TEACHUP

Experimentation protocol

Deliverable D2.2

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Contents

1 INTRODUCTION

This deliverable provides a detailed description of the TeachUP experimentation protocol and experimentation implementation.

The report documents the three main phases of the experimentation. Sampling and randomisation are described in section 1. The implementation of the tested intervention is illustrated in section 2. Finally, section 3 provides a country-level statistical description of the flows of TeachUP participants throughout the four courses.

This deliverable is closely related to the final evaluation report as well as to deliverables D2.1 "Technical report on Sampling" and D2.3 “Econometric Analysis”.

2 SAMPLING AND RANDOMISATION DESIGN

2.1 Target Population

The target population of TeachUP is constituted by teachers. The project in particular involved teachers from **publicly-funded schools** in **ten countries**. TeachUP teachers present **varying levels of professional experience** and are either already teaching or expect to teach in **lower secondary schools.**

The project targeted teachers located in Austria, Estonia, Greece, Hungary, Lit[illegible]ia, Malta, Portugal, Slovakia, Spain and Turkey. In these countries, all publicly-funded schools [illegible]

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grades and all Initial Teachers Education Organizations (ITE organisations) were considered eligible to take part in the project.

Tech-UP analyzed how the impact of personalised support varied based on the level of teachers' professional experience. The experiment therefore involved teachers at different stages of their professional career. In particular, it targeted both students completing their training to become teachers (i.e., **student teachers, STs**) and teachers already serving in a school (i.e., **professional teachers, PTs**).

Since the path to becoming professional teachers varies across countries,[1] the identification of ITE organisations had to be adapted to fit the different models of initial teacher training. In all countries except Spain and Turkey, STs were targeted while attending their last year of Master's degree or other university program or course providing ITE. In Spain and Turkey, TeachUP focused on teachers in the induction phase instead.

Finally, the experiment was centred on professionals already teaching, or expected to teach, in lower secondary schools (**ISCED 2 level**). In the national educational systems involved in the experiment this corresponds approximately to grades 6-9/10, or to students aged 10 to 13.

2.2 Sampling Strategy

Once the target population was defined, a sample of schools and ITE organisations was drawn and, within these organisations, all PTs and STs were invited to participate. This procedure was carried out with the goal of obtaining a large enough sample to guarantee adequate statistical power to the experiment and a representative sample of the entire teacher body in terms of professional experience.

With regards to the **size of the sample**, our goal was set at a minimum of **4,000 PTs and STs** across the ten countries. The target number was split across countries to reflect each country's size. Such a high target number was aimed at guaranteeing statistical power, allowing us to produce reliable impact estimates.

Concerning the **representativeness of the sample,** our goal was to obtain a sample of teachers that, on average, was comparable to the entire teacher population. Clearly, ensuring external validity to the experiment was a crucial condition in order to generalize the results of the evaluation to the entire teacher population. Failing to achieve this goal, would have meant limiting the learning potential of the entire evaluation.

In order to obtain a representative sample, we adopted a **stratified sampling design** articulated in the following 3 steps (Figure 1):

[1] European Commission. Education, Audiovisual, and Culture Executive Agency. (2015). [illegible]aching Profession in Europe: Practices, Perceptions, and Policies." *Eurydice Report*.

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1. For each country, we collected the **complete lists** of eligible schools and ITE organisations with information such as identification codes, geographical locations and organisations' size.
2. In order to maximise the geographical representativeness of the sample, we divided schools and ITE organisations into **sampling strata** based on the geographical location of the organisations. In smaller countries, we either did not create strata or used the type of school program instead of geographical aggregations. Also for ITE organisations we did not set up any strata because of the limited number of these organisations.
3. Within each of the non-overlapping strata, schools and ITE organisations were randomly selected. We then followed a **probability sampling approach**, which took both strata and single organisations' size into account (e.g. more schools were selected in bigger strata, and bigger schools had a higher likelihood of being sampled than smaller schools). Random sampling allows retrieving a representative sample of schools and ITE organisations, i.e. having characteristics that, on average, are comparable to those of the entire population of schools and ITE organisations (e.g. in terms of size and geographical location). An additional sample of schools/ITE organisations ("reserve list" or "oversample") was drawn within each stratum in order to replace schools/ITE organisations that refused to participate. For ITE organisations, the sampling process had to be simplified as, in some cases, the number of ITE organisations was too small to even consider sampling and all were included in the study.

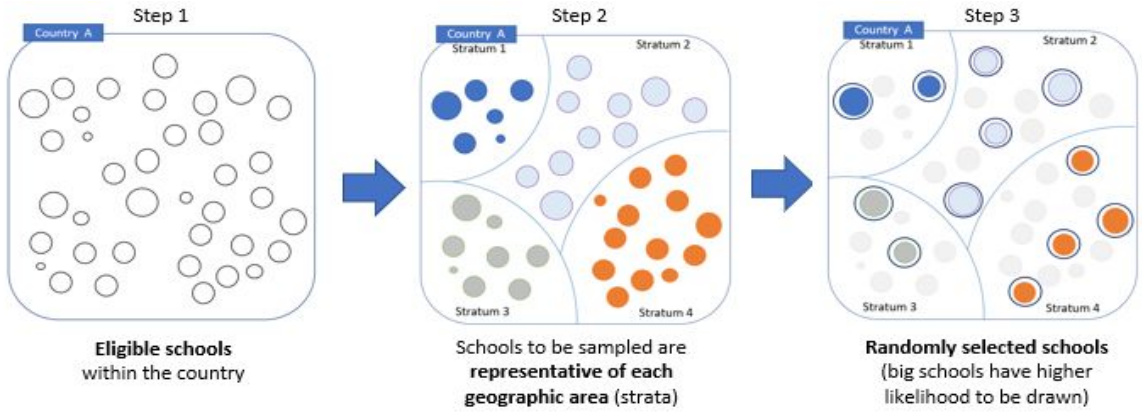

Figure 1 The Three steps of the TeachUP sampling

As already mentioned, there are multiple paths to becoming professional teachers. In the ten countries in our experiment the most common path is to complete a general academic career and a mandatory teacher specialization lasting 1 to 3 years (type A). Some countries, however, also offer single teacher programs that last longer and prepare directly for teaching (type B). A third path is common in Greece: after completing a non-pedagogical degree (such as Math), you may then become a secondary school teacher without additional ITE (type C). For the purpose of TeachUP, the main difference between type B and C is that in the latter there does not only include people interested in becoming teachers but also other students that are not the target of TeachUP.

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For TeachUP, we gathered country-specific information through an ***ad hoc*** **internal online survey** aimed at collecting comparable information on teacher programs. Using this information, we created a common protocol for sampling student teachers. In order to effectively account for country-specific differences in the sampling stage, distinct criteria were applied to different countries. The table below summarizes the career path type(s) that apply in the various countries and the corresponding sampling solution adopted in our experiment (Table 1).

Table 1 ITE organisations and solution adopted for sampling

Country	Type	Short description of the ITE organisation	Criteria used for ITE Organisations (Level-1 sampling units)
Austria	A	After completing a bachelor degree, future teachers need to attend 1-year of ITE that is provided by Colleges	Last year of colleges providing ITE
Estonia	A+B	Future teachers must complete a pedagogical master degree, without having to attend any additional ITE course	Last year of pedagogical master degrees
Greece	A+B+C B	Future teachers of ISCED-2 level have two options: 1) obtaining a bachelor degree in a university department with pedagogical courses (e.g., Mathematics, Physics, Literature etc.) without having to attend any additional ITE course; 2) completing a bachelor university degree without pedagogical adequacy plus: i) either attending additional ITE provided by ASPETE schools or university (1 year) ii) or completing a postgraduate university degree in the field of educational science (2 years) Future teachers of ISCED-1 level need a bachelor degree of the University departments of Early Childhood Education and Primary Education	Last year of university departments of Early Childhood Education and Primary Education
Hungary	A+B	Future teachers have two options: 1) completing a generalistic bachelor degree, + a teacher MSC/MA degree; 2) completing an "undivided" teacher program (lasting 5 or 6 years). In both cases, without having to attend any additional ITE course	Last year of: 1) teacher MSC/MA 2) undivided teacher program
Lithuania	A+B	Future teachers have two options: 1) *integrated model* - trainee teachers follow a professional route from the start and get both bachelor degree and teacher qualification without any additional courses; 2) *consecutive model* - after completing any bachelor degree, completing a degree for teacher qualification provided by universities (lasting 12 months)	Last year of 1) universities offering the integrated model 2) universities providing teacher qualification degrees *Note*: both tracks are available within the same university
Malta	B	After completing a 4-year bachelor degree in Education at the University of Malta, future teachers go through a 2-year induction programme by the Ministry of Education (Quality Assurance Department)	Last year of bachelor degree in education (University of Malta)

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Portugal	A	Future teachers have to complete a master teaching degree (2 years)	Last year of the master degree in teaching (university or some other higher education institutions)
Slovakia	A	Future teachers have to complete a 2-year university master degree for secondary education in pedagogical and teachers faculties)	Last year if pedagogical and teachers' faculties
Spain	A	Future teachers have to go through three phases: Phase 1: 1-year ITE course (master' degree in Teaching in Secondary Schools) delivered by universities Phase 2: Public Exam Phase 3: Induction (one year)	Last year of master degree in teaching Note: On request of the Spanish national partner, the experimentation will involve future teachers in academic year 2016/2017 that will follow the MOOC in the induction period
Turkey	A	Future teachers' training process develops in three phases: Phase 1: ITE courses delivered by the universities (14 weeks, from mid-September till the end of December) Phase 2: Public Exam Phase 3: Induction (one year) organised at provincial level	81 Provincial Directorates of National Education managing student teachers' induction year. *Note*: On request of the Turkish national partner, the experimentation will The focus on teachers in induction (Phase 3)

The following two tables show the results of the sampling process for schools (Table 2) and for ITE organisations (Table 3). We observed highly heterogeneous response rates across groups and countries. Among schools, on average 16 out of 100 invited schools had at least one enrolled teacher (61% in Turkey and from 4% to 100% in EU countries). Among ITE organisations the acceptance rates were, on average, even lower (3.4%) mainly due to non-response or explicit refusals in Turkey (3%). In the other countries the rates were higher, ranging from 10% in Estonia to 82% in Hungary (Malta had only one ITE organisation so its rate is less informative). It is worth mentioning that the sampling design of Turkey and Austria differ from the one implemented in the other countries because of some peculiarities.

Table 2 Summary of the sampling process for schools

Country	**Target** Professional Teachers	**Target** schools	**Invited** schools	**TeachUP schools**	**Acceptance rate (%)**
Austria	300	76	497	29	5.8
Estonia	150	45	183	78	42.6
Spain	500	66	282	23	8.2
Greece	200	78	313	72	23.0
Hungary	300	111	721	84	11.7
Lithuania	200	64	254	48	18.9
Malta	50	10	10	10	100.0
Portugal	300	37	51	29	56.9
Slovakia	200	78	613	25	4.1

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Turkey	550	185	185	113	61.1
Total	**2,750**	741	3109	511	16.4

Table 3 Summary of the sampling process for ITE organisations

Country	**Target** Student Teachers	**Target** ITE	**Invited** ITE	**TeachUP ITE**	**Acceptance rate %**
Austria	300	14	14	3	21.4
Estonia	150	2	19	2	10.5
Spain	500	12	19	13	68.4
Greece	200	11	11	8	72.7
Hungary	300	11	11	9	81.8
Lithuania	200	11	11	6	54.5
Malta	25	1	1	1	100.0
Portugal	300	24	24	16	66.7
Slovakia	200	10	10	8	80.0
Turkey	550	641	13,151	390	3.0
Total	**2,725**	737	13271	456	3.4

2.3 Recruitment

In March 2018, we launched an **informative/recruiting campaign** to contact all PTs and STs in the sampled schools. More specifically, the invitation was sent via e-mail by the National Coordinators to the directors of the TeachUP schools and ITE organisations. They, in turn, circulated it to all the PTs and STs of their organisations.

Overall, **4,090 teachers** from 511 schools and 456 ITE organisations accepted the invitation to participate in TeachUP. The target sample of 4000 was therefore achieved. Teachers signed up to the project and became "TeachUP Teachers" by filling out an online **Baseline Survey (BS)** conducted prior to the start of the courses. Its main goal was that of collecting background information and baseline data with particular reference to teachers' experience with self-regulated learning, views on online learning, digital competencies, teaching beliefs and practices. BS questions and wording were mainly taken and adapted from already existing and validated cross-national surveys (e.g., TALIS, ICILS, PIRLS, TIMMS and Survey of Schools: ICT in Education).

Overall, 97% of TeachUP teachers answered all questions. It is important to note th[illegible]ipants filled in this survey only once, this means that the BS information which was [illegible]

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personalised agents was collected in a static manner, and thus not updated in real-time as participants progressed through the course series.

Participants were encouraged to register for the entire series of 4 courses, but it remained possible for participants to take up courses 2, 3 or 4 even if they had not participated in the previous TeachUP course(s).

Table 4 Distribution of TeachUP teachers across participating countries

Country	TeachUP (student/professional) teachers
Austria	62
Estonia	187
Spain	521
Greece	311
Hungary	302
Lithuania	225
Malta	53
Portugal	276
Slovakia	103
Turkey	2,050
Total	4,090

Teacher recruitment followed the so-called “no one forced, no one denied” principle, i.e. within each school and ITE organisation teachers were free to sign up to the project. Response rates resulted low in general but very heterogeneous across groups and countries as a result of both non-responses or explicit refusals and peculiar sampling procedures. The distribution of PTs and STs across the participating countries is shown in Table 4.

The goal of TeachUP was to conduct a single experiment across ten countries, rather than ten parallel country-level experiments (which would have required a much larger sample of PTs and STs). However, because of the success in reaching a large sample size, it was possible to take contextual and teacher profile heterogeneity into due account. The evaluation focused on four sub-groups: professional teachers in EU Member States, student teachers in EU Member States, professional teachers in Turkey and student teachers in Turkey. Thanks to this sub-division the experiment yielded comparative estimates of the effectiveness of personalised support depending on teachers’ professional stage (PTs vs STs) and institutional context (EU MSs vs Turkey).

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2.4 Randomisation

The sample of TeachUP Teachers was randomly split into two groups: the **treatment group** (2,132 PTs and STs) received personalised support in addition to the standard design of an online course; the **control group** (1,958 PTs and STs) only received the standard design of an online course.

Allocation to the two groups happened randomly through a lottery-like mechanism. Randomisation ensured that **the two groups were on average identical except for their exposure to personalised support**. Any difference detected after the program implementation can therefore be attributed to the treatment (i.e. personalised support).

The randomisation procedure was implemented recognizing the issue of **contamination** (i.e. the possibility that, through interaction, treated teachers could pass part of the treatment on to control teachers). It should be stressed that the threat posed by contamination in TeachUP was limited as the contents of the support are not easily transferable (they are highly personalised and support agents are instructed to interact exclusively with the treatment group).

The two possible sources of contamination we identified and addressed are online and off-line contamination. To avoid **online-contamination**, two separate online courses were set up (for all the four courses) in each country: one for the treated, the other for the control group. The two courses were identical, except for the possibility of obtaining personalised support in the treatment group. Online interaction was limited to each group. In principle, online interaction on open platforms or social networks was possible; this could not be controlled for.

To minimise the risk of **off-line contamination**, **assignment** to the treatment or the control group did not occur at the teacher level but **at organisation level** (school and ITE, depending on the target population). Teachers of a given school or ITE organisation were entirely assigned either to the treatment or the control group. Consequently, PTs and STs from the same institution either all had access to personalized support or none of them did. This setup made it challenging for treated and control teachers to interact during the experiment.

After the first randomisation (see Table 5), more schools/ITE joined because registrations were reopened at the end of each course for organisations belonging to the sample. After the first course, only newly registered teachers/schools were randomised, the outcome of the first randomisation was maintained. No new organisations entered the project after the last reopening.

Table 5 The process of cumulative randomisation of schools and ITE organisations

	4th November 2018				7th January 2019				19th February 2019		
	1ST RANDOMISATION				2ND RANDOMISATION				3RD RANDOMISATION		
	total	controls	treated		total	controls	treated		total	controls	treated
AT	31	16	15		-	-	-		1	-	1
EE	80	40	40		-	-	-		-	-	-
ES	35	18	17		1	1	-		-	-	-
GR	80	40	40		-	-	-		-	-	-
HU	90	46	44		2	-	2		1	1	-
LT	54	27	27		-	-	-		-	-	
MT	11	5	6		-	-	-		-	-	-

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PT	44	21	23		1	-	1		-	-	-
SK	33	16	17		-	-	-		-	-	-
TR	485	243	242		18	8	10		-	-	-
Total	943	472	471		22	9	13		2	1	1

Note: After the first randomisation, only newly registered teachers/schools were randomised, because the outcome of the previous randomisations was maintained. Added schools/ITE after Nov 2018 were part of the sample/reserve list of already invited schools. No school joined at the fourth course.

The following table (Table 6) shows the result of the randomisation process for schools and ITE organisations. By definition, the size of the control and target group in terms of number of schools is, overall, the same. Differences within countries are marginal and due to rounding. Organisations with at least one TeachUP teacher are labelled ***TeachUP school*** and ***TeachUP ITE organisation*** respectively.

Table 6 The randomisation of schools and ITE organisations

Countries	**TeachUP schools**			**TeachUP ITE orgs.**		
	total	**controls**	**treated**	**total**	**controls**	**treated**
Austria	29	15	14	3	1	2
Estonia	78	39	39	2	1	1
Spain	23	12	11	13	8	5
Greece	72	36	36	8	4	4
Hungary	84	42	42	9	4	5
Lithuania	48	24	24	6	3	3
Malta	10	5	5	1	0	1
Portugal	29	13	16	16	8	8
Slovakia	25	12	13	8	4	4
Turkey	113	57	56	390	194	196
Total	**511**	**255**	**256**	**456**	**227**	**229**

Teachers belonging to TeachUP schools/ITE organisations were labelled as TeachUP teachers. The complete trend of registration is represented in Figure 2.

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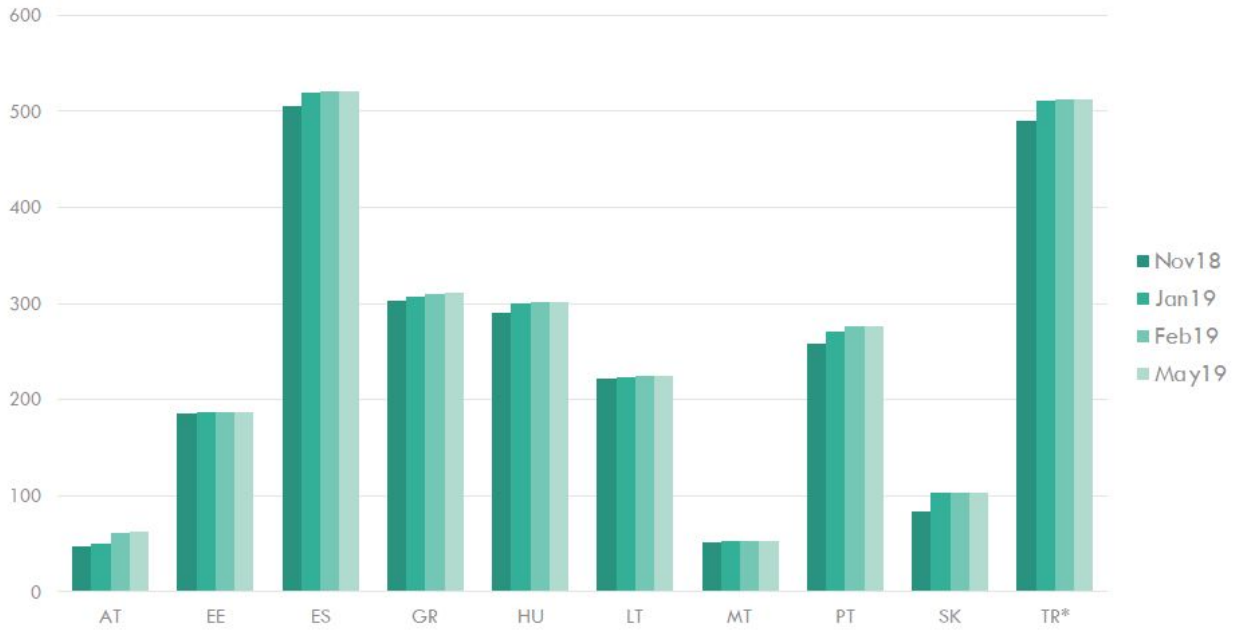

Note : (*) for Turkey, bars represent one fourth of the total

Figure 2 TeachUP teachers: complete trend of registrations

Table 7 shows the results of the randomization process for PTs and STs. As the size of the schools and ITE organisations did not appear in the algorithm used to perform the randomisation, the relative size in terms of teachers of treatment and control groups was different across countries. These unbalances are often negligible and do not affect the impact evaluation analysis.

Table 7 Number of Professional Teachers and Student Teachers belonging to treated and control groups

Countries	Professional Teachers			Student Teachers		
	total	controls	treated	total	controls	treated
AT	42	24	18	19	14	5
EE	180	93	87	7	2	5
ES	75	29	46	446	225	221
GR	153	65	88	157	111	46
HU	197	109	88	105	22	83
LT	191	116	75	34	6	28
MT	23	8	15	30	0	30
PT	203	78	125	73	40	

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SK	46	17	29	57	14	43
TU	1,078	484	594	970	499	471
Total	**2,188**	1023	1165	**1898**	933	965

A number of integrity checks was performed to ensure that the randomised groups were equivalent both at baseline as well as at the follow-up survey (see deliverable D2.3).

3 Treatment

3.1 Protocol

The TeachUP project **developed and tested an innovative personalised support mechanism** for online courses, which offered a direct and **personalised support** infrastructure that helped participants navigate through the course contents and community.

Support Interventions were focused on four areas: providing content-related feedback, developing self-regulated learning competences, offering practical support on how to proceed and motivating participants.

The tested solution consisted of **personalised messages** addressed to those who were most in need because of their individual characteristics, or because of their behavior on the course platform during the course. The messages were intended on one side, to induce latecomers to begin and on the other side, to provide guidance to complete tasks and to solve problems during the course.

The personalised support mechanism was organised around 9 interventions consisting of triggers and actions (Table 8). Triggers determined which course participants were eligible for personalised support. Then, each trigger had an associated action addressing the specific characteristics of the trigger.

Teachers' needs of support were predicted on the basis of **teachers' profiles** as determined with a **Baseline Survey** and **teachers' behaviors** collected through the course platform data (see Deliverable D2.3).

A set of **triggers** was identified building upon available research results showing which characteristics or actions of participants correlate with course participation.

Baseline Survey data were exploited to identify four types of "in-need" teachers:

1. Teachers with low levels in at least two of the following indicators: **beliefs** about effectiveness of online learning, **expectations** of likelihood to take online in the

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future or about course completion and activity, or teachers with an **education level** lower than a Master degree;
2. Teachers with low **SRLO** (i.e., indicates low competence in at least 2 of the self-regulated learning components);
3. Teachers with no **experience of online courses** or low ability and **confidence with online learning technologies**;
4. For course 4 only, teachers were targeted as "in-need of support" on the basis of a predictive model of course completion, which exploited a set of baseline characteristics that was good predictors of that risk in previous courses (i.e. motivation, English proficiency, subject of teaching, age, previous experience, internet access, gender, level of education) (see next section).

Course platform data instead allowed to identify five additional types of needs:

1. Teachers who had not started 5 days after the module launch;
2. Teachers who had not submitted their work for the peer review activity 2 days prior to the deadline;
3. Teachers who made two or more support requests via the contact form of the course platform within a period of 1 week and never visited the course FAQ page;
4. Teachers who indicated dissatisfaction/confusion with the feedback provided by at least 2 out of 3 peers in the peer review activity;
5. Teachers who visited less than 70% of required module sections 1 week after the module launch.

Each trigger had an associated **action** which was **addressing the specific characteristics of the trigger**, for example an email highlighting resources that can help to succeed in online learning and an offer for a 1:1 video call to conduct a "walk-through" of the course interface (Table 8).

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Table 8 TeachUP personalised support model: triggers and actions of the nine interventions

Interventions			
#	Trigger	Action	Aim
1	User indicates low levels in at least 2 of the following indicators: - belief about effectiveness at online learning, - expectations of likelihood to take online courses in the future, - Education level lower than Masters	In course 1-3 the agent contacted the user with a personalised message that included an offer for a video call, template and guidance for succeeding in online learning using a learning plan. In course 4 the agent contacted the user with a general message offering support of any kind at any point during the course should the user like to reach out.	Course Completion
2	User indicates low competence in at least 2 of the following self-regulated learning components: - Goal setting - Task strategies/time management - Help seeking - Self-evaluation - Elaboration	In course 1-3 the agent contacted the user with a personalised message that included general guidance on the importance of SRLO, an example of how to develop the SRLO components, as well as an offer for a video call to discuss specific SRLO strategies. In course 4 the agent contacted the user with a general message offering support of any kind at any point during the course should the user like to reach out.	Course Completion
3	User has low experience of online courses or reports low ability and confidence with online learning technologies	In course 1-3 the agent contacted the user with a personalised message that included an offer for a video call to "walk-through" the course interface and tools or to identify a set of questions they have about the course. The agent would then provide answers to these questions. In course 4 the agent contacted the user with a general message offering support of any kind at any point during the course should the user like to reach out.	Course Completion
4*	Weighted mix of low motivation, low English proficiency, subject of teaching, age, previous experience, internet access, gender, and level of education	Support agent contacted the user with a general message offering support of any kind at any point during the course should the user like to reach out.	Course Completion
5	User has not started 5 days after module launch.	Support agent contacted the user with a personalised message reminding of the importance to stay on track and encouraging the user to keep going as well as offering advice on how to plan their learning time and self-motivate.	Course Start
6	User has not submitted their work for the peer assessment activity 2 days prior to the deadline	Support agent contacted the user with a personalised message about the deadline, offering tips on how to complete the work and where to find support, including the possibility for a video call prior to the deadline, in order to answer any final questions.	Course Completion
7	A user has made two or more support requests via the contact form of the course platform within a period of 1 week and has never visited the course FAQ page.	Support agent contacted the user with a personalised message highlighting ways how users can find answers to their questions, including finding peer support but in particular highlighting the FAQ page and the support section of the forum.	Course Completion
8	User indicates dissatisfaction/confusion with the feedback provided by peers in the peer assessment activity	Support agent provided feedback to the work submitted.	Course Satisfaction
9	User has visited less than 70% of module sections 1 week after module launch	Support agent sent a personal message offering support to help user benefit more from the course content, including a possibility to book a 1:1 session to discuss how to use the content.	Course Completion

*Course 4 only

In course 4 targeting was slightly revised with the introduction of an additional intervention based on those individual characteristics that were good predictors of the likelihood of dropping out in the previous TeachUP courses. Indeed, we found that in courses 1, 2 and 3 among controls (so net of any possible effect of the personalised support) the probability of completing the course among targeted and non-targeted was very similar, meaning that targeting was not precise at identifying those at risk of dropping out. Exploiting the predictive probability of completing previous TeachUP courses, we found that motivation, English proficiency, subject of teaching, age, previous experience, internet access, sex, level of education were important elements to identify those in need. Another important predictor of course completion would have been previous experience in TeachUP. However, we did not use it to make up the new intervention in course 4 because not all those who started that course had a previous TeachUP experience and our aim was to produce forecast estimates based on previous information that would also apply to first-time course participants. The revised targeting has improved the accuracy in identifying those most in need of help. Unlike what happened in the first three courses, the fourth targeted group showed statistically significantly lower completion rates than the non-targeted.

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3.1.1 Changes to the tutoring model for course 4

In order to refine the targeting rule for course 4, we compared the actual scenario with the ideal one and notice that: (i) among non-completers some were targeted but others who were in need were not, and (ii) among completers some had been targeted even if they had a lower risk of not completing the course without any support.

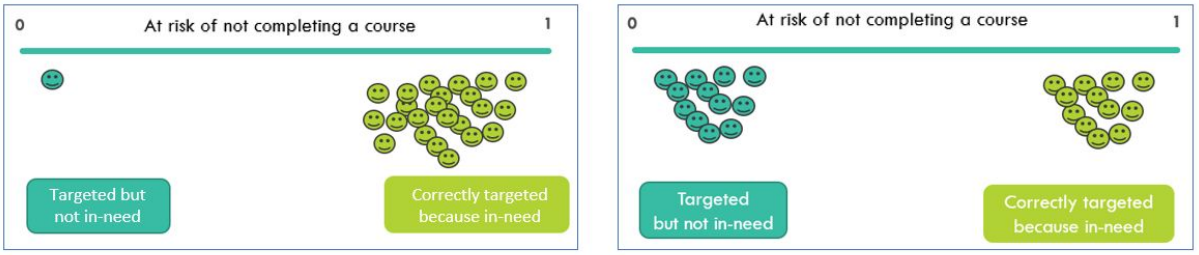

Figure 3 Targeting and risk of not completing a course: Ideal and actual scenario

For (student/professional) teachers who enrolled in a previous TeachUP course we knew:

1. who completed a course
2. their individual characteristics (via BS)
3. who has been targeted (via protocol, i.e. triggers 1 to 9, except intervention 4)

Based on this information, we checked among the control group those characteristics that were more associated with the probability of completing a course independently from the targeting status. We did so by estimating (separately for courses 1, 2 and 3) the probability of completing the course using all the baseline features as predictors. Then we compared the distribution of this probability of those who actually completed the course with that of those who dropped out. Theoretically, among the former, this probability should be as close as possible to 1, while among the latter it should be shifted to zero (Figure 3).

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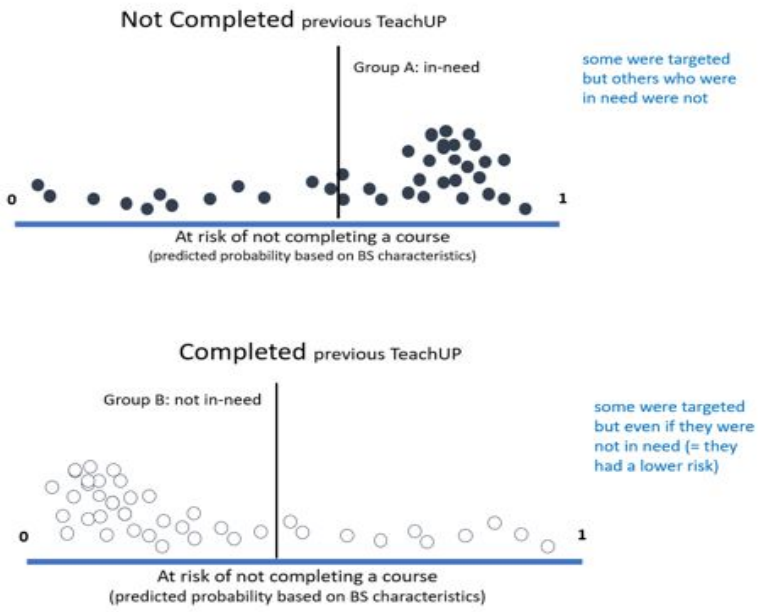
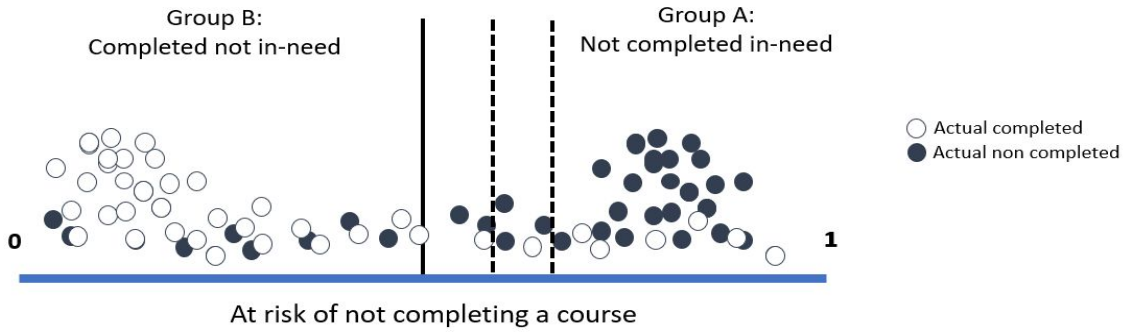


Figure 4 Predicted probability of completing a course (based on Baseline characteristics) of those who actually completed or not completed it

In practice, however, the two curves were partially overlapped (Figure 4). Through a ROC curve analysis, we were able to identify how much the predictive model was able to distinguish completers from non-completers.



RULE for intervention 4: Set a threshold maximising A (targeting those in-need) or B (not targeting those not in-need)

Figure 5 Targeting rule for intervention 4

Moreover, this tool allowed us to identify a threshold in the predicted probability able to maximize, on the one hand, the group of users who did not complete the course and who, acc[illegible] their characteristics, had a high risk of doing so and, on the other hand, the group of users [illegible]

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despite a low expected drop-out risk. The ROC curve analysis was quite similar in the three courses. To refine targeting in course 4, in the end, we used the predicted probability calculated on course 3 and assigned to the new intervention all enrolled in course 4 with a predicted probability below 0.74.

3.2 Targeting

Table 9 shows the count of interventions activated during the whole project.

Table 9 Distribution of interventions activated during the whole project by participants and course

Interventions	Course 1	Course 2	Course 3	Course 4	Total
1	170	158	157	156	641
2	147	130	131	131	539
3	549	497	490	492	2028
4*	-	-	-	274	274
5	-	1160	1227	274	2661
6	-	225	111	117	453
7	-	5	7	0	12
8	-	5	0	3	8
9	-	36	103	106	245

A teacher could receive multiple interventions (Figure 5). Those receiving interventions only for their actions/inactions were about 55% in course 2 and 3 and 40% in course 4. Those receiving both types of interventions were one third in course 2 and 3 and a half of course 4 participants. In all the three courses, those receiving only interventions 1-4 were a minority (5% or less).

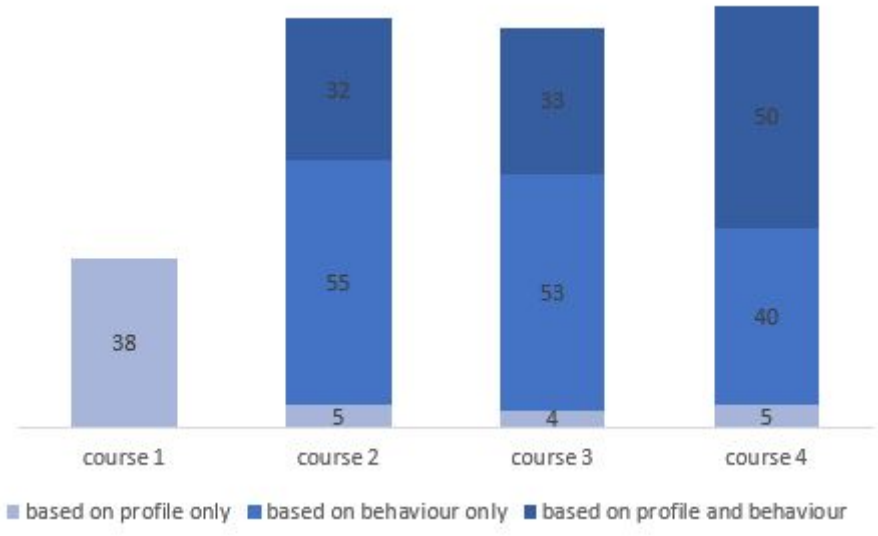

Figure 5 Proportion of teachers in the treatment group who received the different support interventions, by course

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Some interventions offered participants the possibility to take part in a 1:1 session. However, the number of 1:1 online sessions that actually took place was very low.

Table 10 Acceptance rate of 1:1 sessions in interventions based on participants' profile, by group

Group	Treatment group	Interventions 1-4	Acceptance of 1:1 session	%
Professional teachers from EU countries	513	210	17	8.1
Student Teachers from EU countries	472	225	18	8.0
Professional teachers from Turkey	567	317	8	2.5
Student Teachers from Turkey	440	282	11	3.9
Total	**1,992**	**1,034**	**54**	5.2

4 Course participation patterns

Table 11 shows the flows of participants (controls and treated jointly) through the four courses. The figures included in the table related to enrolment in the courses, start of the courses and completion of the courses. The figures are divided by teacher profile (i.e., professional and student teachers) and country.

The table confirms the results presented in the TeachUP Final evaluation report as regards the decreasing start rates when moving from course 1 to course 4 and the parallel increase in completion rates among starters. Variations across countries in these patterns exist, but the overall patterns are confirmed.

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Table 11 Enrollment, start, completion in the four courses, by teacher profile and country.

	Course 1			Course 2			Course 3			Course 4		
	E	S	C	E	S	C	E	S	C	E	S	C
PTs												
AT	36	22	12	27	17	6	27	9	7	24	11	7
EE	114	77	47	89	43	40	96	41	37	94	40	30
ES	59	40	18	28	11	9	34	11	10	28	13	11
GR	111	80	47	94	47	34	102	42	32	109	47	36
HU	103	68	32	85	49	26	73	39	23	85	32	21
LT	155	125	82	75	62	48	78	59	47	81	58	50
MT	17	10	6	12	7	5	12	5	5	13	7	7
PT	146	77	37	99	43	24	90	29	22	90	31	22
SK	33	26	3	24	3	2	24	4	1	23	2	0
TU	953	575	274	898	244	165	895	182	144	884	165	133
Total	**1,727**	**1,100**	**558**	**1,431**	**526**	**359**	**1,431**	**421**	**328**	**1,431**	**406**	**317**
STs												
AT	4	2	2	6	2	1	15	5	2	5	2	1
EE	4	2	2	5	2	2	3	2	2	2	2	1
ES	368	226	112	330	124	84	322	94	67	336	83	59
GR	135	73	37	113	45	32	114	40	35	114	36	28
HU	86	48	19	67	24	11	65	12	10	68	12	6
LT	26	16	4	13	7	3	13	2	2	13	3	1
MT	28	13	8	25	11	9	26	9	9	25	9	9
PT	48	23	7	37	10	4	36	8	3	37	6	3
SK	30	19	8	36	10	6	29	6	4	29	4	1
TU	804	398	190	850	158	93	842	113	75	845	77	49
Total	**1,533**	**820**	**389**	**1,482**	**393**	**245**	**1,465**	**291**	**209**	**1,474**	**234**	**158**

Note: E=enrolled; S=started; C=completed

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