Chapter 13
Teachers' Professional Information and Communications Technology Responsibility: Further Development of a Scale to Measure the ICT Ethos of Teachers

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Introduction

Since about the turn of the millennium children and teenagers are increasingly growing up in a world where the use of information and communications technology (ICT) is part of daily life – a circumstance that led Prensky (2001) to speak of the so-called Digital Natives. Thereby they often acquire an extensive know-how i.e. practical knowledge with regard to the use of these kinds of new technologies, despite their youth. This leads to them often having superior skills with regard to the application of ICT compared to their teachers (e.g. Feierabend et al., 2016). However, what can't be assumed is that superior knowledge, skills and a broader applicability go hand in hand with an increase in sensitivity with regard to the responsible use of new technologies. Some examples would be the use of third-party intellectual property, an intimate self-portrayal, or the verbal abuse and vilification of outsiders up to and including to cyberbullying (e.g. Biedermann et al., 2018; Pieschl et al., 2013). Therefore, an immediate and necessary task of teachers is the promotion of responsible conduct regarding the ethical use of ICT among their students. This is not something which is the exclusive responsibility of informatics and media education teachers;it needs to be carried out by all teachers.

Hereby we are dealing with a complex construct encompassing aspects like a professional and ethical ability to make judgments, convictions regarding the ICT ethos and a professional and ethical code of conduct of teachers. All of this can be paraphrased as the ICT ethos of teachers. The ethical responsibilities in the domain of ICT are not the same as for example in the domains of business or politics; they are probably less visible and less structured (cf. e.g. Beck, 2006; Nucci, 2001; Oser & Biedermann, 2018a, b; Veugelers, 2010). These special challenges in the domain

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of ICT have compelled us to develop i.e. advance a measuring tool for this purpose. Specifically, we aim to enable an empirical measurement of ethical responsibility of teachers with regard to the ICT competencies of their students. The first step of this article is to present a further development of Çoklar's (2012) ICT ethical leadership scale. Following this, the second step consists of an analysis of to what extent ICT responsibilities are adopted and implemented by teachers (in German-speaking Switzerland) – in short: which ICT ethos is expressed and implemented by teachers in their professional practice.

Teacher Ethos and Responsibility in Dealing with ICT

The term *ethos* was originally used by Homer in the eigth century BCto reference the place and practices of animal habits (cf. Worman, 2002). Subsequently, the term ethos started being used in reference to humans, and it was Aristotle who in the fourth century BC started using the term in reference to the character (in the sense of virtue) and habits of humans exclusively (Smith, 2004). The habit refers to righteous conduct and can therefore only be manifested through activities: "Men become builders by building houses, and harpists by playing the harp. Similarly, we become just by the practice of just actions, self-controlled by exercising self-control, and courageous by performing acts of courage" (NE, I, II, 1103a, 31–33 according to Smith, 2004). To develop ethos it is also necessary to repeatedly perform virtuous actions, and these actions should be oriented towards the right goal, which Aristotle described by using the term *telos* (cf. ibid.).

Aristotle's characterization of ethos grounds discussions involving the term to this day. The necessary alignment of *telos* points towards the fact that ethos should be expressed especially when dealing with specific situational conflicts. Descriptions of ethos are therefore often mentioned in close relationship with a profession, e.g. the ethos of medicine, of law, of clerks and of teachers, who are the concern of this article (with focus on the domain of ICT as presented above).

At the turn of the twenty-first century, many authors dealt with the question of teacher ethos. Concepts like e.g. (a) a general stance (attitude) towards welfare (Campbell, 2003, 2014), (b) moral aspects of decision-making by teachers (Jackson et al., 1993), (c) professional conduct during conflict-laden teaching situations (Forster-Heinzer, 2015), (d) reflection of social structures under the aspect of justice i.e. injustice (Gardner et al., 2009), (e) the moral style (Fenstermacher, 2001; Fenstermacher et al., 2009), (f) the distinction between prevention, delegation, individual decision-making, complete and incomplete discourse (Oser, 1998) or (g) the acceptance of responsibility towards hurtful conduct by students in a welfare sense (Noddings, 1992/2005, 2008) were developed and in part empirically tested. A common feature of all of these concepts is that they are based on the conduct i.e. the actions of teachers which enable the (academic) development of their students. According to Oser and Heinzer (2010; cf. also Oser, 2018) this always revolves around the «Sense of Necessity», by which the authors mean the necessity to

recognize professional support and to possibly prevent i.e. to counter in an engaged manner and thereby bring about positive change in situations of stagnation and especially of impairment and discrimination. In that sense teachers, who do not only concern themselves with the proper and suitable learning process, but who fundamentally have the best interest of each and every one of their students at heart, are attributed with a high professional ethos (cf. Campbell, 2013; Hanhimäki & Tirri, 2009; Noddings, 2002; Oser & Biedermann, 2018a; Sanger & Osguthorpe, 2013; Tirri, 2012; Ziegler, 2016; Zutavern, 2001).

To take care of one's students, in the sense of prevention and intervention with regard to reprehensible dealings with new technologies, is a special form of ethos. This is because in this case infringements are not obvious, a special kind of monitoring of children and teenagers with regard to behavioral change is necessary, and because these forms of disclosure can't be planned ahead for in an obvious manner. Teachers need to be able to (a) convey information regarding the positive and negative ways of dealing with ICT, (b) identify active and potential offenders as well as victims of misuse, (c) support victims and implement exercises in which students need to emphasize with the role of the victim, as well as to (d) convey values of protection of intimacy and integrity. Teachers need to feel responsible if their students display reprehensible conduct whilst dealing with ICT. Çoklar (2012) explored the question of what constitutes these reprehensible activities i.e. what values should be conveyed by teachers regarding the use of ICT. Leaning on the concepts of Mason (1986), he worked out under the term of «Ethical Educational Leadership» (e.g. Branson & Gross, 2014) these four dimensions as being of importance with regard to the «ICT Ethical Leadership»:

(a) Intellectual property: Revolves around the question of use of materials and information on the internet, as well as the purchase of services which are forwarded in one's own name.
(b) Privacy: Revolves around questions of security regarding personal data which gets saved in the digital environment.
(c) Accessibility: Revolves around the question of necessary know-how regarding the use of technology in order to get access to information.
(d) Accuracy: Revolves around the question of validity i.e. correctness of information and its identification (cf. also Akbulut et al., 2008).

Referring to computer ethics as described by UNESCO (2002), Çoklar (2012) holds that the leadership role of the teacher necessitates that teachers guide all their students towards an ethical ICT behavior. Through a data-driven approach he arrived at the four dimensions of the «ICT Ethical Leadership»:

1. Mentorial ICT ethical leadership which is based on helping and scaffolding students (e.g "I can explain to the people in the environment where I live the damages caused by the use of unethical use of ICT"; 10 Items, $\alpha = .88$);
2. Visionary ICT ethical leadership including items of a kind of ideal that teachers should have (e.g. "I can make a list of ICT ethical rules that have to be obeyed."; 6 Items, $\alpha = .86$);

3. Cultural ICT ethical leadership which is based on expectations parents and students have towards a teacher in general (e.g. "I encourage rewarding of students who use information and communication technologies ethically in different ways"; 5 Items, $\alpha = .80$); and

4. Instructional ICT ethical leadership encompassing teaching competences with respect to ICT demands in classrooms (e.g. "I can direct my students to educational sources where they can learn ethical computer use"; 3 Items, $\alpha = .80$).[1]

Through this inductively acquired and exploratory-factor, analytically hardened four-dimensional scale of the «ICT Ethical Leadership», the ethical guidance is not regarded as a matter of factual knowledge, but it is established on a different action-oriented plane of responsibility. This means that the aforementioned characterization of ethos as an action links to Aristotle and therefore manages to be convincing. As a result, ethical leadership goes beyond personal ethical conduct, since it ultimately includes the actions of students within a classroom setting for which the teacher holds responsibility.

Setting Objectives and Formulating Questions

Through his work, Çoklar (2012) made an important step towards capturing the characteristics of ICT Ethical Leadership. However, some limitations do appear by taking a more critical look at his work. For example, through the application and use of ICT, teachers convey ethical values as well. These values can have three forms of responsibility: (a) taking responsibility for a product, (b) taking responsibility regarding the identity of another person and (c) taking responsibility regarding the actions of another person. While form a of responsibility is often the focus of the teacher, for forms b and c this is seldom the case (e.g. when students develop their own forms of subtle negative and immoral behavior, disguise bad behavior or refuse to take responsibility for their actions towards other students). With regard to the target group it can be stated that Çoklar's (2012) operationalizations towards capturing the ICT ethos are focused on college students in their senior year and not on practicing teachers.

Therefore, it is plain to see that up to the present point there remains a persistent lack of suitable instruments for the empirical-quantitative research of ethical responsibility of teachers in the domain of ICT which focuses on the above mentioned forms b and c. By working on this gap in the research, the article at hand aims to present a further development of Çoklar's (2012) instrument for capturing ICT

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[1] The internal consistency of the ICTELS scale (Information and Communication Technologies Ethical Leadership Scale), which consists of 24 items in total, lies at a Cronach's alpha of .93. The study group that was formed for the construct validity of the scale consists of 305 pre-service teachers in the computer teaching departments in 9 different universities in Turkey in the 2008–2009 academic year. 60.7% of the students were male (185) and 39.3% were female (120).

ethos, whereby the focus is set on the economical use of the instrument and on practicing teachers. Specifically, as a first step, the reliability and the factor structure of the developed instrument are tested. Building on this, the following three questions are pursued:

1. (How) can ICT responsibility of teachers be empirically measured?
2. How strongly developed are ICT responsibilities of teachers in Switzerland?
3. Can these ICT responsibilities be explained by some individual (select few) attributes as well as by aspects of the school and lesson?

Data Acquisition and Sampling

Within the context of ICILS 2013 (International Computer and Information Literacy Study) of the IEA (International Association for the Evaluation of Educational Achievement) it was possible to conduct a written survey of teachers, school administrators and ICT personnel alongside the testing and surveying of eighth grade students (in Switzerland 3225 students from 98 schools). The teachers were surveyed about their education and training in the domain of ICT, about the deployment of ICT in their lessons, as well as about their attitudes and expectations towards ICT in school. In Switzerland it was also possible to apply a national module through which questions about the ethical responsibility of teachers in the domain of information and communications technology could be asked. The data acquisition of the international survey and of the national module was conducted through a questionnaire, whereby the dimensions regarding the ethical responsibility in the domain of ICT were recorded through a standardized Likert-scale (cf. Table 13.2 about operationalization). In total 910 seventh, eighth and ninth grade teachers took part in the ICILS 2013; some of them did not fill out the added national module completely. In the case of missing answers, the subjects were excluded from the statistical analysis. This was done in order to make use of only complete datasets for the modeling and description of the construct. The average age of all participants was 43.7 years and 53% of them were women. Table 13.1 contains the characteristics of the sampled teachers from Switzerland.

Table 13.1 Characteristics of the teachers from Switzerland

	Number	% women	% public school	% more than 2 years of experience	Age
Total	910	53%	99%	87%	43.7
German-speaking Switzerland	474	49%	98%	87%	44.6
French-speaking Switzerland	237	51%	99%	85%	41.6
Italian-speaking Switzerland	199	64%	100%	88%	43.9

Empirical Findings

ICT Ethos of Teachers: Factor Structure and Scale Analysis

Exploratory Factor Analysis The scale of ethical responsibility of teachers in the domain of ICT is based on a total of 14 items which were evaluated by the teachers in accordance with a predefined four-level answer format ranging from (1) doesn't apply to (4) does apply. The items were taken from Çoklar*'s* (2012) original 24 items and translated into German. Since the three theoretically defined dimensions "behavior towards unethical conduct with ICT", "awakening and strengthening of ethical sensitivities in conduct with ICT" and "cultural embedment of ethical ICT principles" differ from Çoklar*'s* four dimensions, the items were assembled anew from different dimensions, whereby they were partially modified as well.

In order to investigate the factor structure of individual items, a principal component analysis (PCA) was conducted with the 14 items. The items were rotated by an oblique-angled Promax-rotation in the direction of a simple charge pattern of the manifested variable. Factor loading > .50 was hereby deemed significant (Backhaus et al., 2016; Bortz & Schuster, 2010; Bühner, 2011). As a statistical criterion for the number of factors to be extracted we chose eigenvalues greater than one (Kaiser-Guttmann criterion). The analysis extracted the theoretically postulated three factorial solution with eigenvalues of 5.52 (component 1), 1.29 (component 2) and 1.11 (component 3; variance clarification of 56.5%) and satisfactory quality criteria (sample suitability according to Kaiser-Meyer-Olkin = .89; Bartlett-test on sphericity χ^2_{91} = 3291.68, p < .001) (cf. Table 13.2). Furthermore, thereliability analysis of the three dimensions confirms that with the help of the 14 items the ethical responsibility of teachers in the domain of ICT can be mapped, whereby the internal consistency of the scales (scaling quality) with a Cronbach's alpha between .70 and .82 can be classified as satisfactory.

From a content aspect, the three extracted dimensions show two distinguishable domains respectively: (1) The «Behavior towards unethical conduct with ICT» shows aspects of recognition and clarification of unethical behavior as well as the readiness to take action and correct unethical behavior. (2) «Awakening and strengthening of ethical sensitivities in conduct with ICT» is focused on prevention of unethical behavior. On the one hand it focuses on this in a sense of (knowledge and action based) sensitization towards (in)correct ICT behavior, and on the other hand it focuses on direct feedback and rewards in the case of correct behavior. (3) The «Cultural embedment of ethical ICT principles» contains aspects of the implementation and the enforcement of ethically oriented ICT (school) ordinances.

Table 13.2 Exploratory factor analysis – ICT ethos of teachers

|	1	2	3
Behavior towards unethical conduct with ICT ($\alpha = .82$)			
I intervene if ethically problematic aspects arise in the domain of information and computer technologies (ICT).	.86		
I can explain to my students why they need to behave ethically during their conduct with ICT.	.82		
I can demonstrate to the people in my surroundings how unethical misuse of ICT can lead to harmful outcomes.	.65		
I can perform the necessary steps towards solving problems which arise through violations of ethical principles in the domain of ICT.	.65		
I draw peoples' attention towards following ethical principles whilst they are performing ICT related tasks (internet research, surfing, use of software, etc.).	.52		
Awakening and strengthening of ethical sensitivities in the conduct with ICT ($\alpha = .75$)			
I try to reward students for using ICT ethically.		.84	
I am able to investigate existing behavioral norms regarding ICT, and I am able to discuss those with others.		.60	
I try to implement activities in my lessons which will enable students to adopt the necessary skills for a proper conduct with ICT.		.49	
I am able to convey to my students ethical principles regarding the conduct with ICT.	.46	.54	
I am able to point my students towards sources where they can gain deeper insights into the topic of ethical principles regarding conduct with ICT.	.41	.44	
Cultural embedment of ethical ICT principles ($\alpha = .70$)			
I support moral, social etc. educational offerings which deal with ethical conduct in the domain of ICT.			.84
I urge my teacher colleagues to make efforts on raising ethical principles in the domain of ICT.		.39	.68
I try to raise awareness towards the necessity of ethical conduct in general and in the domain of ICT in particular.	.33		.64
I can demonstrate principles regarding the latest information and communication technologies.	.21	.26	.47
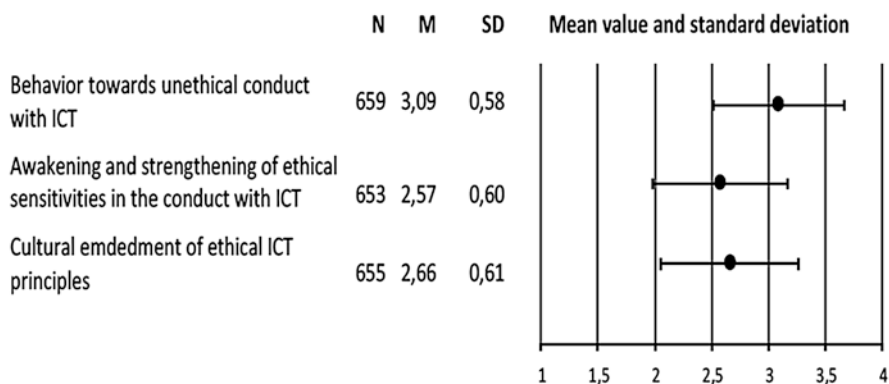
Fig. 13.1 Descriptive statistics of the three dimensions of the ICT ethos of teachers

ICT Ethos of Teachers: Factor Structure and Scale Analysis

With a mean value of 3.09 ($SD = .58$) the "Behavior towards unethical conduct with ICT" was (clearly) approved of by the surveyed teachers. The two other dimensions of the ICT ethos construct possess mean values in the range between approval and rejection («Awakening and strengthening of ethical sensitivities in conduct with ICT» [$M = 2.57$, $SD = .60$], «Cultural embedment of ethical ICT principles» [$M = 2.66$, $SD = .61$]).

The comparison between genders (cf. Figure 13.2) shows that male teachers (in Switzerland) exhibit on average a significantly higher median characteristic in all three dimensions regarding ethical responsibility in the domain of information and communications technology as opposed to female teachers (Dim I: $t(657) = 4.97$, $p < .001$; $M_{Women} = 2.98$, $SD = .59$; $M_{Men} = 3.20$, $SD = .55$ | $d = .39$ [Cohens d];[2] Dim II: $t(651) = 4.39$, $p < .001$; $M_{Women} = 2.47$, SD $= .59$; $M_{Men} = 2.67$, $SD = .58$ | $d = .34$; Dim III: $t(653) = 4.57$, $p < .05$; $M_{Women} = 2.59$, $SD = .63$; $M_{Men} = 2.72$, $SD = .60$ | $d = .21$). However, the effect size of the difference between the groups has to be interpreted as small ($d = .21–.39$).

By differentiating between informatics teachers and teachers not teaching ICT related subjects (see Fig. 13.3), significant differences can be observed in all three subdimensions of the ICT ethos with respect to ethical responsibility of the teacher in the conduct with ICT. The effect size for this can be rated as between medium and large (Dim I: $t(656) = 4.60$, $p < .001$; $M_{ICT-Teacher} = 3.43$, $SD = .41$; $M_{Teacher} = 3.06$, $SD = .58$ | $d = .74$; Dim II: $t(650) = 4.51$, $p < .001$; $M_{ICT-Teacher} = 2.91$, $SD = .48$; $M_{Teacher} = 2.54$, $SD = .60$ | $d = .68$; Dim III: $t(652) = 5.89$, $p < .05$; $M_{ICT-Teacher} = 3.11$, $SD = .55$; $M_{Teacher} = 2.61$, $SD = .60$ | $d = .87$).

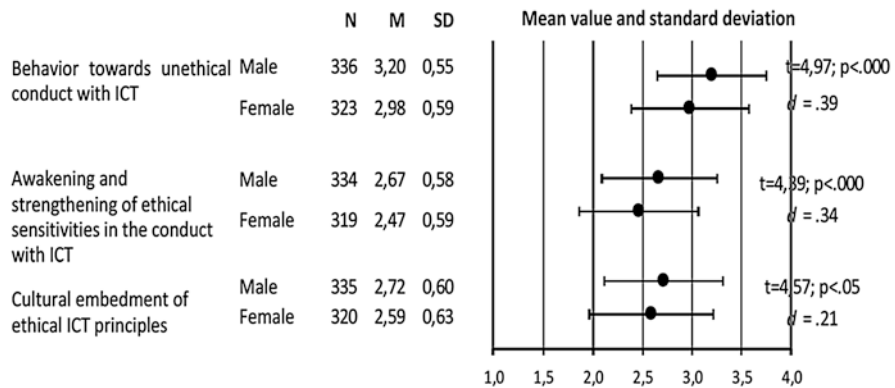|		N	M	SD	Mean value and standard deviation
Behavior towards unethical conduct with ICT	Male	336	3,20	0,55	t=4,97; p<.000
	Female	323	2,98	0,59	d = .39
Awakening and strengthening of ethical sensitivities in the conduct with ICT	Male	334	2,67	0,58	t=4,39; p<.000
	Female	319	2,47	0,59	d = .34
Cultural embedment of ethical ICT principles	Male	335	2,72	0,60	t=4,57; p<.05
	Female	320	2,59	0,63	d = .21

1,0 1,5 2,0 2,5 3,0 3,5 4,0

Fig. 13.2 Gender comparison of the three dimensions of the ICT ethos of teachers

[2] Cohen (1988) differentiates between the following effect sizes: small effect: $d = .20$; medium effect: $d = .50$; large effect: $d = .80$.
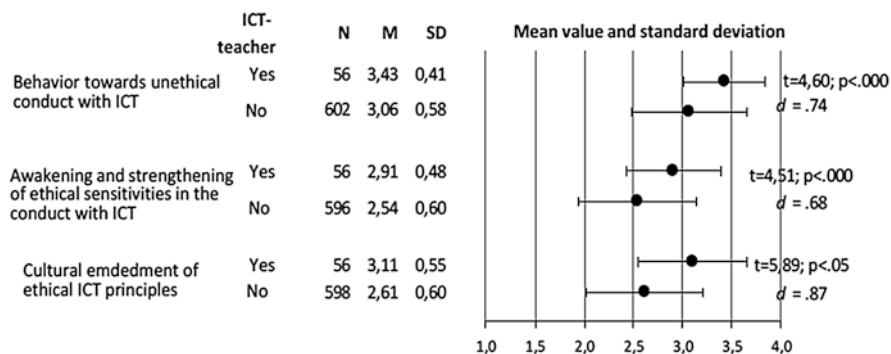
ICT-teacher		N	M	SD	Mean value and standard deviation	
Behavior towards unethical conduct with ICT	Yes	56	3,43	0,41		t=4,60; p<.000
	No	602	3,06	0,58		d = .74
Awakening and strengthening of ethical sensitivities in the conduct with ICT	Yes	56	2,91	0,48		t=4,51; p<.000
	No	596	2,54	0,60		d = .68
Cultural emdedment of ethical ICT principles	Yes	56	3,11	0,55		t=5,89; p<.05
	No	598	2,61	0,60		d = .87

1,0   1,5   2,0   2,5   3,0   3,5   4,0

Fig. 13.3 Subject comparison of the three dimensions of the ICT ethos of teachers

Explanatory Model of the Three Dimensions of the ICT Ethos of Teachers

For the purpose of explaining the three dimensions of the ethical responsibility of teachers in the domain of information and communications technology (ICT), multiple regressions (OLS-models) were conducted (cf. among others Eid et al., 2010; Hair et al., 2010). Gender, deployment of ICT for in-school learning, ICT self-efficacy of teachers, priority of ICT skills in the school and collaboration between teachers in dealing with ICT were consulted as (possible) predictors. The choice of these predictors was based on a two-stage process: In the first stage all of the ICILS 2013-captured constructs were sifted. In the second stage all the constructs from stage one, which are related to some aspects of professional ethos according to the literature, were chosen for the modeling. A total of four explanatory factors which can explain the three dimensions of the ICT ethos of teachers with a total variance between 20 and 26% could be identified (see Table 13.3).

The result shows that the ICT self-efficacy of teachers is a predictor in all three subdimensions of the ICT ethos of teachers. Moreover, the gender ($\beta = -.11$, $p < .01$), priority of ICT skills ($\beta = .25$, $p < .001$), as well as the collaboration between teachers in dealing with ICT ($\beta = .17$, $p < .001$) have been shown to be influential regarding the behavior towards unethical conduct with ICT (Dim I). 20% of the variance of the dimension «Behavior towards unethical conduct with ICT» can be explained through these four predictors. Also regarding the second dimension «Awakening and strengthening of ethical sensitivities in conduct with ICT» 26% of the variance can be explained by ICT self-efficacy ($\beta = .24$, $p < .001$), gender ($\beta = -.06$, $p < .10$) and the collaboration between teachers in dealing with ICT ($\beta = .33$, $p < .001$). 25% of the variance of the dimension «Cultural embedment of ethical ICT principles» of the ICT ethos of teachers can be explained by the predictors ICT self-efficacy ($\beta = .16$, $p < .001$), deployment of ICT for in-school learning ($\beta = -.18$, $p < .01$), priority of ICT skills ($\beta = .37$, $p < .001$) and the collaboration between teachers in dealing with ICT ($\beta = .30$, $p < .001$).

Table 13.3 Multiple regression model for the purpose of explaining the three dimensions of the ICT ethos of teachers

	Model I (AV$_1$)	Model II (AV$_2$)	Model III (AV$_3$)
Gender of the teacher (*male*)	**−.11 **** (−3.1)	**−.06** + (−1.8)	–
Deployment of ICT for in-school learning	–	–	**−.18 **** (−2.8)
ICT self-efficacy	**.20 ***** (5.4)	**.24 ***** (6.6)	**.16 ***** (4.5)
Priority of ICT skills	**.25 ***** (3.9)	–	**.37 ***** (6.1)
Collaboration between teachers in dealing with ICT	**.17 ***** (4.4)	**.33 ***** (9.2)	**.30 ***** (8.1)
N	659	653	655
adj. R^2	**.20**	**.26**	**.25**

Comments: +p < .10; *p < .05; **p < .01; ***p < .001 | depicted: Beta-coefficients (OLS-regression, *t*-value in parentheses); AV$_1$: Behavior towards unethical conduct with ICT, AV$_2$: Awakening and strengthening of ethical sensitivities in the conduct with ICT, AV$_3$: Cultural embedment of ethical ICT principles

Summary and Discussion

In order to empirically capture the ICT responsibility of teachers, a three-dimensional instrument consisting of 14 items has been developed in a theoretical manner, borrowing from Çoklar's (2012) instrument. The results of an exploratory factor analysis confirmed the three-dimensional model consisting of «Behavior towards unethical conduct with ICT» (5 items, α = .82), «Awakening and strengthening of ethical sensitivities in conduct with ICT» (5 items, α = .75) and «Cultural embedment of ethical ICT principles» (4 items; α = .70). Thereby all three dimensions have been shown to be internally consistent – the reliabilities for the three dimensions vary between α = .70–.82 and can therefore be regarded as satisfactory.

Responding to Çoklar's (2012) request that the topic of ICT ethos should preferably be incorporated in studies comparing different countries in order to increase sensitization for the topic of ICT ethos – "Large-scale applications of this type will enable teacher-training programs of countries to become more sensitive on the subject of ICT ethics problems and help solve ICT ethics problems through education" (ib., p. 98) – we were able to deploy our newly developed instrument in the ICILS 2013 (International Computer and Information Literacy Study) of the IEA in Switzerland. In doing so we were able to conduct a survey in written form encompassing a total of 659 seventh, eighth and ninth grade teachers in Switzerland regarding their ICT responsibility (four-stage Likert-scale).

While the dimension «Behavior towards unethical conduct with ICT» (M = 3.09, SD = .58) experiences high approval, the mean values of the remaining two dimensions lie within a range between approval and rejection («Awakening and

strengthening of ethical sensitivities in the conduct with ICT» [M = 2.57, SD = .60], «Cultural embedment of ethical ICT principles» [M = 2.66, SD = .61]). This means that the majority of teachers seems to have developed i.e. they seem to possess a readiness to recognize and clarify ethical behavior as well as a readiness to step in and exert corrective measures if unethical behavior is observed. But the self-disclosures turned out less approving regarding the prevention of unethical behavior as well as the realization and implementation of an ethics-oriented ICT ordinance in schools. It seems to be the case that teachers do appreciate ethically correct conduct regarding ICT in school and in the classroom, but for many this is more a reactive than a proactive measure. Different groups show statistically significant differences in all three dimensions: On the one hand, male teachers display a significantly higher median characteristic with regard to ethical responsibility in the domain of ICT compared to their female counterparts – though the differences show a small effect size. On the other hand, significant differences with effect sizes between medium to large were observed in all three subdimensions of the ICT ethos in favor of informatics teachers compared to teachers who do not teach ICT-related subjects. The second result seems to point to the conclusion that being knowledgeable in the domain of informatics and the related ICT in general promotes the sensitivity and the likelihood of taking action towards ethically correct conduct regarding ICT. Results of multiple regressions demonstrate a variance clarification strength with regard to all three ICT responsibility dimensions whereby especially the aspects of ICT self-efficacy-expectation (β = .16–.24, p < .001) and collaboration between teachers in the domain of ICT (β = .17–.33, p < .001) have shown to be statistically significant. However, the Beta-coefficients hereby must be interpreted as small with regard to their predictive explanatory power. Variance clarifications between 20% and 26% can be found for the three dimensions of ICT responsibility. Although variance clarifications turned out to be limited, the results nonetheless point towards the significance of both the individual level (self-efficacy-expectation and the expected knowledge that goes with this) as well as the inter-individual level (collaboration). Therefore, it can be assumed that developments towards strengthening of ICT responsibility can be promoted through both targeted training for individuals and through team-oriented collaboration structures. Despite the overall successful development of the instrument at hand and the insightful first results, limitations of the study also need to be published and critically reflected upon. (I) On the one hand, the exploratorily elicited three-factorial dimensionality of the construct regarding ICT responsibility in the context of a confirmatory factor analysis (CFA) needs to be empirically tested regarding its construct structure and dimensionality. Besides testing the validity of the construct, a content-related validation of the construct regarding ethical responsibility of teachers in dealing with ICT is still necessary. This needs to be based on further ethically corresponding factors resp. variables – which wasn't realized in the context of the underlying study. (II) Because of the low response rate, the sample is only an incidental sample. Here it would be important to generate a random sample in order to generate representative results with regard to ethical responsibility of teachers. (III) Information relating to individual teachers could only be captured in a rudimentary way. More differentiated

data would be necessary in order to conduct a more in-depth analysis. For example, data concerning training and further education related to ICT, data about the use of leisure time related to ICT, or data about the professional use of ICT. (IV) Additionally, it would be important to create connections between teachers and students in order to trace the importance of the ICT ethos of teachers in relation to the ICT ethos of students. (V) The variance clarification analysis could only be conducted in the sense of a first approach, since explanatory variables had to be created out of general constructs from ICILS 2013. Here it would be important to gather theory-based explanatory constructs in a study and to empirically test those through a model based in theory.

References

Akbulut, Y., Uysal, O., Odabasi, H. F., & Kuzu, A. (2008). Influence of gender, program of study and Pc experience on unethical computer using behaviors of Turkish undergraduate students. *Computers and Education, 51*(2), 485–492.

Backhaus, K., Erichson, B., Plinke, W., & Weiber, R. (2016). *Multivariate Analysemethoden: Eine anwendungsorientierte Einführung*. Springer.

Beck, K. (2006). Relativismus und Rolle – Zur Grundlegung einer differenziellen Moral [Relativism and role – On the establishment of differential morals]. In P. Gonon, F. Klauser & R. Nickolaus (Hrsg.), *Bedingungen beruflicher Moralentwicklung und beruflichen Lernens* (S. 9–22). Wiesba-den: VS Verlag für Sozialwissenschaften.

Biedermann, H., Nagel, A., & Oser, F. (2018). Beschimpfen, Gerüchteverbreitung und Verunglimpfung im virtuellen Raum: Messmodell zu Einstellungen gegenüber Cybermobbing bei Schülerinnen und Schüler. *Schweizerische Zeitschrift für Bildungsforschung, 40*(2), 427–446.

Bortz, J., & Schuster, C. (2010). *Statistik für Human- und Sozialwissenschaftler*. Springer.

Branson, C. M., & Gross, S. J. (Eds.). (2014). *Handbook of ethical educational leadership*. Routledge.

Bühner, M. (2011). *Einführung in die Test- und Fragebogenkonstruktion. 3., aktualisierte und erweiterte Auflage*. Pearson-Education.

Campbell, E. (2003). *The ethical teacher*. Open University Press.

Campbell, E. (2013). Ethical intentions and the moral motivation of teachers. In K. Heinrichs, F. Oser, & T. Lovat (Eds.), *Handbook of moral motivation: Theories, models, applications* (pp. 517–532). Sense.

Campbell, E. (2014). Teaching ethically as a moral condition of professionalism. In L. P. Nucci & D. Narvaez (Eds.), *Handbook of moral and character education* (pp. 601–617). Routledge.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.

Çoklar, A. N. (2012). ICT ethical leadership scale (ICTELS): A study of reliability and validity on Turkish preservice teachers. *International Journal of Human Sciences, 9*(1), 82–101.

Eid, M., Gollwitzer, M., & Schmitt, M. (2010). *Statistik und Forschungsmethoden. Lehrbuch*. Beltz.

Feierabend, S., Plankenhorn, T., & Rathgeb, T. (2016). *JIM-Studie 2016 – Jugend, Information, (Multi-) Media. Basisstudie zum Medienumgang 12- bis 19-Jähriger in Deutschland*. Medienpädagogischer Forschungsverbund Südwest.

Fenstermacher, G. D. (2001). On the concept of manner and its visibility in teaching practice. *Journal of Curriculum Studies, 33*, 639–653.

Fenstermacher, G., Osguthorpe, R. D., & Sanger, M. N. (2009). Teaching morally and teaching morality. *Teacher Education Quarterly, 36*(3), 7–19.

Forster-Heinzer, S. (2015). *Against all odds. An empirical study about the situative pedagogical ethos of vocational trainers*. Sense Publishers.

Gardner, J., Hoilmes, B. & Leitch, R. (2009). *Assessment and social justice: A futurelab literature review* (Report 16). Online unter https://www.researchgate.net/publication/322896490_Assessment_and_Social_Justice. Accessed 10 Oct 2019.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Pearson.

Hanhimäki, E., & Tirri, K. (2009). Education for ethically sensitive teaching in critical incidents at school. *Journal of Education for Teaching, 35*, 107–121.

Jackson, P., Boostrom, R., & Hansen, D. (1993). *The moral life of schools*. Jossey-Bass.

Mason, R. O. (1986). Four ethical issues of information age. *MIS Quarterly, 10*(1), 5–11.

Noddings, N. (1992/2005). *The challenge to care in schools.* : Teachers College Press. (Original work published 1992).

Noddings, N. (2002). *Educating moral people: A caring alternative to character education*. Teachers College Press.

Noddings, N. (2008). Caring and moral education. In L. P. Nucci & D. Narvaez (Eds.), *Handbook of moral and character education* (pp. 161–174). Routledge.

Nucci, L. (2001). *Education in the moral domain*. Cambridge University Press.

Oser, F. (1998). *Ethos – die Vermenschlichung des Erfolgs*. Leske+Budrich.

Oser, F. (2018). Unterrichten ohne Ethos? In H.-R. Schärer & M. Zutavern (Hrsg.). *Das professionelle Ethos von Lehrerinnen und Lehrern: Perspektiven und Anwendungen* (S. 57–72). Münster: Waxmann.

Oser, F., & Biedermann, H. (2018a). Moralentwicklung und Moralförderung. In D. H. Rost, J. R. Sparfeldt & S. R. Buch (Hrsg.). *Handwörterbuch Pädagogische Psychologie* (S. 559–569). Weinheim: Beltz.

Oser, F., & Biedermann, H. (2018b). The professional ethos of teachers is only a procedural approach a suitable model? In A. Weinberger, H. Biedermann, J.-L. Patry, & S. Weyringer (Eds.), *Professionals' ethos and education for responsibility* (pp. 23–39). Sense.

Oser F., & Heinzer, S. (2010). ‚Sense of Necessity': Zur Modellierung des Prinzips der „Pädagogischen Notwendigkeit" als Qualitätsmerkmal der Lehrerprofessionalität. In K. Beck & O. Zlatkin-Troitschanskaia (Hrsg.). *Lehrerprofessionalität – Was wir wissen und was wir wissen müssen* (Lehrerbildung auf dem Prüfstand, Sonderheft) (S.148–172). Landau: Verlag Empirische Pädagogik.

Pieschl, S., Porsch, T., Kahl, T., & Klockenbusch, R. (2013). Relevant dimensions of cyberbullying – Results from two experimental studies. *Journal of Applied Developmental Psychology, 34*, 241–252.

Prensky, M. (2001). *Digital natives, digital immigrants.* Online unter http://scholar.google.ch/scholar_url?url=http://www.academia.edu/download/31169414/Digital_Natives_-_Digital_Immigrants.pdf&hl=de&sa=X&scisig=AAGBfm3ynKoXTqf-LRT1oxz7CyHvYtgWyw&nossl=1&oi=scholarr. Accessed 10 Oct 2019.

Sanger, M. N., & Osguthorpe, R. D. (Eds.). (2013). *The moral work of teaching and teacher education: Preparing and supporting practitioners*. Teachers College Press.

Smith, C. R. (2004). Ethos dwells pervasively: A hermeneutic reading of Aristotle on credibility. In M. J. Hyde (Ed.), *The ethos of rhetoric* (pp. 1–19). University of South Carolina Press.

Tirri, K. (2012). The core of school pedagogy: Finnish teachers' views on the educational purposefulness of their teaching. In H. Niemi, A. Toom, & A. Kallioniemi (Eds.), *In miracle of education? Teaching and learning in Finland* (pp. 55–68). Sense Publishers.

UNESCO. (2002). *Information and communication technologies in teacher education: A planning guide*. Division of Higher Education.

Veugelers, W. (2010). Moral values in teacher education. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International encyclopedia of education* (Vol. 7, pp. 660–665). Elsevier.

Worman, N. (2002). *The cast of character: Style in Greek literature*. University of Texas Press.

Ziegler, B. (2016). Berufswahl und Berufsmoral. In G. Minnameier (Hrsg.). *Ethik und Beruf* (S. 109–132). Bielefeld: Bertelsmann.

Zutavern, M. (2001). *Professionelles Ethos von Lehrerinnen und Lehrern. Berufsmoralisches Denken, Wissen und Handeln zum Schutz und zur Förderung von Schülerinnen und Schülern.* Fribourg: Dissertation. Universität Fribourg, Philosophische Fakultät.