature of the constructs being measured (e.g., Schmitt, 1996). Additionally, the scale measuring the TIP digitalization level has a Cronbach's alpha of 0.72, demonstrating good internal consistency. Overall, these reliability coefficients suggest that the scales used in the study are reasonably consistent in measuring the intended constructs across different time points.

Trainees' overall satisfaction with the compensatory measures implemented by companies and schools during the pandemic increased from 2020 to 2021, while their expected grades decreased across the three years. All three dimensions of their experience

of school-workplace cooperation decreased over the same period, with the Practical Relevance of School Learning experiencing the steepest decline. The reasons for these trends will be analyzed in the next section. Detailed descriptive statistics are provided in Appendix Table A2.

4.2 Latent Growth Model

We conducted three rounds of Latent Growth Model (LGM) analyses for each dimension of trainees' experiences with school-workplace cooperation, utilizing both TIPs and TVPs. The results are summarized in Table 2.

It can be observed from Table 2 that, the growth trends, growth curve across individual trainees and the effects of predictors on outcomes differ for each dimension of trainees' experiences with school-workplace cooperation. These results also highlight the necessity of avoiding the treatment of trainees' experiences with school-workplace cooperation as a single, uniform construct.

Table 2: Results of Growth Curve Model of Experience of School-workplace Cooperation

	Trainees' Experience of School-workplace Cooperation		
	Practical Relevance of School Learning	**Integration of Specialized Knowledge**	**Transparency and Organization of Training**
Intercept	3.551***	1.823***	2.744***
Slope	-1.184***	1.015**	-0.462
Var(intercept)	0.288***	0.062	0.190**
Var(slope)	0.036***	0.105**	0.065*
r(intercept and slope)	-0.118**	-0.041	-0.001

			Trainees' Experience of School-workplace Cooperation		
			Practical Relevance of School Learning	**Integration of Specialized Knowledge**	**Transparency and Organization of Training**
TIPs	Language	on intercept	0.057	0.030	0.092
		on slope	0.014	0.018	-0.085
	Gender (0,female; 1,Male)	on intercept	-0.169*	0.010	-0.059
		on slope	0.041	-0.108	-0.048
	Age	on intercept	-0.040*	-0.021	-0.027
		on slope	0.023	-0.012	0.022
	Digital level	on intercept	0.066	0.070	0.054
		on slope	-0.056*	-0.042	0.005
	Educational level	on intercept	-0.011	0.050	0.110*
		on slope	0.018	-0.028	-0.096**
	Prior grade	on intercept	-0.038	-0.015	-0.011
		on slope	0.026	0.017	-0.034
	Company size	on intercept	0.016	-0.026	-0.017
		on slope	-0.003	-0.025	-0.014
	City size	on intercept	-0.073	0.020	-0.002
		on slope	0.035	-0.003	-0.033
TVPs	Expected grade	on outcome T0	-0.100*	-0.001	0.059
		on outcome T1	-0.182***	0.144**	0.129**
		on outcome T2	0.100***	0.026	0.024
	Corona measures	on outcome T1	0.106**	0.046	-0.032
		on outcome T2	0.097**	0.015	-0.001

* p < .05, ** p < .01, ***p < .001

Concerning the results of LGM for Practical Relevance of School Learning, intercept=3.551 (p<.001), slope=-1.184 (p<.001) which means that the experienced Practical Relevance of School Learning in the first semester (T0) is 3.551 and for every sequential training year Practical Relevance of School Learning is expected to decrease by 1.184 points. The parameters σ^2 intercept=0.288 (p<.001) and σ^2 slope=0.036 (p<.001) represents the variances of the intercept and slope across trainees respectively. Finally,

the estimated covariance or cov(intercept, slope)=-0.118 which implies that there is a negative covariance between the intercept and slope. which implies that the higher the starting experienced Practical Relevance of School Learning, the weaker the increase in experienced Practical Relevance of School Learning. Gender and age significantly negatively influenced the intercept, indicating initial differences in the Practical Relevance of School Learning based on these two variables. Male trainees experienced lower Practical Relevance of School Learning at the beginning of the training (T0) compared to female trainees. This is indicated by the significant negative regression coefficient for gender (-0.169, p = 0.030), suggesting that male trainees' initial evaluations of the practical relevance of their school learning were less favorable than those of their female counterparts. Additionally, Older trainees evaluated the Practical Relevance of School Learning at T0 lower than younger trainees. This is shown by the significant negative regression coefficient for age (-0.040, p = 0.035), indicating that as the training entrance age of trainees increased, their initial perception of the practical relevance of their school learning decreased. Digitalization level had a significant negative impact on the slope (s), suggesting that higher digitalization is associated with a slower decline in Practical Relevance of School Learning over time. TVPs Expected grades and satisfaction with compensatory Corona measures showed significant effects on the observed values of Practical Relevance of School Learning at various time points, highlighting the dynamic interplay between trainees' expectations, their experiences during the pandemic, and their perceptions of school-workplace cooperation. Trainees' satisfaction with compensatory measures during the pandemic positively influences their evaluations of Practical Relevance at T1 and T2. The effect of expected grades is interesting. Initially, higher expected grades are associated with lower perceived relevance, but this relationship reverses by T2.

Concerning the second dimension of trainees' experience of school-workplace cooperation, the estimate of Intercept has significant positive value (Estimate = 1.823, p < .001), indicating the initial status of integration of specialized knowledge. Slope also has significant positive value (Estimate = 1.015, p = .002), indicating a positive growth trend over time. Notably, the slope becomes positive after adding predictors, even though the raw means of Integration of Specialized Knowledge (M_T0=2.53, M_T1=2.52, M_T2=2.40) suggest a decrease. This change occurs because the added predictors might alter the variance structure in the model, affecting the estimation of the growth parameters. This indicates the necessity of considering that part of these residuals might be due to specific occurrences during that time, rather than attributing the variability around the best-fit line for trajectories at each time point solely to unexplained random errors. There is not a statistically significant variability in the initial levels of integration of specialized knowledge among the trainees (Estimate = 0.062, p = 0.244). This means most trainees started with similar levels of perceived integration. The significant slope variance (Estimate = 0.105, p = 0.001) indicates that some trainees experienced a steeper increase (or decrease) in perception of integration of specialized knowledge over time, while others had more gradual changes. This suggests individual differences in how trainees' perceptions of specialized knowledge integration evolved throughout the training period. The estimated covariance (Estimate = -0.041, p = 0.213) is not significant which implies that there is no significant covariance between the intercept and slope. Among all predictors,

only the effect of expected grades is significant, indicating a positive effect on trainees' perception of integration of specialized knowledge at T2.

The third dimension of school-workplace cooperation has significant intercept (Estimate = 2.744, p < 0.001) with significant intercept variance (Estimate = 0.190, p = 0.001, which indicates that trainees started with different levels of perception of transparency and organization of training at the beginning of the training. The slope is not significant (Estimate = -0.462, p = 0.096), whereas the slope variance of it is significant (Estimate = 0.065, p = 0.034). When the variance of the slope is significant but the slope itself is not, it suggests that while there is considerable variability in how individuals' scores change over time (i.e., the growth trajectories differ), on average, these changes may not be statistically significant. In other words, although there are differences in how trainees' experience of transparency and organization of training scores evolve over time, the average change across the entire sample may not be large enough to be considered significant. However, the fact that there is significant variability in these changes indicates that some individuals may experience substantial improvements or declines in experience of transparency and organization of training, while others may remain relatively stable. This finding underscores the importance of considering individual differences in growth trajectories rather than relying solely on average trends. It suggests that while the overall change in organizational learning may not be significant when looking at the entire group, there are still meaningful variations in how individuals' scores change over time, which should be taken into account in further analysis and interpretation. The covariance (Estimate=-0.001, p = 0.978) between intercept of slope is not significant, which means that the relationship between the initial levels of experience of transparency and organization of training and the rate of change is not significant.

5 Conclusion and Discussion

In this study, to examine how the organizational and pedagogical dimensions of subjective perception of school-workplace cooperation change throughout the entire training course across individual trainees, we analyzed these dimensions using a latent growth model (LGM). This approach allows us to track the growth trajectories of these dimensions over time and across trainees. We specifically investigated how time-invariant and time-varying factors influence trainees' perceptions of school-workplace cooperation at both the organizational and pedagogical levels throughout their vocational training. Time-invariant factors, such as baseline characteristics of trainees and training conditions, remain constant over time. In contrast, time-varying factors, such as changes in training conditions or personal circumstances, fluctuate during the training period. Our analysis aimed to uncover: 1. The growth trends in organizational and pedagogical dimensions of school-workplace cooperation across the training duration. 2. The effect of COVID-19 pandemic during the special time period. 3. The differential impact of time-invariant and time-varying predictors on these growth trends. 4 The unique contributions of these predictors in shaping the trainees' experiences and perceptions of cooperation between schools and workplaces. By examining these aspects, we gain a comprehensive understanding of how trainees' subjective perceptions evolve and the

factors that drive these changes, thereby providing valuable insights for enhancing the effectiveness of vocational training programs.

5.1   Growth Trajectories in Trainees' School-Workplace Cooperation Experiences

The analysis of trainees' experiences of school-workplace cooperation reveals notable differences across the dimensions of Practical Relevance of School Learning, Integration of Specialized Knowledge, and Transparency and Organization of Training, particularly in terms of their initial levels (intercepts), changes over time (slopes), and variability among trainees. Firstly, regarding the intercepts, trainees initially perceive the Practical Relevance of School Learning most positively (intercept = 3.551), followed by Transparency and Organization of Training (intercept = 2.744), and then Integration of Specialized Knowledge (intercept = 1.823). The significant variance in the intercepts for Practical Relevance of School Learning (0.288) and Transparency and Organization of Training (0.190) indicates substantial differences among trainees in their initial perceptions for these dimensions. In contrast, the variance in the intercept for Integration of Specialized Knowledge (0.062) is not significant, suggesting more uniform initial perceptions among trainees.

In terms of changes over time, the slope for Practical Relevance of School Learning is significantly negative (-1.184), indicating a decline in this perception throughout the training period. On the other hand, the slope for Integration of Specialized Knowledge is significantly positive (1.015), showing an improvement over time. The slope for Transparency and Organization of Training (-0.462) is not significant, indicating stability in perceptions over time. The significant variances in the slopes for Practical Relevance of School Learning (0.036) and Integration of Specialized Knowledge (0.105) highlight considerable differences among trainees in how their perceptions change over time. The variance in the slope for Transparency and Organization of Training (0.065) shows some variability but is less pronounced.

Furthermore, the correlation between intercept and slope differs across dimensions. For Practical Relevance of School Learning, the significant negative correlation (-0.118) suggests that trainees with higher initial perceptions tend to experience a faster decline. In contrast, there are no significant correlations between intercept and slope for Integration of Specialized Knowledge (-0.041) and Transparency and Organization of Training (-0.001), indicating that initial perceptions do not predict the rate of change in these dimensions.

Overall, these findings answered the research question about the growth of perception of school-workplace cooperation across both training years and individual trainees, and highlighted the distinct trajectories and variances of different dimensions of school-workplace cooperation. The decline in the practical relevance of school learning, the improvement in the integration of specialized knowledge, and the stability in the transparency and organization of training underscore the necessity of considering these dimensions separately rather than treating trainees' experiences of school-workplace cooperation as a uniform construct.

Trainees might start with high expectations about the practical relevance of their school learning, which could explain the high initial intercept. However, as they progress

through their training and face real-world challenges, they may find that the school knowledge cannot be immediately and directly used to deal with workplace demands, and they face the realities of the workplace, the disconnect between theory and practice can become more evident, leading to a decline (negative slope). The positive growth trend (positive slope) in the integration of specialized knowledge suggests that as trainees advance in their training, they gradually see how specialized knowledge fits into their practical work. As trainees progress, they typically gain a deeper understanding of how specialized knowledge indirectly supports their work. This cumulative learning effect can result in an improvement over time (positive slope). The lack of significant variance in the intercept for this dimension suggests that trainees generally start with similar levels of perceived integration, possibly due to a shared understanding of the relevance of specialized knowledge at the beginning of their training, reflecting a common baseline at a deeper pedagogical level. While both dimensions evaluate pedagogical cooperation, they exhibit distinct patterns of growth curves. It is logical that trainees, at the onset of training, possess varying levels of understanding regarding how school knowledge directly applies to workplace issues. However, they share a common level of deeper understanding about the implicit integration between them.

The decline in the Practical Relevance of School Learning may not necessarily be negative, especially when viewed in light of the concurrent increase in the perception of Integration of Specialized Knowledge. This suggests that as trainees progress, they may move away from expecting direct applicability of school learning to workplace tasks and instead develop a more nuanced understanding of how specialized knowledge indirectly supports their professional roles. To facilitate this transition more smoothly:

- Structured Sessions and Guidance: Training programs should incorporate mentorship-guided structured sessions, encouraging trainees to adopt a systematic approach to problem-solving and to apply abstract concepts to predict outcomes. These approaches help trainees adapt from school-based learning to workplace practice. To link practice back to theory, a reflective observation process is essential for transforming experiences into learning, allowing trainees to question the validity and usefulness of their experiences. Additionally, an abstract conceptualization process helps students understand general concepts by relating them to concrete experiences and reflective observation. This aligns with Kolb's Experiential Learning Theory, which emphasizes bridging the gap between theory and practice to improve students' comprehensive understanding through active experience and involvement (Pamungkas et al., 2019). The goal is to support trainees in shifting their focus from seeking immediate, tangible results to deeply integrating school-based knowledge with workplace skills, fostering a holistic and comprehensive understanding.
- Gradual Integration of Complexity: A Kolb-based training curriculum is designed to progressively introduce more complex, real-world tasks, illustrating how specialized knowledge becomes more relevant over time (Pamungkas et al., 2019). The progression follows Kolb's stages: from diverging (feeling and seeing) to assimilating (seeing and thinking), then to converging (thinking and doing), and finally to accommodating (feeling and doing). This approach helps trainees recognize the evolving nature of

their learning in the process of moving from simple tasks to more complex workplace challenges.

- Value of Long-Term Relevance: The integration of school-based knowledge and workplace skills is a long-term process. To maintain motivation, training programs should offer learning opportunities that trainees can immediately apply, while also emphasizing the cultivation of deeper, specialized knowledge that will prove invaluable later in their careers. From the beginning, educators and workplace supervisors should communicate the long-term value of specialized knowledge. Rather than focusing solely on immediate results, trainees should understand that the skills and knowledge they are acquiring will significantly contribute to their career development over time. The goal is to help trainees shift their expectations from short-term, tangible outcomes to appreciating the long-term benefits of their theoretical learning.

The dimension Transparency and Organization of Training involves the clarity, structure, and organizational aspects of the training program, including communication and procedural transparency. Organizational structures and communication policies tend to be stable and consistent throughout the training period, leading to stable perceptions over time (non-significant slope). Trainees might be unfamiliar with dual training system and have varied initial perceptions based on their prior experiences or individual expectations, which explains the significant variance in initial perceptions (intercept).

The stability in the perception of Transparency and Organization of Training suggests that these aspects of vocational training are well-maintained throughout the program. However, the variance in initial perceptions points to the need for clear communication at the outset to ensure all trainees understand the structure and expectations of the program.

- Clear Orientation Programs: Implementing robust orientation programs that provide detailed information about the structure, policies, and expectations of the training program can help standardize trainees' initial perceptions. This will help ensure that trainees start with a solid understanding of how the program is organized and what is expected of them.
- Maintaining Organizational Standards: The consistency in perceptions of transparency and organization reflects strong organizational practices. Vocational training programs should continue to uphold these standards while ensuring that any changes or updates are clearly communicated to trainees.

The findings reflect the complex and dynamic nature of trainees' experiences with school-workplace cooperation. The decline in the perceived practical relevance of school learning, the improvement in the integration of specialized knowledge, and the stability in transparency and organization of training highlight the importance of addressing these dimensions separately. Practical Relevance of School Learning is dynamic and context-dependent, Integration of Specialized Knowledge benefits from cumulative learning and application, and Transparency and Organization of Training tends to be stable due to standardized organizational practices.

5.2 Effects of TIVs

We find Gender Effect and Age Effect on the initial level of the perception of practical relevance of school learning. These results highlight important demographic influences on trainees' initial perceptions of the practical relevance of their school learning. Gender and age were significant factors, with male and older trainees starting with a less favorable view of the practical relevance of their education. Older trainees may have had more opportunities to be exposed to different workplace environments before their entrance into their actual training program. Consequently, they may have a clearer understanding of how theoretical concepts translate into practical skills based on their prior experiences. Gender effect regarding work roles and responsibilities may shape perceptions of practical relevance. For example, males may perceive their education as more relevant if it aligns with perceptions of hands-on skills required in technical settings, while females may prioritize aspects such as communication or organizational skills that are traditionally associated with administrative roles (Anker, 2001; Barbezat, 2003). Furthermore, the occupation industrial management assistants has seen higher representation of females (BIBB, 2020; 2021; 2022), female trainees may perceive their school-learning as more directly applicable to the workplace.

Educational level influences trainees' perception of the Transparency and Organization of Training (one sub-dimension of trainees' experiences of school-workplace cooperation) with a positive intercept and a negative slope due to several factors. Trainees with higher prior educational levels (such as "Fachhochschulreife" (enabling advanced technical college studies) and "allgemeine Hochschulreife" (allowing university studies)) may begin their training with a stronger foundation in organizational and structural understanding. This initial preparedness can lead to a higher initial perception of transparency and organization in their training. Additionally, higher prior educational levels often come with higher standards for organizational practices. Trainees with such backgrounds might initially perceive the training structure as more transparent and well-organized because it aligns with prior experiences. Over time, trainees with higher educational levels might develop a more critical perspective and start noticing inconsistencies or areas for improvement that were not apparent initially. This growing awareness can lead to a decline in their perception of transparency and organization. Furthermore, higher prior educational levels might enable trainees to handle more complex tasks and responsibilities. As they advance, the training might become more intricate, and the organizational aspects might seem less transparent and more challenging to navigate, causing a negative slope in their perception. However, this assumption whether trainees handle more complex tasks and responsibilities should be tested based on the concurrent competence during their training, rather than solely prior educational level.

These findings concerning the significant influence of gender, age and prior educational level on how trainees perceive the school-workplace cooperation highlight the importance of programs offering flexible, personalized learning paths and regular feedback and adjustment to help keep trainees engaged and aware of the trajectory of their learning.

- Addressing Gendered and Occupational Perceptions: Gender sensitivity measures in educational sectors, aimed at imparting knowledge about structural gender inequalities and fostering collaboration to reduce them, are gaining increasing attention (see Steinweg et al., 2023). To promote gender equity and balanced skill development in VET, it is essential to incorporate gender-sensitive strategies from macro to micro levels. Introducing both male and female mentors who have successfully navigated industrial management roles can demonstrate the importance of both technical and organizational skills for career success, while also helping to balance gendered perceptions of school-based learning. Alongside this, gender-sensitive assessment criteria should be implemented. Diversifying the assessment framework to account for traditionally gendered skillsets ensures that both male and female trainees feel their strengths are acknowledged. Additionally, regular gender sensitivity training for staff help foster a more inclusive environment where trainees, regardless of gender, feel supported in their development and empowered to succeed.
- Gender and Age-Specific Interventions: Not all trainees transition smoothly from valuing the immediate applicability of school learning to appreciating the deeper integration of specialized knowledge. To address these differences, early-stage interventions that cater to the specific needs of male and female trainees, as well as younger and older participants, are essential.
- Workshops that emphasize both soft and hard skills can be instrumental in balancing gendered perceptions of relevant knowledge. For instance, showcasing the importance of soft skills like communication alongside technical expertise in various workplace settings helps trainees understand that both are crucial for success. This approach allows male trainees to value soft skills and female trainees to recognize the importance of technical skills, fostering a more holistic view of workplace competencies. Customized onboarding programs for older trainees to link theoretical concepts to the trainees' prior experiences can effectively help bridge the gap between previous knowledge and current training.
- International VET programs provide examples of personalized, need-oriented initiatives that address gender and age-specific requirements. Programs that focus on gender-sensitive measures, such as those highlighted by Dietz et al. (2021), offer concrete strategies for analyzing and addressing gender-specific needs while providing context-specific support. These tailored interventions into vocational education and training can help ensure that all trainees, regardless of gender or age, receive the support they need to navigate their learning journey successfully by acknowledging the diverse needs of trainees.
- Adapting Training for Different Educational Backgrounds: Training programs should be adapted to maintain engagement and satisfaction across different educational levels. From the outset, providing clear and comprehensive explanations of the training structure can help align expectations. As the program continues, regular feedback opportunities allow trainers to assess how trainees' perceptions evolve, ensuring that any misalignment in expectations can be addressed before dissatisfaction sets in. Additionally, incorporating more advanced organizational and project management training can offer these trainees practical applications for their higher expectations, keeping them engaged by providing leadership oppor-

tunities within the training context. By continuously monitoring perceptions and adjusting the organizational approach to better meet the expectations of trainees with advanced educational backgrounds, the training can remain responsive and supportive, ensuring that all participants feel their needs are addressed throughout the program.

Another important finding is that the level of digitalization significantly and positively influences the growth rate of trainees' perception of the practical relevance of school learning. However, the other two dimensions of experienced school-workplace cooperation were not statistically influenced by this factor. This may be because the integration of specialized knowledge depends more on curriculum measures than on infrastructure such as digitalization. Teachers and trainers with higher media-didactic competence are better equipped to leverage digital tools based on various didactic concepts and learning situation goals (Ma & Winther, 2024). The dimension of transparency and organization of training depends more on policies and strategies and is relatively stable, rather than being influenced by the level of digitalization.

The findings indicate that digitalization positively impacts trainees' perceptions of the practical relevance of school learning but does not significantly influence the deeper integration between school-based knowledge and workplace-based practice. This suggests that the deeper integration may be more closely tied to the media-didactic competence of teachers and trainers, who are responsible for effectively using digital tools. Therefore, training programs should prioritize developing media-didactic competence in educators and incorporating more digital tools and platforms into the curriculum to enhance both learning and workplace preparedness.

- Professional Development for Educators: Offer professional development programs aimed at building media-didactic skills, enabling teachers and trainers to effectively integrate digital tools that connect theoretical knowledge to real-world applications. These programs should cover digital pedagogy, the use of simulations, interactive learning platforms, and digital collaboration tools to create more engaging and relevant learning experiences.
- Incorporating Digital Platforms into Curriculum and Work-Based Learning: Expand the use of digital tools that allow trainees to collaborate virtually, analyze real-time data, and participate in digital simulations that mirror workplace challenges. This not only enhances the perception of school-workplace cooperation but also equips trainees with the skills needed for an increasingly digitalized work environment. Educators should incorporate media-didactic practices into their daily teaching routines to strengthen the integration of digital tools in both theoretical and practical learning contexts.

5.3 Effects of TVPs

The expected grade in the TVP has a reversed effect on the perceived Practical Relevance of School Learning during the final stage of training. In the initial and middle stages, in line with assumptions and previous research findings, trainees with higher expected

grades may believe that the knowledge acquired in school can be directly applied to meet workplace requirements, and this belief leads them to evaluate this aspect more critically (Berger, 1999; Wenner, 2022), resulting in a decline. However, in the final stage, there is a shift in perspective towards a deeper understanding of theoretical concepts and their broader implications in the workplace. This change in mindset prompts a reassessment of the perceived Practical Relevance of School Learning, leading to the reversed effect on the TVP expected grade. This interpretation is further supported by the significant positive impact of the expected grade predictor on the Integration of Specialized Knowledge at T1, indicating that trainees expecting better grades tend to focus on deeper integration rather than immediate application.

This reversed effect of trainees' expected grade also serves to highlight the existence of a long-term effect. To address this, monitoring trainees' performance expectations can provide valuable insights into their perception of school-workplace cooperation. By regularly assessing these expectations through check-ins, performance reviews, and reflective sessions, educators can tailor the curriculum to better support trainees' evolving needs. For those with high expectations, curricula should be designed to enhance deeper pedagogical cooperation, providing them with challenging tasks that align with their high performance goals. For trainees with lower expectations, the curriculum should focus on offering additional support to help them overcome difficulties and foster greater engagement with school-workplace integration. Ultimately, being sensitive to trainees' performance expectations allows educators to adjust the curriculum dynamically, ensuring that school-workplace cooperation is reinforced and trainees are fully supported in their development, regardless of their initial expectations.

The other TVP, corona measures, also has limited effect on the contemporary perception of school-workplace cooperation. The dimension "Integration of Specialized Knowledge," which is assumed to be more dependent on curriculum and didactic factors, and the dimension "Transparency and Organization of Training," which perhaps involve more stable policies and strategies, were statistically not influenced by corona measures.

The limited impact of pandemic-related measures on school-workplace cooperation, particularly in the dimensions of "Integration of Specialized Knowledge" and "Transparency and Organization of Training," suggests that disruptions caused by the pandemic did not significantly affect curriculum-based or policy-driven aspects of training. This finding implies that temporary external factors, such as the pandemic, can be buffered through robust curricula and policies, ensuring continuity in the integration of specialized knowledge and the organization of training processes. This was especially true during the pandemic crisis, where there was strong commitment from both teachers and students, as well as the training companies, to continue learning processes digitally in order to safeguard trainees' progress toward their vocational qualifications (Maier, 2020).

5.4 Study Limitations and Future Research

It is important to note that in this study, we based our findings on prior research and included only a limited scope of predictors. The variability of experienced school-workplace

cooperation might be influenced by various factors such as individual characteristics (e.g., age, gender), contextual factors (e.g., digitalization level, pandemic-related measures), and possibly other unmeasured variables. For example, the growth in perceived integration of specialized knowledge may result from better curriculum alignment, improved teaching methods, or increased opportunities to apply specialized knowledge in the workplace. Investigating the dimension of transparency and organization of training should consider more macro-level factors such as cooperation and communication strategies and policy. This also raises the question of whether trainees can accurately perceive and evaluate these factors.

In conclusion, this study confirmed the various subdimensions of trainees' experiences in school-workplace cooperation, highlighting their diverse growth dynamics and the varying perceptions among individual trainees. Further research is required to develop predictive models across different levels, from micro to macro, in order to identify and understand these factors. This knowledge can then be used to customize interventions and support to effectively address the unique needs of each trainee. Several key directions for future research can be derived from these findings, including but not limited to:

1. Causality Instead of Correlation: While this study identifies correlations between trainees' perceptions of school-workplace cooperation and TVPs, future research should focus on determining whether a causal relationship exists. For example, the positive relationship between desired grades and the perception of Integration of Specialized Knowledge raises the question of whether ambitious trainees perceive deeper school-workplace cooperation at a pedagogical level—potentially due to psychological factors such as goal-oriented attention—or if the perception of greater integration of specialized knowledge enhances trainees' self-confidence and ambition. Understanding causality would provide more actionable insights for educational program design and curriculum development.

2. Using School-Workplace Cooperation as Predictors for Training Outcomes: In this study, we used TIPs and TVPs to explain the perception of different dimensions of school-workplace cooperation. Future studies could explore the potential of school-workplace cooperation as a predictor for broader training outcomes, such as long-term career success or satisfaction. By analyzing how cooperation between educational institutions and workplaces influences these outcomes, researchers can gain deeper insights into the long-term benefits of strong school-workplace integration.

3. Analyzing the Effect of Concrete School-Workplace Cooperation Strategies: In this study, although we distinguished between three dimensions of school-workplace cooperation, further research should investigate the specific strategies used to enhance school-workplace cooperation and their effectiveness in improving both practical skills and theoretical knowledge integration. By analyzing different cooperation models (e.g., digital learning platforms, mentoring programs, project-based learning), researchers can identify best practices that contribute to more effective training programs. This could lead to more targeted interventions that ensure a stronger and more seamless connection between school-based education and workplace demands.

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Appendix

Table A1: Sample Characteristics

Aspect	Coding	Frequency	Percentage	Valid Percentage	Cumulated Percentage
Gender n = 455	Female	291	63.5	64	64
	Male	164	35.8	36	100
Educational Level (highest school leaving certificate) n = 456	Below Secondary school (e.g. Hauptschulab-schluss)	1	0.2	0.2	0.2
	Secondary school certificate (Mittlere Reife)	91	19.9	20.0	20.2
	Advanced technical college (Fachhochschulreife)	133	29.0	29.2	49.3
	General higher education certificate (allgemeine Hochschulreife/Abitur)	231	50.4	50.7	100
Expected Grade n =602	1.0 – 1.5	116	25.3	26.2	26.2
	1.6 – 2.0	237	51.7	53.6	79.9
	2.1 – 2.5	81	17.7	18.3	98.2
	2.6 – 3.0	7	1.5	1.6	99.8
	3.1 – 3.5	1	0.2	0.2	100
Language(s) (spoken at home) n = 453	Only German	344	75.1	75.9	75.9
	More than German	101	22.1	22.3	98.2
	Only other than German	8	1.7	1.8	100
Company Size (Number of employees) n = 438	1 – 5	2	0.4	0.5	0.5
	6 – 10	2	0.4	0.5	0.9
	11 – 20	9	2.0	2.1	3.0
	21 – 50	30	6.6	6.8	9.8
	51 – 100	49	10.7	11.2	21.0
	101 – 250	95	20.7	21.7	42.7
	251 – 500	105	22.9	24.0	66.7
	501 – 1000	68	14.8	15.5	82.2
	>1000	78	17.0	17.8	100

Aspect	Coding	Frequency	Percentage	Valid Percentage	Cumulated Percentage
City Size (location of company) n=431	Large city with a population of 100.000 or more	67	14.6	15.5	15.5
	Medium-sized city with a population between 20.000 and 100.000	181	39.5	42.0	57.5
	Small town with a population under 20.000	183	40.0	42.5	100

Table A2: Scale Statistics

Scale	Time point	Item Number	Cronbachs Alpha	M	SD
Practical Relevance of School Learning	T0	4	0.736	2.51	0.73
	T1	4	0.723	2.06	0.69
	T2	4	0.788	1.83	0.76
	T0	3	0.794	2.53	0.74
	T1	3	0.661	2.51	0.80
	T2	3	0.689	2.40	0.82
Transparency and Organization of Training	T0	3	0.636	2.40	0.80
	T1	3	0.689	2.23	0.84
	T2	3	0.671	2.13	0.87
Digitalization	T0	3	0.716	0.93	0.95
Corona Measures	T0	1		2.55	1.06
	T1	1		2.62	1.14
Expected Grade	T0	1		0.96	0.73
	T1	1		1.07	0.89
	T2	1		1.20	0.95