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Press the Button: Designing Learning from Home – The Teacher's Willingness to Change the School Work Routine

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Abstract

What are the challenges and prerequisites for successfully reshaping instructional practices for home-based or remote digital learning? The success of organizational change processes is largely contingent on the willingness of those involved. This article investigates the factors influencing teachers' readiness to digitize their daily work routines, particularly in terms of teaching and learning processes. A total of 72 teachers from vocational schools in Germany participated via the SmartSurvey App during the Covid-19 Pandemic. The quantitative analysis is structured across three levels: firstly, assessing how teachers adapted to the new reality of remote work; secondly, analyzing their readiness to navigate the new instructional landscape characterized by remote teaching and learning processes; and thirdly, exploring teachers' overall attitudes towards digital media and their competency in media-didactics, drawing connections to the remote utilization of digital tools.

Keywords: working from home, remote teaching-learning process, digital media, media-didactic competence, attitudes towards digital media

1. Introduction

1.1 New Digital Teaching-learning Concepts in Changed Organizational Structures

Contemporary advancements in technology have facilitated a significant shift towards remote work across various occupations and industries, a trend that has been further emphasized during the pandemic. The relocation of the workplace to the home environment emerged as a crucial strategy for maintaining economic activity while minimizing the risk of infection and reducing stress among employees (Neumann et al., 2020; DAK-Gesundheit, 2020; Ahlers et al., 2021). Empirical research conducted prior to the pandemic already indicated that remote workers tend to be more productive on average compared to their counterparts working in traditional office settings (Bloom et al., 2015). During the crisis, a majority of companies, employees, and job applicants expressed positive sentiments towards remote work and expressed a desire to retain this option even after the pandemic subsides (Felstead & Reuschke, 2020; Ernst, 2020; Stürz et al., 2020; Alipour et al., 2020). This preference can be attributed to various factors, including the elimination of commute-related stress, flexible work hours, and the opportunity to enhance digital skills through the digitization of work processes (Rubin et al., 2020; YouGov, 2020; IFES, 2020). Even as society gradually returns to normalcy post-pandemic, the desire to continue working from home is expected to grow substantially, heralding a new era in work organization (Alipour et al., 2020). However, the implications of remote work for teachers, particularly in the context of digitalization in education, remain underexplored. This raises important questions about whether teachers should also be considered as part of the privileged group entitled to home working arrangements and what factors contribute to the success or hindrance of remote teaching and learning concepts. Addressing these questions will be crucial in shaping the future of education and work practices in the in the age of digitalization. Investment in digitalization within the education system has indeed been increasing steadily, reflecting a broader trend towards incorporating technology into teaching and learning processes. To what extend technology plays a role in the relocation of the workplace for teachers? The potential benefits of sustainable remote work arrangements for teachers have not been extensively explored in scientific discourse. Questions remain about the feasibility of relocating teachers' workplaces to their homes and the potential barriers to implementing digital teaching and learning concepts in a remote work environment. Addressing these questions requires a comprehensive understanding of the complex interplay between technology, pedagogy, organizational culture, and individual preferences and needs of teachers.

Prolonged school closures have been empirically studied in various research focusing on teacher and school strikes (cf. Anger & Plünnecke, 2020). However, it's important to note that these findings may not directly apply to the relocation of teaching and learning activities to the home environment. Unlike strikes, the digital transition to remote teaching and learning requires widespread commitment from teachers, students, and other participants to ensure the continuity of educational processes through digital means. In this context, the pandemic served as a natural intervention, precipitating significant changes against the backdrop of a broad commitment among stakeholders to maintain teaching-learning processes digitally (Maier, 2020). This commitment underscores the unique nature of the pandemic-induced shift to distance learning, with collaborative efforts aimed at adapting to the new reality of remote education while safeguarding the desired qualifications. The altered work reality is characterized by two main aspects: the emergence of a new home working reality for teachers, facilitated by digital media, and the systematic shift from traditional face-to-face teaching to e-learning, resulting in a novel didactic-methodological instructional landscape.

1.2 Changed Work Reality

1.2.1 Teacher's Home Working Access and Use

First and foremost, the question arises regarding the availability of the option for teachers to work from home. The transition of teachers' work from schools to home encompasses various aspects of school work routines, including the organization of remote teaching processes, communication among stakeholders in education and training system, and the provision of close advisory support to students.

Insights from research conducted by Mergener (2020) on home working access are particularly intriguing. This study indicates that access to remote work is primarily granted in occupations characterized by predominantly cognitive tasks and minimal manual activities. Specifically, within the occupational group of "teaching and training occupations" (classified according to Bundesagentur für Arbeit, 2010), over 70 percent of employees have access to home working opportunities. Consequently, in theory, teachers could perform their duties from home (cf. Mergener, 2020). Interestingly, at the activity level, the average intensity of teaching and training activities does not significantly affect the likelihood of home working access, as evidenced by Mergener's findings (2020). However, engagement in other higher cognitive activities, such as development, advertising, marketing, and organization, significantly enhances the probability of accessing remote work opportunities. Why does the theoretical potential for home working access among teachers contrast with the lack of correlation between teaching and training tasks and actual home working opportunities?

In the post-COVID era, tech giants like Twitter and Facebook are committing to permanent remote work options for their employees. This acknowledgment underscores a potential shift where remote work becomes the norm rather than the exception for occupations characterized by predominantly cognitive tasks. However, in contrast to this trend, the education sector is striving to return to traditional face-to-face teaching practices. Efforts are underway to support the digital transformation of schools, as evidenced by initiatives like DigitalPakt School 2019 to 2024, The digitization of the German education and training system is crucial; however, it seems that the current efforts are not fully leveraging the potential of remote work of teachers. The reasons behind this underutilization of remote work in teaching and training activities have not been extensively documented. Available evidence suggests that teachers are generally open to the idea of conducting administrative tasks remotely, such as email management and research. However, there is reluctance when it comes to instructional tasks, possibly due to didactic barriers, institutional policies, and technological limitations.

1.2.2 Distance Learning?

In the literature, it is argued that the successful implementation of distance teaching-learning processes relies on the competent use of digital media (Kerres, 2013). However, existing findings regarding the digitalization of the German school system reveal a significant desideratum: the integration of digital media into everyday school life is highly heterogeneous. While digital media usage in the classroom is not yet commonplace, with only around 30 percent of students reporting regular use according to the 2018 PISA survey (Eickelmann et al., 2019; Bofinger, 2007; Senkbeil & Wittwer, 2007; Wiedwald et al., 2007), they are often employed as supplementary tools rather than integral components of learning arrangements. This trend is particularly pronounced in media-didactic research, which tends to focus on individual digital media applications or their use as supportive tools in classroom teaching, rather than on the development of comprehensive distant teaching-learning concepts. One explanation for this limited integration may be found in research emphasizing the drawbacks of digital media, such as reduced learning motivation, success, and efficiency, despite theoretical arguments and empirical evidence supporting the benefits of e-learning (Kerres, 2013, p. 79). Consequently, digital learning media are often relegated to a secondary or supplementary role in the context of successful teaching and learning processes, with little support for replacing traditional face-to-face teaching with e-learning (Kerres, 2013, p. 8).

1.2.3 Shaping Change

To some extent, the pandemic served as a catalyst for change, prompting a significant shift in the way teaching and

learning processes are conducted. This shift, brought about by the necessity of remote teaching, introduced a new working reality where educators are required to facilitate the teaching-learning process from their homes. This change not only poses logistical challenges but also necessitates a reevaluation of organizational structures to ensure the continued quality of education delivery. Interestingly, crises like the pandemic can accelerate the adoption of organizational changes as stakeholders recognize the urgency for adaptation. The reason is that the personal beliefs that change processes are necessary are growing (Holt et al., 2007). Leveraging theories of organizational change can offer valuable insights into how educational institutions can effectively navigate and respond to these challenges (Figure 1).

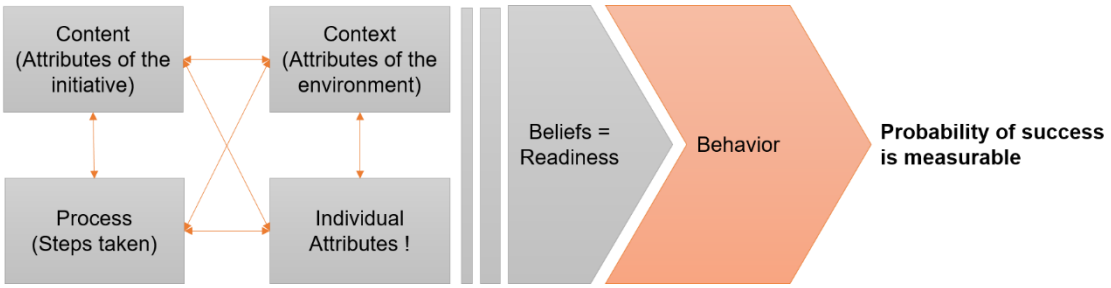

Figure 1. Four-factor model of willingness to change (Adapted from Holt et al., 2007, p.235)

The theoretical model suggests that the closer the changed work reality aligns with the usual work routine and the more effectively the change process is supported, the greater the willingness of the involved actors, thus increasing the likelihood of successful organizational change. In the context of teachers working from home, characterized by the implementation of remote teaching-learning processes and management of organizational and technical tasks (cf. MSB NRW, 2020, p.7), this implies that: the more acquainted teachers are with designing digital/distance teaching-learning processes and the more seamlessly learning technologies and digital media are integrated into their daily work routines, the more readily they will adapt to and implement the altered work requirements. In essence, it can be inferred that with enhanced integration of digital media and learning technologies into everyday school practices, the overall transition to working from home is expected to be smoother and more effective.

1.2.4 Impact of Digital Transformation on Vocational Training

Vocational schools, also known as trade or technical schools, offer specialized education and training designed to prepare students for specific trades or careers. These programs emphasize practical skills and hands-on experience in fields such as business management, engineering, healthcare, and automotive repair. Vocational education provides pathways to employment for students who prefer not to pursue traditional academic routes and is a critical component of educational systems in many countries. A notable feature of vocational education in countries like Germany, Austria, and Switzerland is the dual training system. This approach combines classroom instruction in vocational schools with on-the-job training in companies, allowing students to apply theoretical knowledge in real-world settings. In Germany, vocational education often begins after the completion of secondary education (around age 15 or 16), with students typically ranging from ages 16 to 25 (BIBB, 2021). As these young students prepare for careers in an increasingly digital world, vocational education must adapt to the changing landscape of work processes.

Work processes are rapidly changing due to digital transformation, known as "Industry 4.0," which affects all industries by altering work and production processes (Hasenbeck, 2019; Hirsch-Kreinsen, 2017). These digitally driven transformations have significant implications for existing organizational structures, customer relationships, and business models, which are increasingly being aligned with the digitalization of products, services, and processes (Sczogiel et al., 2019). As a result, competency requirements for professionals are evolving (Brötz et al., 2014). In this context, vocational training must increasingly focus on competency development required in more digitalized and authentic scenarios (Anselmann et al., 2022; Spöttl & Windelband, 2021). Hybrid models, combining online learning with limited in-person sessions, are being explored (Johnson et al., 2020). However, the success of such models depends on a careful investigation of the readiness of vocational education and training (VET) participants—including teachers, trainers, and trainees—to adapt their work and learning routines. Challenges such as access to job-specific equipment and tools, and maintaining engagement in a virtual setting, must be addressed to ensure effective implementation.

2. Research Questions and Hypotheses

This article explores the factors influencing teachers' readiness to adapt their daily work routines, particularly their teaching processes. The analysis is conducted at three distinct levels:

Analysis Level 1: Within the education system, the rapid expansion of remote working opportunities due to the pandemic has introduced numerous challenges and obstacles. These include limited digitization of work processes and difficulties

in providing employees with necessary communication tools (Ernst, 2020; Fraunhofer, 2020), leading to complaints about the stressful nature of working from home for many individuals. A study utilizing data from the Harvard Business School workforce survey (Hövermann, 2021) indicates that industries with better preparedness for digital challenges prior to the crisis find the transition to remote work more manageable. Furthermore, satisfaction with remote work is strongly associated with a desire to continue working from home post-pandemic (Ahlers et al., 2021). According to the theory of "organizational change" (Holt et al., 2007), we made the following assumptions:

• Organizational changes can be successfully implemented if the changed work reality is more closely oriented to the usual work routine.

• One indicator of familiarity with work routines is the degree of the integration of digital media into everyday school life before the change.

The following hypothesis can be derived from these assumptions: A good integration of digital media into everyday school life before the pandemic increases the willingness of teachers to master the organizational and technical transition to the new reality of working from home (H1).

Analysis level 2: In addition to the willingness to change on a non-teaching level, the focus here is in particular on the willingness of teachers to systematically replace classic face-to-face teaching with digital teaching-learning processes. Eder (2010a, 2010b) empirically identified the following hurdles of the use of digital media in schools:

(1) Lack of computer equipment or temporary technical faults

(2) Teacher's attitude towards the pedagogical-didactical added value of digital media for teaching-learning processes

(3) Competence deficits of teachers

(4) Time or organizational problems in schools

Against the background of the pandemic conditions, we made the following assumptions:

• Schools encouraged and supported working from home, time or organizational problems are no longer seen as an obstacle to the integration and use of digital media. Computer equipment or temporary technical disruptions are operationalized in the present study as home working conditions.

• In addition to the teacher's attitude towards digital media and the teacher's media-didactic competence, the media competence of the students, as perceived by the teacher, can also influence the willingness for digital implementation.

The following hypothesis can be derived from these assumptions: A good integration of digital media into everyday school life before the pandemic increases the willingness of teachers at a didactic-methodical level regarding to the attitude of the teachers towards digitization, the media-didactic competence of the teachers and the media competence of the students perceived by the teachers. (H2).

Analysis level 3: Here we take a closer look at teachers' willingness to implement teaching-learning processes from home.

The teacher's attidtude towards digital media and their effectiveness in remote instructional processes are evident in their computer-related and media competence, which facilitates their working methods (cf. Lorenz & Endberg, 2016). This suggests that the acceptance or rejection of digital media is not solely determined by the objective level of digital media integration in daily classroom activities, but rather by the subjective perception of the limitations and benefits experienced in teaching practice. Moreover, the teacher's own media-didactic and digital competence influence the extent to which their instructional concepts are executed using digital media. Based on these observations, the following hypothesis is proposed: The teacher's media-didactic competence serves as a mediator of the relationship between the integration of digital media in everyday school practices and the teacher's attitude towards digital media (H3). Additionally, it is posited that for teachers accustomed to traditional materials such as blackboards and textbooks, the barrier to implementing e-learning lies not in technological proficiency, but in pedagogical execution (H4). Given that IT specialists typically handle maintenance, software procurement, and technical equipment administration for digital media usage, basic computer skills suffice for teachers to utilize digital tools in teaching. However, it is the perceived pedagogical and didactic value of digital media for teaching and learning processes that predominantly influences teachers' preference for traditional tools over digital ones (Eder, 2010a, Eder, 2010b).

The hypotheses formulated thus far address the familiar work routines of teachers and their readiness to adapt to technical, organizational, and didactic changes. To further elucidate the analysis, we propose considering the actual utilization of digital media in crafting distant teaching-learning processes as an additional determinant of the altered work environment. We anticipate that incorporating the actual use of digital media for teaching and learning purposes will enhance the predictive capacity of both teachers' media-didactic competence and students' media competence. Specifically, we hypothesize that the model will demonstrate improved predictive capabilities for teachers' media-didactic competence

and students' media competence when it encompasses the practical utilization of digital media for teaching, surpassing the mere integration of digital media into daily instructional practices (H5).

Figure 2 delineates the operationalization of these concepts and terms, depicting the relationships among the various variables under consideration.

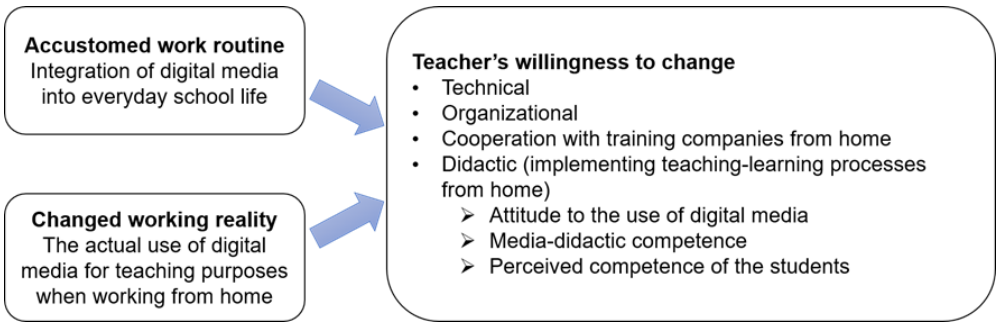

Figure 2. Operationalization

3. Method

3.1 Sample

We conducted the survey during the pandemic from March to June 2021 via the SmartSurvey App[1]. Our sample consisted of 72 vocational school teachers from North Rhine-Westphalia (NRW) and Baden-Württemberg, Germany. Participants were recruited through email invitations and professional networks, targeting educators actively involved in vocational training programs. Before beginning the survey, participants received detailed written information outlining the study's purpose, procedures, potential risks and benefits, and the confidentiality of their responses. This information was presented on the initial page of the survey. Participants were informed that their involvement was entirely voluntary, and they had the right to withdraw from the study at any time without any repercussions. Consent was implied through the completion of the survey, as participants had to acknowledge that they had read and understood the information provided. This process ensured that all participants were fully aware of their rights and the nature of the research before contributing their responses. Only those participants who completed the questionnaire were considered in the following analysis. On average, the respondents have been working as vocational school teachers for 14 years (Max = 38, Min = 1, SD = 7.37). The years of professional activity will be used as a control variable in the following analysis.

3.2 Construction of the Questionnaire

The questionnaire was meticulously crafted to encompass the distinctive features of business vocational schools. The scale "Integration of Digital Media into Everyday School Life" is designed to assess the extent of digitalization in schools prior to the closures prompted by the pandemic. Respondents are asked to indicate their level of agreement with four statements using a 5-point Likert scale, which ranges from "Completely agree" to "Do not agree at all." One example item from this scale is: "We are currently using digital learning forms and media that we have been implementing at the school for a long time."

The segment titled "Actual Use of Digital Media for Teaching Purposes when Working from Home" focuses on three key teaching activities: lesson preparation, lesson design, and the dissemination of learning materials. The section includes specific inquiries into the following areas: (1) Availability of Digital Learning Applications for Course Preparation: This is assessed with three items using a dummy code format to indicate whether digital learning applications are available (yes) or not available (no). (2) Frequency of Creating Various Digital Course Formats: This is measured using five items on a 5-point Likert scale, ranging from " several times per week" to "never". (3) Mediums Used for Distributing Learning Materials: This includes seven items using a dummy code format to denote availability (yes or no) of various distribution methods. The assessment considers both synchronous methods (e.g., video conferencing) and asynchronous approaches (e.g., recorded lecture videos). Additionally, the segment examines the use of general tools such as calculation programs and design software, as well as learning media like learning management systems and platforms. It also includes job-specific software such as ERP and Workflow 2.0.

The section titled "Organizational and Technical Transition to Working from Home" was assessed using a single, broadly formulated item that solicited feedback from teachers. Respondents rated their experiences on a 5-point scale, ranging from "very good" to "very bad". Additionally, due to Germany's dual-training system, which divides learning between

[1] The mobile app "SmartSurvey" was developed as part of the DFG-funded project "INTERCONNECT"; it is available on iOS and Android.

companies and vocational schools, we evaluated cooperation with training companies using five statements. This aspect is crucial for understanding the unique organizational responsibilities of teachers at vocational schools when working remotely. Respondents were asked, "To what extent do you agree with the following statements during the Corona period…". An example statement includes: "…there are binding agreements between the vocational school and the company on how collaboration will continue." Participants rated their agreement on a five-point scale from "Completely agree" to "Do not agree at all."

The scale measuring Teachers' Attitudes toward the Use of Digital Media comprised four items. Among these, two items explored teachers' preferences regarding digital learning media versus traditional materials, as well as their satisfaction levels with the use of digital media, based on their direct assessments. The remaining two items delved into teachers' inclinations toward mastering digital teaching media through further professional training, indirectly gauging their attitudes toward digital tools. An example item is: " Special training programs to learn how to use digital learning media (e.g., virtual classrooms, learning platforms) are very important for my career." Participants rated their agreement on a five-point scale from "Completely agree" to "Do not agree at all."

Teachers self-evaluated their media-didactic competence using a five-point scale, which consisted of five items assessing their proficiency in both the technical and didactic aspects of digital learning media. The items included both direct inquiries and indirect questions, such as whether teachers regularly participated in training courses aimed at enhancing their media-didactic competence. The scale measuring students' media competence as perceived by teachers comprised three items that gauged teachers' perceptions of their students' proficiency in e-learning on a five-point scale.

To account for the conditions of working from home, we recorded factors such as equipment availability, household disturbances, and stress levels, which could potentially influence teachers' remote work experiences. An example item is: "When working from home, I am often disturbed by the people in my household." Participants evaluated the extent to which they agreed with the statement on a five-point scale, ranging from "Completely agree" to "Do not agree at all."

4. Results

4.1 Examination of the Prerequisite

We performed a factor analysis to investigate the questionnaire's structure and the underlying variables. The distribution of items across scales closely aligned with our expectations, confirming the theoretically derived structure. However, one item from the Teachers' Media-didactic Competence scale and one item from the Integration of Digital Media in Everyday School Life scale did not load onto the expected factors and were consequently excluded from subsequent analysis. The results of the reliability and normal distribution test, assessed using the Shapiro-Wilk test, are summarized in Table 1.

Table 1. Scale Characteristics: Number of Items, Alpha, Normal Distribution, Mean and SD

Scale	Number of Items	Cronbach's Alpha	Normal Distribution	M	SD
Integration of digital media into everyday school life	4	0.695	Yes	2.97	0.88
Cooperation with training companies	5	0.768	Yes	3.17	0.90
Teachers' media-didactic competence	5	0.808	No	3.52	0.87
Attitude to the use of digital learning media	4	0.761	Yes	3.45	0.87
Perceived media competence of the students	3	0.806	No	2.52	0.94
General technical transition to working from home	1		No	3.04	1.33
General organizational transition to working from home	1		No	2.43	1.16
Conditions of home working	5	0.731	No	4.02	0.81

Two scales have a Cronbach's alpha higher than 0.8, indicating good reliability, while three scales have a Cronbach's alpha higher than 0.7, suggesting acceptable reliability. Only one scale, "Integration of Digital Media into Everyday School Life," has a Cronbach's alpha slightly below the traditional threshold of 0.7. Although a Cronbach's alpha of 0.7 and above is generally considered acceptable, a slightly lower alpha can be deemed acceptable in social and educational research under certain conditions (George & Mallery, 2003; Kline, 2000). Given that this scale is newly developed and encompasses various aspects of digitalization in schools, which can introduce more variance and reduce reliability, a

Cronbach's alpha of 0.695 is considered acceptable. Non-parametric methods (e.g., Pearson correlation) are applied for scales that lack a normal distribution.

4.2 Hypothesis Testing

Hypothesis 1: A good integration of digital media into everyday school life generally facilitates the organizational and technical transition to working from home.

The results of Spearman correlation show that The Integration of Digital Media in Everyday School Life correlates significantly with the General Technical Transition ($r_s = 0.371$, $p = 0.002$) and with the General Organizational Transition ($r_s = 0.356$, $p = 0.002$). Pearson correlation shows that The Integration of Digital Media and the Cooperation with Companies from Home also correlate significantly ($r = 0.460$, $p < 0.001$). According to Cohen (1988), this is a medium effect. If the conditions of home working are controlled, the correlation between the Integration of Digital Media and the Technical Transition ($r_s = 0.223$, $p = 0.070$) is no longer significant, the correlation between the Integration of Digital Media and the Organizational Transition becomes weaker but still remains significant ($r_s = 0.249$, $p = 0.042$).

Hypothesis 2: A good integration of digital media in everyday school life correlates positively with the attitude of the teachers towards digitization, the media-didactic competence of the teachers and the media competence of the students perceived by the teachers.

The result of the Spearman correlation shows that the Integration of Digital Media and the Teachers' Media-didactic Competence correlate positively ($r = 0.446$, $p < 0.001$). The correlation between the Integration of Digital Media and the Attitude of Teachers towards Digitalization is also significantly positive ($r = 0.311$, $p = 0.010$). A moderately positive correlation between the Integration of Digital Media and the Media Competence of the Students, as perceived by the teachers, can also be demonstrated ($r = 0.425$, $p < 0.001$).

Hypothesis 3: The teachers' media-didactic competence causes the actual correlation between the integration of digital media in everyday school life and the teachers' attitudes towards digitization.

The results show that both the Teachers' Attitudes and the Teachers' Media-didactic Competence correlate positively with the Integration of Digital Media. But if we control for the Teachers' Media-didactic Competence, the correlation between the Attitude and Integration of Digital Media is no longer significant ($r = -0.053$, $p = 0.670$). Thus, the hypothesis is confirmed.

Hypothesis 4: For teachers using "classic" materials such as blackboards and textbooks, the barrier is the instructional implementation in e-learning rather than the use of technology.

To take a closer look at teachers' attitudes towards the use of digital media for teaching and learning processes, we examined the correlation between the item "I like 'classic' materials, e.g., blackboards, textbooks better" and the item "I am technically good at designing the online lessons/learning tasks", and the correlation between the item "I like 'classic' materials, e.g., blackboards, textbooks better" and the item "I can do the online lessons/learning tasks well in terms of didactics". The results show that preference for "classic" materials correlates strongly negatively significantly with both the use of technology for designing e-learning tasks ($r_s = -0.571$, $p < 0.001$) and didactics ($r_s = -0.699$, $p < 0.001$). The correlation between the preference for "classic" materials and the use of technology is no longer significant when the item "I can do the online lessons/learning tasks well in terms of didactics" is controlled ($r_s = -0.224$, $p = 0.083$). The hypothesis is confirmed.

Hypothesis 5: The teachers' media-didactic competence and the students' media competence can be better predicted, if in addition to the integration of digital media in everyday school life, the model also includes the actual use of digital media for teaching purposes from home as a regressor.

In hierarchical regression analysis, in addition to the Integration of Digital Media in Everyday School Life, we included three variables of teaching activities when working from home as indicators of the Actual Use of Digital Media for Teaching Purposes as predictors in the regression model in blocks: forms of digital design of distance learning and their frequencies, digital learning applications available for lesson preparation, and media through which the learning materials were distributed.

The result of the hierarchical regression using Teachers' Media-didactic Competence as the criterion shows that model 1, which only contains the Integration of Digital Media as a predictor, accounts for 26.8% of the variance of the criterion. When three additional variables of Actual Use of Digital Media for Teaching Purposes from Home are also modeled as predictors, the explanation of the variance increases to 64.5%, corresponding to a change of 37.7%. The following table provides a step-by-step view of when predictors were entered into the analysis in blocks.

Table 2. Result of the hierarchical regression analysis with teachers' media-didactic competence as the criterion

Model – Criterion: Teachers' Media-didactic competence	**p-value**	**Percentage of variance explained**	**R-squared change**	**Sig. F change**
1. Predictor: Integration of digital media into everyday school life	0.000	26.8%	0.268	0.000
2. Predictors: Integration of digital media into everyday school life; Forms of digital design of distance learning and their frequencies	0.000	56.0%	0.293	0.001
3. Predictors: Integration of digital media into everyday school life; Forms of digital design of distance learning and their frequencies; Available digital learning applications supporting distance teaching-learning process	0.000	59.6%	0.036	0.266
4. Predictors: Integration of digital media into everyday school life; Forms of digital design of distance learning and their frequencies; Available digital learning applications supporting distance teaching-learning process; Media through which learning materials are distributed	0.000	64.5%	0.049	0.617

The table shows that although all models are significant, only then does the change in R-squared is significantly different from zero when, in addition to the Integration of Digital Media, the model also includes the design of distance learning as the predictor.

Table 3 summarizes the result of the hierarchical regression analysis using the Media Competence of the Students Perceived by Teachers as the criterion. The Integration of Digital Media enters on the first and then three indicators of the Actual Use of Digital Media for Teaching Purposes from Home on the second, third, and fourth levels in blocks. In each model, additional variance is explained by the stepwise inclusion of the variables, and all models are significant. But R-squared change for a single predictor (or a block of predictors) of each step is not significant, meaning that the proportion of variance in the Media Competence of the Students Perceived by Teachers that can be uniquely attributed to the predictors of interest is not significant.

Table 3. Result of the hierarchical regression analysis with media didactic competence as a criterion

Model – Criterion: **The media competence of the students perceived by teachers**	**p-value**	**Percentage of variance explained**	**R-squared change**	**Sig. F change**
1. Predictor: Integration of digital media into everyday school life	0.000	20.7%	0.207	0.000
2. Predictors: Integration of digital media into everyday school life; Forms of digital design of distance learning and their frequencies	0.008	28.7%	0.080	0.371
3. Predictors: Integration of digital media into everyday school life; Forms of digital design of distance learning and their frequencies; Available digital learning applications supporting distance teaching-learning process	0.006	37.7%	0.090	0.100
4. Predictors: Integration of digital media into everyday school life; Forms of digital design of distance learning and their frequencies; Available digital learning applications supporting distance teaching-learning process; Media through which learning materials are distributed	0.028	46.6%	0.089	0.497

5. Discussion

There is no shortage of interpretations regarding the implications of the 'corona crisis' for the education system, from technological advancements to challenges in equity and mental health (e.g., Zawacki-Richter, 2020; Zhang et al., 2020; Naff et al., 2022; Sulaiman et al., 2023). Merely referring to direct experiences during the pandemic is insufficient; a pedagogically relevant reflection on the long-term effects and consequences of this event necessitates a distanced retrospect. Post-pandemic, it becomes crucial to consider the extent to which the new working reality, prompted by the crisis, can impact training and education. This question can be approached from various angles.

On one hand, the spotlight has intensified on the digitization of the German education system. The introduction of initiatives like the DigitalPakt Schule 2019 to 2024 by the German federal government reflects a response to societal pressure and scientific calls for enhanced digitization in schools (BMBF, 2019; Kerres, 2020). However, viewed from a distanced perspective, trends toward working from home are apparent across numerous industries, particularly those involving cognitive activities. Can teachers also leverage the benefits of remote work optimally and eventually adopt home-based work as a sustainable arrangement? Against the backdrop of the underutilization of the potential of remote work, this study aims to address the research question: What factors complicate the new working reality, and conversely, what factors contribute to the success of working from home? The findings aim to shed light on teachers' experiences with remote work during the pandemic and draw insights for the future design of remote teaching-learning processes. This is particularly important for vocational education due to the ongoing digital transformation in the labor market, which demands new skills and competencies from both educators and students (Brötz et al., 2014). Beyond the context of vocational education, understanding the dynamics of remote work is crucial for the entire educational sector, as it informs how educational institutions can adapt to and incorporate digital tools and methods to enhance learning outcomes and

ensure the continuity of education in various circumstances (Freundl et al., 2012; Ibrahim et al., 2023).

The result of Hypothesis 1 indicates that the correlation between the integration of digital media into everyday school life and the technical and organizational transition loses significance when accounting for the conditions of home working. This suggests that the private environment of teachers at home varies and may not always support effective work, despite the prior integration of digital media into school routines. It underscores the influence of the home working environment on the transition to remote work. The conditions of home working, as explored in this study, focus on three key aspects: adequate equipment, technical support, and household environment in the home office. Firstly, having suitable technical equipment, such as stable computer networks and devices conducive to remote teaching, is essential for the seamless use of digital media for teaching purposes from home. Secondly, while qualified IT personnel may have facilitated the implementation of digital tools in schools before the pandemic, teachers may face technical challenges and a lack of support when working from home. Thirdly, apart from technical considerations, creating a conducive work environment at home is crucial for the successful implementation of digitized teaching-learning processes.

In Hypothesis 2, we established a positive correlation between the integration of digital learning media into everyday school life and teachers' willingness to change their work routines at the didactic level. Furthermore, the result of Hypothesis 3 indicates that the relationship between the integration of digital media and teachers' attitude towards the digitalization of teaching-learning processes is mediated by their media-didactic competence. Additionally, Hypothesis 4 confirmed that teachers' preference for "classic" materials, such as blackboards and paper textbooks, over digital tools is influenced by didactic factors rather than technical ones. Taken together, these findings suggest that simply providing or using digital learning media does not inherently influence teachers' attitudes. Instead, teachers must believe that their didactic concepts can be effectively realized using e-learning for them to embrace digital media for teaching purposes. This aligns with prior research indicating that teachers who recognize the importance of digital learning media and feel confident in their technological skills often encounter didactic challenges in practice. The key factor linking the integration of digital media into everyday school life and teachers' attitudes is their competence in using digital learning media in a meaningful didactic manner. This highlights that, regardless of the extent of technical/digital equipment integration in vocational schools, teachers face challenges in utilizing instructional technologies with appropriate didactic-methodical designs suitable for comprehensive educational programs, rather than just individual micro-didactic units. Given the more skeptical attitude of German teachers at vocational schools towards the added value of digital learning media compared to their counterparts in other European member states, there is a clear need to offer advanced and further training courses focusing on the didactic potential of digital media for teachers.

By incorporating the changed work reality alongside the usual work routines in Hypothesis, we aimed to elucidate the factors influencing teachers' willingness to transition to distant teaching-learning processes. Beyond the integration of digital media into the usual working mode, the forms and frequencies of designing distance teaching-learning processes also correlate with teachers' media-didactic competence. Teachers with higher media-didactic competence are better equipped to select adequate digital media for designing distance classes and choose between synchronous or asynchronous implementation based on various didactic concepts and learning situation goals. These concepts may include socializing, cooperation, feedback on results, clarification of work assignments, and inquiry possibilities, as well as feedback methods like real-time or delayed, individual or group-based, and analytical or evaluative approaches. The different forms of distance learning will reflect varying needs for teachers' media-didactic competence. Interestingly, our findings suggest that the provision of learning applications by the school for teachers and the distribution of learning materials are not related to teachers' media-didactic competence. This aligns with Hattie's study, which indicated that the forms of feedback given to students, rather than the content of homework, influence the efficiency of teaching-learning processes (Hattie & Timperley, 2007).

The models utilizing students' media competence perceived by teachers as a criterion suggest that this criterion remains independent of the actual use of digital media for teaching purposes from home. Contrary to our expectations, the assumption that different forms of teaching using digital media would contribute to improving students' media competence to varying degrees was not confirmed in this study.

This result can be interpreted in two ways. Firstly, teachers with higher media-didactic competence may find it easier to design distant teaching-learning processes, but at the same time, they may pay less attention to the media skills of the learners in their didactic planning. Secondly, when considering this result alongside Hypothesis 2, which confirmed the correlation between the integration of digital media into everyday school life and students' media competence perceived by teachers, it's plausible that digital media is already relatively well integrated into schools, and most students have the necessary competence to participate in regular distant teaching-learning processes. Consequently, teachers may not perceive significant differences between students in how they deal with distance learning.

While this study delves into various factors contributing to the success or hindrance of remote teaching and learning

concepts, it primarily focuses on the perspectives of teachers. Nonetheless, the decision for schools to engage in remote teaching is multifaceted. Schools must carefully consider numerous factors, including educational, logistical, social, and public health aspects (Dhawan, 2020; Kaden, 2020; Schleicher, 2020). For instance, remote teaching may exacerbate existing inequities in education, particularly for students from disadvantaged backgrounds who may lack access to technology or a conducive learning environment at home (Van Lancker & Parolin, 2020; Andrew et al., 2020; Dorn et al., 2020). In response, schools may prioritize equity and access by providing in-person instruction for these students. Additionally, in-person schooling offers crucial social interaction and emotional support for students, which are essential for their overall development (Gifford-Smith & Brownell, 2003; Zins et al., 2004).. Recognizing this, schools may prioritize the social and emotional well-being of students by offering in-person instruction.

The reported study was created and carried out under the impression of the corona pandemic; however, it is not limited to pandemic situations, both in its theoretical modeling and empirical analysis; the findings show much more where the implementation of long-addressed needs for change fails. The study implies that every change in work routines must be accompanied by continuous, identity-forming processes (cf. Holt et al., 2007; Hatch, 1993) and justifies the need for educational science reflection - here with the focus: crisis as an impetus for sustainable change.

Disclosure of potential conflicts of interest

Ethics statement

In this non-interventional study (Survey Research), data was collected anonymously with no personal information being recorded. All subjects participated voluntarily in this study. Written informed consent was deemed unnecessary due to the anonymous nature of the survey and the non-interventional design. Participants were informed about the study's purpose, procedures, and their rights as participants before starting the survey. This included information on the anonymity of their responses, the voluntary nature of their participation, and the lack of any direct risks or benefits associated with their involvement. The study adhered to the principles outlined in the Declaration of Helsinki, ensuring the ethical treatment of all participants.

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Authors contributions

Beifang Ma and Prof. Dr. Esther Winther were responsible for the study design and its revisions. Beifang Ma handled data collection and drafted the manuscript, while Prof. Dr. Esther Winther revised the manuscript. All authors have read and approved the final manuscript.

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No additional data are available.

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