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ABSTRACT

Effects of an Online Self-Assessment Tool on Teachers' Digital Competencies*

We evaluate the effects of an online self-assessment tool on teachers' competencies and beliefs about ICT in education. The causal impact of the tool is evaluated through a randomized encouragement design, involving 7,391 lower secondary teachers across 11 European countries. Short-run impact estimates show that the use of the tool led teachers to critically revise their technology-enhanced teaching competencies (-0.14 standard deviations) and their beliefs about ICT in education (-0.35 s.d.), while there is no impact on their probability of taking specific training. The effects are concentrated among teachers in the top-end tail of the distribution of pre-treatment outcomes. We provide suggestive evidence that the feedback score provided by the tool triggered such results by providing a negative information shock.

JEL Classification: I21, C93

Keywords: ICT, technology-enhanced teaching, self-assessed competencies, experimental design, teaching practices

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1. Introduction

With the COVID-19 pandemic and the resulting spread of remote or blended learning in schools worldwide, the use of Information and Communication Technologies (ICTs) in teaching and learning has gained unprecedented attention in the education policy debate. The availability of new technologies for teaching has raised many expectations about the potential contribution that educational technology can bring in terms of improved personalization, enhanced monitoring, and feedback – all key elements for successful teaching (Puzio et al. 2020). However, the literature about the effect of ICTs on learning is controversial, with limited and inconclusive evidence, before the Covid-19 pandemic, backing the positive expectations (Bulman and Fairlie 2016, Escueta et al. 2020).

A possible explanation for the small or mixed effects might lie in the ways teachers use ICTs and in the extent to which they support students in the use of ICTs for learning. While the literature on the effectiveness of educational technology on student learning has rarely, or only indirectly, considered the role of teachers, the role of teachers deserves closer inspection. Some research has shown that, before COVID-19, teachers were not using ICTs very frequently (European Commission 2013, Backfish et al. 2021) nor were they harnessing ICTs' potential (Comi et al. 2017, Falk et al. 2018). However, little is known about the specific teachers' competencies that need to be leveraged to unlock the potential of educational technology for learning. And even less is known about what specific interventions can trigger any desirable change in teachers' digital competencies for teaching.

This paper adds to the literature by investigating the role of self-assessment in teachers' development of competencies in technology-enhanced teaching (TET). Technology-Enhanced pedagogy – which can be defined as "the proficiency in using ICT in teaching, applying pedagogical and didactic judgement, and being aware of its implications for learning" (Laurillard 2012) – is emerging as a specific domain of theory and expertise that takes a plurality of factors into account, including different types of competencies, behaviors, and beliefs. Within this framework, teachers' TET competencies, as opposed to generic ICT skills, gain increasing importance (Tondeur et al. 2017). Recent research on ICT and teaching shows the existence of a strong correlation between TET competencies and both the integration of ICT in teaching (Schmid and Petko 2019, Baran et al. 2019) and beliefs about its effectiveness (Cheng et al. 2020, Voithofer et al. 2019). The importance of the intrinsic value that teachers place in ICT – as revealed by beliefs – is also confirmed by the high predictive power of such dimensions on ICT integration in the teaching practice (Prestridge 2012, Schmid and Petko 2019), possibly reinforcing TET competencies and strengthening the motivational elements behind it (Backfish et al. 2021).

Finding effective approaches to developing TET competencies in the teaching workforce has become a very timely policy goal, especially in periods of remote or blended learning. Teachers seem to be eager to increase their TET competencies (OECD 2020). Large-scale surveys show that on average, teachers share positive beliefs about the beneficial impact of ICT on students (OECD 2020; European Commission 2013). Yet, many of them lack the competencies to effectively use digital resources in their teaching (Backfish et al. 2021, Schleicher 2016) and acknowledge the existence of a gap between what they know and what they should know to effectively integrate ICTs in their teaching (Tondeur et al. 2017, Polly et al. 2010).

One approach to try to raise teachers' TET is targeted teacher training, to improve competencies about ICT that teachers often develop in their free time (European Commission 2013, Tondeur et al. 2013). Partly because traditional large-scale training schemes seem to be limping along behind the fast changes imposed by technological development (Tondeur et al. 2017, Polly et al. 2010), the last decade has witnessed the spread of online platforms implemented at the national level in various European countries (e.g., *Lærermentor* in Norway; *Opeka* in Finland; and, more recently, SELFIE for Teachers by the European Commission) aimed at helping teachers to self-assess their TET competencies and making them aware of any gaps in their knowledge or possible remedies to put in place. These platforms usually ask teachers to fill out questionnaires about their use of ICTs at school and their TET competencies to stimulate self-reflection on their teaching practices, often accompanied by feedback that serves as a self-assessment (Andrade and Valtcheva 2009). One of the contributions of these platforms is to nudge teachers towards forms of continuous and self-regulated training, allowing the teachers to constantly monitor their proficiency levels and guiding them in their professional development needs. The literature on self-regulated learning emphasizes that this ambitious goal can hardly be achieved by self-reflection alone (Cohen et al. 2020), but instead requires additional elements, such as clear learning goals, monitoring learning processes and strategies, effective feedback, and self-assessment (Steffens 2006). In particular, high-quality feedback is considered a key element to transform self-reflective practices into effective self-regulated learning practices (Yan 2020, Faber et al. 2017, Koston et al. 2012).

However, many of the premises upon which self-assessment-based strategies are built are not based on solid evidence grounds. Most studies on self-regulated learning and the relationship between its components and behavioral or cognitive responses have been conducted on students, and not on teachers, and on a very narrow set of outcomes (task completion or achievement metrics) (e.g., Hattie and Timperley 2007, Koston et al. 2012). More studies exist on the practice of feedback, but the

agreement about its effectiveness is confined to specific tutoring or mentoring professional development contexts (Bates and Morgan 2018). Finally, little – if any – evidence exists on what works to change teachers' beliefs about the use of new technologies in teaching, which is particularly important, considering that beliefs are part of the concept of TET competencies.

This paper presents the results of MENtoring Technology-Enhanced Pedagogy (MENTEP), an EU-funded policy experimentation aimed at testing the effectiveness of a newly developed online self-assessment tool on TET competencies in a sample of 7,391 lower secondary education teachers in 11 European countries. The tested intervention (named TET-SAT) is an online self-assessment tool (SAT), which was designed based on evidence from pedagogical literature on self-assessment as illustrated above and with the objective to develop teachers' TET competencies. In practical terms, teachers log on to the TET-SAT, fill out a questionnaire to self-assess their TET competencies, and based on their answer they receive personalized feedback about their level of competencies in the form of a score. Additionally, they receive suggestions about training resources available in their own country as well as at the European level, mapped into the areas covered by the tool. The TET-SAT aims at triggering self-reflection, helping to identify learning needs, and consequently initiate teachers' actions to develop new competencies. The tool can thus be used as part of an iterative and formative process in which the teacher sets personal goals, monitors the progress and redefines new goals, relying on self-regulating learning, namely the capacity to regulate one's own learning (Looney 2015).

We report treatment effects on three short-term outcome variables: self-reported TET competencies, beliefs about the use of ICT in education, and engagement in ICT training. The results reveal that the use of the tool led teachers to critically revise what they thought they knew, namely their TET competencies, during the school year in which the treatment was delivered (average treatment effect on the treated: -0.14 standard deviation). The same downward revision is also observed in their beliefs towards the use of ICT at school (-0.35 s.d.), even if they remain on average favorable. No effects are observed on the likelihood of teachers engaging in ICT-related training. We also provide suggestive evidence that the feedback score triggered the effects on TET competencies and beliefs. We interpret this finding as a reaction elicited by an unexpected (low) value of the feedback, in line with literature on feedback about self-regulation (Kulhavy and Stock 1989). Overall, these findings suggest that the first steps of the iterative process mentioned above have been initiated. However, the timespan of the project (one school year) was too short to assess if, in the medium or long run, teachers have actually started actions to develop new competencies, such as attending further training. Finally, results show no peer effects on any of the considered outcomes.

This paper contributes to the literature in several ways. First, the paper is the first to provide experimental evidence of the impact of an online tool eliciting self-assessment on teachers' TET competencies and beliefs – two factors considered as key facilitators of a competent use of ICTs in education. Second, this paper explores self-regulated learning among teachers by means of a policy centered on voluntary adhesion, a formula which is becoming increasingly common. Finally, the scale of this research allows for a broad generalization of the results, meeting the growing demand for usable evidence and an increased transferability of evidence across contexts (Ravallion 2020).

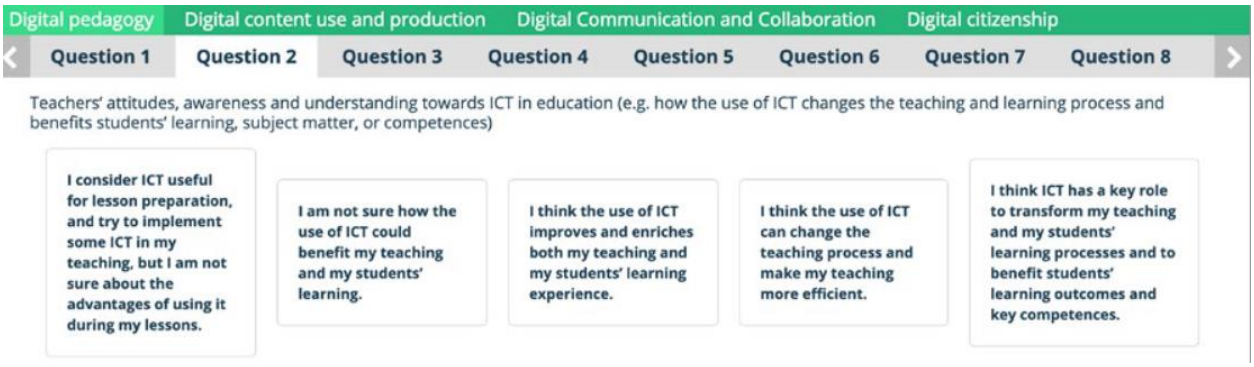
2. Intervention and theory of change

The technology-enhanced teaching self-assessment tool (TET-SAT) was co-designed by scientific experts and national authorities in the field of education from the countries participating in the MENTEP project and inspired by the national and international tools and frameworks that were available at the time the tool was developed, in 2015 (i.e., *Lærermentor* from Norway; *Opeka* from Finland; *HITSA* from Estonia; and *DIGCOMP*, of the European Union). The self-assessment questionnaire covers four areas: i) digital pedagogy; ii) digital content use and production; iii) digital communication and collaboration, iv) digital citizenship, encompassing 15 sub-areas and 30 competencies.[1] Each competency is associated to one item, which comprises five different statements, describing relevant practical pedagogical situations. When filling out this questionnaire, teachers are asked to read the five statements, reflect on their current teaching practice, and select the statement that closely matches their pedagogical practices (Figure 1). The five statements are ranked from the lowest (1) to the highest competency level (5). However, to stimulate teachers' self-reflection and discourage response set and social desirability bias, the five scenarios are shuffled. Time to complete the tool was estimated around 25-30 minutes, in line with actual figures (average completion time: 22 minutes). Teachers are free to complete it multiple times and in different moments and also to navigate back and forth through the items as they wish. It is not mandatory to complete all items, nor is there

[1] The four areas cover the following 15 sub-areas: i) digital pedagogy (planning and implementing teaching with ICT; learning and managing ICT-based learning environments; ICT-supported assessment); ii) digital content use and production (selecting and using digital resources; creative production; copyright and licences; programming); iii) digital communication and collaboration (communicating using technologies and social media; sharing information and resources with students; online participation; collaboration through ICT); iv) digital citizenship (online behaviour; digital identity management; device protection; health and the environment). Moreover, the MENTEP project identifies 30 competences within the different sub-areas (twelve in area (i); six in area (ii); six in area (iii); and seven in area (iv)).

a limit on the number of times teachers can log in and answer the TET-SAT items. However, teachers only receive feedback once they have completed all items.[2]

Fig. 1 Example of a TET-SAT item



Note: The figure provides an example of one of the 30 items of the TET-SAT (Technology-Enhanced Teaching Self-Assessment Tool). Teachers are invited to select the statement which closely matches their pedagogical practices.

In addition to the self-reflection prompted by filling out the self-assessment questionnaire, teachers who complete the questionnaire receive two additional inputs: a feedback score and a two links, one to access online training resources available in their country and one for online resources at the European level (e.g., European Schoolnet Academy courses). The feedback score is computed as the sum of the answers provided by teachers to the different items as well as disaggregated for each of the four areas covered. Teachers also receive a score level ranging from 1 to 5 (i.e., from "beginner" to "expert"). Finally, by clicking on a link appearing next to the score, they also have the possibility to compare themselves to teachers having already completed the tool, both from their country as well as from all other participating countries. An example of the feedback received is provided in Appendix B (Figures B.1 and B.2). Every time a teacher retakes the self-assessment questionnaire, a new feedback score is computed, and the old ones are saved, allowing teachers to monitor their progress.

The TET-SAT has been designed building on self-regulated learning tool indications (Steffens 2006). The three main components of the TET-SAT (self-reflection induced by the questionnaire, the feedback score, and the information about training resources) are integrated to elicit an impact on teachers' TET competencies. First, self-reflection could trigger teachers' critical appraisal of their pedagogical practice and increase their awareness of the potential benefits offered by information and communication technology to teaching and learning. Self-reflection alone, though, is rarely effective

[2] It is possible to access the TET-SAT tool by registering online at http://mentep-sat-runner.eun.org. The final PDF of the items is available upon request.

(Cohen et al. 2020); the feedback score is hence designed to convey information about the competency level reached. Third, the TET-SAT is linked to national training strategies through the free access to specific training resources.

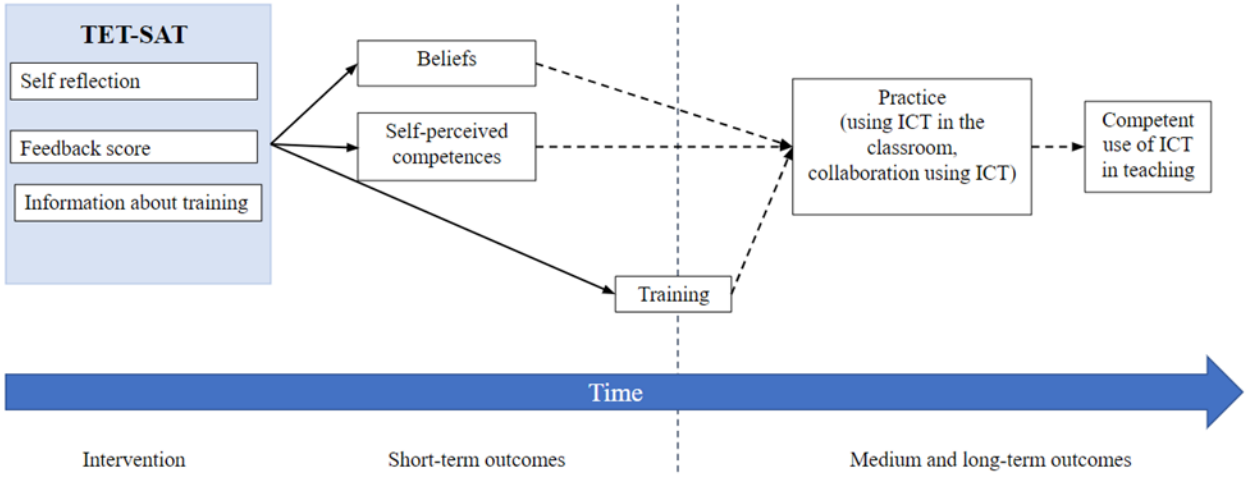
Figure 2 illustrates the theory of change of the intervention and highlights the hypothesized effects of the TET-SAT on teachers' attitudinal and behavioral outcomes. The figure distinguishes short-term outcomes, which are empirically tested in the evaluation (beliefs; perceived competencies; ICT training), from medium/long term outcomes, which cannot be tested in the time frame of the evaluation (possibly more training; practice; competent use of ICTs). The figure also identifies direct effects of the TET-SAT (solid lines) and indirect effects or linkages between outcomes (dashed lines).[3]

Even if, in principle, different key components of the TET-SAT should impact on TET competencies via different channels, the research design does not allow us to evaluate the impact of each component separately. In particular, self-reflection should primarily trigger teachers' beliefs toward ICTs, the feedback score should primarily exert an impact on self-perceived competencies, and the information about the available training opportunities provided via the platform should impact on uptake of training. However, we cannot empirically disentangle such components. Moreover, in the short run, the tool should have an effect on the probability of undertaking specific training, especially through the information about the available opportunities provided via the platform. Effects on behavioral outcomes (e.g., teaching practices), though, are expected to be observable in the medium/long-term, given the time required for enrolment and participation in the available initiatives (training) and a thorough integration into teaching (practice and competent use).

Considering that teachers had few months available to make use of the TET-SAT (about 2.5 months, more details below) and the follow-up survey was conducted soon after exposure to the treatment, the evaluation focuses on outcomes that can realistically be changed in the short-run, namely, self-reported TET competency, beliefs about ICT in teaching and learning, and participation in ICT training, leaving the analysis of medium-term outcomes to future studies.

[3] The figure does not aim at representing a TET theoretical framework of but only the elements that we believe are elicited by the program.

Fig. 2 The MENTEP theory of change



Note: The figure illustrates the MENTEP theory of change. The gray dashed vertical line divides the short-term outcomes, which are empirically tested, from medium/long-term outcomes, which cannot be tested. Solid lines identify direct effects of the TET-SAT (Technology-Enhanced Teaching Self-Assessment Tool); dashed lines identify indirect effects between outcomes.

3. The experimental design

3.1 Target population and sampling

The intervention targeted lower secondary school teachers (ISCED-2)[4] in 11 European countries (Cyprus, Czech Republic, Estonia, Finland, France, Greece, Italy, Lithuania, Portugal, Slovenia, and Spain). A geographically stratified and weighted random sample of schools was drawn from the national lists of eligible schools – i.e., publicly-funded ISCED-2 schools with a satisfactory level of ICT equipment.[5,6] During spring 2016, sampled schools were contacted by the project's national coordinators with a formal invitation letter to participate in the project, followed by a phone contact.[7]

[4] ISCED-2 level corresponds to grades 6 through 9/10 and students are aged 10 to 13 years old.
[5] Schools with an Internet connection of at least 10mbps in each classroom, a student/PC (tablet) ratio of 5:1 or less, and the availability for teachers of a learning environment account or at least a professional email address. While in most countries these criteria were met by all schools, in Italy, Lithuania, Spain, and Greece only a fraction of schools has been included (60%, 59%, 32% and 17% respectively).
[6] For most countries, the strata identify geographical administrative aggregations using the Nomenclature of territorial units for statistics (NUTS). The only exceptions are Cyprus (for which we create only one national-level stratum) and Lithuania, where school track was used as a stratum. The quota of schools drawn in each stratum depends on the stratum's share of the ISCED-2 student population. Finally, each school in a given stratum has a probability of being extracted proportional to its size in terms of students.
[7] In France the sampling process was carried out under the supervision of the Ministry of Education and teachers were directly contacted for participation from a sample extracted by the DEPP (Evaluation, Foresight and Performance

The target of 50 schools enrolled into the program (hereafter MENTEP schools) was met or exceeded in every country but Cyprus (34) and Estonia (32).[8]

All lower secondary school teachers operating in the MENTEP schools in the school year 2016-17 were invited to take part in the project by filling in an online baseline survey. Teachers in MENTEP schools were invited to take part in the survey via email by the national coordinators and received two reminders. Only teachers who completed the baseline survey were included in the project as MENTEP teachers. The sample is composed of 7,391 teachers (Table A.2). As of the baseline survey, MENTEP teachers are characterized by a good familiarity with ICTs, a very high perception of their TET competencies, and very positive beliefs concerning the benefits of technology for both teaching and learning. Descriptive statistics about the sample are presented in Appendix A (Tables A.3, A.4, and A.5).[9]

3.2 Randomization

We implement a randomized encouragement design, in which a random sample of MENTEP teachers is invited to use the TET-SAT, while the remaining teachers receive no invitation (Imbens 2014). Randomization is performed at two levels. First, in each stratum, MENTEP schools are randomly divided into two equally sized groups: treatment schools and control schools. Second, while no teachers in control schools receive the invitation (non-encouraged teachers), in treatment schools a fraction of MENTEP teachers receive the invitation to use the TET-SAT (encouraged teachers). This fraction changes across countries. In some countries (Cyprus, Czech Republic, Estonia, France, and Greece), all MENTEP teachers receive the invitation (design A – 'simple randomization'). In others (Finland, Italy, Lithuania, Portugal, Slovenia, and Spain), only a random sample of MENTEP teachers (60%) receive it.[10] This second design (design B – 'peer effects design') is meant to allow for estimating the peer effects of the encouragement, namely the impact of the presence of encouraged colleagues on the TET competencies of non-encouraged teachers in the same schools. Summing up, teachers can belong to three different categories: i) non-encouraged teachers in control schools (controls); ii) encouraged teachers in treatment schools (encouraged); iii) non-encouraged teachers in treatment

Department of the ministry). The DEPP sample is representative of the French teaching population, based on the MENTEP criteria.

[8] Table A.1 in the Appendix summarizes the output of the schools sampling process.

[9] Descriptive statistics are presented for the sample of teachers participating both to the baseline and to the follow-up survey, which constitute the final sample upon which the analysis is carried out (see Section 3.4).

[10] The initial plan was to implement this peer effect design in all countries, but this was not possible in some countries due to the small number of MENTEP teachers per school.

schools (peers, present only in 'design B' countries). The number of teachers included in each group is reported in Table 1, together with the design implemented in each country.

The encouragement consists of a set of emails sent to teachers, with the details and the link to the TET-SAT. If non-encouraged teachers wished to access the TET-SAT, they had to write to the national coordinator requesting the link and the credentials. In practice, they need to be informed by someone (for instance a colleague) about the existence of the TET-SAT. This is more likely to happen for peers, namely non-encouraged teachers in treatment schools, while it is very unlikely for teachers in control schools and as a matter of fact it happened only for two teachers in total.

Tab.1 The distribution of schools and teachers across experimental groups, by country

Country	Randomiz. design	Control schools		Treatment schools		
		Schools	Non-encouraged teachers	Schools	Encouraged teachers	Peers
Cyprus	A	17	212	17	210	-
Czech R.	A	26	273	26	250	-
Estonia	A	16	179	16	135	-
Finland	B	26	380	26	291	176
France	A	132	356	133	356	-
Greece	A	25	174	25	152	-
Italy	B	25	338	26	256	151
Lithuania	B	25	403	25	255	154
Portugal	B	25	395	25	246	157
Slovenia	B	25	445	25	259	154
Spain	B	24	486	25	340	208
Total	-	366	3,641 (49.30%)	369	2,750 (37.20%)	1,000 (13.50%)

Note: Randomization design A refers to the simple randomization: all teachers in treatment schools received the encouragement). Design B refers to the 'peer effect design': 60% of teachers in treatment schools received the encouragement, the others are considered 'peers'.

3.3 Data

The MENTEP evaluation relies on three sources of data: the baseline survey (BS), the follow-up survey (FuS), and TET-SAT log files. The surveys, translated in each country's official language, were made available online through the MENTEP platform.

The BS survey was pre-tested in each participating country in the summer of 2016 and administered between mid-December 2016 and mid-February 2017. Teachers in MENTEP schools were invited to take part in the BS via email by the national coordinators and received two reminders. Starting from March 2017, after the randomization process was implemented, encouraged teachers were invited to use the TET-SAT via email by the national coordinators. The FuS was launched between mid-May and June 2017, taking into consideration the variability of the school calendar across partner countries. The administration of the FuS followed the same protocol as in the BS, with an email invitation to the teachers, closely followed by a reminder to the school heads.

The BS is composed of 24 questions. It collects background information on teachers, such as socio-demographic information and professional experience, their familiarity with ICT, and baseline data on TET outcomes (self-reported TET competencies, behavior, and beliefs). The FuS is composed of 10 questions aimed at measuring TET outcomes plus a few other questions about how teachers used and perceived the TET-SAT and, for those who did not use it, the reasons for this choice.[11]

The TET outcomes of interest – self-reported TET competency, beliefs about ICT in teaching and learning, and ICT training – were measured both at the BS and the FuS[12] through already validated batteries of items questions coming from international surveys.

The self-reported TET competency index is derived from Tondeur et al. (2017). Teachers were asked to indicate their level of ability in performing five different teaching practices involving ICTs, such as "stimulate students to use ICT in a critical manner," or "Select ICT applications effectively in creating a learning environment". The answers were summarized into one index through principal component analysis (Cronbach's alpha: 0.87 in the BS and 0.94 in the FuS). To assess teacher's beliefs towards ICT in teaching and learning at school, we rely on the scale developed for the ICILS survey,[13] made of 17 items (such as "Using ICT at school...enables students to access better sources of information"), to which teachers can answer from "strongly disagree" (1) to "strongly agree" (5). An index of positive beliefs about ICT at school is computed through principal component analysis (Cronbach's alpha: 0.82 in the BS and 0.82 in the FuS).

Participation in ICT-related training is assessed through a list of 11 ICT-related professional development opportunities drawn by the ICILS survey (e.g., "Introductory courses on internet use

[11] The questionnaires are available in Appendices C and D.
[12] When possible, in order not to induce memory-driven answers, a few items were replaced between the BS and the FuS with similar ones, and the items of each question were reshuffled.
[13] https://www.iea.nl/index.php/studies/iea/icils.

and general applications," "Courses on the pedagogical use of ICT in teaching and learning"), for which the teacher was asked to indicate whether she had participated in it or not in the past three years (in the BS) or in the past 6 months (in the FuS). This TET indicator is constructed as the sum of positive answers.

All indices are normalized so that they have mean 0 and standard deviation 1 in the pooled sample. Finally, survey information is linked with data retrieved from the TET-SAT platform. The latter contain online data about teachers' activity on the TET-SAT (number of accesses, time spent using the TET-SAT, completion of the tool, and the feedback score).

3.4 Experiment's integrity: group balance and attrition

Group equivalence is assessed at the school level by comparing the average characteristics at baseline of the encouraged and non-encouraged schools, and at the individual level, comparing the characteristics of the three groups of teachers (i.e., encouraged teachers, controls, and peers).

At the school level, we compare the mean difference in terms of the number of ISCED-2 teachers for which we possess contact information, the number of students in ISCED-2 grades, and the percentage of teachers completing the BS survey. Table A.6 in the Appendix presents the results: neither substantial nor statistical differences have been detected between treatment and control schools.

At the teacher level, the balance of baseline variables across groups is assessed controlling for sampling strata (standard errors are clustered at the school level). We separately performed equivalence tests comparing (i) non-encouraged teachers (NET) in control schools vs. encouraged teachers (ET), in all countries; (ii) encouraged teachers (ET) vs. peers in treatment schools, only in countries with a peer effects design. The results, summarized in Table A.7, show that the randomized groups are comparable.

Overall, the response rate of the FuS was 75.7%, leading to a final sample of 5,598 teachers, with higher response rates among peers and non-encouraged teachers than among encouraged teachers (82%, 78.6%, and 69.7% respectively, see Table A.8 in the Appendix). The differential attrition between encouraged and non-encouraged teachers can be considered as moderate while the differential attrition between encouraged teachers and peers is high (What Works Clearinghouse 2014). Hence, a more in-depth investigation on the composition of the final sample is in order; for this reason, the balance test between groups described above has been replicated among FuS respondents (Table A.9). The table shows that the three groups are still comparable, and no systematic difference

between groups is detected (the number of significant differences is similar to the one expected due to chance variation).

3.5 Take-up of the intervention

The encouraged teachers taking up the invitation to use the TET-SAT amount to 33.8% while the proportion of those who not only started it but also completed it is 26.7%.[14] This fraction, however, varies substantially across countries, from 16.5% in France up to 61% in Spain (more details in Table A.10). Such country variability is possibly due to various contextual factors (e.g., the culture of self-assessment in national professional development frameworks, the diffusion of new technologies in schools, etc.) and project-specific organizational aspects (e.g., the actual implementation of the experimental protocol by national partners). While the take-up appears quite low, the large scale of the experiment and its implementation at national level provided by national authorities allows us to consider such figures as the expected take-up rate of similar interventions under real-life conditions.

Teachers not using the TET-SAT mainly report lack of awareness as the main reason motivating their behavior (32%, Table A.11). This finding calls for a major attention to initiatives addressed to teachers, where the email channel has to be possibly complemented with other forms of communication. The second reason mentioned by teachers is lack of time (30%), followed by the lack of interest in self-assessment (10%). Other reasons (access problems, lack of interest in training, etc.) are selected by a residual proportion of respondents.

As expected, teachers using the TET-SAT represent a self-selected subset of the encouraged group. As shown in Table A.12, some teacher baseline characteristics are predictive of the probability of accepting the invitation to use the TET-SAT, albeit weakly: teaching a scientific subject, working more hours in non-teaching tasks, the number of ICT devices at home and, most important, the use of mainstream ICT applications in class. These results indicate that a tool based on voluntary participation entails a self-selection component of users concentrated among teachers already positively inclined towards the use of ICT in the classroom. Finally, it is worth noting that, among teachers who completed the TET-SAT, the level of satisfaction with the self-assessment experience and its usefulness, as well as the satisfaction with the technical features of the platform, were high (Table A.13).

[14] Among the teachers who used (and completed) the TET-SAT, the fraction of those who used it more than once during the experimental period is very low (8%).

3.6 Empirical strategy

Treatment effects

The effects of TET-SAT are estimated by comparing the average values of the three outcomes of interest (self-reported TET competency, beliefs about ICT in education, and ICT training) among encouraged teachers in treatment schools with those of teachers in control schools who by design did not receive the encouragement. More precisely, the TET-SAT effects are estimated using the OLS on equation (1).

$$y_{isb1} = b_0 + b_1 Z_{sb} + b_2 y_{isb0} + \delta_b + e_{isb} \quad (1)$$

where y_{isb1} is the outcome of interest for teacher i in school s and stratum b, measured after the intervention; Z_{sb} is a binary indicator, which equals one if the teacher is in a school randomly assigned to the encouragement; y_{isb0} is the pre-treatment value of the outcome on the same teacher, included to improve the precision of our estimates; δ_b are the strata fixed effects, included to take into account sampling and randomization designs; and e_{isb} is the stochastic error, clustered at the school level.

Because of non-compliance, the estimated parameter of interest $\widehat{b_1}$ identifies the intention-to-treat (ITT) effect, namely the causal impact of receiving the encouragement to use the TET-SAT. However, we are also interested in the effect of using the TET-SAT instead of just receiving an invitation to use it. The two estimates are expected to differ substantially because of the high proportion of no-shows (66.2%). More precisely, we investigate two additional parameters: first, the effect of going through the TET-SAT self-assessment items without completing it; second, the effect of completing the TET-SAT questionnaire. While the first of these two effects is motivated by the expectation of changes induced by the first component of the treatment (i.e., self-reflection), the second should also incorporate the effect of this second component of the intervention (i.e., the feedback score).

We retrieve these two additional estimates via an instrumental variable modelling strategy (see Angrist et al. 1996). The teacher's actual use of the TET-SAT T_{isb} is the core explanatory variable, a binary variable taking value 1 if the teacher logged into the TET-SAT, and is instrumented with Z_{sb}, i.e., being randomly assigned to the encouragement. Thus, in the first stage, T_{isb} is estimated as a function of being randomly assigned to the encouragement Z_{sb} (eq. 2 below). In the second stage, the outcome y_{is1} is estimated as a function of the predicted probability of being treated $\widehat{T_{is}}$ (eq. 3).

$$T_{isb} = \alpha_0 + \alpha_1 Z_{sb} + \alpha_2 y_{isb0} + \theta_b + v_{isb} \quad (2)$$

$$y_{isb1} = \beta_0 + \beta_1 \widehat{T_{isb}} + \beta_2 y_{isb0} + \delta_b + \varepsilon_{isb} \quad (3)$$

Because in our setting non-compliance is almost entirely made up of no-shows, with only two cases of crossovers (i.e., two non-encouraged teachers taking the TET-SAT), $\widehat{\beta_1}$ identifies the Average Treatment Effect on the Treated (ATT hereafter; see Bloom 1984). In both models (ITT and ATT estimates), standard errors are clustered at the school level, and outcomes are standardized, thus the estimated impacts can be read as an effect size. Each causal parameter has also been estimated in a second set of models, controlling for the variables included in baseline equivalence analysis.

Peer effects

To investigate the emergence of spillovers within treated schools between encouraged teachers and their peers, we focus on the subsample of countries with the peer effects design and compare the outcomes of non-encouraged teachers in treatment and control schools. Our empirical strategy follows the same approach described in Equation (1), with the only exception that Z_{isb} (the dummy variable indicating if the teacher is encouraged) is replaced by E_{sb}, namely a binary indicator, which equals 1 if the (non-encouraged) teacher works in a school randomly assigned to the encouragement and 0 otherwise. In particular, we estimate equation (4) by OLS, controlling for the relevant pre-treatment TET indicator and sampling strata, and clustering the standard errors at the school level.

$$y_{isb1} = \gamma_0 + \gamma_1 E_{sb} + \gamma_2 y_{isb0} + \delta_b + \omega_{isb} \quad (4)$$

The estimated parameter of interest $\widehat{\gamma_1}$ identifies the peer effect, namely the impact on the outcomes of interest of having encouraged colleagues.

4. Treatment effects

4.1 Main effects

Table 2 reports ITT, ATT-Start and ATT-Complete estimates of the TET-SAT on the three outcomes of interest, with and without the inclusion of baseline covariates as controls.

ITT estimates show that the intervention had a statistically significant negative effect on both self-reported TET competency and beliefs toward ICT (-0.06 s.d. and -0.15 s.d., respectively), while it

had a nil effect on the probability of engaging in ICT training, probably due to the short time (2.5 months to use the TET-SAT, immediately followed by the FuS) and the timing of the treatment (second semester). When controlling for covariates, results do not change.

These results are confirmed when looking at the ATT estimates. When considering ATT - Start, the results show that the use of TET-SAT leads teachers to critically revise their competencies in technology-enhanced teaching and their opinions about ICT in education. In other words, teachers using the tool evaluated themselves, on average, 0.14 standard deviations less competent than the controls and revised their beliefs downward by 0.35 standard deviations. There is no impact on training participation. If we consider as treated only teachers who completed the TET-SAT, as the share of treated teachers over encouraged ones is smaller, the ATT is slightly larger (competency: -0.17 s.d; beliefs: -0.43 s.d.). The null effects on training are confirmed. ATT estimates are robust to the inclusion of control variables.

Tab. 2 The effects of the TET-SAT on self-reported TET competency, beliefs about ICT in teaching, and TET training

	Self-rep. TET competency		Positive beliefs about ICT in teaching and learning		Training in TET	
	(1)	(2)	(3)	(4)	(5)	(6)
Controls mean at FuS	0.024		0.027		1.308	
ITT	-0.061**	-0.055**	-0.152***	-0.150***	0.024	0.037
	(0.027)	(0.026)	(0.026)	(0.026)	(0.049)	(0.048)
ATT – Start	-0.140**	-0.125**	-0.350***	-0.346***	0.055	0.085
	(0.061)	(0.060)	(0.061)	(0.061)	(0.110)	(0.109)
ATT – Complete	-0.171**	-0.153**	-0.430***	-0.424***	0.067	0.104
	(0.074)	(0.073)	(0.075)	(0.076)	(0.135)	(0.133)
Observations	4,701		4,774		4,707	
Controls						
Pre-treatment outcome	YES	YES	YES	YES	YES	YES
Strata FE	YES	YES	YES	YES	YES	YES
Additional Controls	NO	YES	NO	YES	NO	YES

Note: *** p<0.01; ** p<0.05; * p<0.1. Standard errors clustered at the school level in parentheses.
ITT: Intention to Treat. ATT: Average Treatment Effect on the Treated. "ATT – Start" considers as treated all teachers who started the TET-SAT; "ATT – Complete" considers as treated teachers completing the TET-SAT (for comparison with Section 4.3). TET: Technology-Enhanced Teaching; SAT: Self-Assessment Tool.

Impact heterogeneity

Following the literature on the effects of information updates on behavioral and emotional responses,[15] we explore if the teachers reacted differently according to their initial TET level and estimate the heterogeneous impact of the treatment. We hence replicated the ITT estimates shown in column (2) of Table 2 for tertiles of teacher level of the corresponding pre-treatment outcomes (Table 3). For all TET indicators, teachers in the upper part of the pre-treatment distribution (i.e., the more competent, the more in favor, the more trained) reacted more to the treatment. The negative effect is concentrated among teachers belonging to the third tertile of the distribution (TET competencies) and to the second and third tertiles (beliefs). The null effect on training seen above seems to be the result of a negative effect among teachers with low initial ICT training and a positive and significant effect among those with recent experiences of ICT training. The differences between the first and the third tertiles are always statistically significant except for TET competency, indicating that the impact of the treatment was differentiated among starting level.

Together with the overall effect, these results should be read keeping in mind that at baseline teachers had on average a very high perception of their TET competencies and very positive beliefs concerning the benefits of technology for teaching and learning (see Section 3.1), and this is even more pronounced for teachers in the third decile of the distribution – possibly unrealistically high. The effects may thus be interpreted as teachers becoming more realistic/less naïve about the use of ICT at school.

[15] A rich literature on information update is present in Economics (e.g., Viscusi 1997; Cameron 2005) and on Educational literature (e.g., information on student ability on academic enrolment decisions, see Bobba and Frisancho 2016, or information on earning prospects on academic choice, see Wiswall and Zafar 2015), although no study focuses on the effects of self-assessment on competencies, beliefs and willingness to undertake training.

Tab. 3 Heterogeneous impact of the TET-SAT on self-reported TET competency, beliefs about ICT in teaching, and ICT training, by initial level. ITT estimates

	BS level of the corresponding TET indicator		
	Low (1st tertile)	Medium (2nd tertile)	High (3rd tertile)
Outcomes	(1)	(2)	(3)
Self-reported TET competencies	-0.076	0.021	-0.151***
	(0.052)	(0.037)	(0.050)
Observations	*1,468*	*1,882*	*1,351*
Significance of the differences (p-value)			
Low vs medium level	0.103		
Low vs high level	0.295		
Medium vs high level	0.005***		
Positive beliefs about ICT	-0.038	-0.188***	-0.212***
	(0.042)	(0.040)	(0.044)
Observations	*1,541*	*1,673*	*1,560*
Significance of the differences (p-value)			
Low vs medium level	0.007***		
Low vs high level	0.005***		
Medium vs high level	0.660		
Training in TET	-0.125**	0.041	0.237**
	(0.059)	(0.068)	(0.115)
Observations	*1,679*	*1,743*	*1,285*
Significance of the differences (p-val.)			
Low vs medium level	0.005***		
Low vs high level	0.003***		
Medium vs high level	0.131		
Pre-treatment outcome	YES	YES	YES
Strata FE	YES	YES	YES
Additional Controls	NO	NO	NO

Note: *** p<0.01; ** p<0.05; * p<0.1. Standard errors clustered at the school level in parentheses.
All specifications control for the corresponding pre-treatment TET indicator and for strata fixed effects.

4.2 Peer effects

Even if no requests to access the TET-SAT among non-encouraged teachers (but in two cases) were recorded, it is still possible that peer effects took place through interaction between encouraged and non-encouraged teachers in treatment schools. Table 4 summarizes the estimated peer effects on TET competencies, beliefs about ICT in education, and ICT training. In the table, we first present the ITT

estimates in the sub-group of countries implementing the peer effect design, to verify if estimates are comparable to those obtained in the full sample: the ITT impacts are smaller and not significant/marginally significant but go in the same direction as those found in the full sample.

In the bottom panel, we present the peer effects. As expected, there is no impact on TET competencies in the short run: we do not expect the self-reflection component of the treatment to work for peers, and they do not receive the feedback score. Also, peers' training is unaffected. We detect a positive, weakly significant effect on beliefs, indicating that peers of teachers exposed to the TET-SAT have more positive beliefs about ICT in education. This might signal that non-encouraged teachers are hearing about the tool and increase their interest in the topic of ICT. However, this effect is only marginally significant, so results should be interpreted with caution.

Tab. 4 Peer effects: impact of having encouraged colleagues on TET competency, beliefs, and TET training

	Self-reported TET competency	Positive beliefs about ICT	Training in TET
	(1)	(2)	(3)
ITT (Main effects) [a]	-0.051	-0.054*	0.071
	(0.034)	(0.030)	(0.061)
Observations	*3,073*	*3,120*	*3,081*
Peer effects [b]	-0.027	0.061*	0.034
	(0.039)	(0.034)	(0.072)
Observations	*2,735*	*2,779*	*2,748*
Pre-treatment outcome	YES	YES	YES
Strata FE	YES	YES	YES
Additional Controls	NO	NO	NO

Note: *** p<0.01; ** p<0.05; * p<0.1. Standard errors clustered at the school level in parentheses. All specifications include the corresponding pre-treatment TET indicator and strata fixed effects. Results including all the additional control variables are similar (in terms of magnitude and significance), available from the author upon request. [a] Control teacher vs. encouraged teachers. These results can be compared with the first row of Table 2 (columns 1, 3, 5) for all countries. [b] Control teachers vs. peers (non-encouraged teachers in treatment schools).

4.3 Interpreting the main effects: the role of the feedback score

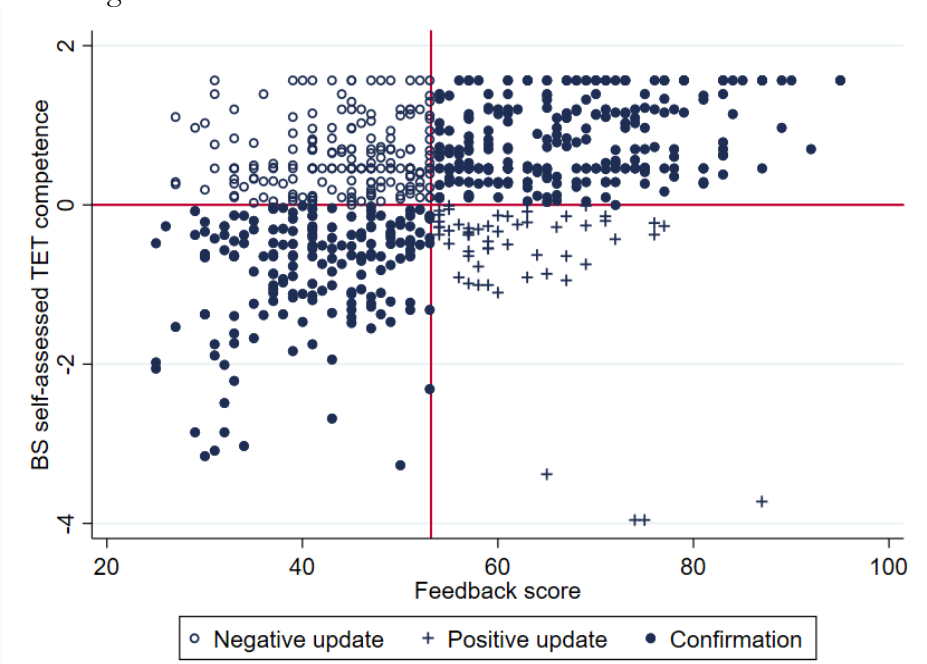
In this section, we provide non-experimental evidence about the role played by one of the components of TET-SAT, the feedback score, in changing teachers' outcomes. We focus on the feedback component in light of the importance attached to the role of feedback in educational environments (Hattie and Timperley 2007). Moreover, a parallel strand of literature in Economics studying reactions

to information updating has also shown that information updates falling far from one's own priors or perceptions ("information shocks") have the potential to trigger strong behavioral responses (e.g., Viscusi 1997; Gonzalez 2017). Clearly, though, we cannot exclude the contribution of other channels that we cannot measure.

The feedback score can be understood as a piece of objective information that teachers receive as an output of their self-reflection exercise about their TET competencies. Receiving this information can alter the way teachers perceive their own competencies, but the information contained in the score has a different value between teachers depending on the extent to which that score is in line with teachers' self-conceptions. While for some teachers the feedback score would just be a confirmation of what they already thought (i.e., when the feedback score matches pre-treatment perceived competencies), for other teachers the feedback could represent a sort of information update. The latter can be a negative one (when teachers receive a competency score from the TET-SAT which is lower than their self-reported competency at the BS) or a positive one (when the feedback reveals to the teachers that they are more competent than they thought). Figure 3 shows a scatter plot of teachers' self-reported TET competencies at the BS (vertical axis) and teachers TET-SAT feedback score (horizontal axis).[16] The vertical and horizontal lines represent the average values of the two variables. Just considering the position of the teachers below or above the average, the graph reveals that for most teachers (about 68%, filled dots) the feedback score confirmed their self-reported level of TET competencies: at the BS, they have TET competencies below (above) the average and receive a feedback score below (above) the corresponding average. On the other hand, only a marginal fraction of teachers (8%, symbol plus) received a positive update, while a sizable share of teachers (28%, circles) discovered from the TET-SAT that their level of TET-competencies is lower than they previously thought. This pattern is in line with the experimental finding of a negative impact of TET-SAT on TET competencies.

[16] Self-reported TET competencies collected with the baseline survey and the feedback score are not directly comparable, both because of the questions/items on which they are built and because of the metrics in which they are presented: teachers do not directly compare the two measures as only the feedback score is known to them in a numeric form, while the level of self-reported competence is unknown to them, as it was computed by the research group from the baseline survey data and it was not communicated to the teachers. Nevertheless, the two measures are related.

Fig. 3 The information value of the TET-SAT feedback score



Note: The feedback score ranges from 25 to 95. The observations include all MENTEP teachers completing the TET-SAT (734). The red vertical and horizontal lines represent the average values of the two variables.

To assess the impact of the feedback score, we restrict the sample to the teachers who completed the TET-SAT, namely teachers receiving the feedback score from the tool and take advantage of the availability of our outcome measures both before and after the intervention. Even if the primary aim of the analysis is to evaluate the effect of the feedback score on self-assessed TET competencies, we measure its impact also on the other two main outcomes (beliefs and training), given the integration of the feedback within the other project's components.

To measure the impact of the feedback score on the outcome, we estimate by OLS the following regression among teachers who completed the TET-SAT, as well as the two surveys:

$$y_{isb1} = \theta_0 + \theta_1 y_{isb0} + \theta_2 F_{isb} + \delta_b + o_{isb} \quad (5)$$

where F_{is} is the feedback score received by the teacher (standardized). θ_2 is the parameter of interest and identifies the impact of the feedback score on the outcomes, controlling for the initial level of the TET indicator. The main assumption underlying the model is that, once controlling for the initial level of the TET indicator, there are no other omitted variables correlated both with the outcome and the feedback score, which may bias the results. While there is no way to test this

assumption, it seems unlikely that over the short lapse of time between the BS and the FuS teachers may have had different experiences, relevant to the outcomes we are considering and correlated with the feedback score.

Results are presented in Table 5. There is a clear and strong association between the feedback score and self-reported TET competency: one standard deviation increase of the feedback score induces a 0.4 standard deviation increase in the self-reported TET competency. This implies that the feedback influenced the self-perception of the teachers, by aligning them with the new piece of information provided by the TET-SAT. To put it differently, teachers who received a feedback value below the average might have experienced a negative information shock and have revised their priors downwards. Experimental results on impact heterogeneity above (Table 3) seem to corroborate this interpretation, which is also in line with previous research on information shocks (Gonzalez 2017). Positive and significant effects of the feedback score are also detected in the cases of beliefs about ICT and ICT training. Interestingly, the negative information shock seems to have also influenced the beliefs of the teachers about the utility of ICT, while at the same time decreasing their likelihood of taking up additional training.

Tab. 5 Impact of the feedback score on self-reported TET competency, beliefs about ICT in teaching, and TET training

	Self-reported TET competency	Positive beliefs about ICT	Training in TET
	(1)	(2)	(3)
TET-SAT feedback score (std.)	0.398***	0.078**	0.308***
	(0.046)	(0.035)	(0.066)
Observations	672	674	669
Pre-treatment outcomes	YES	YES	YES
Strata FE	YES	YES	YES
Additional controls	NO	NO	NO

Note: *** p<0.01; ** p<0.05; * p<0.1. Standard errors clustered at the school level in parentheses.
The feedback score is standardized (mean 0, standard deviation 1).

5. Discussion and conclusions

This research provided the first experimental evidence in Technology-Enhanced-Teaching competencies, on the potential of online tools to enhance them and on the role provided by feedback on teachers' attitudes and behaviors.

Time constraints on the project forced the evaluation to focus on short-term outcomes only: self-reported TET competencies, beliefs about the use of ICT in teaching and learning, and training in ICT. Teachers revised downwards their perceived TET competencies and their beliefs about whether ICT is useful in teaching and learning. Such negative effects are present among those teachers who were more positive about ICT and those who felt more competent before using the tool. Suggestive evidence shows that this downward revision has been likely triggered by the feedback score teachers got from the system on completing the TET-SAT, an external assessment of their TET-SAT competencies. The TET-SAT had an impact on the top-end tail of the distribution, teachers with a very high perception of TET competencies and very positive beliefs about the benefits of technology, helping them to better evaluate their own competencies and to build a more informed opinion about the use of ICT. On the other hand, we find that teachers already more engaged in training increased their participation further and that also this (self-reported) behavior seems to have been elicited by the feedback.

Taken together, these results contribute to our understanding of the way in which self-assessment tools have the potential to impact self-regulated learning among educational professionals and on the way in which such professionals react to feedback on their competencies in online contexts attended on a voluntary basis.

This experiment was marked by a take-up rate between one third and one-fourth of teachers. It is important to underline that this informs us about the take-up rate of such an intervention in a "real-world" scenario and its variability across national contexts. In other words, it represents a plausible benchmark of the extent to which teachers would adopt such a tool in the case of a scale-up of this intervention. At the same time, this result draws the attention of policy makers to the need to consider with care the issue of raising the interest and cooperation of teachers to improve their participation rate (e.g., face to face or virtual meetings), considering that teachers who made use of the tool are a self-selected sub-population. Teaching in scientific subjects and having a good familiarity with ICT are those who reacted more positively to the offer of using the TET-SAT but, paradoxically, also those probably less in need of it.

More research is needed to disentangle two critical aspects, which could not be properly addressed within the current study. A first question to be investigated is whether light-touch interventions – such as the online self-assessment tool evaluated in this study – have the capacity to generate tangible and sustainable effects on teaching practice and, ultimately, on student learning gains. A second issue worth exploring is which specific mechanisms can drive a change in teachers' responses. The MENTEP results provide suggestive evidence on the importance of the feedback mechanism for teachers' self-perceived competencies, beliefs, and training in ICT, but they do not allow conclusions on whether the feedback played an independent role or only in combination with the two other components of the intervention, i.e., self-reflection and information on training.

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Effects of an Online Self-Assessment Tool on Teachers' Digital Competencies

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Appendices

Contents:

Appendix A: Additional tables

Tab. A.1 Samples of schools: invited schools, schools refusing to participate, and schools recruited (MENTEP schools), by country

Country	Invitations	Refusals	MENTEP Schools
Cyprus	69	35	34
Czech Republic	165	113	52
Estonia	73	41	32
Finland	103	51	52
France	-	-	-
Greece [a]	100	50	50
Italy	101	51	50
Lithuania	91	41	50
Portugal	85	35	50
Slovenia	59	9	50
Spain	201	152	49
Total	1,047	578	469

Note: [a] In France, the sampling process was carried out under the supervision of the ministry of education. Teachers, and not schools, were directly contacted for participation from a sample carried out by the DEPP (Evaluation, Foresight and Performance Department of the ministry). The DEPP sample was representative of the French teaching population, based on the MENTEP criteria.

Tab. A.2 Teachers with available contact information and sampled teachers (MENTEP teachers), by country

Country	MENTEP Schools	Teachers with contact information	MENTEP Teachers
Cyprus [a]	34	590	422
Czech Republic [a]	52	813	523
Estonia	32	705	314
Finland	52	1,969	847
France	-	-	712
Greece [a]	50	393	326
Italy	50	1,752	745
Lithuania	50	1,519	812
Portugal	50	2,797	798
Slovenia	50	931	858
Spain	49	2,246	1,034
Total	469	14,649	7,391

Note: [a] In these countries, most schools sent only the list of teachers giving consent to handle personal information.

Tab. A.3 Characteristics of teachers participating in the project

Individual characteristics	
Sociodemographic characteristics	
Women (%)	75.1
Age groups (%)	
Less than 40	25.0
Between 40 and 50	35.8
More than 50	39.2
Professional background	
Subject taught (%)	
Humanities	42.2
Scientific fields	32.3
Other subjects	25.5
Weekly working hours	
Teaching	18.0
Preparing lessons	8.2
Administrative duties	4.3
Other	3.3
Total	33.8
Years of teaching experience	20.7
Tenure (experience in the school)	12.0
Teachers' overall familiarity with ICT	
Age when first used a PC (%)	
9 years/younger	6.9
10-19 years	37.0
20-29 years	33.2
30-39 years	16.7
40 years/older	6.2
ICT time at home (%)	
0-60 min/day	49.8
1-3 h/day	38.7
3+ h/day	11.5
Availability of ICT devices at home (%)	
Tower PC	54.5
Portable PC	88.0
Tablet	58.8
Internet connection	93.8
Cell-phone internet	83.3
Printer	74.3
ebook reader	15.1
Observations	5,598

Tab. A.4 Teachers' self-reported TET competences and views on ICT at the BS

Self-reported TET competences (I am able to...)	**Agree Percentage**
Stimulate students to use ICT in a critical manner	90
Support students in searching information by means of ICT	95
Support students to communicate with ICT in a safe, responsible and effective way	90
(Re)design ICT applications in view of a specific educational setting	71
Select ICT applications effectively in creating a learning environment	77
Views on ICT at school (ICT at school…)	
Enables students to access better sources of information	94
Helps students to consolidate and process information more effectively	84
Helps students learn to collaborate with other students	75
Enables students to communicate more effectively with others	64
Helps students develop greater interest in learning	76
Helps students work at a level appropriate to their learning skills	76
Helps students develop skills in planning and self-regulation of their work	65
Improves academic performance of students	60
Observations	5,598

Note: The values refer to the cumulative relative frequency of teachers answering slightly agree, agree and totally agree. The two groups of variables are used to construct the standardized indexes for TET competences and views on ICT.

Tab. A.5 ICT-related behavior of MENTEP teachers at the Baseline Survey

ICT-related behaviors	**Percentage**
Use of ICT in some lessons, in most lessons, in every lesson for	
Presenting information through direct class instruction	95
Providing remedial or enrichment support to individual students or small groups of students	77
Enabling student-led whole-class discussions and presentations	74
Assessing students' learning through written tests	56
Providing feedback to students	76
Reinforcing learning of skills through repetition of examples	85
Supporting collaboration among students	75
Mediating communication between students and experts or external mentors	31
Enabling students to collaborate with other students (within or outside school)	56
Collaborating with parents or guardians in supporting students' learning	56
Supporting inquiry learning	76
Assigning written task/ exercises / homework to students	77
Facilitating / supporting individual or collaborative oral presentation by students	82
Communicating with students out of the classroom	61
Collaboration using ICT	
I work together with other teachers on improving the use of ICT in classroom teaching	56
I collaborate with colleagues to develop ICT based lessons based on the curriculum	42
I observe how other teachers use ICT in teaching	48
I work with other teachers on cross-curricula projects involving ICT	38
No collaboration with ICT	16
How often do you use the following tools? At least in some lessons	
Educational software	50
Tutorial software	53
Digital learning games	59
Word/Power Point	92
Spreadsheets	53
Multimedia production tools	52
Data logging and monitoring tools	15
Simulations and modelling software	19
Social media	28
Communication software	72
Computer-based information resources	93
Interactive whiteboard	52
Graphing or drawing software	32
E-portfolios	17
Mobile devices	55
Learning management systems	33
Observations	5,598

Tab. A.5 *continued* - ICT-related behavior of MENTEP teachers at the Baseline Survey

ICT-related behaviors	**Percentage**
Has participated in any training courses in the past three school years	
Introductory courses	23
Advanced courses on applications	17
Advanced courses on internet use	15
Equipment-specific training	41
Courses on the pedagogical use of ICT	42
Subject-specific training on learning applications	20
Course on multimedia	13
Participation in online communities	20
ICT training provided by school staff	41
Personal learning about ICT	57
Other	23
None of the above	8
Total	5,598

Tab. A.6 Balance test, school characteristics

Variables	Non-encouraged schools	Encouraged schools	Difference	P-value
BS respondents (%)	66.2	66.2	-0.04	0.983
Num. of ISCED-2 teachers	20.1	19.6	-0.50	0.631
Number of students	238.5	245.7	6.89	0.507
Obs. (N of schools)	369	366		

Note: For each variable we report the average value in encouraged and non-encouraged schools, the mean difference between the two groups of schools, and the corresponding p-value. Controlling for sampling strata. BS stands for Baseline survey.

Tab. A.7 Balance test, teacher level, initial sample

	Mean [c]		NET vs ET [c]		Mean [d]		NET vs Peers [d]	
	NET	ET	Coef.	SE	NET	Peers	Coef.	SE
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Personal and professional characteristics								
Woman	0.742	0.736	-0.001	0.015	0.746	0.772	0.034*	0.019
Age: <40 years old	0.249	0.256	-0.007	0.016	0.207	0.211	0.007	0.023
Age: 40-49 y. o.	0.353	0.347	-0.004	0.014	0.365	0.363	-0.003	0.016
Age: >49 y. o.	0.392	0.396	0.014	0.015	0.421	0.421	0.001	0.018
Humanities subjects	0.425	0.416	-0.009	0.011	0.418	0.415	0.001	0.014
Scientific subjects	0.305	0.313	0.008	0.012	0.293	0.291	-0.001	0.015
Other subjects	0.252	0.261	0.013	0.013	0.283	0.286	-0.002	0.016
Hours teaching	18.093	18.117	0.001	0.001	18.519	18.613	0.001	0.001
Hours lesson preparation	8.197	8.338	-0.000	0.001	7.322	7.333	0.001	0.001
Hours admin.	4.294	4.168	-0.002	0.001	4.115	4.007	-0.001	0.002
Hours residual	3.241	3.030	-0.002	0.002	3.378	3.219	-0.001	0.002
Hours tot	33.805	33.623	-0.000	0.001	33.310	33.138	0.000	0.001
Experience	20.883	20.597	0.000	0.001	21.725	21.459	0.000	0.001
Tenure	12.277	11.757	0.000	0.001	13.474	12.403	-0.002	0.001
Overall difference: P-value	*0.869*				*0.843*			
ICT access and ICT related behaviors								
Age first pc: <10 y. o.	0.070	0.071	-0.006	0.024	0.072	0.065	-0.033	0.030
Age first pc: 10-19 y. o.	0.379	0.355	-0.031**	0.013	0.369	0.349	-0.020	0.017
Age first pc: 20-29 y. o.	0.313	0.342	0.036**	0.014	0.325	0.353	0.027	0.017
Age first pc: 30-39 y. o.	0.169	0.165	-0.000	0.017	0.166	0.169	0.008	0.022
Age first pc: >40 y. o.	0.069	0.067	-0.005	0.026	0.067	0.063	-0.008	0.034
Age first internet: >19 y. o.	0.236	0.227	-0.021	0.016	0.218	0.212	-0.011	0.021
Age first internet: 20-29 y. o.	0.386	0.407	0.023*	0.013	0.395	0.403	0.007	0.018
Age first internet: 30-39 y. o.	0.257	0.251	-0.004	0.014	0.262	0.264	0.007	0.018
Age first internet: >40 y. o.	0.121	0.114	-0.012	0.021	0.125	0.121	-0.003	0.027
ICT use at home: 0-60 min./day	0.495	0.507	0.020	0.013	0.504	0.516	0.018	0.016
ICT use at home: 1-3 hours/day	0.395	0.388	-0.014	0.013	0.388	0.370	-0.024	0.016
ICT use at home: >3 hours/day	0.110	0.105	-0.016	0.021	0.107	0.114	0.015	0.03
Number of ICT devices at home	5.210	5.164	-0.006	0.004	5.255	5.311	0.003	0.005
Self-reported TET competences [a]	0.011	-0.020	-0.003	0.007	0.051	0.014	-0.007	0.008
Positive views ICT in teaching [a]	-0.014	-0.005	0.005	0.007	0.039	0.065	0.003	0.01
Negative views ICT in teaching [a]	-0.009	0.005	0.008	0.007	-0.002	0.017	0.007	0.009
Use of ICT in lessons [a]	0.005	-0.005	-0.001	0.007	0.030	-0.006	-0.01	0.009
Collaboration with colleagues on TET [b]	1.861	1.801	-0.013**	0.006	1.793	1.756	-0.006	0.007
Mainstream ICT appl. used in class [a]	0.011	-0.051	-0.009	0.008	0.087	0.100	0.003	0.010
Educational ICT appl. used in class [a]	0.016	-0.010	-0.009	0.007	-0.009	-0.033	-0.005	0.008
TET training [b]	2.567	2.475	-0.006	0.004	2.505	2.564	0.002	0.005
Overall difference: P-value	*0.120*				*0.615*			
Missing values								
Missing personal var.	0.024	0.011	-0.188*	0.114	0.013	0.013	-0.004	0.085
Missing professional var.	0.002	0.001	-0.011	0.142	0.002	0.003	0.105	0.158
Missing ICT at home var.	0.001	0.002	-0.064	0.152	0.001	0.002	0.117	0.213
Missing TET var.	0.009	0.007	-0.052	0.066	0.011	0.008	-0.071	0.069
Overall difference: P-value	*0.342*				*0.639*			
Observations	3,641	2,750	6,391		2.447	1,000	3,447	

Note: *** p<0.01; ** p<0.05; * p<0.1. Standard errors clustered at the school level. [a] Pre-treatment values of the outcomes expressed as standardized factors. [b] Pre-treatment values of the outcomes expressed as count (number of yes answers for collaborations; numbers of selected professional activities in the previous 3 years). [c] All countries. [d] Countries with the peer effects design (Finland, Italy, Lithuania, Portugal, Slovenia, and Spain). Columns 3, 4, and 7, 8 show the coefficients of distinct linear probability models (one for each variable), regressing the treatment status on each one of the pre-treatment characteristics, controlling for sampling strata. NET stands for Non-encouraged teachers. ET stands for Encouraged teachers.

Tab. A.8 Response rates by randomization design and randomization group

Teacher group	N of teachers			Response rate (percentage)
	BS	FuS	FuS-BS	
Overall				
Non-encouraged	3,641	2,861	-780	78.60
Peers	1,000	820	-180	82.00
Encouraged	2,750	1,917	-833	69.70
Total	7,391	5,598	-1,793	75.70
Countries with no peer effect estimation (randomization design A)				
Non-encouraged	1,194	900	-294	75.40
Encouraged	1,103	757	-346	68.60
Total	2,297	1,657	-640	72.10
Countries with peer effect estimation (randomization design B)				
Non-encouraged	2,447	1,961	-486	80.10
Peers	1,000	820	-180	82.00
Encouraged	1,647	1,160	-487	70.40
Total	5,094	3,941	1,153	77.40

Note: Countries with randomization design A (simple randomization) are Cyprus, Czech Republic, Estonia, France, and Greece; countries with peer effect randomization design (B) are Finland, Italy, Lithuania, Portugal, Slovenia, and Spain. BS stands for Baseline Survey; FuS stands for Follow-up Survey.

Tab. A.9 Balance test, teacher level, final sample

	Mean [c]		NET vs ET [c]		Mean [d]		NET vs Peers [d]	
Variables	NET	ET	Coef.	SE	NET	Peers	Coef.	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Personal and professional characteristics								
Woman	0.746	0.742	-0.002	0.018	0.757	0.782	0.033	0.022
Age: <40 y. o.	0.248	0.266	0.007	0.019	0.207	0.216	0.014	0.025
Age: 40-49 y. o.	0.360	0.351	-0.006	0.015	0.370	0.360	-0.008	0.018
Age: >49 y. o.	0.388	0.383	0.004	0.017	0.419	0.422	0.001	0.021
Humanities subjects	0.418	0.411	-0.008	0.013	0.418	0.424	0.008	0.016
Scientific subjects	0.319	0.331	0.010	0.015	0.304	0.294	-0.007	0.017
Other subjects	0.245	0.251	0.013	0.016	0.270	0.274	-0.003	0.018
Hours teaching	17.892	17.834	0.001	0.001	18.493	18.544	0.001	0.001
Hours lesson preparation	8.219	8.497	0.000	0.001	7.446	7.470	0.001	0.002
Hours admin.	4.413	4.221	-0.003*	0.001	4.185	4.044	-0.001	0.002
Hours residual	3.349	3.123	-0.003*	0.002	3.454	3.304	-0.002	0.002
Hours tot	33.854	33.644	-0.001	0.001	33.549	33.320	-0.000	0.001
Experience	20.700	20.423	0.000	0.001	21.741	21.606	0.000	0.001
Tenure	12.178	11.547	-0.001	0.001	13.603	12.599	-0.002	0.001
Overall Difference: P-value	*0.573*				*0.838*			
ICT access and ICT related behaviors								
Age first pc: <10 years old	0.071	0.070	0.001	0.028	0.072	0.060	-0.048	0.035
Age first pc: 10-19 y. o.	0.377	0.363	-0.019	0.016	0.364	0.359	-0.005	0.019
Age first pc: 20-29 y. o.	0.323	0.340	0.025	0.016	0.333	0.341	0.010	0.019
Age first pc: 30-39 y. o.	0.166	0.165	-0.003	0.019	0.168	0.176	0.012	0.025
Age first pc: >40 y. o.	0.063	0.062	-0.012	0.030	0.062	0.063	0.002	0.038
Age first internet: >19 y. o.	0.235	0.232	-0.012	0.018	0.219	0.215	-0.009	0.022
Age first internet: 20-29 y. o.	0.390	0.411	0.025*	0.015	0.392	0.394	0.006	0.020
Age first internet: 30-39 y. o.	0.258	0.246	-0.011	0.016	0.267	0.267	-0.000	0.020
Age first internet: >40 y. o.	0.116	0.110	-0.019	0.024	0.122	0.124	0.003	0.030
ICT use at home: 0-60 min./day	0.496	0.496	0.011	0.015	0.506	0.510	0.014	0.018
ICT use at home: 1-3 hours/day	0.388	0.393	-0.000	0.015	0.380	0.371	-0.018	0.017
ICT use at home: >3 hours/day	0.116	0.111	-0.026	0.022	0.113	0.120	0.009	0.032
Number of ICT devices at home	5.240	5.230	-0.002	0.005	5.262	5.349	0.006	0.006
Self-reported TET competences [a]	0.058	0.027	-0.002	0.008	0.089	0.056	-0.006	0.009
Positive views ICT in teaching [a]	0.000	0.033	0.010	0.008	0.044	0.114	0.011	0.010
Negative views ICT in teaching [a]	-0.044	-0.039	0.002	0.008	-0.025	-0.006	0.007	0.010
Use of ICT in lessons [a]	0.024	0.040	0.004	0.008	0.037	0.040	-0.004	0.010
Collaboration with colleagues on TET [b]	1.864	1.846	-0.006	0.007	1.795	1.784	-0.003	0.008
Mainstream ICT appl. used in class [a]	0.026	-0.025	-0.009	0.008	0.111	0.141	0.005	0.011
Educational ICT appl. used in class [a]	0.031	0.028	-0.003	0.008	-0.006	-0.003	-0.000	0.009
TET training [b]	3.122	3.133	-0.001	0.004	2.509	2.615	0.004	0.005
Overall difference: P-val	*0.653*				*0.866*			
Missing values								
Missing personal var.	0.022	0.008	-0.247**	0.118	0.012	0.010	-0.048	0.096
Missing professional var.	0.001	0.002	0.049	0.156	0.002	0.004	0.151	0.162
Missing ICT at home var.	0.001	0.002	0.021	0.164	0.002	0.002	0.115	0.212
Missing TET var.	0.007	0.004	-0.106	0.080	0.010	0.005	-0.148*	0.075
Overall difference: P-val	*0.230*				*0.197*			
Observations	2,861	1,917	4,778		1,961	820	2,781	

Note: *** p<0.01; ** p<0.05; * p<0.1. Standard errors clustered at the school level. [a] Pre-treatment values of the outcomes expressed as standardized factors. [b] Pre-treatment values of the outcomes expressed as count (number of yes answers for collaborations; numbers of selected professional activities in the previous 3 years). [c] All countries. [d] Countries with the peer effects design (Finland, Italy, Lithuania, Portugal, Slovenia, and Spain). Columns 3, 4, and 7, 8 show the coefficients of distinct linear probability models (one for each variable), regressing the treatment status on each one of the pre-treatment characteristics, controlling for sampling strata. More precisely, columns 3 and 4 present the values of the estimated regression coefficients and their corresponding standard errors for the comparison of NET vs ET (all countries). NET stands for Non-encouraged teachers. ET stands for Encouraged teachers.

Tab. A.10 TET-SAT take-up rates

Country	Total number of encouraged teachers	Encouraged teachers who started the TET-SAT		Encouraged teachers who started and completed the TET-SAT	
		N	%	N	%
Cyprus	210	112	53.3	98	46.7
Czech Republic	250	42	16.8	32	12.8
Estonia	135	36	26.7	25	18.5
Finland	291	48	16.5	35	12.0
France	356	116	32.6	83	23.3
Greece	152	77	50.7	68	44.7
Italy	256	62	24.2	45	17.6
Lithuania	255	89	34.9	69	27.1
Portugal	246	64	26.0	42	17.1
Slovenia	259	158	61.0	134	51.7
Spain	340	126	37.1	103	30.3
Total	2,750	930	33.8	734	26.7

Note: In addition to the figures above, two non-encouraged teachers in non-encouraged schools (one in Italy and one in Slovenia) started and completed the TET-SAT.

Tab. A.11 Reasons for refusal to use the TET-SAT – Main reason

Main reason	Overall
Unaware of it	32.0%
Time constraints	30.1%
Not interested in self-assessment	10.4%
Already competent	4.3%
Could not access	4.1%
Do not use ICT	2.9%
Not interested in training	1.3%
Other	14.9%
Observations	1,068

Note: overall, non-complier teachers are 1,091, but 23 of them did not answer the question.

Tab. A.12 Characteristics of encouraged teachers associated with the use of the TET-SAT

Variables	Using TET-SAT
Woman	0.001
	(0.029)
Age: 40-49 years old	0.016
	(0.033)
Age: More than 49 y. o.	0.047
	(0.044)
Scientific subject	0.044*
	(0.026)
Other subjects	-0.002
	(0.029)
Hours teaching	-0.004*
	(0.002)
Hours lesson preparation	-0.001
	(0.002)
Hours admin.	-0.001
	(0.002)
Hours residual	0.005*
	(0.003)
Experience	-0.003
	(0.002)
ICT use at home (1-3 h. /day)	0.004
	(0.025)
ICT use at home (3+ h. /day)	-0.010
	(0.041)
ICT devices at home (number)	0.019**
	(0.008)
Self-reported TET competences (BS)	0.020
	(0.014)
Positive beliefs (BS)	0.005
	(0.013)
ICT collaboration with colleagues (BS)	0.007
	(0.013)
Use of ICT mainstream applications (BS)	0.042***
	(0.013)
Use of ICT educational applications (BS)	-0.002
	(0.013)
TET training in ICT (BS)	0.004
	(0.007)
Constant	0.388***
	(0.073)
Observations	2,750
R-squared	0.131
Strata FE	YES
Missing variables controls	YES

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the school level. The associations reported in the table are obtained via a linear probability model.

Tab. A.13 Teachers' opinions on the usefulness of the TET-SAT

Item	Agree (percentage)
TET-SAT helped me to assess my competence	64
TET-SAT helped me to re-think use of ICT in teaching	62
TET-SAT took too much time	38
TET-SAT was boring	30
TET-SAT was useful	63
TET-SAT was easy	75
Feedback page useful to assess my competences	69
Resources useful to improve teaching	51
Overall satisfied	63
Self-comparison useful	55
I would recommend tool	60
Inspired to try new practices in my teaching	54
I prefer to use self-assessment tool to other methods of ass.	57
Observations	818

Appendix B: The feedback score

Figure B.1 The feedback score

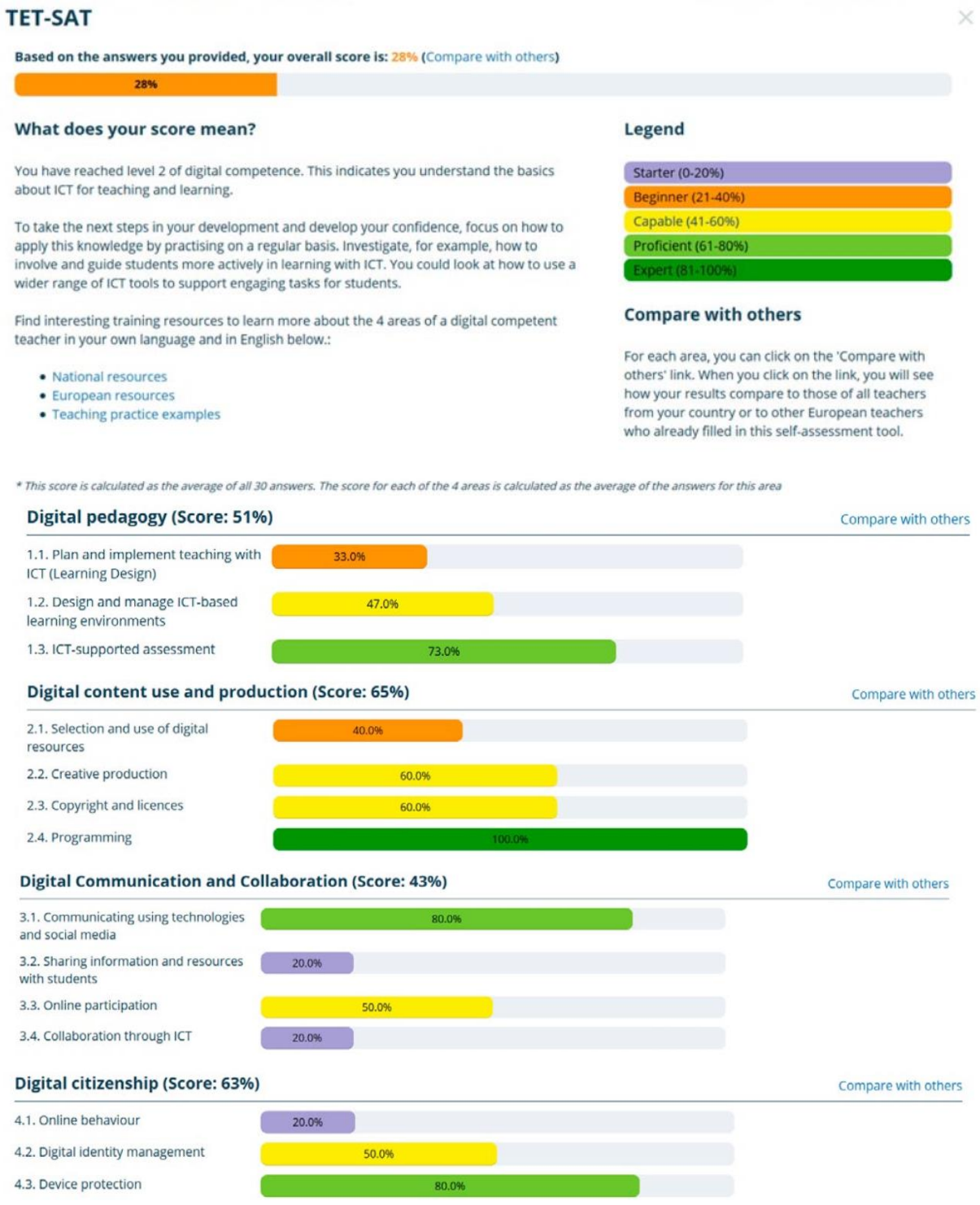
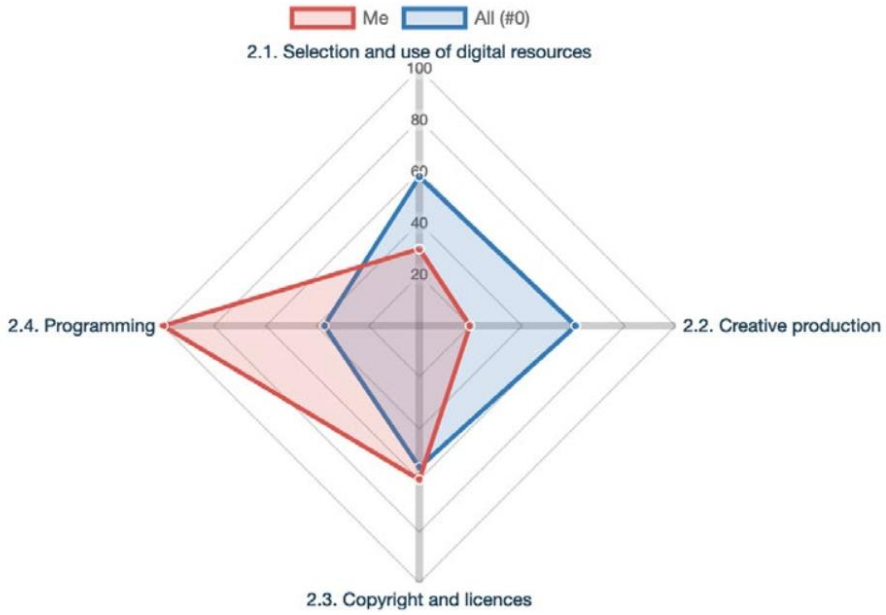


Figure B.2 The feedback score – compare with others



Appendix C: Baseline survey

Offline version of the MENTEP Baseline Survey for teachers (final version online)

INTRODUCTION

Please answer the questions for the school that you have been selected for to participate in this survey. This is the sampled school you are registered with on the MENTEP platform. The school name is also displayed on your profile page on the MENTEP website.

Acronyms: ICT Information and Communications Technology

A. Teaching Background Information

A.1 Professional background

1. What are the main subjects you teach in your school during the school year (2016/2017)?
Please, indicate only those that individually account for at least 20% of your teaching time in this school. In case the exact name of your subjects does not appear below, please mark the category you think best fits the subject.
Select the appropriate answers (multiple choice possible)

- o Reading and writing
  Includes reading and writing in the mother tongue, reading and writing in the language of instruction, reading and writing in the tongue of the country (region) as a second language (for non-natives), language studies, public speaking, literature
- o Mathematics
  Includes mathematics, mathematics with statistics, geometry, algebra etc.
- o Science
  Includes science, physics, physical science, chemistry, biology, human biology, environmental science, agriculture/horticulture/forestry
- o Social studies
  Includes science, physics, physical science, chemistry, biology, human biology, environmental science, agriculture/horticulture/forestry
- o Modern foreign languages
  Includes languages different from the language of instruction.
- o Technology
  Includes orientation in technology, including information technology, computer studies, construction/surveying, electronics, graphics and design, keyboard skills, word processing, workshop technology / design technology
- o Arts
  Includes arts, music, visual arts, practical art, drama, performance music, photography, drawing, creative handicraft, creative needlework
- o Physical education
  Includes physical education, gymnastics, dance, health
- o Religion and/or ethics
  Includes religion, history of religions, religion culture, ethics.
- o Practical and vocational skills
  Includes vocational skills (preparation for a specific occupation), techniques, domestic science, accountancy, business studies, career education, clothing and textiles, driving, home economics, polytechnic courses, secretarial studies, tourism and hospitality, handicraft

2. When did you start working as a teacher?
Please chose the year from the list below
[Drop down menu]

3. When did you start working as a teacher in the school you are currently working in (school year 2016/2017)?
This question concerns your work for the school you are registered with on the MENTEP platform (the sampled school). Please chose the year from the list below
[Drop down menu]

Questions 4, 5, 6 and 7 concern your work for the school you are registered with on the MENTEP platform (the sampled school). Please do not include the work you do for other schools. Please write a number in each row and round to the nearest hour in your responses. Write 0 (zero) if none.

4. Focusing on a typical school week in your school, please, estimate the number of teaching hours you spend on average on Teaching of students in school (either whole class, in groups, or individually)
____

5. Focusing on a typical school week in your school, please, estimate the number of teaching hours you spend on average on Planning or preparation of lessons (including marking of student work).
Please consider only hours spent at school! ___

6. Focusing on a typical school week in your school, please, estimate the number of teaching hours you spend on average on Administrative duties in school (including school administrative duties, paperwork), and other clerical duties you undertake in your job as a teacher (e.g. organization of school excursions)
Please consider only hours spent at school! ___

7. Focusing on a typical school week in your school, please, estimate the number of teaching hours you spend on average on any other activities carried out at school not covered by the previously mentioned (Q4, Q5, Q6)
___

8. Do you work as a teacher also in other schools other than this school?
- YES
- NO

9. If yes, please indicate how many hours do you work as a teacher (consider all the types of activities listed in question 4 to 7) in these other schools during a typical school week
Please consider only hours spent at school.
____

10. How often do you have the following types of interaction with other teachers in your school?
Tick one box for each row

	Never or almost never	2 or 3 times per month	1 to 3 times per week	Daily or almost daily
a) Discuss how to teach a particular topic				
b) Collaborate in planning and preparing instructional materials				
c) Share what I have learned about my teaching experiences				
d) Visit another classroom to learn more about teaching				
e) Work together to try out new ideas				

A.2 Familiarity with ICT

11. How old were you when you first used a computer?
Please tick only one box

- o 9 years or younger
- o 10 to 19 years
- o 20 to 29 years
- o 30 to 39 years
- o 40 years or older

12. How old were you when you first accessed the Internet?
Please tick only one box

- o 9 years of younger
- o 10 to 19 years
- o 20 to 29 years
- o 30 to 39 years
- o 40 years or older

13. Do you use at home any of these devices?
Multiple answers possible

- o Desktop computer (e.g., a tower PC)
- o Portable laptop, or notebook
- o Tablet computer
- o Internet connection
- o Video games console
- o Cell phone (without Internet access)
- o Cell phone (with access)
- o Portable music player
- o Printer
- o Ebook reader (e.g. Kindle)
- o None of the above

14. How often do you use a computer/tablet/smartphone for activities other than work each day on average (e.g., shopping, organising photos, socialising, entertainment, booking a hotel, contacting family and friends)
Please tick only one box.

- o No time
- o 1-60 minutes per day
- o Between 1 hr and 3 hours per day
- o More than 3 hours per day

B. Technology Enhanced Teaching Information

B.1 Attitudes towards ICT

15. To what extent do you agree or disagree with the following statements about using ICT in teaching and learning at school?
Tick one box for each row

Using ICT at school...	Strongly agree	Agree	Disagree	Strongly disagree
a) Enables students to access better sources of information				
b) Results in poorer writing skills among students				
c) Helps students to consolidate and process information more effectively				
d) Introduces organisation problems for schools				
e) Helps students learn to collaborate with other students				
f) Impedes concept formation, which is better done with real objects than computer images				
g) Enables students to communicate more effectively with others				
h) Encourages copying material from published Internet sources				
i) Helps students develop greater interest in learning				
j) Helps students work at a level appropriate to their learning skills				
k) Limits the amount of personal communication among students				
l) Helps students develop skills in planning and self-regulation of their work				
m) Results in poorer calculation and estimation skills among students				
n) Improves academic performance of students				
o) Distances students from learning				
p) Helps students to develop responsible and ethical use of the Internet and know about its dangers (e.g. cyberbullying, spams, security threats)				
q) Helps students to protect their digital identity				

B.2 Use of ICT

16. Think about the typical teaching week since the start of the school year, how often have you used ICTs (e.g., computer devices and software) in doing the following activities?
In case it is too soon to refer to this school year, please consider a typical teaching week in the past year.
Tick one box for each row

	Does not apply	I used ICT to support this activity:			
	(I never did this activity at all)	never	in some lessons	in most lessons	in every or almost every lesson
a) Presenting information through direct class instruction					
b) Providing remedial or enrichment support to individual students or small groups of students					
c) Enabling student-led whole-class discussions and presentations					
d) Assessing students' learning through written tests					
e) Providing feedback to students					
f) Reinforcing learning of skills through repetition of examples					
g) Supporting collaboration among students					
h) Mediating communication between students and experts or external mentors					
i) Enabling students to collaborate with other students (within or outside school)					
j) Collaborating with parents or guardians in supporting students' learning					
k) Supporting inquiry learning					
l) Assigning written task/ exercises / homework to students					
m) Facilitating / supporting individual or collaborative oral presentation by students					
n) Communicating with students out of the classroom					

17. Think about the typical teaching week since the start of the school year, have you done the following in your school?
In case it is too soon to refer to this school year, please consider a typical teaching week in the past year.
Select the appropriate answers (multiple choice possible)

- o I work together with other teachers on improving the use of ICT in classroom teaching
- o I collaborate with colleagues to develop ICT based lessons based on the curriculum
- o I observe how other teachers use ICT in teaching
- o I work with other teachers use ICT in teaching
- o None of the above

18. Think about a typical teaching week since the start of the school year, how often have you used the following tools in your teaching?
In case it is too soon to refer to this school year, please consider a typical teaching week in the past year.
Please tick one box for each row

	Never	In some lessons	In most lessons	In every or almost every lesson
a) Educational software, developed specifically for educational purposes (e.g., Sketchpad, Geogebra, Interactive physics, etc)				
b) Tutorial software or practice programs (e.g., instructional computer-based programs to illustrate step- by step on how to do something)				
c) Digital learning games				
d) Word-processors or presentation software (e.g. [Microsoft Word], [Microsoft PowerPoint],)				
e) Spreadsheets (e.g. [Microsoft Excel])				
f) Multimedia production tools (e.g., media capture and editing, web production)				
g) Data logging and monitoring tools (e.g., devices with temperature, light, speed sensors)				
h) Simulations and modelling software				
i) Social media (e.g., Facebook, Twitter, Pinterest, Snapchat, Instagram – subject to age restrictions)				
j) Communication software (e.g., e-mail, blogs, forums)				
k) Computer-based information resources (e.g., websites, wikis, encyclopedia)				
l) Interactive whiteboard				
m) Graphing or drawing software				
n) E-portfolios				
o) Mobile devices (e.g., tablets, smartphones, etc.)				
p) Learning management systems (e.g., virtual learning environments like Moodle)				

19. In which of the following professional development activities related to ICT have you participated in the past three school years?
Select the appropriate answers (multiple choice possible)

- o Introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.)
- o Advanced courses on applications (e.g. advanced features of office applications (word-processing, spreadsheets, presentations) complex relational databases, administering a Virtual Learning Environment etc.)
- o Advanced courses on internet use (creating websites/home page, video)
- o Equipment-specific training (interactive whiteboard, laptop, etc.)
- o Courses on the pedagogical use of ICT in teaching and learning
- o Subject-specific training on learning applications (tutorials, simulations, etc.)
- o Course on multimedia (using digital video, audio equipment, etc.)
- o Participate in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers
- o ICT training provided by school staff
- o Personal learning about ICT in your own time (e.g. reading articles, tutorials, manuals, websites, etc.)

- Other professional development opportunities related to ICT
- None of the above

20. In total, how much time have you been involved during the past three school years in the above formal professional development opportunities?
Tick one box only

- No time at all
- Less than 1 day
- 1-3 days
- 4-6 days
- More than 6 days

B.3 Knowledge and awareness of ICT

21. To what extent do you agree or disagree with the following statements?
Tick one box for each row

I am able to...	Totally disagree	Disagree	Slightly disagree	Slightly agree	Agree	Totally agree
a) Stimulate students to use ICT in a critical manner						
b) Support students in searching information by means of ICT						
c) Support students to communicate with ICT in a safe, responsible and effective way						
d) (Re)design ICT applications in view of a specific educational setting						
e) Select ICT applications effectively in creating a learning environment (e.g, in view of the group size)						

C. Personal Background Information

C.1 Sociodemographic background

22. Are you:
Check one answer only

- o Male
- o Female

23. How old are you?
Check one answer only

- o Below 25 years old
- o 25-29 years old
- o 30-39 years old
- o 40-49 years old
- o 50-59 years old
- o Over 60

24. What is the highest level of formal education you have completed?
Check one answer only

- o Did not complete ISCED level 3: Upper secondary education
- o Finished ISCED level 4: Post-secondary non-tertiary education
- o Finished ISCED level 5: Short-cycle tertiary education
- o Finished ISCED level 6: Bachelor's or equivalent level
- o Finished ISCED level 7: Master's or equivalent level
- o Finished ISCED level 8: Doctoral or equivalent level

Appendix D: Follow-up Survey

Offline version of the MENTEP Follow up survey for teachers (final version online)

INTRODUCTION

Welcome to the MENTEP Follow-up Survey.

The online survey consists of 10 questions about your use of ICT at school since January 2017. It should take you about 10 minutes to complete it. You will find that some of the questions are similar to the first MENTEP survey: this is on purpose, as we would like to find out about any changes.

How to fill in the survey:

- *Keep to the numerical order of the questionnaire: start from Q1 and work through to Q10, as questions are structured around different key topics and follow a logical sequence.*
- *Your answers are automatically saved as you work through the survey. You can go back to previous questions in case you want to change your answer as you work on the questionnaire. You can also return to the survey later on and continue working on it if you are interrupted or need more time.*
- *All questions must be answered. As you answer a question it appears with a tick next to it.*
- *If you cannot really say which answer option to tick and the "I cannot say" is not given as an option, please nevertheless answer this question trying to give the answer that represent best your views.*
- *Some of the questions have numerous answer options. In that case, you need to scroll down in order to see all of them. If you cannot proceed to the next question, the reason is probably that you did not select all answer options of the current question yet.*
- *To submit your fully completed questionnaire, click on the **'Finish'** button which appears after the last question has been answered. You will receive a notification only when your answers are submitted like this. You cannot submit your responses before you answer all questions.*

To fill in the survey, please click on "Follow-up Survey" on the platform homepage.
Your response is vital for the success of the project, and we thank you in advance for your participation.

B. Technology Enhanced Teaching

B.1 Attitudes towards ICT

1. To what extent do you agree or disagree with the following statements about using ICT in teaching and learning at school?
Please tick one box for each row

Using ICT at school...	Strongly agree	Agree	Disagree	Strongly disagree
a) Enables students to access better sources of information				
b) Encourages copying material from published Internet sources				
c) Helps students to consolidate and process information more effectively				
d) Introduces organisation problems for schools				
e) Results in poorer writing skills among students				
f) Helps students develop skills in planning and self-regulation of their work				
g) Enables students to communicate more effectively with others				
h) Helps students learn to collaborate with other students				
i) Helps students develop greater interest in learning				
j) Helps students work at a level appropriate to their learning skills				
k) Limits the amount of personal communication among students				
l) Distances students from learning				
m) Results in poorer calculation and estimation skills among students				
n) Improves academic performance of students				
o) Impedes concept formation, which is better done with real objects than computer images				
p) helps students to develop responsible and ethical use of the Internet and know about its dangers (e.g., cyberbullying, spams, security threats)				
q) helps students to protect their digital identity				

B.2 Use of ICT

2. Think about the typical teaching week since January 2017. How often have you used ICTs (e.g., computer devices and software) in doing the following activities?
Please tick one box for each row

	Does not apply (I never did this activity at all)	I used ICT to support this activity			
		Never	In some lessons	In most lessons	In every or almost every lesson
a) Presenting information through direct class instruction					
b) Supporting collaboration among students					
c) Enabling student-led whole-class discussions and presentations					
d) Assessing students' learning through written tests					
e) Providing feedback to students					
f) Providing remedial or enrichment support to individual students or small groups of students					
g) Reinforcing learning of skills through repetition of examples					
h) Mediating communication between students and experts or external mentors					
i) Supporting inquiry learning					
j) Collaborating with parents or guardians in supporting students' learning					
k) Enabling students to collaborate with other students (within or outside school)					
l) Assigning written task/ exercises / homework to students					
m) Facilitating / supporting individual or collaborative oral presentation by students					
n) Communicating with students out of the classroom					

3. Think about the typical teaching week since January 2017. Have you done the following in your school?
Select the appropriate answers (multiple choice possible)

- o I work together with other teachers on improving the use of ICT in classroom teaching
- o I work with other teachers on cross-curricula projects involving ICT
- o I observe how other teachers use ICT in teaching
- o I collaborate with colleagues to develop ICT based lessons based on the curriculum
- o None of the above

4. Think about a typical teaching week since January 2017. How often have you used the following tools in your teaching?

Please tick one box for each row

	Never	In some lessons	In most lessons	In every or almost every lesson
a) Educational software, developed specifically for educational purposes (e.g. Sketchpad, Geogebra, Interactive physics, etc)				
b) Tutorial software or practice programs (e.g., instructional computer-based programs to illustrate step- by step on how to do something)				
c) Communication software (e.g., e-mail, blogs, forums)				
d) Word-processors or presentation software (e.g. [Microsoft Word], [Microsoft PowerPoint],)				
e) Spreadsheets (e.g. [Microsoft Excel])				
f) Interactive whiteboard				
g) Data logging and monitoring tools (e.g., devices with temperature, light, speed sensors)				
h) Simulations and modelling software				
i) Social media (e.g., Facebook, Twitter, Pinterest, Snapchat, Instagram – subject to age restrictions)				
j) Digital learning games				
k) Computer-based information resources (e.g., websites, wikis, encyclopaedia)				
l) Multimedia production tools (e.g., media capture and editing, web production)				
m) Graphing or drawing software				
n) E-portfolios				
o) Mobile devices (e.g. tablets, smartphones, etc.)				
p) Learning management systems (e.g., virtual learning environments like Moodle)				

5. In which of the following professional development activities related to ICT have you participated since January 2017?
Select the appropriate answers (multiple choice possible)

- o Introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.)
- o Advanced courses on applications (e.g., advanced features of office applications (word-processing, spreadsheets, presentations) complex relational databases, administering a Virtual Learning Environment etc.)
- o Advanced courses on internet use (creating websites/home page, video)
- o Equipment-specific training (interactive whiteboard, laptop, etc.)
- o Courses on the pedagogical use of ICT in teaching and learning
- o Subject-specific training on learning applications (tutorials, simulations, etc.)
- o Course on multimedia (using digital video, audio equipment, etc.)
- o Participate in online communities (e.g., mailing lists, twitter, blogs) for professional discussions with other teachers
- o ICT training provided by school staff
- o Personal learning about ICT in your own time (e.g., reading articles, tutorials, manuals, websites, etc.)
- o Other professional development opportunities related to ICT
- o None of the above

6. In total, how much time have you been involved since January 2017 in the above professional development opportunities related to ICT?
Tick one box only

- o No time at all because I have not been involved in any of the above-mentioned professional development opportunities related to ICT
- o Less than 1 day
- o 1-3 days
- o 4-6 days
- o More than 6 days

B.3 Knowledge and awareness of ICT

7. To what extent do you agree or disagree with the following statements?
Please tick one box for each row

I am able to...	Totally disagree	Disagree	Slightly disagree	Slightly agree	Agree	Totally agree
a) Stimulate students to use ICT in a critical manner						
b) Support pupils in processing and managing information by means of ICT						
c) Support students to communicate with ICT in a safe, responsible, and effective way						
d) Select ICT applications in view of a specific educational setting						
e) Use ICT appropriately to communicate with pupils						
f) Support pupils to work together with ICT						
g) Provide pupils with activities to exercise knowledge/skills by means of ICT						

Questionnaire ends here for non-encouraged teachers

C.1. Additional questions for <u>encouraged teachers who used the TET-SAT</u>

8. How much do you agree or disagree with the following statements concerning the TET-SAT?
Please tick one box for each row

	I can't say	Totally disagree	Disagree	Slightly disagree	Slightly agree	Agree	Totally agree
a) The TET-SAT helped me to assess my competences in the use of ICT in teaching practices							
b) The TET-SAT helped me to critically re-think the use of ICT in teaching practices							
c) Filling in the TET-SAT took too much time							
d) Filling in the TET-SAT was boring							
e) Filling in the TET-SAT was useful							
f) The TET-SAT was easy to use							
g) The feedback page was useful to understand my level of competencies							
h) The National and European resources at the end of the Feedback page were useful to improve my teaching practices							
i) Overall, I am satisfied with the tool							
j) The possibility to compare myself with other teachers that already completed TET-SAT was useful							
k) I would recommend the tool to other teachers							
l) The use of TET-SAT inspired me to try out a new practice in my teaching							
m) I prefer to use a self- assessment tool to identify my level of competences and areas of improvement to other methods of assessment (e.g., external evaluation)							

9. At the end of the feedback page, we provided two links to online resources for ICT "training" (National & European resources). Did you consult any of the available online resource?

National Resource:

- o Yes
- o No
- o Does not apply, as I did not complete the tool

European Resource:

- o Yes
- o No
- o Does not apply, as I did not complete the tool

10. How would you rate the following features of the TET-SAT?

Please rate the features on a scale from 1 to 10, where 1 means poor and 10 excellent (plus option Cannot say)

- The graphic interface ___
- The online access to the tool (registration and log-in page) ___
- The organisation of the contents on the platform ___
- The feedback page ___
- The user friendliness of the tool ___
- The contents of the tool, overall ___
- The contents of the tool in the area of "digital pedagogy" ___
- The contents of the area in the area of "digital content use and production" ___
- The contents of the area in the area of "digital communication and collaboration" ___
- The contents of the area in the area of "digital citizenship" ___
- The online national training resources ___
- The online international training resources ___
- The language of the tool, in particular the self-assessment items, was clear and easy to understand ___

C.2 Additional questions for <u>encouraged teachers NON TET-SAT users</u>

11. Why did not you use the TET-SAT?
Multiple answers possible

- o I do not think that filling in an online self-assessment tool is an interesting way for me to progress
- o I do not feel the need because I do not use ICT for teaching and learning practices
- o I do not feel the need because I already have proper competences for what I need to do
- o I am not interested in additional training in technology-enhanced teaching
- o I was not aware of such opportunity
- o For time constraints
- o There were technical problems, and I didn't manage to access it
- o For other reasons

12. Among the reasons you selected above, please indicate the main reason (only one) for not using TET-SAT?
Only one answer possible

- o I do not think that filling in an online self-assessment tool is an interesting way for me to progress
- o I do not feel the need because I do not use ICT for teaching and learning practices
- o I do not feel the need because I already have proper competences for what I need to do
- o I am not interested in additional training in technology-enhanced teaching
- o I was not aware of such opportunity
- o For time constraints
- o There were technical problems, and I didn't manage to access it
- o For other reasons