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Contents

Underequipped skilled educators. The case of Southern Italian high school teachers for students with special educational needs

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This article has been developed jointly by the authors.
Katia Caposeno wrote the sections 1 - Introduction and 8 - Conclusions
Alessia Scarinci wrote the section 2 - Theoretical perspective
Anna Dipace wrote the sections 3 - Aims, 4 - The context and 5 - Data collection
Fedela Feldia Loperfido wrote the sections 6 - Data analysis methods and 7 - Results
Jarmo Viteli supervised the whole research design.

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Abstract:
How is digital culture at school shaped? How do teachers perceive the use of ICT in education and, more specifically, in the teaching activities they arrange? This paper describes a research inspired to Opeka. This is a Finnish project realized by the University of Tampere since 2004 and aimed at grasping the teachers' perception on ICT in education through a 106-items questionnaire. By this first research, it emerged that four different factors (Leadership and Management, Time and Motivation, Resources and Access to Resources, Confidence and Competence) compose the teachers' digital culture. We translated the questionnaire from Finnish to Italian and administered it to the participants in the TFA program at the University of Foggia (IT). We then run Principal Component Analysis, and two Independent t-test and Manova test to grasp the differences of the factors in relation to some demographics. Results show that, in the Italian sample, the factors imply components about both rules and contribution of the educational community in the mediated learning activities. Several significant differences emerged in relation to demographics on the different factors. However, probably these differences can be culturally mediated.

Keywords: teachers' digital culture, media and education, factors, demographics and differences

1. Introduction

The use of ICT has modified the didactic practices and continuously transforms learning activities, methods and settings (Limone, 2012). In turn, pedagogy is required to strengthen the strategic role of ICT in the learning contexts (Dipace, 2015). These changes in the educational field is sustained by the development of new studies and by European polices trying to integrate Information and Communication Technology (ICT) in education. National and local laws as well are regulating the use of ICT at school and promoting the development of the so called "Digital Agenda". As Messina & De Rossi (2015) highlight, the knowledge society is trying to integrate the educational models in the changing contemporary society. According to this perspective, as new devices are developed and spread, students' digital skills have to be increased. In order to support this advancement, several dimensions should be taken into account when pedagogical activities are designed. In our view, they are the teachers' digital culture, the students' view on technology in education and the specific context within which these two dimensions interact with one another. We do claim that the context is composed, in turn, by several other characteristics, like specific laws, cultural values on ICT and education, principles within a school, historical aspects about ICT, and so on. In this paper, we focus on the dimension of the teachers' digital culture. We first propose a literature's frame on the topic, by describing how digital

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culture at school an be understood, what aspects can compose it and how it can be described through both surface and deep levels. Then, we analyse how the teachers' digital culture is characterized in an Italian sample of students in a TFA course at the University of Foggia (IT).

2. Theoretical perspective

In the contemporary society, an enlargement of the educational contexts is needed, by integrating both formal and traditional educational institutions with no formal and informal ones. This process asks for the development of a new role for teachers, since new teaching skills have to be identified. These competences imply both appropriate design of innovative learning activities and use of ICT in education (Gallina, 2008). This implies the possible integration of both face-to-face and digital didactics, the blending of the traditional tools/activities (like the use of papers or the organization of the learning activities in a face-to-face classroom) with the virtual environment. In a broader view, we can say that: "The total competence of teachers and instructors consists of a number of components where professional competence, the ability to teach the subject, the ability to structure the learning activities and knowledge of assessment and guidance are central elements" (Brown, 2001, p. 281). At the specific level related to the hybrid learning activities, we ask what roles ICT can play. Ingrosso (2004) claims that the teacher is the director of a complex educational scenario, mediating between the learning practices the student participates in and the chances given by technology. This implies a new teacher-profile composed by innovative and complex characteristics. Indeed, the teacher is:

- A learning designer, since she plans pedagogical activities and experiences in blended (mixing virtual and face-to-face) environments;
- Authoritative but not commanding, since she empowers students in the management of their own learning path, supports personalized learning experiences, and shares with students digital, multimodal and social learning environments;
- Collaborative, since she uses the digital tools to create and share the learning projects, and to compare herself to colleagues;
- Digital, since she makes advantage of digital platforms not just as repository of books, exercises and so on, but as tools to develop new interactions supporting the learning processes;
- A researcher, since she organizes the educational activities by looking at the student's results;
- Able to create the so called "ubiquitous assessment" (Googman, & Carey, 2004), which implies the use of evaluation activities all along the learning process and not just during defined steps or at the end of the learning experience.

In this panorama, web 2.0 gives the chance to create virtual learning environments enabling both distance collaborative work and sharing of materials (Vayola, 2016). However, some studies (Avvisati et al., 2013) showed the difficulties of integrating educational technological tools. Such a difficulty often depends on "external" obstacles (like the lack of the adequate equipment in schools), which can be defined as first level barriers (Hew & Brush, 2007). However, there is also a second level of obstacles, which are the internal ones and are related to the know-how of teachers and schools about the educational technology, the teachers' digital skills, and their attitudes, believes and perceptions about the digital tools (Ertmer, 2005, 2012; Gallego & Masini, 2012). Buckingham (2007) claims that teachers are still resistant to the introduction of ICT in classroom, since its usefulness to the increasement of students' achievement is not clear. That is, very often teachers perceive the role of technology in education as being ambivalent. However, a question still stays on: how is the teachers' digital culture characterized? By referring to the general teaching process, Stevenson (2006) describes it as a system of relationships among the management, the rules and the artefacts. Furthermore, he defines four metaphors to describe ICT. They are depicted as resources, tutors, environments and tools. The idea of ICT as resource refers to the ways teachers choice different digital technologies and us them to answer the students' needs. The image of ICT as a tutor represents the idea that digital technologies are designed and built to support the students' learning process, to guide it and to scaffold its steps. The metaphor of Environment is about the idea that students can control and autonomously explore digital microworlds wherein they build their own knowledge. In other words, in this microworlds, students teach the computers, instead of being taught by them. The image of ICT as a tool is more common than the previous ones and has several meanings (a mere tool for doing a task, a resource to support thinking processes, and so on). These metaphors seem to describe the connection point between students and teachers, that interconnecting space between the main actors of the learning experience. However, by a more general view, Loveless (2011) suggests that three aspects shape the relation between ICT and

teachers' working. Namely, economic, social and cultural settings guide the us of ICT for both teaching and learning. Furthermore, the change over time of teachers' knowledge about ICT in education is a facet to be considered to understand the way the digital culture at school can be composed. Brown (2001) recommends that both tacit and explicit dimensions shape the digital teaching. The tacit one is like the roots of a tree or, in short, those deep and immerse meanings about digitally mediated educational processes. The explicit dimension, instead, is like the leaves, the visible aspects which are on the surface of the learning experiences. More specifically, "The tacit dimension is like the roots buried below the surface and deeply immersed in the soil that makes it robust. The explicit lives in books and in our brains as concepts and facts and deals with the "know-what." The tacit deals with the "know-how" that is best manifested in work practices and skills. The tacit resides in action, most often in participation with others. As a consequence, tacit knowledge can be distributed as a shared, socially constructed understanding that emerges from collaboration" (Ibidem, p. 68). Viteli, Sairanen, & Vuorinen (2013) elaborated a four-factors more specific schema to describe how both teachers' and schools' digital cultures are shaped. Namely, the following four dimensions characterize such cultures: 1) Leadership and Management. This is about the way teachers organize the digital tools for creating learning activities, the cooperative or conflicting interactions they have with colleagues and/or technical experts at school; 2) Resources and Access to resources. This is about the perception of having enough or insufficient resources (tools, infrastructures, and so on) for making meditated learning activities; 3) Confidence and Competence. This is about the skill and experience teachers have about the use of digital devices in the teaching activities; 4) Motivation and Time. This involves the motivational dimension supporting the teachers' use of ICT in education.

In this paper, we initially refer to this four-factors schema to grasp the factors composing the digital culture of the Italian burgeoning teachers involved in this study. Then, we grasp the characteristics of the dimensions grasped through Principal Component Analysis and the differences among participants according to some demographics.

3. Aims

- To measure which factors are associated with the perception Italian teachers have about the use of ICT at school;
- To analyse what demographics (gender, experienced/not experienced teachers, the level of schools) are associated with those factors in a TFA course for teachers of students with special educational needs;
- To analyse eventual differences and commonalities between two different educational contexts (the Finnish and the Italian ones).

4. The context

The research was inspired by Opeka, which is a Finnish project lead by the University of Tampere (FI). It was aimed at grasping the digital culture of schools by answering a 106 items self-report questionnaire exploring the dimensions shaping the teachers' perception of ICT at school. Namely, it is aimed at measuring the distribution of digital devices in schools, their use for didactic purposes, the teachers' digital skills and the digital competences teachers taught students. During Opeka project (since 2004 and still ongoing), more than 3000 teachers were interviewed in Finland. Right after the compilation, teachers received the results of the questionnaire compared with the results of their own school and the municipality where this is located. As results, it emerged that the four factors (Leadership and Management, Resources and access to resources, Confidence and Competence, and Time and Motivation) described in the paragraph "2.Theoretical perspective" compose the teachers' digital culture. In October 2017, we repeated the administration of the questionnaire in Apulia, a Southern Italy region. The participants were attending TFA, which is one of the possible alternative paths people can attend in Italy to become teachers. Namely, a person can get the qualification as a kindergarten or primary school teacher by attending a specific 5-years master degree. To become a secondary school teacher, instead, you have to get a master degree on a specific field (e.g. Science, Literature, etc.) and then a 1-year specialization degree (which is the TFA) to learn pedagogical theories, methods and tools. During TFA, students (the future teachers) participate in both theoretical and training activities to learn by senior teachers how to teach. After the qualification, teachers can work as substitute teachers or can participate in a public competitive exam to become tenured teachers. TFA are organized by public universities and to become a teacher for students with special educational needs you have to attend TFA even to teach in both kindergarten and primary school. The participants in this research were teachers attending TFA for

special educational needs organized at the University of Foggia for 2017-18 academic year. Therefore, in the entire sample of participants, there were four different groups of teachers corresponding to the four school grades existing in Italy (Kindergarten, 28%; Primary school, 28%; Middle school, 17%; Secondary school, 27%). Furthermore, some participants are already teachers taking the qualification for special educational needs (85,5%), some others are becoming teachers through TFA course (3,5%), some others are at the first year of teaching (11%).

5.Data collection

The original Finnish questionnaire was translated to Italian by two researchers who first made a literal translation. Then, a broader team of researchers (composed by four experts) checked the translation and rearranged it by taking into account the Italian cultural aspects about the teaching processes. During a third step, 10 teachers were involved to complete the questionnaire and indicated eventual unintelligible aspects. As a further step of the questionnaire's preparation, the team arranged the final questions according to the teachers' suggestions. The definitive tool was a 60-items self-report questionnaire (five demographic questions and 55 questions about the perception teachers have about the use of ICT in education). Each of the 55 items was structured as a five-points Likert scale (0=completely disagree, 5=completely agree) and the questionnaire was administered during the first week of the course by an online google module. Furthermore, the 55 items were split in four scales: 1) Digital working environment (5 items), composed by items about the technological infrastructures and the usability of ICT at school; 2) Organizational culture (8 items), composed by items about the use of ICT in the school community and the teachers' professional development; 3) Pedagogical activities (26 items), composed by items about the use of ICT in education, the activities teachers usually take at school by using ICT, the use of ICT in didactic activities by students (according to the teachers' perception), the evaluation practices mediated by technologies and related to ICT mediated educational activities; 4)The teachers' digital skills (11 items), composed by items exploring the planning of digital contents and environments by teachers, the safeness related to the use of ICT at school, the teachers' digital skills about old and new media for education.

6.Data analysis methods

After collecting data, we used the following methods of analysis:

- Explorative factorial analysis through Principal components method (PCM) to detect the dimensions composing the Italian teachers' digital culture. We run PCM by asking for four factors, according to literature;
- The calculation of the reliability of the factors emerged through the factorial analysis;
- The calculation of the correlation of the factors emerged through the factorial analysis;
- The creation of four sum variables corresponding to the reliable factors;
- The independent samples t-test to detect differences between males and females;
- The independent samples t-test to detect differences between experienced teachers and not experienced teachers;
- Manova test to detect the differences among the participants belonging to the several school levels (kindergarten, primary school, middle school and secondary school).
  All of the analysis was made through IBM SPPS software.

7.Results

An initial principal component analysis (PCA) was conducted on the 100 items (106 less the demographic items) with orthogonal rotation (varimax). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analyisis, KMO=,762 («good» according to Field, 2009), but not all KMO values for individual items were above the acceptale limit of .5 (Field, 2009). Bartlett's test of sphericity χ^2 (2346) = 6,722, p<,001 showed that not all the correlations between items were sufficiently large for PCA. Therefore, just items with correlations larger than .3 were taken (Field, 2009), which were 55. PCA was conducted just on the 55 items with orthogonal rotation varimax. According to literature (op.cit.), PCA was run by asking for four factors. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO=,813 ("great" according to Field, 2009) and all KMO values for individual items were above the acceptable limit of .5 (Filed, 2009). Bartlett's test of sphericity χ^2 (1653) =5,927, p<,001 showed that all the correlations between items were sufficiently large for PCA. Table 2 shows the number of item clustered on the same component and the variance explained by each component.

Component	Number of items	Variance explained	Reliability (Cronbach's α)
1	17	15,79 %	.93
2	17	14,09%	.93
3	12	13,55%	.90
4	8	8,64%	.87

Table 2
COMPONENTS, NUMBER OF ITEMS, VARIANCE AND RELIABILITY

By analysing the items composing each factor, we defined the components as follows. Component 1 represents the "Use of ICT and teaching", since it is composed by items exploring the reasons why teachers could use digital tools during their job week or their students should use them (e.g., to build collaborative knowledge, for interdisciplinary learning activities, to interpret information, and so on). Component 2 represents "Innovative teaching and evaluation", which implies items grasping if and how teachers can use new technology for innovative learning and assessment activities (e.g. I use e-portfolios to evaluate students, I use learning analytics to assess the students' activities, I use virtual reality activities, and so on). Component 3 represents "Rules and digital skills", which involves those items analysing how teachers perceive the rules related to the use of technology (e.g., When I use a new digital tool I always read the terms of use and conditions, I guide students to protect themselves from the common risks related to the use of new technology, I know how to use digital materials for teaching, etc.). Component 4 represents "Educational community", which implies items exploring the technical support in the use of digital tools by colleagues and specialists (e.g. I receive technical support for the digital tools at school). Furthermore, it is saturated by items analysing the relational dimension of the school community and the eventual support it gives to the teachers (e.g. We share suggestions and support each other about the use of new technology for education). After running the PCA, we checked the correlation among the four factors through Persons' r. Results show that Component 1 has a significant positive relationship with Component 2, r=.61, p (one-tailed) <.01; Component 3, r=.72, p (one-tailed) <.01; Component 4, r=.31, p (one-tailed) <.01. Component 3 has a positive significant relationship with Component 2, r=.74, p (one-tailed) <.01 and Component 4, r=.36, p (one-tailed) <.01. Component 4 has a positive significant relationship with Component 2, r=.36, p (one-tailed) <.01 as well.

We also run the independent samples t-test to detect differences between males and females. Results show that, on average, male participants have a higher score (M=49,88, SE=2,88) than female (M=41,97, SE=1,13) on Factor 1. This difference is significant t(153)=-2,32, p<.05. On average, male participants have a higher score (M=48,17, SE=3,12) than female (M=40,38, SE=1,15) on Factor 2. This difference is significant t(152)=-2,24, p<.05. On average, male participants have a higher score (M=42,11, SE= 1,55) than female (M=38,62, SE=.89) on Factor 3. This difference is not significant t(153)= -1,33, p>.05. On average, male participants have a higher score (M=27,35, SE=1,12) than female (M=23,95, SE=.58) on Factor 4. This difference is significant t(155) =-1,98, p>.05. Therefore, by giving a general glance to these results, there emerges that, on average, male have higher scores than females on all of the factors. These differences are significant for Component 1 (Use of ICT and technology), Component 2 (Innovative teaching and evaluation) and Component 4 (Educational community). They are not significant for Component 3 (Rules and digital skills).

Much more interestingly, we run the independent samples t-test to detect differences between experienced teachers (80%) and not experienced teachers (people having the first teaching experience during the TFA training) (20%). Results show that, on average, experienced teachers have a higher score (M=43,62, SE=1,16) than not experienced teachers (M=39,25, SE=2,92) on Factor 1. This difference is not significant t(151) = -1,46, p>.05. On average, experienced teachers have a higher score (M=41,62, SE=1,18) than not experienced teachers (M=39,58, SE=3,33) on Factor 2. This difference is not significant t(150) = -,66, p>.05. On average, experienced teachers have a higher score (M=39,58, SE=,86) than not experienced teachers (M=35,87, SE=2,43) on Factor 3. This difference is not significant t(151) = -1,64, p>.05. On average, experienced teachers have a higher score (M=25,51, SE=,59) than not experienced teachers (M=23,38, SE=1,41) on Factor 4. This difference is not significant t(153) = -,771,

p>.05. Therefore, by looking by a glance this analysis, we can see that, on average, experienced teachers have higher scores than not experienced teachers on all of the factors, but that these differences are not significant.

At the end, we run Manova test to detect the eventual differences on the factors in relation to the different levels of school (kindergarten, primary school, middle school and secondary school). Namely, A separate ANOVA was conducted for each dependent variable, with each ANOVA evaluated at an alpha level of .025. There was a significant difference among the teachers' groups on Factor 1, $F(4, 144)=11.85$, $p=.000$, partial $\eta 2=.248$ with secondary school (M=52.08) scoring higher than middle school (M=46,92), primary school (M=42,71) and kindergarten (M=35.42). There was a significant difference among the teachers' groups on Factor 2, $F(4,144)=3.299$, $p=.013$, partial $\eta 2=.084$ with secondary school teachers (M=48.229) scoring higher than middle
school (M=40.28), primary school (39.286) and kindergarten (M=38.048). For Component 3 "Rules and digital skills" the assumption of Levene's test >.05 was not met. For Component 4 "Educational Community" p>.025.

8.Conclusion

As quoted in Windschitl & Sahl (2002), several studies suggest that teachers who use technology tend to become more constructivist in their pedagogical orientation over time (Becker & Ravitz, 1999; Means, 1994; Mehlinger, 1996), but even that literature has not offered clear explanations for how or why some teachers transform their practice. Part of the reason for the lack of explanatory power in this research base is that the majority of studies have been devoted to tracing changes in individual teachers' knowledge, beliefs, and instructional practices, while ignoring the fact that teachers' thinking is often influenced by both the social contexts in which they operate and the institutional cultures that profoundly shape the meaning of their work (Little, 1990; Minick, 1985). This theoretical aspects seem to match and explain some results emerging from this research. Namely, we can say that an interesting difference emerges between the Finnich and the Italian contexts. That is, the Finnish components were "Leadership and Management", "Resources and Access to resources", "Confidence and competence", "Motivation and Time". In the Italian context, we defined the following factors "Use of ICT technology", "Innovative teaching and evaluation", "Rules and digital skills" and "Educational community". In some ways, the Finnish factor "Resources and access to resources" and the Italian one "Use of ICT and teaching" are similar. However, in the Italian sample, the use of digital tools seems to be connected with the teaching activities in a unique factor. The Finnish component "Confidence and competence" can be associated with the Italian one "Rules and digital skills", since both of them represent the dimension about digital competences teachers have. However, the Italian factor seems to stress the role of rules and, perhaps, the idea that teachers are not yet confident with the use of ICT at school and need to take into account what both formal and procedural rules point out to use ICT in an effective way. At the same time, the factor that we called "Educational community" emerges. In this sense, it seems that both co-constructivist and collaborative processes are in some ways related with the use of ICT. That is, the role of the community shaped by colleagues, principals, technical experts, and so on is defined as a component characteristic for the Italian context. Another interesting result is about the difference between male and female teachers in the sample. That is, according to the independent t-test, on average, males have significant higher scores on Component 1, 2 and 4. That is, by going in depth in the items of the respective factors, it seems that males are more confident than females with the use of ICT in education. In respect to the differences related to demographics, the independent t-test to get the differences between experienced and not experienced participants shows that there are differences between the two groups (more experienced teachers have, on average, higher scores on all the factors). This result suggests that can be a mediation of the experience in the way teachers perceive and use ICT for education. Manova test also shows that, on factor 1 and 2, there are significant differences among the several groups. Therefore, as you go ahead with the level of school, you can find higher scores on the average.

In a final synthesis, we can say that a difference in respect to the Finnish four-factors schema emerges, since the Italian one takes into account the importance of the rules and the crucial role of the educational community in the use of ICT at school. However, even if these results are interesting, further future research could be run. Indeed, some other questions and hypothesis can be explored, since, for example, cultural aspects can mediate the centrality of rules in the teachers' practice. At the same time, it can influence the emerging of the community aspects and the differences between females /males,

experienced/not experienced teachers, and among the different school levels. Furthermore, form a methodological point of view, this article can represent just a first step of analysis, since there is not a randomized sample. When we run PCA, we took just the items with significant correlations to grasp the four factors and the reliability of each factor was high enough. However, the questionnaire was not a validate scale and needs to be furtherly structured according to the Italian population. The high number of items for each factor can also positively impact on its reliability and subdimensions within each factor could be explored.

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