
DIGITAL EDUCATION TO FOSTER THE SUCCESS OF STUDENTS IN DIFFICULTY IN LINE WITH THE DIGITAL EDUCATION ACTION PLAN

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Abstract

Because of the Covid-19 pandemic, the need to promote digital education has been felt even more, bringing the DELTA Research Group to reflect on how digital education could optimally facilitate the creation of an educating community able to promote and support educational success exclusively through distance learning. In order to answer, in this paper the experience of the 2019/2020 edition of “Scuola dei Compiti” (a recovery project for secondary schools of the poorest suburbs of Turin) is analysed in the perspective of the priority strategies illustrated in the Digital Education Action Plan for the period 2021-2027. Results will show that this was a forerunner experience perfectly in line with the principles and directions outlined in the document. Moreover, thanks to digital education, even a peculiar edition of the project such as this one has been a success: in fact, it has allowed students to improve from a cognitive and metacognitive point of view, even during a time that was very difficult for some families.

Introduction

In Italy, the digital competence level is very low (only 44% of people between 16 and 74 years old have basic digital skills, while the European average is 57%) and the digital divide disfavours social inclusion and the exercise of full democratic citizenship (Selva, 2020). In order to meet this need, since many years the main goal of the DELTA (i.e. Digital Education for Learning and Teaching Advances) research group of the University of Turin is to improve Digital Education. The DELTA Research Group implements its research through trials and projects involving many secondary school students and that aim not only to improve their cognitive and meta-cognitive processes but also to enhance their digital competence (Barana & Marchisio, 2016; Barana et al., 2020b). The DELTA Research Group studies and develops innovative and effective methodologies to promote school success, also with the use of new technologies. In 2020, the global Covid-19 pandemic gave

a further boost to the group's research, forcing some of the projects that were meant to be in-person to shift to distance learning only. An example of this implementation is the project against school failure "Scuola dei Compiti" (i.e. "School of Homework") of the University and the City of Turin (Barana et al., 2017). It started in 2013 to support those students from Turin poorest suburb upper and lower secondary schools who needed to reduce failures in STEM subjects (where STEM stands for Science, Technology, Engineering, and Mathematics), foreign and Italian languages. In its first six editions (up to the 2018/2019 one) the project has involved 9564 students from grade 8 to 10. Since its first edition, the project has provided supporting courses with the face-to-face modality (called "traditional" courses) and others called "digital" courses that were making the most of a specific DLE (i.e. Digital Learning Environment) with the blended learning modality that alternated classroom-based and online moments. All courses have always been aimed at disadvantaged students, whose families were in unfavourable economic situations and/or not able to support them in their education. The practical need to redesign "Scuola dei Compiti" in an entirely online mode for the 2019/2020 edition has brought to the following research question: "how can the previously acquired competences of the research group, and in general the digital education, optimally facilitate the creation of an educating community able to promote and support educational success exclusively through distance learning?" The results of this edition of "Scuola dei Compiti" are in line with the promotion of a high-performing digital educational ecosystem and the improvement of digital skills and competences for the digital transformation i.e. the two strategic priorities outlined in the 2020 Digital Education Action Plan (European Commission, 2020). The DEAP is the plan of the European Commission, which outlines the measures for the digital inclusive and high-quality instruction and training that should be adopted by every European country. It covers the programming period 2021-2027 and it defines priorities and corresponding actions on which the EU can provide an added value. Although the DEAP was published in September 2020, the research of the DELTA research group has somehow anticipated most of the fundamental aspects indicated in this document, as will be illustrated in the results section.

The "digital" experience to promote school success

Because of the Covid-19 pandemic, the need to promote the development and adoption of digital learning environments has been felt even more, even in the context of remedial education (Bolondi et al., 2021; Darling-Hammond et al., 2020). "Scuola dei Compiti" was therefore entirely redesigned for its 2019/2020 edition in order to be completely digital and thus be able to reduce educational poverty and promote school success. It became a vast experimentation of a totally online recovery project after only one experience in the past, with smaller numbers, that was carried out in the framework of the project "Ragazzi

Connessi” (i.e. “Connected Youth”) (Fissore et al., 2020). Thanks to previous editions and competences developed by the research group over the years, many methodologies have been implemented to favour students in difficulty in order to immediately take the side of the neediest students, who risked being the most fragile in this historical period, which certainly was not the easiest. The project was made possible thanks to the collaboration among the schools, the city of Turin, and the DELTA research group, which cooperates with several departments of the University of Turin. The actors involved have been many: staff of the Municipality of Turin; teachers, trainers, scholarship recipients and tutors of the departments of Molecular Biotechnology and Health Sciences, Mathematics, Foreign Languages, Humanities, Physics, Philosophy, and Educational Sciences; students and their families; teachers, school staff, headmasters of the schools involved. There were multiple goals: not only to reduce early school leaving but also to recover school failures and overcome learning difficulties, increase passion and motivation in studying, reach self-confidence and facilitate the transition from lower to upper secondary school. In a time of global pandemic, it became even more necessary to reach these goals (Giovannella et al., 2020). As in previous editions, the 2019/2020 one also provided tutoring hours held by university students selected on the basis of their study program and their profit and appropriately trained for their role in the school context. The subjects involved were: Chemistry, English, Italian, French, digital Latin, Mathematics, digital Mathematics, Physics, and German (where all courses without the adjective “digital” were “traditional”). Although with the redesign of “Scuola dei Compiti” every course was online, the difference between “traditional” and “digital” courses was still significant, as it will be shown in the results. In fact, at the beginning of February, all tutors had attended a two-meetings initial training: an introduction to the project and a specific pedagogical training. Besides, tutors of “digital” courses attended further training on the most innovative teaching methods for school recovery in a blended perspective, that is, integrating face-to-face moments with online ones; “traditional” tutors did not attend them because their courses were supposed to be held face-to-face. When the project was modified because of the new social distancing rules, this second part of the training was synthetically re-proposed to every tutor in online mode. 87 courses have been activated, each of them for a small group of students (5-10 students) which followed up to two hours of weekly tutoring. The number of weeks was different for each school (from 7 to 15 weeks), to satisfy their different needs; the project ended for all with the closure of schools at the beginning of June. The reprogramming of the project in a totally online way has led to strategic considerations by the people in charge of the project (from the Municipality and the University of Turin but also teachers and headmasters of schools) on how to make the most of digital technologies for a recovery online path. This led to the decision to fully use the integrated DLE (Digital Learning Environment) that was already set for “digital” courses. The DLE would have been the

space, shared by tutors and students, where all tutoring activities could take place (Barana & Marchisio, 2021). In fact, thanks to the collaboration with the ICT services of the Department of Computer Science of the University of Turin (Barana & Marchisio, 2020a), the project provides a Moodle platform integrated with the web conference system Adobe Connect, the Advanced Computing Environment Maple through the MapleNet plugin and the Automatic Assessment System (AAS) Möbius (<https://www.digitaled.com/products/assessment/>). This DLE (available on <https://scuoladeicompiti.i-learn.unito.it/>) with the described supplements facilitates the implementation of collaborative and cooperative learning, adaptive teaching, and problem-solving, thanks to the possibility of using forums and creating supplementary and interactive activities (Barana et al., 2019a; Barana et al., 2019b; Paiva et al., 2015). The font used by the platform is “EasyReading” (<http://www.easyreading.it/it/>) which is Dyslexia friendly and accessible.

Methodology

To evaluate the effectiveness of digital education in facilitating the creation of an educating community able to promote and support educational success exclusively through the distance-learning modality, various initiatives have been undertaken, at the beginning of the project, in itinere, and at the end. These included: numerous meetings among the people in charge of the project to reprogram the guidelines according to the new rules of social distancing; various gatherings with teachers to support them and to receive feedback weekly reports sent by tutors. At the end of the project, all the actors involved were asked to fill in online questionnaires. This was critical to obtain evidence and data to monitor progress and improve the understanding of challenges and opportunities of this digital transformation, as indicated in the DEAP as well. All students filled in one Likert-scale questionnaire while their teachers and their tutors filled one for each of their students in order to compare the results for each student from three different points of view. Questionnaires investigated students’ improvement at a cognitive and metacognitive level as well as the impact of this vast experimentation of an entirely online recovery project. In the teachers’ questionnaire, it was also required to indicate the average mark of a student in a specific subject before starting the course (which will be called “initial mark”) and a feedback by teachers on the increase (or decrease) of students’ performance in that subject at the end of the school year. This numerical value (which will simply be called “increase” and will be preceded by a minus sign in case of a “decrease”) had to be given based on the latest activities of the student carried out together with the teacher during the last months of distance learning and, regardless of the mark, they would have put in the school report. The sum of the “initial mark” and the “increase” will be called “final mark” for brevity.

Results

The following analysis discusses the data collected through these questionnaires and meetings at the beginning, in itinere, and at the end, in the perspective of strategic priorities of the DEAP (European Commission, 2020). These priorities indicate that to promote digital educational ecosystems of high performance it is necessary to: have infrastructures, connectivity, and digital equipment; plan and develop effective digital skills (including effective and up-to-date organizational skills) and digitally competent and confident education and training staff; high-quality content, easy-to-use tools, and secure platforms, respecting privacy and ethical standards.

Infrastructure, connectivity, and digital equipment

Initially, 41 schools were supposed to participate in the 2019/2020 edition of “Scuola dei Compiti” (for a total of 189 courses to activate) but, due to the sudden pandemic, only 21 have decided to continue. This was caused by reasons mainly related to the poor digital infrastructures possessed by their students (connection and devices), which were necessary in order to take part in the project in a fully online mode. Many schools had already provided devices and mobile SIM for connection to the neediest students who, however, were not always the same students enrolled in the project. This highlighted an important factor indicated in the DEAP, namely the need for greater investments in connectivity, and equipment in order to guarantee access to digital education to anyone in the future. The students who actually participated in this edition of the project and who could therefore access the platform amounted to 635; however, fewer questionnaires were received because it was not easy to remotely control their completion. The answers analysed, therefore, refer to 338 questionnaires filled in by students, 453 by tutors, and 415 by teachers. Participation in the project was good, thus underlining the fundamental role of this digital edition in increasing equality and inclusion, allowing the most disadvantaged students, the real target of the project, to continue learning even during the school closing period.

Digital skills and digitally competent and confident education and training staff

Courses were highly attended also thanks to the initial training provided to tutors. Tutors, all aged 22 to 25, were able to quickly acquire the digital skills necessary to use technology effectively and creatively to engage, motivate, and also support their students in the acquisition of digital skills, as indicated in the DEAP. “Digital Latin” and “digital Math” courses were the most popular, after the “German” course that was however only one and attended only by 2 students. The 62 students enrolled in “digital Latin” courses attended on average 17 hours of tutoring while the 51 students enrolled in “digital Math” courses attended on average 14 hours; all the other courses (traditional Math, Chemistry, French,

English, Italian, Physics) had an average attendance of 10 hours each. This highlights that the initial training provided to “digital” tutors, deeper and more detailed, has led to the success of their courses; the subsequent analysis of “initial and final marks” also proves this success. As also highlighted by DEAP it is therefore observed that the greater the skills of educators (in this case of tutors) the greater the probability of success of online courses. The project proved to be a success also from a cognitive point of view: in fact, looking at answers given by teachers to the question “In your opinion, compared to before the ‘Scuola dei Compiti’ course, has your student improved in the discipline?”, 75% of them answered “yes, they have”. Furthermore, according to teachers, students who have improved the most are those who have taken courses in “traditional Math”, “traditional English”, “digital Latin” and “digital Math”. In general, before attending the course, students’ average marks in the subject were on average 5.16 (out of 10); the average mark of students after attending the course was 5.85: there was, therefore, an average increase of +0.69 points and the difference is statistically significant to a pairwise Student’s t-test ($t = 20.66$, $p < 0.001$). The project was in fact aimed at students with minor insufficiency and the data show that it is particularly effective for them as it allows to recover those few points that can lead very close to sufficiency if not full sufficiency. The average increase in “digital” courses is 0.89 out of 10, significantly higher than the increase in “traditional” courses (0.63 out of 10); the difference is significant on an ANOVA test ($p = 0.01$). This shows once again how the different methodologies adopted by “digital” tutors led to a greater success of their students. These data are also confirmed by analysis of the questionnaires completed by students. They state that, at the end of the course, their knowledge of the subject has increased by more than half a point out of 5: from an average value of 2.6 (expressed in Likert scale 1 to 5) before attending the course to 3.2 after attending the course. Confidence also increased from 2.8 to 3.4. Interest in the subject, self-paced study, and participation in lessons with the teacher also increased on average after the course. Despite the course being entirely remote, students declare that they have improved in all these metacognitive aspects. Furthermore, most of the students report that they attended online meetings mainly because they found them interesting and useful (with mode 4 on a Likert scale of 1 to 5), the tutor was young and nice (mode 3), and because they themselves were motivated to improve their skills (mode 4). The role of the tutor has therefore proved to be fundamental in this extraordinary edition of the project; in fact, it was them who guided their students thanks to their digital skills. In so doing, tutors were of great support to teachers, who already had a lot on their plate, dealing with daily teaching with the whole class. As also indicated by the DEAP, a good understanding of the digital world should be part of the formal and non-formal education provided to make basic digital skills part of the key transferable skills, and “Scuola dei Compiti” was a good way to help this process for students and tutors. In fact, a good relationship developed between tutors and students,

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which was fundamental for the success of the project. 54.8% of students stated that they felt “very” or “very much” comfortable with the tutor (4 or 5 expressed in a Likert scale by 1 to 5); only 0.4% of them responded negatively (the average is 4.1). Students’ answers tend to be confirmed by those of the tutors, whose answer to the question “has the student established a good relationship with the tutor?” reached an average of 3.2. To conclude, we report that students greatly appreciated the course they received despite all the difficulties of this historical period: 81% of them declared that, in case of need, they would like to attend a similar course again. Furthermore, students found that the tutors’ explanations were interesting (with an average of 3.72 on a Likert scale of 1 to 5), that the number of meetings was sufficient (average of 3.59) and they declare that in such a period of health emergency being able to participate to the project was supportive (average of 3.47).

High-quality content, easy-to-use tools, and secure platforms, respecting privacy and ethical standards

One of the key elements to deliver the project was the Digital Learning Environment made available for the project. As shown in Table 1, students showed that they generally appreciated the opportunities offered by the online platform, in which they found interactive materials, the support of the tutor from home in asynchronous activities, and collaborative activities to be carried out with their peers. These materials and activities were created specifically by tutors from scratch or taken from a database of ready-made materials made available by the research group. This allowed to design high-quality educational content, and digital technology has been crucial, as indicated in the DEAP. Only “digital” tutors have created interactive materials and tests for automatic formative assessment because they have been trained on how to do it: in table 1, the “mean” column only considers answers of those who actually used them; the “N.A.” column shows the number of students who replied that they did not use them. We also underline the fact that these data were collected at the end of the project, in June 2020, when we were just emerging from the pandemic situation and all the frustrations it caused.

Table 1: Answers from students about digital content involved in the project

Answers from students	Responses	Mean	St. Dev.	Mode	N.A.
Was the platform easily accessible?	338	3.06	1.213	3	0
Did you appreciate communicating with the platform?	338	3.17	0.985	3	0
Would you like to have a platform also for school lessons?	338	3.11	1.326	3	0
How much did you appreciate having interactive materials?	276	3.57	1.075	4	62
How much did you appreciate tests?	163	3.12	1.027	3	175
Did tests help you to learn from your mistakes?	163	3.49	1.008	3	175

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These results are particularly positive if we take into consideration that, for most students, the totally online mode was a novelty that they had never experienced before. In fact, the majority of teachers stated that their students “never” took part in online lessons nor used online material before the health emergency (the mode of answers given is 1 on the Likert scale as shown in Table 2). The project was for many students a first step into their digital literacy and encouraged healthy, safe, and meaningful uses of digital technology, as indicated in the DEAP.

Table 2: Answers from students about their previous digital experience

Before the pandemic has the student ...	Responses	Mean	Mode	St. Dev.
... already taken part in online lessons carried out by the teacher?	415	1.6	1	1.072
... already used online material made available by the teacher?	415	2.02	1	1.064

Furthermore, by asking to specify which type of online resource they had already used before the pandemic, it appears that 51.8% of students had already used handouts in pdf or word format but 31.3% of them had never used any type of interactive material at all given by their teacher. This is an influential factor because it shows even more how difficult it was for students and teachers to adapt to the conditions dictated by the social isolation imposed: in addition to having to attend lessons online without physical contact, students also had to get used to using certain types of resources never used before. Therefore, given that this modality of course delivery was new for most of the students involved, some answers collected in table 3 given by teachers, students, and tutors are very relevant. We asked them which modality they would feel most appropriate in the future for the fruition of the project for the student they were filling out the questionnaire about. For all three actors involved in the project, the best way was the “mixed” one, in which face-to-face tutoring alternates with online tutoring with the support of an online platform. This was also the same modality already offered in the past for courses called “digital” (or “experimental” in the first editions). The second modality chosen is the one with only face-to-face tutorings but always supported by an online platform to have materials available for recovery. It is also meaningful that the majority of actors involved agree that in a future edition they would like to have a platform available to support tutorings (only 14% of the total of the answers collected say they prefer face-to-face tutoring without any platform support).

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Table 3: Answers from teachers, students and tutors about the most appropriate modality of fruition of the project

After this experience, what could be the best modality for the next edition?	Teachers	Students	Tutors
Only face-to-face tutorings, without platform	9.6%	14.9%	18.5%
Only face-to-face tutorings, with platform	24.2%	18.9%	33%
Only online tutorings, with platform support to access interactive materials	0%	10.8%	3.5%
In blended modality, both face-to-face and online tutorings and with platform	50.7%	24.2%	37.3%
Missing data	15.5%	31.2%	7.7%
Total	100%	100%	100%

Conclusions

Thanks to the experience of the research group in digital education, it was possible to successfully deliver the project by fully exploiting the most innovative teaching technologies and methodologies that have made students involved improve from a cognitive and metacognitive point of view. It was an action aimed at the most vulnerable, the invisible ones, in a period that was very difficult for some families, and digital education has played a fundamental role in increasing equality and inclusion, allowing even the most disadvantaged students to be able to be involved and not be left behind. It was also an opportunity to make all the actors involved think about how digital technologies can be integrated into education and training and it served for many as a first hint of digital literacy to develop an understanding of risks and opportunities linked to digital technology and to encourage a healthy, safe and meaningful fruition. Furthermore, students and tutors involved have acquired valuable digital skills and competences that should, from this historical period onwards, become part of the formal and non-formal education provided in every education and training institution in order to make the competences become basic digital skills part of the key transferable skills. Rereading the experience of “Scuola dei Compiti” in the light of DEAP (European Commission, 2020) we can see that this was a forerunner experience perfectly in line with the principles and directions outlined in the document. Past experiences of the research group have provided tutors (and therefore students) with high-quality educational content to increase the relevance, quality, and inclusiveness of the recovery intervention; the project has therefore served to facilitate flexible and accessible learning opportunities for the learners involved. This extraordinary edition of the project has served to promote a high-performance digital educational ecosystem, as once again stated in the DEAP. In fact, it has made all the students, tutors and teachers involved understand its potential: 86% of them at the end of the project agree on the fact that “in a future edition of the project they would like to have an online platform available to support tutors”. Answering the research question, it can

therefore be said that digital education has succeeded in its intent of facilitating the creation of an educating community exclusively through the distance-learning modality able to promote and support the educational success of students in difficulty and to help them in their academic success limiting their school dropout. Obviously, a lot of work still needs to be done in order to be able to reach a complete transformation of education for the digital age, but the information and knowledge gained from this first trial will be useful to improve the understanding of challenges and opportunities of the digital transformation in future education projects. Although this was an entirely online experimentation caused by unavoidable external factors, it is clear that, in the future, the digital component will no longer be missing even in recovery projects; this experience was fundamental to lay the foundations for future projects which, regardless of the pandemic, could adapt more and more to these new modalities. Starting from this very experience, the DELTA Research Group is now implementing, among other things, a new recovery project during the school year 2020/2021: this was designed to be held online from the very beginning, given the excellent results observed during the last edition of “Scuola dei Compiti”.

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