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Will–Skill–Tool Components as Key Factors for Digital Media Implementation in Education: Austrian Teachers’ Experiences with Digital Forms of Instruction during the COVID-19 Pandemic

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Abstract: Although comprehensive digitalization (e.g., the provision of skills and resources) had already been placed on Austria’s education policy agenda prior to the emergence of COVID-19, there is evidence that educators had some difficulty ensuring digital learning opportunities for their students when schools closed in early 2020. Against this backdrop, the present study, which drew on qualitative data from the large-scale INCL-LEA (Inclusive Home Learning) study, aimed to determine whether secondary school teachers ($n = 17$) from Viennese schools met the prerequisites for successfully implementing digital instruction, formulated in the Will–Skill–Tool model developed by Christensen and Kzenek (2008). Findings reveal that teachers primarily associated their sufficient digital skills with three factors: (1) basic interest and competence, (2) recently attended training, and/or (3) a positive attitude toward changing teaching practices. Interestingly, some educators recognized that digitization offers great potential for implementing individualized teaching approaches. However, the findings point to the didactic necessity of digital socialization in terms of social communication and inclusion when establishing emergency digital education.

Keywords: COVID-19; spring 2020; school closures; Austria; secondary school teachers; will–skill–tool model; digital media implementation

1. Introduction

The COVID-19 crisis is considered an unprecedented exceptional situation for all involved in education and has led to numerous profound challenges for students, teachers, principals, and parents or guardians. In March 2020, 107 countries introduced national school closures as the first immediate response to the sharp increase in new infections [1]. As a result, educators around the world were forced to temporarily abandon traditional teaching methods. Furthermore, teachers had to quickly adapt to this unusual disruption in education by moving to online teaching within a few days [2,3].

As digital instruction became necessary to promoting educational continuity, access to and competencies in using technological devices and digital instructional formats, as well as the affective-motivational conditions (e.g., attitudes) of teachers, would have been required for successful implementation in the classroom [3,4]. Against this backdrop, the current study draws on Christensen and Knezek’s theoretical Will–Skill–Tool model [5] to examine various factors that influenced teachers’ use of digital technologies during the period of emergency distance education due to the materialization of COVID-19 in spring 2020. The current study is of great importance as it contributes to building and sharing

sound knowledge about the preparation and use of digital tools by teachers. In addition, the results provide insights that may promote further development of individualized didactic approaches using information and communication technologies.

1.1. COVID-19 and School in Austria: A Chronology of Events during the 2019/20, 2020/21, and 2021/22 School Years

As in many other countries [6], the 2019/20, 2020/21, and 2021/22 school years in Austria have not been spared from the effects of the COVID-19 crisis. School closures were initiated in March 2020. This rapid and unpredictable change in regular school operations led to a transition to synchronous and asynchronous digital teaching and learning methods at all levels of education. However, schools remained open to those students whose parents or guardians were engaged in employment away from home or who were unable to allow students to attend classes from home [7]. After two months of distance teaching and learning, Austrian schools finally reopened in May 2020 [8].

Although the 2020/21 school year started with regular on-site teaching, education policymakers decided to suspend regular classes in November 2020 until further notice for the secondary school level and in December for all other school levels. Again, schools remained open for care and educational support [9]. At the end of the semester break, all students returned to school and attended classes in shifts, beginning in February 2021. Accordingly, classes were divided into two groups, with one group attending school on Mondays and Tuesdays and the other group attending on Wednesdays and Thursdays. Distance education was maintained on the other day of the week [10]. In April 2021, the Federal Ministry published a “phased plan for re-activating the schools” [8], providing the return of all students to schools. However, classes continued to be taught to two separate groups of students until the end of the school year [8].

In view of the rising vaccination rate among teachers, the Federal Ministry envisaged the reintroduction of continuous in-person classroom teaching for the 2021/22 school year. However, the rapid spread of seasonal COVID-19 prompted the implementation of a three-week safety period at the beginning of the semester (which included COVID-19 testing three times a week and wearing face masks), a basic safety plan for all schools, and specific measures depending on the number of new infections in each region [11]. Due to the rapidly increasing number of infections nationwide, the Federal Ministry issued a decree in November 2021 allowing absences from class without justification or teacher approval [12]. These specific measures were not removed until the end of February 2022, i.e., at the start of the new semester. Further, students living with at-risk individuals were allowed to remain in distance learning until the end of the school year. In summary, teachers in Austria were faced with the task of constantly adapting to changing education policies and flexibly responding to challenging situations.

1.2. The Role of Digitalization in Austria’s Education System

Until spring 2020, cooperative learning and face-to-face encounters between teachers and students characterized regular classroom situations in Austria. However, because of the COVID-19 crisis, about 128,000 teachers and about 1.1 million students [13] in Austria were thrust into unfamiliar digital teaching and learning environments. Given the inevitable need to urgently adapt to the pandemic-induced governmental and social requirements in early 2020, educators felt compelled to maintain a minimum level of communication with students to subsequently support and monitor their learning processes [3]. As a result, teachers had to decide overnight how to teach virtually to prevent the spread of the COVID-19 virus.

While digital forms of teaching and learning have played rather minor roles in the history of the Austrian education system [14], teachers’ digital literacy and digital literacy training opportunities crucially impacted the adaptation to online teaching during COVID-19 [3]. In addition, the results of a study by Dincher and Wagner [15] indicate that teachers’ affinity (i.e., acceptance, skills, and technophobia) for technology and perceived

learning effectiveness with regard to technology were strongly associated with the use of web-based teaching and learning methods during pandemic-related distance education. However, several study findings suggest that a large number of teachers in Austria, as in other countries, felt inadequately prepared to deliver instruction in digital form with little notice [16,17]. Furthermore, a literature review conducted by Helm et al. [18], considering studies from Austria, Germany, and Switzerland, indicates that about 10–30% of teachers rated both their own skills and those of their colleagues as insufficient for providing high-quality digital learning opportunities. In addition, several studies report large differences in technical equipment and Internet connections between school locations and within schools [16,19]. Overall, the unexpected global emergence of COVID-19 led to the discovery of previously unnoticed grievances and deficiencies in schools across the country.

This fact is all the more astonishing given that efforts to foster digitalization in Austrian schools date back to 2000 when the Federal Ministry of Education sought to ensure the availability and use of technical devices (e.g., laptops and computers) in schools [14]. Even today, Austria's education policymakers are committed to further advancing digitalization in schools. Accordingly, projects such as the "master plan for digital education" [20] and the "8-point plan for digital teaching" [21] were recently initiated. The 'Master Plan for Digital Education,' published by the Ministry of Education in 2018, provides for curricula revisions, teacher training, and the expansion of technological infrastructure [20]. Furthermore, the "8-Point Plan for Digital Teaching" contains even more ambitious targets, such as ensuring nationwide IT infrastructure by 2023 and embedding digital learning in all Austrian schools by 2024 [21].

Although these developments continue against the backdrop of the inexorable growth of digitalization, Fraillon et al. [22] point out that many schools in European countries lag behind the expected progress toward transforming information and communication technologies. Thus, the 2018 International Computer and Information Literacy Study (ICILS) considering twelve countries (i.e., Chile, Denmark, Finland, France, Germany, Italy, Kazakhstan, the Republic of Korea, Luxembourg, Portugal, the United States, and Uruguay) revealed interesting results. Across countries, the vast majority of participating teachers indicated that they already had experience with various information and communication technologies but still experienced some barriers to their use in the classroom [22]. Accordingly, it appears that while a large majority of educators recognized the benefits of using information and communication technologies (ICT) in the classroom, those teachers who reported using ICT less frequently were concerned about possible negative effects. Thus, teachers fear that students may copy material from the internet or deteriorate in their ability to express themselves in writing. In summary, several findings indicate that while there are significant differences between countries in ICT availability and use, teacher collaboration, and conditions of professional learning, there is a positive correlation between the frequency of ICT use and teachers' attitudes toward ICT [22].

1.3. Pedagogical Digital Competencies

Before detailing the theoretical model that underlies the current study, a brief look at the European Framework for the Digital Competence of Educators (DigCompEdu), which was developed by the European Commission's Joint Research Center to promote the digital literacy of education staff and drive digital innovation in education in all member states, is provided [23].

Given the rapid pace of technological advancement, it is increasingly necessary for educational institutions to be equipped with high-quality didactic resources to prepare youth for the demands of the industrial world. For example, as described in the concept of learning factories, learners are introduced to innovative teaching and learning methods at an early stage of their education, where they can test and consolidate their theoretically acquired knowledge in real, technology-based learning spaces [24]. However, in order for students to develop digital and technical skills and be prepared to act safely and

productively in a technology-infused environment, teachers must have a wide range of competencies.

The European Framework for the Digital Competence of Educators (DigCompEdu) provides a general reference frame for developers of teacher digital literacy models [23]. DigCompEdu proposes 22 core competencies organized in six areas: (1) professional engagement, (2) digital resources, (3) teaching and learning, (4) assessment, (5) empowering learners, and (6) facilitating learners' digital competence. Accordingly, educators need to be able to (1) use digital technologies for their professional development and for the common good and (2) select digital resources that best fit their teaching and learning objectives and create new digital educational resources. In addition, teachers must be capable of (3) planning, designing, and implementing digital learning strategies and (4) using digital technologies to enable innovative assessment approaches. Finally, the DigCompEdu framework formulates the need for teachers (5) to use digital technologies to enhance learners' active engagement in the learning process and (6) to facilitate students' digital competencies. Overall, the DigCompEdu framework, with its six defined basic competencies, provides the skills that twenty-first-century teachers need to navigate an educational environment characterized by technology-driven change [25].

1.4. The Will–Skill–Tool Model (WST)

The model for technology integration proposed in this paper was developed for use in educational contexts at the beginning of the twenty-first century. This much-noted model for explaining technology integration in classrooms is comprised of three core constructs that predict 90% of the variance in digital media usage by classroom teachers. These constructs aim to examine the relationships between teachers' attitudes toward computers (*Will*), which can be described in contemporary terms as attitudes toward digital technologies, teachers' technology competence (*Skill*), and available digital resources (*Tool*). According to Christensen and Knezek [5], the importance and originality of this model lie in these three constructs, which are essential ingredients for effectively integrating information technology (digital technology) into classroom practice. There are needs for positive attitudes, corresponding competencies, and, finally, sufficient technical infrastructures (*Tool*).

1.4.1. The Will Key Factor

The confidence and positive attitude with which a teacher uses digital technologies can greatly influence the effective implementation of technology methods in the classroom. The *Will* key factor relates to the emotional and perceptual level by surveying feelings: lack of anxiety [26], lack of teacher confidence [27], attitude and beliefs toward technology and its usefulness for teaching, level of IT curricular expectations, computer confidence, and openness to change [28].

1.4.2. The Skill Key Factor

According to Knezek and Christensen, the *Skill* key factor is the ability to use and experience digital technologies. This includes, above all, self-perceived confidence and a willingness to use digital technology. Knezek and Christensen describe this aspect as a "self-assessment process" [28] (p. 311), in that teachers' positive attitudes and beliefs, acceptance of the need for digital technologies, and competencies in technology use have significantly positive relationships. The indicators that can be categorized under *Skill* are (1) digital technology educational qualification, (2) digital teaching experience, (3) dealing with different software, hardware, and apps, (4) technological and pedagogical teaching competencies, and (5) media didactics.

1.4.3. The Tool Key Factor

The *Tool* key factor is the measure of access to digital technologies. For example, the use and deployment of certain tools, such as Microsoft Teams, Moodle, SchoolFox, learning

videos, and Skype, among others. To capture the *Tool* construct, the elements that were used show the number and usage behavior regarding digital devices, which means how often the devices and tools are used for teaching [29].

The *WST* model has been empirically tested several times. In 1999, Knezek et al. tested their model in Texas [30]. They surveyed 39 teachers regarding the three predictors (*Will–Skill–Tool*) and were able to explain an 84 percent variance in ICT use in the classroom using regression analysis. The model was tested in countries such as the United States [31], Mexico [32], Switzerland [33], Ghana [26], the Philippines [34], and Ireland [35]. Petko [33] used the *WST* model with self-selected measures to determine the influence of a constructivist teaching style on digital media use in Swiss classrooms. He confirmed a variance resolution of 39 percent of the model's validity, which is not nearly as high as the results of Christensen and Knezek's studies. Nevertheless, Petko considers the predictors crucial to a high level of digital technology integration (cf. *ibid.*, 33–34). The results of the study in the Philippines (a total of 325 teachers) indicated that the *WST* model examines significant (up to 54%) variances in ICT integration in science and mathematics education. The results show, furthermore, that science teachers had higher scores in the *WST* key factors and ICT integration than mathematics teachers [34].

In 2005, Knezek and Christensen presented an extended version of the model (*WSTP* model) by adding a fourth construct: pedagogy [28] (p. 314). The *WST* model was extended with the *Pedagogy* construct to capture different teaching styles (constructivist and behaviorist), which are typically understood as teaching approaches or instructional strategies. The fourth factor is also related to technology integration and explores the level of confidence teachers demonstrate in using digital instructional strategies to enhance student learning.

1.5. The Current Study

Against the backdrop of previous studies dealing with teachers' digital competencies, the Will–Skill–Tool model (*WST*) offers a multifaceted approach to capturing teachers' perceptions of professional demands, which, until before the pandemic, were not considered mandatory and therefore tended to be implemented according to individual preference. Thus, the objective of the paper is to reveal teachers' experiences and perceptions of digitalized teaching on three levels: the will level (RQ1), skill level (RQ2), and tool level (RQ3). The study, therefore, addresses three research questions, as follows:

RQ1: What are secondary school teachers' attitudes toward digital teaching during virtual teaching due to the COVID-19 pandemic?

RQ2: How did secondary school teachers perceive their digital skills during virtual teaching due to the COVID-19 pandemic?

RQ3: How did secondary school teachers implement digital tools in their teaching during virtual teaching due to the COVID-19 pandemic?

2. Materials and Methods

2.1. Procedure

The analyzed data were derived from the longitudinal Inclusive Home Learning (INCL-LEA) research project [36]. As a quick response to government education mandates altering the delivery methods of education, the research project was initiated to scientifically accompany various participants in the Austrian education system during this unusual and unpredictable situation. To shed light on teachers' initial reactions to the transition from classroom teaching to digital teaching with regard to their own competencies and professional opportunities, this study refers to data from interviews conducted during the beginning of the pandemic.

2.2. Interviews

The interview guideline was developed by a research group at the University of Trier (SCHELLE study) [17]. The guideline included different topics addressing teachers'

perceptions about their professional and personal experiences during the beginning of the COVID-19 pandemic. The following focal points were addressed: (1) perceived well-being during remote teaching, (2) perceived opportunities for a digitalized educational future, (3) differentiated teaching methods, (4) support of students' learning processes, (5) performance testing and error correction, and (6) evaluation and assessment.

In the present study, qualitative data from secondary school teachers are used, which were collected through semi-structured interviews using an interview guideline. Interviews with 56 Austrian teachers were conducted and audio-/video-recorded via Zoom (average duration of 50 min).

2.3. Sample

For the present study, the material for analysis was selected from interviews with lower secondary teachers from Viennese schools. This focus stems from the mandatory school subject "basic digital education" at the lower secondary level [33] (BMBWF, 2018a), which is assumed to lead to a greater affinity for and professional habits in dealing with digital teaching methods among teachers at the lower secondary level than, for example, primary school teachers. The sample of secondary school teachers consisted of 17 participants with a mean age of 44.76 years ($SD = 13.11$) and an average teaching experience of 18.88 years ($SD = 14.80$) (for further information, see Table 1).

Table 1. Sample description.

	Gender	Age	Teaching Experience
Teacher 1	Female	25	2
Teacher 2	Female	28	4
Teacher 3	Male	30	4
Teacher 4	Female	32	1
Teacher 5	Female	33	7
Teacher 6	Female	33	7
Teacher 7	Female	41	19
Teacher 8	Female	43	18
Teacher 9	Female	44	5
Teacher 10	Female	45	12
Teacher 11	Male	49	28
Teacher 12	Male	54	29
Teacher 13	Female	58	38
Teacher 14	Female	60	38
Teacher 15	Female	61	41
Teacher 16	Male	62	40
Teacher 17	Female	63	38

2.4. Data Analysis

After successful completion of the data collection, the structuring qualitative content analysis, according to Mayring, was used for subsequent analysis [37]. This evaluation method brings the advantage of a theory-based, rule-guided reduction of large amounts of text to its manifest components. Prior to the analysis of the interviews, a system of deductive categories was formed on the basis of in-depth theoretical considerations. Following Mayring [37], a guideline for category formation was created that contains definitions of individual categories, examples (text excerpts) that fall under respective categories, and coding rules for correctly assigning the text contents.

Based on the underlying theoretical framework regarding the WST model and the results of the qualitative data, the following three categories (Table 2)—displaying not only the model but also the previously presented research questions—were elaborated upon:

Table 2. Categories created during data analysis.

Category 1		
Teachers' Attitudes toward Digital Teaching		
1.1 Attitudes with positive connotations	1.2 Attitudes with negative connotations	
<p>Category 1 addresses teachers' attitudes toward digital instruction during the COVID-19 pandemic. This focus, related to the theoretical basis of this study (namely the will–skill–tool model), is about teachers' experiences at the first level: the dimension of teachers' will. The theoretical model focuses only on attitudes with positive connotations (SOURCE). As a counterpart, one additional category dealing with negative attitudes is also necessary. This addition seems important because the transition to digital instruction was not a personal choice made by teachers according to their individually intended adaptations but forced teachers' adaptations to sudden changes in basic working conditions.</p>		
Category 2		
Teachers' digital competencies in the context of education		
2.1 Positive self-perception	2.2 Negative self-perception	2.3 Acquisition of skills
<p>Category 2 refers to teachers' media pedagogical competence (skill), characterized by two opposing perspectives. These two perspectives are characterized by the teachers' "positive self-perception" or "negative self-perception" of their competencies. Depending on how the teachers assessed their media pedagogical competencies, further conclusions could be drawn regarding the integration of digital media.</p>		
Category 3		
Teachers' implementation of digital tools		
3.1 Use of digital tools		
<p>Category 3 looks at digital tools used by teachers during school closures. Accordingly, this category provides information about the types of digital devices (e.g., computer, iPad, and laptop) and digital platforms (e.g., Microsoft Teams, LMS, Moodle, and Skype) that teachers accessed during distance learning. In addition, the results assigned to this category provide information about how educators used these applications.</p>		

3. Results

The following section provides in-depth insight into the results of the data analysis. To offer a deeper understanding, the findings are supported by several selected participant statements.

3.1. Teachers' Attitudes toward Digital Teaching

To capture the *will* component of the will–skill–tool model, which serves as the theoretical foundation of this study, teachers' attitudes were considered a construct with two diametrically opposed perspectives throughout the data analysis. Thus, the results reveal whether participants reported fundamentally positive or negative attitudes toward digital teaching methods.

3.1.1. Attitudes with Positive Connotations

In the course of the analysis, the overarching category "Positive attitudes" was broken down into the following seven sub-categories: (1) "Previous experiences with digital technologies," (2) "Change of perspective," (3) "New experiences," (4) "Innovative action," (5) "Differentiation and individualization," (6) "Expansion of media-pedagogical competence," and (7) "New possibilities of regular instruction." During the school closures, participants perceived the aspect of "Previous experiences with digital technologies" as particularly enriching. For instance, one teacher stated that she had already participated in numerous projects and programs promoting digitalization in schools and had therefore already acquired some knowledge about digital technologies and their educational use. Furthermore, a first sign of rethinking digital instruction can be seen in the category "Change of perspectives," as illustrated by the following interview extract:

"I notice that, at least at my school, a change in thinking is taking place because we now realize that this digitization actually only brings benefits, and I definitely see a lot of progress, especially in the attitude of my colleagues, but also in my

own. There is actually only one [type of] person who is kind of resisting a little bit. Otherwise, everyone is very active, regardless of the generation of teachers. They all hold Skype classes, and I think most of them are very happy with that as well." (Teacher 4)

In some interviews, the increase in "New experiences" with digital media was also seen as an opportunity to redesign instruction. Accordingly, several participants repeatedly emphasized that the new and unfamiliar classroom situation opened up opportunities for "Innovative action":

"Actually, much more attention should be paid to the progress of digitalization because, especially in the area of differentiation, online platforms offer much more variability. I am able to respond to students much more individually. I think that we should work much more in this regard because there are also other platforms, such as apps for cell phones you can use. I think that school, as we know it at the moment, is partly outdated and not up to date anymore. And that we should invest in digitalization and technical progress as far as differentiation is concerned." (Teacher 4)

With regard to the sub-category "Expansion of media-pedagogical competence," those teachers who had already gained experience with digital technologies and media were more confident in implementing inclusive distance instruction than educators who had not previously used digital approaches in their classrooms. In this context, it did not matter whether teachers had acquired digital knowledge and skills from in-service training or were self-taught. Since educators indicated that individualization and differentiation measures could now be implemented in more diverse ways, two of the teachers interviewed found the use of digital tools helpful in guiding students to learn independently. Finally, teachers reported that students were now gaining experience with digital media and tools that they may need for their current and future life situations, including their professional practice. Regarding "New possibilities of regular instruction," educators expressed their wish to use digital resources more often in regular classes in the future. Teachers justified this by saying that using digital teaching methods opens up a form of teaching that leaves more room for individualization and open work:

"Yes, definitely, so I think that we will maintain a lot of what we are doing now, or at least I am sure that I will maintain some of it. We have now dealt with systems and tools that we would perhaps not have dealt with for a long time, which are also totally usable in regular teaching." (Teacher 5)

3.1.2. Attitudes with Negative Connotations

In the course of the interviews, teachers expressed both positive and negative attitudes toward digital instruction. Based on educators' statements, the following seven sub-categories could be identified: (1) "Lack of previous experiences with digital technologies," (2) "Lack of media education competencies," (3) "Structure and time management," (4) "Lack of social contact," (5) "Lack of resources," (6) "Social and educational inequality," and (7) "Skeptical attitude." The category "Lack of previous experiences with digital technologies" includes both educators' acquired knowledge about digital teaching approaches and the extent to which these digital teaching approaches were previously applied in class. Some participants did not feel well prepared for this new and unforeseen situation, as the following quotation suggests:

"Oh no, not at all ((laughs)), not at all. We've had in-school training, one or two that might have been quite helpful, but no, not at the university and also not as part of my internship." (Teacher 5)

In addition, teachers often expressed feeling that they were facing excessive demands at work due to their current "Lack of media education competencies." Accordingly, teachers indicated that their lack of ability to use media meaningfully resulted in significant ad-

ditional work and other burdens. The excessive demands perceived by teachers are also reflected in the category “Structure and time management.” Several educators reported that they did not receive any information from school administrators about the structure or time management of digital instruction during the early 2020 school closures. Furthermore, in contrast to the positive experiences of teachers presented earlier, several participants indicated that they found it easier to implement inclusive teaching strategies, such as differentiation, during regular face-to-face instruction than during distance teaching.

Teachers also cited a “Lack of social contact” with their students and unavailable technological equipment (“Lack of resources”) in students’ homes as important stressors:

“I’m a person who likes to be around people, and I think that a lot of teachers feel that way, and it’s just a shame that our current work doesn’t give back as much as regular work.” (Teacher 5)

It appears that teachers were more comfortable working face-to-face with students in the classroom than in distance education, as the teachers considered the social aspect as one of the most important components of the teaching profession. With regard to a “Lack of resources,” some teachers reported that it was difficult for them to stay in touch with students who did not have access to necessary technical equipment (e.g., laptop, computer, and internet connection) at home. In fact, one participant stated that students’ restricted accessibility due to a lack of resources proved to be the biggest obstacle during distance teaching. The teachers interviewed cited an increase in “Social and educational inequality” as the most significant negative consequence of these differences in access to technical resources. Accordingly, several educators indicated that the achievement gap between students from socioeconomically disadvantaged backgrounds, on the one hand, and students from socioeconomically privileged backgrounds, on the other hand, may be further exacerbated by the conditions of distance learning.

Finally, some of the teachers were rather critical of the use of digital media in the classroom. One reason for this “Skeptical attitude,” according to many educators, is that using digital media in the classroom essentially depends on first addressing current barriers, such as a lack of digital knowledge and skills and a lack of resources in schools and among students.

3.2. Teachers’ Digital Competence in the Context of Education

The second important superordinate category (“Teachers’ digital competence in the context of education”) refers to teachers’ subjectively perceived skills in handling digital media. In this regard, the categorized content elements are based on educators’ self-assessments and were collected using the following questions: (1) How well do you feel your teaching degree/traineeship/in-service training prepared you for digital teaching? (2) Have you noticed any changes in your competency since you first used digital media in the classroom? (3) Have you had any experience with digital elements in the classroom? If yes, which ones?

As with responses on attitudes (*will* component), educators’ responses on self-assessments of their competencies (*skill* component) could each be assigned to one of two sub-categories: positive and negative self-perceptions.

3.2.1. Positive Self-Perception

Teachers’ self-perception of media pedagogical competencies is based on various situations, procedures, and experiences. In the course of the interview, a 32-year-old teacher showed a positive attitude toward digital instruction and expressed the following in terms of subjectively perceived competencies:

“It’s easier for me to switch to e-learning via Skype and co. because I usually sit in front of a computer a lot and I don’t ever have technical problems. I’ve always been an IT expert.” (Teacher 4)

It is also striking that teachers who have only recently completed their teacher training evaluated their digital competencies better than teachers who have been in their profession for a longer period of time. Thus, the age of those teachers who reported positive self-perception ranged from 25 to 45 years:

“So I was lucky that I just recently graduated from university (laughs), so I know some online materials and I am also good with computers.” **(Teacher 1)**

In general, many of the teachers said they were confident in their own digital skills. However, it is interesting to note that participants often expressed this positive self-perception in relation to their enforced exposure to digital media, triggered by distance teaching. Accordingly, educators indicated that the development of their skills has led to an increase in the potential scope for implementing digital instruction:

“Yes, my media competence has certainly become greater than it was before, and I will benefit from this. Yes, definitely. My media competence has definitely improved.” **(Teacher 10)**

3.2.2. Negative Self-Perception

Some teachers made negative comments about their self-perceptions of their own digital competencies. However, these specific teachers often expressed general dissatisfaction with digital instruction. Accordingly, educators found this new and unfamiliar way of teaching overwhelming and time-consuming. Teachers with plenty of work experience, in particular, indicated that the analog teaching and learning materials they had been using for years could only be used to a limited extent during distance instruction and that they perceived the digital preparation of analog worksheets as burdensome:

“I finished my teacher training 40 years ago. There were no computers then. I worked with a typewriter, but I do not feel like an expert. Most of the time I don’t even know what to ask, but I do not feel ready.” **(Teacher 14)**

Other teachers said they had no choice but to use digital media and prepare online lessons under psychological and time pressures, even if they lacked the necessary skills, as they saw it as their responsibility to continue to provide learning opportunities for students.

3.2.3. Acquisition of Skills

Based on the data, it is apparent that participants showed different approaches to using digital technologies. On the one hand, several educators said they had no choice but to face the task of acquiring media education skills to provide instruction to their students from a distance. As a result, teachers had to acquire the competence to use certain digital media effectively in the classroom, either in collaboration with colleagues or on their own initiative:

“Then I turned to my colleagues and asked them how they do it and what they do, and there was a young colleague who told me that he had been using a certain online program for a long time and that it worked very well, and as a result I decided to use it too.” **(Teacher 16)**

On the other hand, ten out of seventeen teachers stated that they had already obtained media education knowledge and skills as part of their studies, seminars, or in-service training and were, therefore, able to implement their previously acquired competencies in the course of distance instruction. Nonetheless, all these teachers indicated that they felt compelled to upgrade their skills in spring 2020 because designing and delivering instruction through videoconferencing, correcting work assignments online, or creating instructional videos required a higher-than-average skill level.

3.3. Teachers’ Implementation of Digital Tools

This category provides insight into teachers’ use of various digital devices, such as computers, laptops, iPads, and various digital tools and platforms, during distance

instruction. Teachers' experiences using digital resources in the classroom were surveyed with the following questions: (1) How did you implement digital instruction? (2) What technical tools did you use during distance teaching and learning?

Use of Digital Tools

The use of digital tools was broad and diverse, as the survey revealed, since teachers' experiences were characterized by various difficulties. According to the participants, challenges primarily arose from data security issues and overloading the learning platforms. In the survey, teachers related a major problem in the use of digital tools to students' lack of technical resources. Thus, without comprehensive and uniform equipment, participants could only partially require the use of digital tools for all students:

“So at least that every student is equipped with the same technical resources, that is, that every child has access to the Internet, a laptop or a tablet, and a printer. Yes, so, of course, it would be a relief to know that everyone has the same requirements. This would also save a lot of phone calls.” **(Teacher 10)**

Other difficulties for teachers included the inconsistent use of digital tools at all levels and the related problem of providing students with access to these tools. Teachers complained of an overabundance of options regarding digital devices and platforms used for distance learning. Among other things, this has caused students and faculty to feel overwhelmed by the variety and resulted in the difficulty of providing children with access to all these digital instruments.

“Some of the kids send me the completed work tasks via WhatsApp, which I don't think is great at all, but I have to accept that, especially with those I can't reach otherwise. Some have responded on Google Drive. Since we don't have a platform for everyone, Google Teams is under construction, but that won't be ready until the fall. So we have to rely on different platforms right now, and that means a big loss of communication with a lot of follow-up calls.” **(Teacher 4)**

To avoid this situation, one participant's school site had already selected a specific platform to use during distance learning before schools closed, set it up with students, and clarified how to work with it:

“When we heard that schools were closing, there was an internal training on how to use Microsoft Teams. After that, I showed my class, again in more detail how they can work with it.” **(Teacher 8)**

Tools, such as SchoolFox and Schoolupdate, were primarily used to communicate with students and parents or guardians. In addition, participants reported using email, WhatsApp, Zoom, Skype, and Microsoft Teams (Teacher 4; Teacher 10; Teacher 11; Teacher 13; Teacher 16).

However, the use of digital tools was not only characterized by the difficulties mentioned above but also opened up new ways of teaching by allowing educators to use creative and diverse strategies. Table 3 provides an overview of open-source platforms, apps, and other tools used by the participants during distance teaching.

Table 3. Digital tools during Inclusive Home-Learning/-Teaching.

Communication and Learning Platform	Management, Organization, and Task Processing (Apps, etc.)	Other
www.LMS.at (learning platform)	Microsoft Teams (platform for meetings, notes and attachments, uploading and downloading files)	PowerPoint (presentation software for digital illustrations and lesson design)
SchoolFox (digital software for internal communication and LMS)	Digi4School (digital bookshelf)	Voice Over (audio recording for PowerPoint)

Table 3. Cont.

Communication and Learning Platform	Management, Organization, and Task Processing (Apps, etc.)	Other
Google Meet (for video conferences)	Google Classroom (digital classroom management and deployment)	YouTube (learning videos)
Edhu (teaching and learning app)	One Note (digital notebook software)	Podcasts (learning videos and audios)
Anton App (learning app for German, German as a second language, mathematics, music education, subject lessons for secondary school I)	ÖBV—Österreichischer Bundesverlag (digital teaching materials and books for all school levels)	
HELBING e-zone (learning platform)	One Drive (digital storage location for children’s completed work tasks)	
Kinderzeitmaschine (game-based learning platform)		
Kahoot (game-based learning platform)		

4. Discussion

In this study, we took the opportunity to explore teachers’ experiences and perceptions of digitalized teaching on three levels, prompted by the radical transformation from regular in-person instruction to digital teaching and learning caused by the COVID-19 pandemic. Building on the theoretical foundation of Knezek and Christensen’s *WST* model [28], we used qualitative interviews with a total of 17 teachers to investigate the relationships between teachers’ media-related attitudes (*will*), abilities to use digital technologies (*skill*), and available technical resources (*tool*) that should lead to media integration in the classroom. In the course of performing an in-depth analysis of participants’ statements, awareness was raised concerning a variety of factors that can influence teachers’ use of digital teaching approaches. In line with other studies in the context of digital forms of instruction [28] and broader contexts such as inclusive education [38], the results of this study underpinned the important role of teachers’ attitudes in implementing high quality (digitalized) teaching. At first glance, the results indicated that both positive and negative attitudes toward digitalized teaching could be found in teachers’ responses. Two aspects were especially linked with positive attitudes: being “up-to-date” with teaching methods and addressing students’ individual needs. Clearly, teachers recognize that previous teaching has not been connected with digital innovations outside of school. However, the use of digital tools tends to support existing teaching methods rather than developing new teaching methods [38,39].

It is interesting to note the causes to which the surveyed teachers attributed their perceived adequate or inadequate competencies regarding digital teaching during the pandemic. Focusing on the positive perceptions of their own digital teaching skills, teachers mainly linked their sufficient skills to three factors: (1) basic interest and competence, (2) recently attended training, and/or (3) a positive attitude toward a change in teaching methods. It is encouraging to compare these findings with the work of König et al. [3], noting that the extent to which teachers previously attended training dealing with digital literacy has had a crucial impact on how in-service teachers were able to adapt to online teaching during school closures.

In line with this, teachers identified major concerns with regard to their digital skills that were inevitably expected due to changing educational circumstances. The biggest challenge, especially for teachers with years of teaching experience, was that established teaching methods and strategies suddenly became obsolete and could not be implemented in the context of school education in times of pandemic. The results regarding self-perceived skills in digital teaching accord with our earlier research, indicating that digital forms of teaching and learning in Austrian schools played little to no role before the pandemic [14].

For this reason, teachers’ professional reliance on well-used school pedagogies and didactic methodologies seems inadequate for rapid transformation according to social

characteristics and needs. This may be related to changing educational circumstances during the pandemic. However, as we have already seen previously, it may also be due to other societal trends and the unpredictable needs of certain groups of students (e.g., students with a refugee history [40]).

Interestingly, some teachers linked the use of digitalization with another shift in education: inclusion in the sense of addressing the individual needs of each student. Individualized instruction is a well-known requirement of inclusive education [36], and teachers have recognized that there is a huge potential to implement individualization through digitalization [3]. From this perspective, future studies could gain insight into students' perceptions to determine whether they perceived a higher level of individualization during the COVID-19 phase.

As in the context of inclusive education, a positive correlation was found between teachers' attitudes and prior experience in digitization, which is directly related to teachers' competencies and willingness to implement digital learning and teaching formats [41]. In addition to a lack of experience, organizational barriers (e.g., structure and time management) were also raised as factors hindering digitization. In addition, two critical aspects of digitization, in particular, were raised among teachers: "Lack of social contact" and "Social and educational inequality." Research in the context of COVID-19 and education [2,42] has already shown that teachers and students suffer from limited social contact due to digitalization. However, this could be explained by the fact that teachers were less likely to use synchronous digital instruction (e.g., videoconferencing) at the beginning of distance education [18] and, as a result, often did not consider the social-emotional aspects of learning. Against this background, the sudden transition from face-to-face to digital-only teaching highlights the didactic necessity of digital socialization in terms of social communication and inclusion. Especially when considering that the pandemic was accompanied by far-reaching negative psychological consequences for individuals, which made it difficult to even operate successfully in environments that were already familiar and explored, finding one's way into a new facet of the digital world—namely, online school—seems like a comprehensible challenge for all involved [43]. This assumption underlines the fact that it is not digital communication and the associated social inclusion as such that poses a problem, but rather the sudden conversion of the traditionally proven face-to-face communication in the school system to digital communication. Therefore, the perceived challenges may be more related to the non-established digital communication structures in the compulsory school system than digital interaction per se [21]. This can potentially be countered by implementing the government's digitization plan [20]. In addition, introducing innovative digital tools that enable synchronous and adaptive delivery of instructional content and are easy to use, such as ASYMPTOTE [44], may serve as a solution to the perceived lack of face-to-face contact associated with digital teaching and learning.

Following the *WST* model, it would be necessary for all these components to be fully represented in the student sample. For instance, while teachers spoke positively about the potential for digital tools to support digitalization, they also pointed to the potential for reinforcing educational inequity. Thus, students who are at risk for academic development (e.g., students with special educational needs, students from low socio-economic backgrounds, and students with linguistic barriers in the language of instruction) tend to have limited access to digital devices and, therefore, often have lower digital literacy skills. In this sense, digitization also has the potential to increase educational inequality, as was the case for Austrian students during the COVID-19 period [45,46].

5. Conclusions

Even though previous education policy efforts pushed for digitization in schools, little progress was made before the emergence of COVID-19. This raises the question of whether a change in the ideas and implementation of education and pedagogy requires a radical cut to be implemented. One explanation might be that the major organizational aspects of digitalization processes [47] have been underestimated. However, the use of digital tools and

technologies does not automatically lead to new and improved educational practices [39]. Accordingly, recent studies indicate that several factors other than teachers' attitudes (*will*), competencies (*skill*), and resources (*tool*) are important to ensure high-quality online instruction, such as increased interaction between teachers and parents or guardians, teachers' ability to guide students in digital instruction, and teachers' support and motivation [48]. Further, improving education to provide equity for students, regardless of their characteristics and needs, is perceived as a complex issue. In this context, several aspects have to be taken into account from an intersectional perspective (awareness of the cumulation of systematic discrimination due to the intersection of diverse differential categories [49,50], e.g., pedagogical, organizational (tools), but also the personal aspects (will and skills) of all actors involved (school policy makers, principals, teachers, students, etc.).

The results of the current study provide insights into teachers' self-perception regarding their attitudes toward digital teaching and competencies in implementing and creating digital teaching methods and learning situations for their students during the beginning of the COVID-19 pandemic. In addition, the empirical findings in this study provide a new understanding and contextualization of educational demands, particularly the need to focus on newly arisen challenges that teachers face regarding their pedagogical goal to ensure quality and equity in education.

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