Article

From Resistance to Digital Technologies in the Context of the Reaction to Distance Learning in the School Context during COVID-19

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Abstract: In the relationship between teachers and distance learning in the context of COIVD-19, a series of unprecedented dynamics have emerged relating to a process of open-air experimentation that is going on in the world of school. The main constructs investigated in this paper concern the professional perceptions of teachers in terms of their skills and resistances towards digital technologies. To investigate this topic, a questionnaire on distance learning was administered to a sample of 658 teachers. From a methodological point of view, factor and reliability analyses and correlation and regression analyses were conducted. From the analysis of the results, it emerged that the questionnaire measures the resistance of teachers to distance learning and focuses on three main dimensions (two positive and one negative) that link teachers' perceptions to the resistance to distance learning. In conclusion, the theme of the acceptance of technologies in the practice of teachers is still a subject full of meaning for professional perception and vision. A second issue concerns precisely the relationship between digital technologies and users, which must no longer focus only on the relationship with students but also on the perspective of the other training actors, including teachers.

Keywords: professional resistance; information and communications technology (ICT); distance learning; teacher perception; e-learning

1. Introduction

The contemporary debate revived by the COVID-19 pandemic has begun to reflect on the effects of digital technologies on learning. Educational research has shown that digital media enhance learning when they support basic processes such as active participation, connection to the real world, facilitation of teamwork, and frequent and recursive feedback [1–3]. Within school contexts, the media can play a fundamental role, for example, in the acquisition of reading, as the educational programs adapt to the students, provide continuous feedback, and, through gamification elements, increase motivation. Digital media, therefore, can improve academic success as a learning tool if properly used. This consideration introduces the theme of use/acceptance/professionalism of the digital teacher, which is the subject of this research work and takes on unprecedented implications in the contemporary context.

For years, the concept of teaching professionalism has been anchored to the knowledge system, making it an indicator of quality in the teaching process. The model developed by Seidel and Stürmer [4] indicates the professional vision as a qualifying element for the competent teacher. According to this model (Figure 1), the professional vision is structured in two dimensions, noticing and reasoning. The contextualized nature of learning (noticing) is organized around three main elements:

- Goal orientation is intended as a moment of clarification of teaching and learning objectives to motivate students.

- Teacher support is understood as support for teachers and through which self-esteem and intrinsic motivation are facilitated and functional learning environments are designed.
- Positive learning climate, the last element, is the precondition for educational success within the classroom.
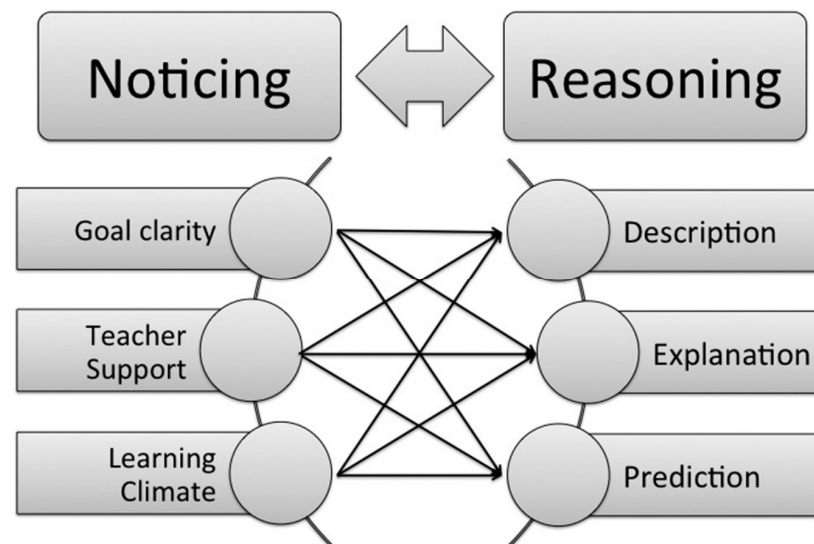
Figure 1. Model of Seidel and Stürmer's professional vision. Source: Seidel and Stürmer [4].

The second dimension concerns the concept of reflection (reasoning), which is divided into three actions necessary for the teaching profession: knowing how to describe (description), knowing how to explain (explanation), and knowing how to predict (prediction). All three actions converge to structure a truly effective educational intervention within the classroom context.

The construct of the professional vision is strongly debated within teacher training studies, as it is still lacks depth. The technological declination of the professional vision has accentuated the characteristics of the two dimensions of noticing and reasoning, and, consequently, it has made necessary didactic actions of planning, monitoring, and continuous experimentation.

Area-Moreira et al. [5] and Tołwińska [6] found that the greatest resistance by teachers relates to the lack of technological resources, ease of access, and adaptation of the school to multimedia learning environments. Perceptions also play a role in reinforcing the resistances described; in fact, they are influenced by the personal characteristics of teachers and their motivation, which affects teachers' sense of effectiveness and the real use of ICT in teaching practice. The European DigComp framework provides for the emergence of digital (and non-digital) skills for the citizen and is divided into three key points: complexity of the task, autonomy, and cognitive domain. The framework in the initial version [7] prescribed the development of four specific application areas for the construction of digital skills, such as data literacy, communication and collaboration, digital content creation, and security. This framework has evolved into the DigCompEdu model for educators, which provides for the acquisition of meta-skills (learning to feel professionally or learning to act with the media) that are the mediators in the relationship with pupils. The theoretical model describes a greater degree of awareness, reflexivity, and cooperation in the digital and the pedagogical visions [8]. The six areas on which it focuses concern professional engagement, digital resources, teaching and learning assessment, empowering learners, and facilitating learners' digital competence. The self-evaluation is the key tool of development and consolidation of the teachers' digital competence.

Schools try to integrate ICT into teaching processes in ways that are increasingly complex in order to improve the didactic strategies adopted. Educational innovation

once again makes the teacher the main person responsible for managing and monitoring student learning to achieve educational success [9]. Finally, in addition to the instrumental value of technology, a fundamental element is also assumed by the presence of virtual learning environments, which are hybridized to school practice that structurally reforms this ongoing process.

2. Materials and Methods

The massive and almost exclusive use of digital education starting from March 2020 in schools around the world has sparked the interest of psychologists and pedagogues on learning problems related to distance learning. The tangible effects were widely visible in all grades of compulsory education, university training, internship, simulations, and professional training with experimentations that varied depending on the purpose of the educational intervention. The purpose of this article is to investigate the perceptions of teachers in the preservice training path who have experimented with e-learning using different roles and methods. In fact, they have taken on the dual role of teachers in compulsory schools and university students in specialization courses for support, experimenting firsthand with additional methods of distance teaching (online lessons, simulations, group work, internships, etc.).

A previous pilot study in the Italian context [10,11] adapted a second short questionnaire to determine the attitudes of teachers in an economics faculty who were already engaged in online professional training courses. The new tool, with a high degree of reliability, investigated users' attitudes towards distance education. The final version of the questionnaire, in addition to demographic questions about gender, school level, years of teaching, experience, work situation, etc., also presented eighteen Likert-type questions regarding online courses and related statements with which the user could express various levels of agreement or disagreement (a copy of the questionnaire in Italian is available in [11]).

The research is developed in the Italian context, where the initial teacher training course is online and nationally distributed; the students, therefore, belong to all areas of Italy (67% from southern Italy). The 10-year-old University of Foggia is a leader in distance learning, and since March 2020, it has been providing all the training of fully online teachers (including workshops and internships). The Italian version of the questionnaire was administered to the teachers of the initial training course for the support of the teachers of the University of Foggia ($n = 658$). The data were divided by demographic profile, elaboration of the answers, and teaching level (childhood, primary school, lower secondary school, or upper secondary school). The data were provided via a Google form in December 2020 during the COVID-19 state of emergency. Using the online form made it possible to receive results in real time and to quickly view a summary. The advent of the COVID-19 pandemic has produced a disruption of distance learning methods not only in formal contexts such as schools and universities but also in non-formal education agencies [12]. Didactic structures, tools, and methods have changed in the specialization courses of teachers, in professional training, and even in internship activities (which have always been areas of learning by doing). In this context, the University of Foggia has experimented with an online group work model that incorporates digital learning environments, simulation-based learning, and gamification. The use of simulation in learning communities has produced positive results in terms of learning, relationships, and emotions.

An initial demographic analysis confirms research on gender differences which demonstrates that, in the lower levels of education (childhood, primary), males represent only 1.1% of respondents for primary education and 4.4% for childhood (crossing this last figure with employment, they are all teachers of other degrees at the second title, and, therefore, male students do not work with the degree linked to childhood as the first job choice). The percentage also exceeds 30% in lower and upper secondary school grades. The average age was over 42 for kindergarten, over 40 for primary, 36.1 for middle school, and 39 in high

school. In addition, the average years in education were 14.4 for childhood, 16.4 for primary school, 18.4 for lower secondary school, and 19.4 for upper secondary school (in the Italian context, the achievement of the diploma requires 13 years of compulsory school, leaving out the years of kindergarten). When asked if they had previously taken or taught an online course, 53.7% of the kindergarten teachers said yes, and 59.7% of the primary school teachers had already attended or taught online courses, while for middle and high school, the percentage of affirmative answers fluctuated between 70% and 80%. The remainder of the respondents, despite online education having become the main training channel, had no experience with online courses.

3. Results and Discussion

All data were processed in IBM's statistical software SPSS version 25 (Armonk, NY, USA). Before the main analysis, data were screened for univariate and multivariate outliers. All cases that had the standardized z-score on any of the variables out of $+/- 3$ range were removed from further analyses. In total, twelve univariate outliers were detected and removed from further analyses. In order to detect multivariate outliers, Mahalanobis's distance was used. In total, nine multivariate outliers were removed from further analyses. After data cleaning, total sample size was 637.

3.1. Factor and Reliability Analyses

In order to test the psychometric characteristics of the Perceptions towards Online Courses Questionnaire (POQ), exploratory factor analysis and internal consistency reliability analysis were computed.

The internal consistency analysis showed that the items 5, 6, 8, 10, 17, and 18 did not have a significant corrected item-total correlation. Their item-total correlation was lower than 0.30, and they were removed from the scale and further analyses. In addition, the item number 9 was removed because it did not have a significant correlation with any of the principal components extracted in the exploratory factor analysis. The final version of the questionnaire consisted of 11 items. Chronbach's alpha coefficient for the final version of the scale was $\alpha = 0.73$. Hence, we can say that POQ scale had acceptable reliability.

Principal component method was used for the factor extraction, and direct oblimin was the method of rotation. Principal component analysis (PCA) is a technique for reducing the dimensionality of such datasets, increasing interpretability but at the same time minimizing information loss. The result of the KMO (Kaiser-Meyer-Olkin) test was 0.71, which is middling; however, it indicates that the 71% of variance among POQ items was common variance. Hence, the data were suitable for factor analysis. Bartlett's test of sphericity was also significant $\chi^2(45) = 1691.98$, $p < 0.001$. The final two factor solution explained 43.42% of variance (Table 1). The exploratory factor analysis showed that three principal components can be extracted from the data. The correlations of items with principal components are presented in Table 2.

Table 1. Total variance explained.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %		% of Variance	Cumulative %
1	3.020	27.458	27.458	1.817	16.522	16.522
2	1.712	15.560	43.018	2.099	19.078	35.600
3	1.418	12.895	55.914	0.860	7.820	43.420
4	0.909	8.264	64.178			
5	0.776	7.050	71.228			
6	0.724	6.586	77.814			
7	0.662	6.019	83.833			
8	0.636	5.782	89.615			
9	0.523	4.752	94.366			
10	0.416	3.786	98.152			
11	0.203	1.848	100.000			

Extraction method: maximum likelihood.

Table 2. Item-component correlation (pattern matrix [a]).

	Component		
	1	**2**	**3**
1 One of the advantages for the student of taking an online course is that the "lesson times" are flexible.	−0.939		
2 One of the advantages, for the teacher, of teaching an online course is that the "lesson times" are flexible.	−0.843		
3 The interaction/lessons with the teacher are more frequent in a normal school context than in an online lesson.		0.441	
4 Science courses in an online environment are among the hardest for college students		0.363	
12 Lack of student-student interaction in an online classroom could hinder their learning experience.		0.734	
13 The textbook is a necessary aid more in an online lesson than in a traditional lesson			0.504
14 Tests in an online course are more difficult for students.			0.796
15 For a teacher yhe tests in an online course are more difficult to administer.			0.527
16 Online courses require students to prepare the material themselves more than in a "traditional" classroom course.			0.396
7 For me it is important to interact with students (face to face) outside the classroom.		0.393	
11 I miss face-to-face interaction with students in an online lesson.		0.767	

Extraction method: maximum likelihood. Rotation method: oblimin with Kaiser normalization. [a]. Rotation converged in 6 iterations.

Super component or the second level component is a result of hierarchical factor analysis. Super component is extracted by the same rules and methods as the principle components. The only difference is in input variables. Hence, in principal component analysis, input variables are the questionnaire variables, and output variables (the result) are principal components. In hierarchical factor analysis, input variables are principal components, and the result are super components. Hierarchical factor analysis is a good tool to test whether the questionnaire is homogeneous and whether principal components converge to one or more higher level components. The hierarchical factor analysis showed that all three principal components converged into one super component, hence, we can say that POQ questionnaire measures one construct, which can be interpreted or defined as teachers' perceptions towards online classes. The first component was negatively correlated, while the other two components were positively correlated to the super component. Based on the correlations between the items and the components and between the components and the super component, we may say that POQ scale measures negative perceptions towards online classes. Hence, a higher score on this questionnaire indicates more negative perceptions. This study addresses the issue of teachers' digital skills and resistance to the use of digital technologies in the school context. Studies on teachers' professional development link perception to the acceptance of technology. Specifically, an effective tool was analyzed to monitor teachers' resistance to the use of distance learning, especially in lessons and in professional practice. Future research developments could evaluate the effects of such resistance on teachers' professionalism and students' motivation and self-determination. It is hypothesized that the phenomenon of the use of digital technology in the teaching/learning process is mediated by positive or negative perceptions that the subject has of digital technology. The "forced" acceptance due to the pandemic also has effects in terms of perceptions.

3.2. Correlation and Regression Analyses

In order to determine whether demographic variables significantly predict perceptions towards online classes, a multiple linear regression analysis was computed. The independent (predictor) variables were grade, age, years of training (experience), and sex. The dependent variable was the total score on the POQ scale.

The correlation between grade and POQ was statistically significant ($\rho = -0.08$, $p = 0.04$). The correlation was negative, which means that teachers in higher grades tend to have more negative perceptions of online classes. However, here, it must be pointed out that this correlation is very low, and the two variables share only 0.6% of variance. In addition, because this correlation was calculated on a fairly large sample, it is very probable that the correlation is spurious and significant only because of the large number of participants in the sample.

The correlation between age and POQ was not statistically significant ($r = 0.07$, $p > 0.05$); hence, the variable age did not have any effect on perceptions towards on-

line classes. The correlation between years of experience and POQ was not statistically significant (r = −0.04, $p > 0.05$); hence, the variable years of experience did not have any effect on perceptions towards online classes. Finally, the correlation between sex and POQ was not statistically significant ($\chi(28) = 22.09$, $p > 0.05$); hence, sex did not have any effect on perceptions towards online classes.

Before the regression analysis was computed, the assumptions for this statistical technique were tested. The results showed that all the assumptions were met (normally distributed numerical criterion variables, no outliers, homogeneity of variance, homoscedasticity). The regression analysis showed that the model was not statistically significant $F(4589) = 1.78$, $p > 0.05$. Hence, we may conclude that grade, age, sex, and years of experience do not predict perceptions of teachers towards online classes significantly. The data collected by the demographic section confirm the need for training in media education despite the highly qualified personnel investigated in this work (average = over 17.15 years of training). In the compilation of the questionnaire, two clear themes emerged: resistance to the acceptance of technology in the school, especially in lower school grades (where the resistance manifests itself in more important forms) and awareness of a new population of pupils in contemporary school. The transition from resistance to technologies in the didactic field to professionalizing use by teachers involves a complex process of redefinition. Potentially, no educational technology produces positive or negative effects by itself, but of course, it depends on the use made of it. Therefore, the presence in the studies of negative effects (addictions, health, sedentarism, isolation, etc.) or positive effects (playfulness, relational aspects, learning, skills, etc.) must all be read within a broader debate on educational purposes and components. Therefore, the focus of educational research, especially in future research developments, must take into account not only the effects on the new generations but of the entire educational and extra-educational population (teachers, educators, etc.). One of the most evident effects of contemporary distance learning is the determination of physical, psychological, and professional states of well-being/discomfort of all the training actors. At this point in the scientific debate, therefore, the need arises to formulate a well-structured professional paradigm oriented towards professional competence and well-being [13].

Recent research [14] has shown how media education in many international contexts has found ample space in what are defined as "third spaces", that is, areas of extra-educational and socio-cultural animation. The carving out of this specific niche for digital media arises from the resistance to change and conservatism of school systems. The advent of the disruption due to COVID-19 has upset this system by suddenly introducing digital media into school teaching and designating it as the only way for schools to survive in the pandemic. However, the debate on post-COVID measures is stirring up further debate concerning a return to didactics of an exclusively frontal nature. In order to ensure that the knowledge and the experiments implemented were not in vain, it is necessary to take up the challenge posed by the interviewees in this study, namely that of creating hybrid and virtual learning environments within schools which allow for the continuation of this ongoing change process.

4. Conclusions

Downstream of the enormous process of e-learning experimentation that has taken place throughout the world since the pandemic big bang, today, the scientific debate is questioning the future of distance learning in the post-COVID era. The educational innovation resulting from the socio-health emergency has gone through two distinct phases: (1) the rescue phase of excessive optimism for the use of digital technology as the only channel for providing training in all levels of education and (2) a nostalgic phase, in which the need for a return to presence and forms of socialization of knowledge is accentuated. The professional vision model prescribes in the noticing phase the orientation toward the objectives, which requires clarification of the teaching–learning goals; therefore, reflection on necessary and professional use of digital technologies in teaching becomes

a fundamental moment in the training (and vision) of teachers. Distance teaching as an exclusive mode of training during the pandemic has forced teachers to describe, explain, and predict their actions in distance teaching. The knowledge, the training, and the use of these practices contribute to the professional vision and to the development of reflexivity on the part of the teachers.

The model that emerged from this further study made it possible to measure and develop a model that investigates the atavistic resistance and opposition to the use of distance learning among teachers in the Italian context.

As for the second theme, the new students who populate the classrooms experience and perceive the world through the eyes of the digital world where technological innovation is the norm, not a process to be implemented. The contemporary student's thinking is characterized by a logic that is structured on the hybridization of different languages and textual forms (such as texts, images, videos, and sounds) that simultaneously return an image of the world and an overall mental map [15]. The teacher's design goal is to give shape to the learning process (which also allows for achievement of the educational result) for the student immersed in his specific socio-relational context. This goal is achievable through the provision of educational stimuli also built with digital media.

Teachers have a role of renewed authority because, now aware of their own abilities and limitations, they exploit the digital resources available to build a strong educational process. From this point of view, scientific research must support the transition to this step not only by providing innovative teaching tools but also by taking care of the training of the teachers themselves and not neglecting their professional perceptions and visions.

For future research developments, it is necessary to monitor the follow-up within the training contexts one year after the pandemic when the use of blended technology (and methodology) will be structural. This analysis will show whether teachers' nostalgia for face-to-face lessons is related to their resistance to change or is a pedagogical structure implicit in their perception and a widespread teaching style.

References

1. Sarid, M.; Peled, Y.; Vaknin-Nusbaum, V. The relationship between second language college students' perceptions of online feedback on draft-writing and academic procrastination. *Read. Writ.* **2021**, 1–25. [CrossRef]
2. Limone, P. Towards a hybrid ecosystem of blended learning within university contexts. In Proceedings of the First Workshop on Technology Enhanced Learning Environments for Blended Education (teleXbe2021), Foggia, Italy, 21–22 January 2021.
3. Lapitan, L.D., Jr.; Tiangco, C.E.; Sumalinog, D.A.G.; Sabarillo, N.S.; Diaz, J.M. An Effective Blended Online Teaching and Learning Strategy during the COVID-19 Pandemic. *Educ. Chem. Eng.* **2021**, *35*, 116–131. [CrossRef]
4. Seidel, T.; Stürmer, K. Modeling and measuring the structure of professional vision in preservice teachers. *Am. Educ. Res. J.* **2014**, *51*, 739–771. [CrossRef]
5. Area-Moreira, M.; Bonilla, P.J.S.; Mesa, A.L.S. La transformación digital de los centros escolares. Obstáculos y resistencias. *Digit. Educ. Rev.* **2020**, *37*, 15–31. [CrossRef]
6. Tołwińska, B. The Role of Principals in Learning Schools to Support Teachers' Use of Digital Technologies. *Technol. Knowl. Learn.* **2021**, 1–14. [CrossRef]
7. Vuorikari, R.; Punie, Y.; Gomez, S.C.; Van Den Brande, G. *DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model (No. JRC101254)*; Joint Research Centre: Seville, Spain, 2016.

8.   Caena, F.; Redecker, C. Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu). *Eur. J. Educ.* **2019**, *54*, 356–369. [CrossRef]

9.   Nagar, N.; Shachar, H.; Argaman, O. Changing the Learning Environment: Teachers and Students' Collaboration in Creating Digital Games. *J. Inf. Technol. Educ. Innov. Pract.* **2019**, *18*, 61–85.

10. Totaro, M.W.; Tanner, J.R.; Noser, T.; Fitzgerald, J.F.; Birch, R. Faculty perceptions of distance education courses: A survey. *J. Coll. Teach. Learn.* **2015**, *2–7*, 13–20. [CrossRef]

11. Toto, G.A. Perceptions and effects of distance learning detected during an online course on ICT for aspiring nursery and primary school support teachers. In Proceedings of the First Workshop on Technology Enhanced Learning Environments for Blended Education (teleXbe2021), Foggia, Italy, 21–22 January 2021.

12. Ossiannilsson, E. Some Challenges for Universities, in a Post Crisis, as Covid-19. In *Radical Solutions for Education in a Crisis Context*; Springer: Singapore, 2020; pp. 99–112.

13. Myers, N.D.; Prilleltensky, I.; Lee, S.; Dietz, S.; Prilleltensky, O.; McMahon, A.; Pfeiffer, K.A.; Ellithorpe, M.E.; Brincks, A.M. Effectiveness of the fun for wellness online behavioral intervention to promote well-being and physical activity: Protocol for a randomized controlled trial. *BMC Public Health* **2019**, *19*, 737. [CrossRef] [PubMed]

14. Potter, J.; McDougall, J. *Digital Media, Culture and Education: Theorising Third Space Literacies*; Springer: London, UK, 2017.

15. Toto, G.A.; Limone, P. New Perspectives for Using the Model of the Use and Acceptance of Technology in Smart Teaching. In Proceedings of the 2nd International Workshop on Higher Education Learning Methodologies and Technologies Online, HELMeTO 2020, Bari, Italy, 17–18 September 2020.