Start@unito: Open Online Courses for Improving Access and for Enhancing Success in Higher Education

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Abstract: Digital Education, in particular open online courses, plays an important role in providing free education to people who wants to learn. The University of Turin, with the financial support of the bank foundation Compagnia di San Paolo, has developed the project "start@unito": a selection of university modules in a broad range of topics, administered through open online courses freely available. These courses could be also used to facilitate the transition between secondary and tertiary education and to enhance the success in Higher Education. In this paper we discuss the project, focusing on the adaptive solutions adopted in the preparation of the online resources and describing some results after the first nine months of courses availability.

1   INTRODUCTION

Since the beginning of the third millennium, the use of technology for learning purposes has increased quantitatively and qualitatively together with the improvement of technology itself.

Across the years, many attempts to create effective e-learning programs took place and interacted with the development of tools and protocols, like free copyright licenses Creative Commons, the construction of repository programs and MOOCs and the birth of virtual communities of practice.

The digital education, which uses the information technologies to support learning, can be a useful tool for the realization of the declaration of Rights to education primers (Tomaševski, 2001), which elucidates key factors, like the respect of all human rights in education, as well as enhancing human rights through education. This document, which directly follows from the Universal Declaration of Human Rights, stated the most important features that education must have through 4 "A":

- acceptability, to ensure that education is of good quality, thus enforcing the mininal standards;
- accessibility at different levels: access to education must be secured and free for all children at least in the compulsory education age-range (elimination of barriers and ostacles like distance, fees, gender discrimination);
- adaptability, which states that schools ought to adapt to children, according to the best interests of each child and paying attention to people with disabilities;
- availability, which means allowing the establishment, funding and using of educational institutions by non-state actors.

Nowadays the trend is to focus mainly on open digital education. The main reason of this choice resides in the diffuse access to the world wide web via many kind of devices from anywhere. In this context, many institutions, mainly universities. devoted to spreading education, are trying their best in order to prepare Open Educational Resources (OER). In fact, universities must accomplish their Third Mission, that is to generate knowledge outside academic environments to the benefit of the social, cultural and

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economic development. At the University of Turin, thanks to a funding from the bank foundation Compagnia di San Paolo, the project "start@unito" was born: a collection of open online courses which are complete university modules, available to anyone and anytime. The courses were built by experts in each subject, university professors and grant holders, who were also trained in the latest digital education technologies and methodologies (Bruschi et al., 2018)

Unlike the repositories of open educational resources like MERLOT (https://www.merlot.org), OER Commons, etc. available online, start@unito aims at providing open learning, which includes both content and didactic support to learning, primarily in the form of adaptive assessment and personalized feedback. By design the program does not avail itself of online tutors, forums or teacher-student interaction. Therefore, the biggest challenge is to create interactive contents that somehow compensate the missing learning interaction.

2 STATE OF THE ART

E-learning provides many advantages (Ross et al., 2010): it offers a variety of freely available contents; it is a more affordable training opportunity for students because all they need is a device connected to the web; it can accommodate everyone's needs; it provides adaptive learning. Apart from these numerous advantages, it is important to recall that Technology Enhanced Learning (TEL) is not effective by itself, but it needs knowledge and deep understanding on how technology works (Hicks 2011). In fact, the quality of the digital learning materials is very important, especially according to the following tasks: enhancing learning (Sangwin 2015); supporting metacognitive processes (Nicol and Macfarlane-Dick, 2006); facilitating adaptive teaching strategies (Barana et al., 2017c). The University of Turin has an historical background in e-learning since the beginning of the new century. Nowadays in Italy, the University of Turin is quite advanced in the use of digital technologies, both in a local setting with the projects "Scuola dei compiti" (Barana et al., 2017c) and "Orient@mente" (Barana et al., 2017a; Barana et al., 2017b), at a national level with the projects "PP&S Problem Posing and Solving" (Brancaccio et al., 2015b) and in a European context with the project "SMART Science and Mathematics Advanced Research for good Teaching" (Brancaccio et al., 2015a). In the Italian scenario, there are two other important platforms that deliver online courses: EduOpen (Rui, 2016) and Federica

(Calise and Reda, 2017). EduOpen, designed by University of Modena and Reggio Emilia, enlists 17 Italian universities as members and hosts 150 online courses about basic and professional disciplines and professional scientific research. Federica platform, developed and maintained by the University of Napoli, refers to the study materials of about 100 university modules in e-Learning, available at any time, with contents organized in training modules. In a worldwide view, there are many providers of Massive Open Online Courses (MOOCs), like EdX (https://www.edx.org/) and Coursera (https://www.coursera.org/), which launched the concept of MOOC itself and are, even today, used by a huge number of learners. These open platforms issue electronic course certificates after attending a course within a strict period (course edition) and together with other learners (virtual classes). Many universities in Northern Europe and North America have joined these platforms to make their online courses available as a sort of university showcase. Users of the MOOCs of these platforms are usually a very large number, but only a small percentage of them complete the MOOCs and get certified. Although one-third of MOOC participants are from North America, MOOCs have a global reach – with regional distinctions: for example, Africans enroll at twice the rate in social science courses than other courses. South Asians are most likely to take engineering and computer science courses (http://monitor.icef.com/2014/07/who-uses-moocs-and-how/).

Working all at the same time is one of the advantages of supplying online contents of this kind, giving stimuli to reach the top in the ranking of the course; on the other hand, users are usually forced to complete activities to view the next parts.

3 THE START@UNITO PROJECT

3.1 Description

With the project "start@unito", the University of Turin provides learners with a Learning Management System (LMS), available at https://start.unito.it, that delivers, at the time of writing, twenty freely available, self-paced, online courses on different topics. Anyone can follow these free online courses even if not enrolled at the university. These courses cover many first year disciplines from four different areas (scientific, humanistic, economic, law). Registering to the platform is quick and easy using social network credentials. There are no time

restrictions, thus the pace of study is autonomous, there are many practice self-assessment tests and many multimedia contents to explore. After completing all the proposed activities of a course and passing the final test, students receive a certificate of attendance of the online course and they can take the university exam as soon as they enroll in a degree course.

3.2 Objectives

The main goal of the project, already reached in other projects (Barana et al., 2017a; Barana et al., 2016a; Barana et al., 2017b), is to facilitate the transition between secondary and tertiary education and to enhance the success in Higher Education: usually there is a big difference between learning in high school and at the university. Making the students anticipate their career by taking a complete exam prior to their enrolment at the university could improve the outcomes of first year university students. This is important for the evaluation of the education quality provided by the institution: these criteria are tied to the number of ECTS credits acquired during the first year of university studies and to the drop-out rate calculation. Moreover, by involving many people from different departments with the preparation of online courses, the University of Turin aims to spread the use of digital technologies in university activities. Finally, an online course could be useful for students in many other ways: as a means of orientation, in order to understand if the topic is of interest for the students and improve university guidance. In addition, students are supported at the start of their university education path and provided with an overview of the education programs offered by the university.

3.3 Target

The courses are aimed primarily at high school students who wish to choose a university career before enrolling or to sit an exam even before the start of the academic year, but they are also open to off-site or foreign university students. Moreover, access to self-paced courses may be beneficial for both disabled and particularly gifted students. The problems that University of Turin wants to address with this project are of different kind:

- different approach to the subject between secondary school and university;
- students face mandatory exams for which they have no aptitude, and usually are not easy to pass;

- the lecture rooms are full of students, making it hard to attend;
- low self-awareness of students' responsibilities and duties regarding their study;
- many students change course of study after the enrollment;
- difficult access to some of the bachelor courses due to admission tests;
- scarce use of e-learning in university modules;
- working students and students with special needs have difficulties in attending lectures.

3.4 Model

In order to prepare the online courses, people involved in start@unito used their best knowledge about didactics and technology. In fact, it is universally acknowledged that technology itself is not enough for extracting the best from the learning process. The actors involved in the project adopted a model for the preparation of the open online courses inspired by the Deming Cycle: Plan, Do, Check, Act.

Figure 1: The Deming Cycle.

Plan: the Scientific Committee, who is in charge of planning the project, is composed of Professors who have already an intense experience in online learning. The Chief of the Scientific Committee is the Vice-Rector, supported by the project manager, expert in digital education, and by two Research Fellows and Coordinators, who were expert and became more expert about e-learning and surroundings.

Do: a group of experts in their own teaching subject is engaged in creating the courses, helped by coordinators, by Junior Grant Holders and with the guidance of professors of the Department of Philosophy and Educational Sciences, of the staff of the IT and E-learning bureau (DSIPE) and of an interdepartmental center, Cinedumedia (http://www.cinedumedia.it/) devoted to multimedia production. In order to facilitate their work, professors and fellows attended a training session in which they rethought the contents in terms of learning objects, they gained confidence with the platform and

with many other tools for preparing digital contents, they learned the basics about copyright, accessibility and web language.

Check: coordinators, acting as Instructional Designers, validate the contents, manage platform and communication, dispose online support and elaborate data.

Act: platform managers, in agreement with researchers, provide adjustments according to feedback from students.

Behind the scenes, a useful help was provided by the technical platform manager, experienced in handling and developing the virtual learning environment Moodle.

3.5 Tools

The University of Turin manages its e-learning platform and hosts school teachers and students for educational projects (Giraudo et al., 2014; Barana et al., 2016b; Marchisio et al., 2017). Based on the previous experience of University of Turin, the project adopted a Learning Management System (LMS) Moodle (https://moodle.org/), which provides a single, robust, pluggable, customized and secure system. Pluggability is the main feature, because the platform is integrated with many tools. The main integration, which has been partly developed and maintained by the University of Turin since 2008, is the one with the Maple suite. The Maple suite is a powerful Advanced Computing Environment (ACE) which consists in two main online tools mainly for STEM oriented disciplines (Science, Technology, Engineering and Mathematics) useful to analyze, explore, visualize, and solve mathematical problems: Maple NET and Maple T.A. The first one is devoted to turn native Maple Worksheet into online resources (Baldoni et al., 2011), the second one is an Automatic Assessment System (AAS) that, beyond the natural use of testing and monitoring students results with freely available homework, allows a large flexibility inheriting many benefits from the computing environment, especially geometric visualizations in two and three dimensions, interactive components, algorithms, randomly generated variables. The Maple T.A. integration (recently turned into Moebius Assessment, https://www.digitaled.com/) allows assignments to be run as Moodle resources with an automatically updated results gradebook (Barana et al., 2015, Barana et al., 2016).

The integrated tool for hosting videos is Kaltura (https://www.kaltura.com/), a Software as a Service (SaaS) solution which allows great flexibility and many powerful properties, like quizzes inserted directly in videos in order to make students' learning more effective.

3.6 Structure of the Modules and Learning Objects

The courses structure is modular and displayed through a grid format, according to the general guidelines for the creation of e-learning course (Rogerson-Revell 2007); each section, which is worth one ECTS, corresponding to a different topic, for the purpose of addressing students through the course contents and of showing the whole content at a glance.

When accessing the online course, students can choose their own path among the topics and materials, following their interests. All the activities do not flow automatically in front of students' eyes: they must explore each one and browse pages and questions. The first contents of each course are an introduction to the course, the learning outcomes, and some useful information about how to have the course recognized by the University of Turin, along with some information on exam procedures and how to correctly explore the online course itself.

Within the course the other resources are organized through the structure of a learning object.

Entry test and introduction: before going through the online contents, a test is useful to see if students have the right prerequisites and make them aware on what they are going to learn in the following steps;

Online contents: short resources in which just one concept is introduced briefly. Sometimes resources are integrated with quick tests;

Summary: map of all the concepts studied, with hyperlinks to the referred resource;

Exit self-assessment test: to allow the students to check their learning.

Deepening (External resources): the web provides a huge quantity of videos, journals, articles, blogs, scientific sites, official pages, data, which could be useful for the student to have a look at. They are inserted according to their copyright regulations.

Other course tools available are:

Glossary: a list of the most important words and concepts of the course, with hyperlinks to definitions directly within the texts of online resources. This way lessons are highly interactive;

Progress bar: the relevant course resources allow completion tracking, providing the student with an overview of their study, what resources are already studied and what is missing;

Gradebook: at any time, students can check their grades and their test details.

3.7 Adaptive Methodologies

Since students are alone in the learning process, many adaptive methodologies were adopted during the preparation of the open online courses.

First, modules contain many tests with automatic assessment and activities of interactive exploring which allow the students to self-verify their comprehension. It is well known that assessment and metacognition are deeply interlaced: frequent and well-structured feedback helps learners understand where they are going and how they are going, giving information not only about how the task has been performed (task level), but also about the process that should have been mastered (process level), and enabling self-regulation and self-monitoring of actions (self-regulation level) (Hattie at al. 2007). In case of difficulties or important conceptual nodes, particularly in STEM disciplines (Science, Technology, Engineering, Mathematics), or in case of wrong answer to a question, adaptive questions were inserted through Moebius Assessment, which step-by-step guide the student to the resolution and interactively show a possible process for solving the task. The step-by-step approach to problem solving with automatic assessment is conceptualized in terms of feedback, highlighting the formative function that the sub-questions fulfil for a student who failed the main task. The interactive nature of this feedback and its immediacy prevent students from not processing it, a well-known risk that causes formative feedback to lose all its powerful effects (Sadler 1989). Moreover, students are rewarded with partial grading, which improves their motivation.

Questions are always available, automatically changing the embedded data, helping the students to repeat the reasoning without learning by heart. The use of this automatic formative assessment raises the awareness of the students and let them know their progress in real time. This adaptive learning strategy was deeply studied and experimented with excellent results (Barana et al., 2018; Barana et al., in press).

Moreover, many other strategies were adopted in order to facilitate the autonomous study:

- the videos inserted in the open online courses are short to let the student focus;

- the conceptual maps help the student to move and to find the topics easily inside the module;

- the animations and the variety of learning objects inserted make the study workload lighter;

- the possibility to print the material allow students to read the lessons offline.

3.8 Properties of the Model

The model is characterized by the following properties.

Availability: materials are distributed under a Creative Commons license; they can be freely re-used in schools or in other learning contexts.

Accessibility: the LMS uses the high-legibility font "EasyReading" (http://www.easyreading.it/) which was designed for people with dyslexia, but proved to be useful for everyone; all resources were designed taking into consideration many accessibility details like color contrast, short sentences, transcriptions of videos, etc.

Adaptability: the structure is versatile to suit different learning approaches and teachers' requirements.

Consistency: many projects within the University of Turin adopted the model, thus improving students' familiarity with the system throughout their career.

Control: coordinators perform analysis and, if necessary and in agreement with professors, corrections; immediate and interactive feedback provides a useful support to students.

Convenience: the system is suitable for research or exploiting new technologies.

Efficiency: the model is one of the first points of contact between learners and institutions.

High Quality: the online contents are created by qualified personnel, through the collaboration of experts from distinct ranges of expertize.

Sustainability: contained costs for students, they are only asked to maintain a device and its connection on their own.

Usefulness: there are many ways in which this project is useful: to students, because they are more aware of their enrollment choices, positively affecting institutions and improving the quality of courses; to professors, who acquire new skills and can use all the start@unito materials during their lectures.

3.9 Certification

At the end of an online course, a certificate of acquired knowledge is issued, certifying the attendance to the module and the passing of the final automatic assessment tests. This certification is required to attend the university examination and thus to obtain the ECTS. At the beginning of the current Academic year, one hundred students enrolled at University of Turin and took the university examinations in order to obtain the ECTS.

4 RESULTS

The project started in July 2017 with 20 university modules prepared for the academic year 2018/2019. The platform currently counts around 7000 (November 2018), which are rapidly increasing in the latest months. In February 2019, more than 5000 students added these modules to their career plan.
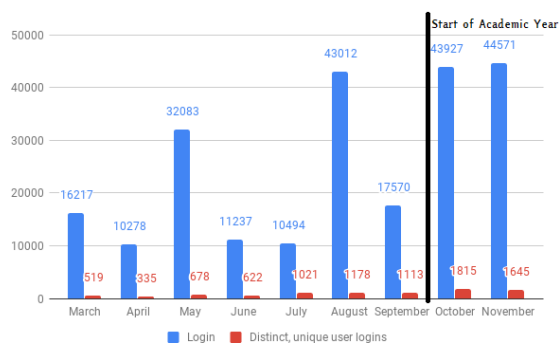

Figure 2: Number of Logins and Unique logins in 2018.

Looking at the users' login to the platform in Figure 2, it appears that before and after the high school final exam, respectively in May and August, there is an increased number of accesses. July and August is a good period for online learning, as the high school students are preparing for their university career, because they just ended the 5-year-cycle and they are evaluating which path will be the right one for their future. After September, exams and usual university activities start bringing to an increase in the number of logins to the platform: from March 2018 to February 2019 students completed more than 160000 activities.

The number of subscriptions to courses is subject to several factors: mostly the attitude of students, which is unpredictable, but also an attractive title, the advertisement or the presentations made in schools can help in shaping the choices. Students can interact with the course in many ways: a number of students just had a quick look at the courses, in fact the percentage of students who completed less than 30% in a single course hovers around 90%, while a small percentage of students, around 5%, completed the course they started. In this setting, the course was considered completed when more than 60% of activities were marked complete, because in some activities the completion marking is not automatic, but the mark it's a users' choice (i.e. some assessments are not marked automatically because there are no constraints related to the tests and users can mark it complete when they feel satisfied about their results). According to researches (Jordan 2015), the completion rate of an

online course has a mean value around 12%. Further analyzing the completion progress of students, it must be noticed that some users, around 5%, who did not complete the course, moved directly to a specific topic. This behavior is highlighted by a set of sequentially completed activities. Other students probably used the course for a revision (around 10%): this could be noticed by the fact that more than one activity is skipped and the progress bar is clearly fragmented. Simply skipping one activity is not enough to say that a student used the course for a revision. All these behaviors reflect the open access nature of the platform, combined with the absence of time constraints. After the completion of the course, students are asked to fill in a questionnaire. It is important to mention that there is no online tutoring: professors support only the regular university students. Figure 3 below summarizes the mean of the answers we have obtained so far.
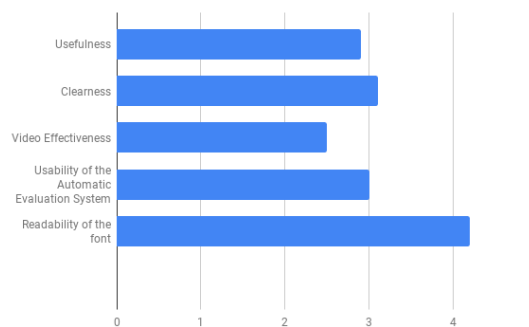

Figure 3: Results from final evaluation questionnaire (1 = Very poor, 5 = Very good).

Analyzing the data, we can see how the appreciation of video resources is slightly below average. Students declared to prefer textual resources like web pages, lessons, books (74%) compared to video resources (22%). This may also depend on the device used for viewing online resources: users with mobile devices prefer videos. In fact, 67% of the students used a personal computer, while 16% used the smartphone and 16% used a tablet.

Students can write global feedback on the course. Here there are some examples: "The course as a whole is clear, well organized and well explained", "The list of topics to be studied allows a general understanding of what to study from a textbook", "Good way to anticipate an exam", "It allows not to attend lessons", "It allows a free management of study and learning time, and provides a complete overview of the exam topics", "It is exciting to follow, it feels like being in the classroom". These answers from students represent important feedback,

which might suggest improvements for both the existing and the new courses.

Some difficulties were met during the preparation of the open online courses. For example, the training of the grant holders and teachers took more time than we thought because only few of them were already used to thinking about digital materials or to using the Moodle platform for their lessons. It was very important to support them constantly and to have regular meetings with them in order to find together the best solutions for the different needs of each subject. Moreover, the advertising of the Project started a bit late. Many high school teachers complained about the fact that for them it was important to have the open online courses available already from the beginning of the year because they could have used them with their students to deepen some topics.

5 FUTURE

The internationalization of university modules is a key point for the future of the project start@unito. The University of Turin will extend the offer of the project adding 30 new open online courses for the academic year 2019-2020, including some missing disciplines, like Pedagogy, Chemistry, and a set of courses in foreign languages specifically designed for students included in exchange and mobility programs. Many of the new courses are being developed in English: this has the precise purpose of promoting the internationalization and the mobility of students.

A further development of the start@unito project concerns the achievement of the objectives through the use of measurable parameters regarding the number of ECTS achieved by the students in the first academic year 2018/2019 and the drop-out rate.

Furthermore, a control of the contents and materials online is foreseen according to the feedback obtained from the students and a survey will be submitted to professors to evaluate their experience in designing and preparing online contents and adopting a common examination procedure.

6 CONCLUSIONS

Start@unito comes from a previous and thorough experience of the University of Turin about digital education. Through meetings with secondary school teachers and with students, the use of online resources was underlined with great attention. This way of conveying knowledge is a useful service for different types of students. All people involved in the design of courses learned a lot and were aware of the new skills acquired. The responses from students and the increasing number of subscribed users suggest that the all the work was done in the right way, even if there are many suggestions for improvement, too.

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