

Open platform of self-paced MOOCs for the continual improvement of academic guidance and knowledge strengthening in tertiary education

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Abstract

The project Orient@mente mission is to support students in the transition from high school to university. Several MOOCs are available in order to support three main actions: guidance to the University offer, automated self-testing of basic knowledge, self-paced review of the fundamental disciplinary concepts learned at high school; all of them are useful in order to successfully attend the courses of the first year. A key feature of the project is the continuous open-access to the platform that helps students who want to attend a scientific university course. Contents are built according to educational models grown thanks to the experience and the research carried out by the University of Turin in e-learning, especially in the use of an accessible learning management system integrated with an advanced computing environment, an automated assessment system and a web conference system to enhance teaching and learning. In this paper, the methodologies adopted are discussed, the obtained results are presented and the future developments are proposed in the light of relevant data collected from the platform usage and feedback.

Keywords

automatic assessment, learning management system, self-paced MOOC, university guidance, virtual learning environment.

Introduction

The use of Massive Open Online Courses (MOOCs) is making inroads worldwide. As a matter of fact, over the last years the evolution of open-access online courses in terms of pedagogical studies and technical implementation has rapidly increased (Grainger, 2013). It is known that online education can pursue several goals that are not necessarily strictly related to the disciplinary contents, such as the enhancement of the ability to self-evaluate and self-regulate one's learning or the development of digital, problem solving and collaborative competences (SMEs & e-LEARNING Project, 2015). The transition from high school to university is a critical turning point in students' lives: they need to be aware of their choice and prepared for the moment when expectations meet the reality. Schools and universities are responsible for making this experience as positive as possible. The use of new technologies and virtual environments can be helpful for this purpose. Multimedia resources are effective to show students what they will face at university and the possible interaction between users allows them to contact university students and professors to know their experience. Moreover, online tests with feedback allow them to examine whether they have an adequate preparation to understand the first year's courses, while interactive learning materials can help them to fill their gaps (Pyke, 2012).

This paper discusses the actions undertaken by the University of Turin for the orientation of students who want to enroll to the university, developed under the project Orient@mente. The chosen asset for such a guidance is a learning management system, an advanced computing environment, an automated assessment system and a web conference system. The MOOCs for academic orientation were created according to three main goals: making students more aware of their skills to fulfill certain academic curricula, informing students about what they are going to study, and strengthening students' weaker skills. This paper discusses the methodologies adopted in Orient@mente and the results obtained.

State of the art

The University of Turin addressed the need of providing help to students in their career and study choice after considering the state of education in Italy. From the 2010/2011 to the 2014/2015 academic years, the percentage of students who enrolled at Italian University right after the conclusion of upper secondary education slightly decreased from 54,4% to 49,1%. A student out of two acquires more than half the credits (CFU) expected for the first year. In contrast, one out of four will get less than half and one out of five does not get anyone. One year after the enrollment, 74% of students confirm the subscription in the same graduating class in which they have registered, 14.8% change

it, while 11.2% abandon the studies. Moreover, the scientific area records the greatest number of movements after the first year (MIUR, 2015).

Comparing the state of education in Italy with the European scenery, Italy ranks in the lowest places for the diffusion of tertiary education: the percentage of 30-34 years old people having completed tertiary or equivalent education is 23.9% in 2014, far from the European average (38%) and from the European target defined by Europe 2020 strategy (40%) (European Commission, 2015) (OECD, 2014).

University of Turin has a wide experience in the use of the digital asset chosen for Orient@mente, that is an integrated e-learning platform based on Moodle, which is used by many courses to share lectures materials with students. Practices of using Moodle and its integrations for enhancing learning of scientific disciplines are studied and experimented by the University of Turin in several projects at local, national and European level. Orient@mente arises in this panorama as the first example of open platform. Its openness is a relevant aspect, since it is a little choice that has big impacts not only on users' self-preparation, but also on the university formative offer itself: university guidance can be better designed according to feedback collected from a range of users wider than the students' community.

The Project Orient@mente started in the 2014/2015 academic year, thanks to a funding from the Ministry of Education, University and Research and with the support of the Managing Director of the Regional School Management of Piemonte and of several high school executives (USR Piemonte, 2015). The Project consists in the development of an open online platform for the fruition of self-paced MOOCs, serving as an effective dematerialized orientation for secondary school students who intend to apply to a scientific course in the University of Turin. Orient@mente services are hosted on a dedicated instance of Moodle, reachable at the following URL: <http://orientamente.unito.it>. The Moodle learning management system is integrated with a suite of specific-scope selected software: the Advanced Computing Environment (ACE) Maple, the Automated Assessment System (AAS) Maple T.A. and the web conference system Adobe Connect.

The Project started under the direction of the Department of Mathematics "G. Peano" with the joint participation of 15 scientific University courses: 9 courses of the School of Science of Nature, namely Chemistry and Chemical Technology, Physics, Computer Science, Mathematics, Financial and Insurance Mathematics, Science and Technology of Materials, Biological Sciences, Geological Sciences, Natural Sciences; 4 courses of the School of Agriculture and Veterinary Medicine (SAMEV), that is Production and Management of Livestock and Untamed Animals, Agricultural Science and Technology, Environmental and Forest Sciences, Food Science and Technology; the course of Herbal Techniques and the course of Biotechnology.

In the platform there are three different kinds of self-paced MOOCs which correspond to the three different purposes of the Project:

- orienting courses which provide information about the study courses and the careers that can be undertaken with such degrees;
- testing courses for verifying students' basic knowledge and skills and to enhance their awareness about their initial situation;
- realignment courses for strengthening their competences and filling the gaps in their preparation.

These MOOCs are grouped in three different categories whose names (“Explore the study courses”, “Prepare to the tests”, “Realignment courses”) clarify their purposes.

The platform development is coordinated and controlled by a team of researchers of the Department of Mathematics “G. Peano” and the ICT services of the Computer Science Department who are responsible of the working of the platform. University professors have been designated to select and arrange the materials which would be implemented in the courses, as guarantee of its quality.

Methodology

The Project Orient@mente aims to prepare students who intend to apply for the screening tests required to access limited entry courses, but it is also useful for students who enroll - or are enrolled - to open entry courses; it should help to decrease the rate of university dropouts after the first year, to have a more selected range of enrolled students and to improve their first year exams results. Rather than being designed in the shape of a self-standing resource, the platform is conceived to offer the chance to connect with existing e-learning resources of the University of Turin, to add different-purpose MOOCs, to connect with new tools developed for specific disciplinary requests and to update the material depending on changes of University admission tests that may occur in the near future.

While preparing and realizing Orient@mente, great attention was put into ensuring the high quality of all courses and of the whole project. The process was based on team-working and modelled on the Deming cycle: plan–do–check–act (T.A. Walasek, 2011). Preliminary studies and planning with managers and digital experts from the University have been carried out to define the suitable instruments and methodologies. 21 students, holders of a scholarship, were selected and trained by tutors of the Department of Mathematics in the use of the digital tools; they then started to create the contents for the platform, coordinated by the referents of the University Courses involved. The platform developers and their collaborators continuously adjust the materials and services

offered on the base of feedback collected from users through specific and ever-open surveys.

Orient@mente's dedication is to be a clear guide for users who search for university web resources and it is built according to the principles of immediateness of communications and self-explanation. Users are directed to Orient@mente services from advertisements on the University websites which link to the Orient@mente front page. Here, a description of the platform is displayed both to enrolled and not-enrolled users, serving as a brief summary about how to find desired materials and information. High structured MOOCs are equipped with mind maps of the contents and delineations about learning methodologies suggested by teachers. Interactive activities are self-explanatory. In addition, users are redirected to the websites of the University Departments involved for further information and more specific resources.

The three categories of MOOCs are implemented and updated according to the needs:

1. in order to show students what studying a subject actually means and the career opportunities to which it can lead, the orienting paths are presented through 15 MOOCs, one for each scientific university course involved in Orient@mente. They share an identical structure, composed of sections dedicated to the following services: essential information about the related university course, interactive resources for helping students to be more aware whether the chosen study path is the right one, forums to ask for further information and advice, online tutoring conducted by trained tutors who have just graduated in the course of interest and facsimiles of the admission tests. While their structure is similar, each MOOC differentiates for the innovative orienting resources and guidance activities it stores, which depends on the subject; resources varies from simple text files to complex interactive lessons and algorithmic automatically graded assignments made through the integration of the platform with the ACE and the AAS. Since these MOOCs are related to scientific courses, an important example of orienting resource is the presentation of relevant experiments that students are going to carry out at the University, digitally exposed from the students' point of view.
2. The structure of the testing category reflects the one of the admission tests: it covers all the scientific subjects involved in the TARM or in the admission tests: Basic Mathematics, Advanced Mathematics, Logic, Physics, Chemistry, Biology, Earth Science, and Comprehension of Scientific Texts. For each subject, a dedicated MOOC is proposed, composed of a series of tests, a preliminary video guide about how to perform a test and collect results and feedback at the end, and an appreciation survey. About 2000 is the total amount of automatically graded questions created by the trained postgraduates under the supervision of teachers from the university courses joining the Project.

3. Realignment courses consist in four MOOCs respectively on Biology, Chemistry, Physics and Mathematics. Each MOOC is highly structured, composed by a list of modules (which correspond to the sections of the Moodle course), in turn split in smaller submodules, or lessons, which focus on a specific topic. With the purpose of making its structure clear, on the top of each MOOC there are a general description and a mind map of the topics covered, while each module and submodules have their own brief summary. In order to facilitate the learning process (and to be adaptable to the widest range of learning styles), each topic is exposed in different modalities, such as video lessons, tests, and interactive files. More specifically, lessons are organized according to a regular pattern consisting of the following activities: Explore, Applications, Quizzes, Exercises, Solutions. At the end of the Module there is a test about the whole module's theory.

Explorative and interactive materials are created with the ACE Maple, which is one of the most innovative and effective tools for learning Mathematics and Scientific disciplines. With Maple it is possible to perform numeric and symbolic computations, geometric visualizations in two and three dimensions and to add interactive components where students can change parameters and analyze the different results. Files created with Maple can be added to a Moodle page thanks to its integration with MapleNet, which allows Maple worksheet to be visualized within a Moodle page maintaining their interactivity.

The questions in quizzes and tests are created through the automated assessment system Maple T.A., which is integrated in Moodle. Maple T.A. questions can contain algorithmically generated variables, so that students obtain different data and graphics at every new attempt to perform the same assignment. The algorithmic peculiarity of questions brings two main advantages: on one side, it offers students more chances of drills for the admission tests, on the other, it forces them to repeat the reasoning until it has been mastered, thus strengthening the learning. The online tests allow students to acquire confidence with the modality of the admission tests, their structure and time limits. Each test of the testing courses contains 10 questions and covers a range of required knowledge and skills to be mastered at different levels, in order to fit all students. They can work independently and whenever they want: the immediate automatic feedback allows them to acknowledge their level of preparation (Luik, 2007).

The online tutorings are performed through the integration of Moodle with the web-conference tool Adobe Connect, which enables the synchronous interaction among users thanks to the sharing of voice, chat and desktop. Students from all over Italy can thus meet graduate students from Turin to ask questions and curiosities by simply sitting at home in front of their pc or smartphone. Tutorings are carried out at fixed times, mainly in the times of the year closer to the enrollments; every orienting course has also a forum, open all year round, that provides participants with asynchronous support.

Thence, Orient@mente is not simply an illustrative archive of the formative offer of the University of Turin: interactivity and interaction turn university guidance into an active process where students are protagonists. Challenged to actively try and explore, they can become more aware of their attitudes, knowledge and skills, and find out whether the courses offered by the University of Turin will meet their interests or not (Pyke, 2012).

The surveying action is conducted in several ways: on the platform each user can ask for help via an integrated Helpdesk or request information to a dedicated mail address; daily answer is guaranteed. At the end of every testing course, an open questionnaire asks about personal scholastic career, usefulness of the services, and free suggestions. Moreover, there is a second questionnaire open to all platform users since March 2016.

University affiliates have federated access to Orient@mente, while everyone may access the platform via the use of personal credentials from social networks that are popular among students: Facebook, Github, Google, Linkedin, Windows Live. The processing of personal data is governed by principles of correctness, legality, transparency and protection of privacy and rights according to the Italian Legislative Decree. n. 196 of 30 June 2003 (D.Lgs. n. 196: Codice in materia di protezione dei dati personali, 2003). Lastly, the default platform aspect uses the high-legibility font EasyReading® (EasyReading), that was chosen in order to maximize the website legibility to dyslexic students.

Results and discussion

Since the service go-live on 14 July 2015, the platform has registered a constant activity. 4657 is the total amount of subscribed users, updated to the 23th of May 2016. 48% of users is from Piedmont, 50% from the rest of Italy and 2% reach from foreign countries. During the first 4 months, that overlaps the period of admission tests, an average of 198 users have enrolled weekly to the platform. A comparable rate of registrations was also recorded during the week before the early session of admission tests organized in April 2016 and addressed to students of the last year of secondary school of Piemonte and Valle d'Aosta.

Clearly, the rate of usage of the platform is different according to both the MOOC's category, the subject, and to the type of materials stored on the MOOC. The orienting area collects 2460 users' subscriptions. As shown by Figure 1, the main activity was recorded during the first four months, which correspond to the opening of the University enrollments.

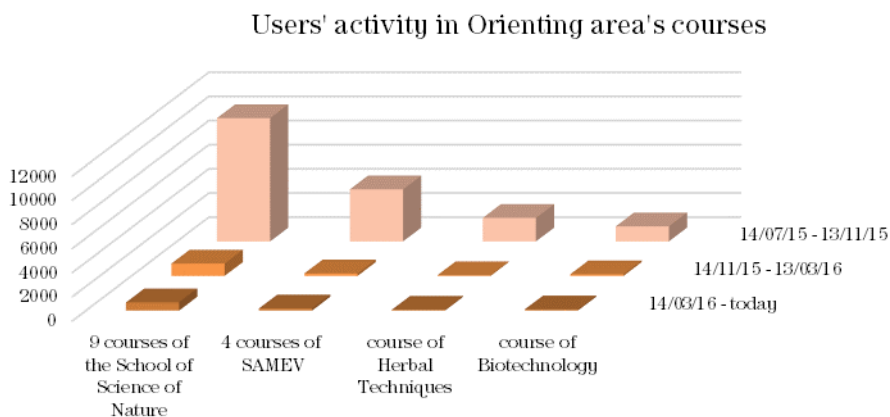


Figure 1 – Users' activity in Orienting area's MOOCs grouped by Schools

The testing area is the most visited. It collects an average of 1210 subscribers per test course, with the highest registrations to the courses of the subjects which occur in the majority of the admission tests, that are Biology and Mathematics. Until 26 May 2016 users have submitted a total amount of 38.464 disciplinary tests. Figure 2 shows the numbers of completed tests grouped by discipline.

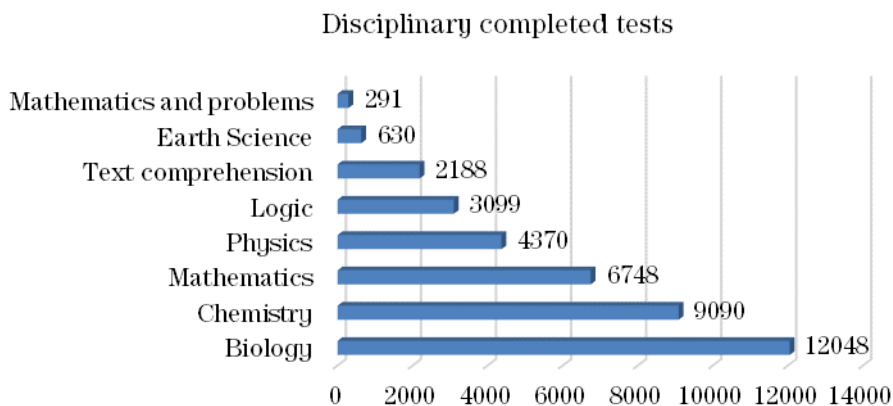


Figure 2 – Disciplinary completed tests

Besides the completed tests, the platform has registered other 4152 attempts to the tests which have not been submitted (graded) - it means that users did not request the correct answers and feedback: it is likely that these tests have been opened just to have a look at the contents. The questionnaire at the end of the test courses shows a high level of appreciation of the Project: 95% of the submitters answered “Yes” to the question “Do you consider Orient@mente a useful service offered by the University of Turin?”. Moreover, several suggestions helped to identify some improvement for the didactic materials.

The results collected by the second questionnaire show a high approval of the platform: the easiness of use, the usefulness of the services offered and the overall appreciation were evaluated by at least 3 points out of 5 by more the 86% of the interviewed (Figure 3).

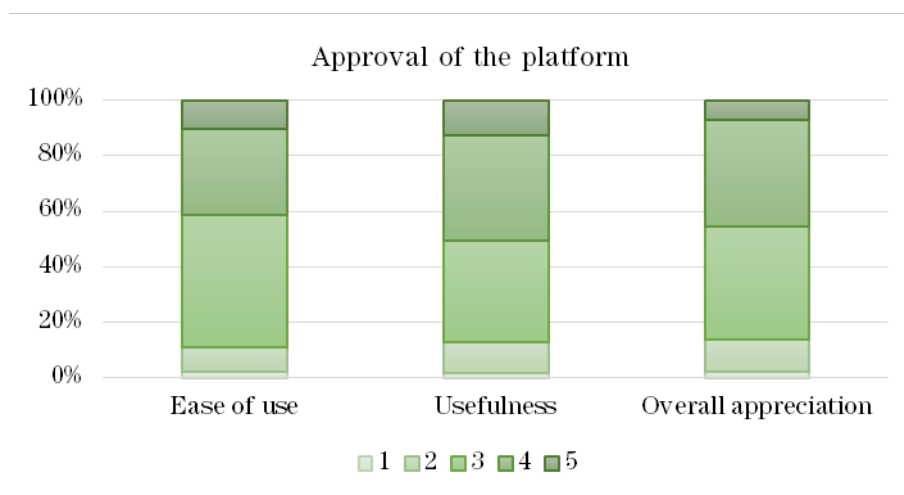


Figure 3 – Approval of the platform

The questionnaire also inquires about the user’s academic career: as expected, a considerable percentage of platform users has not enrolled to a scientific course during the current academic year (40%). However, the 95% of the remaining has enrolled at the University of Turin. From the feedback, it is confirmed that the testing area covers the lack of a free area for verifying self-preparation for the main subjects of the university courses. The question “Did the testing area help you to pass the entry test of the study program in which you subscribed?” was evaluated with at least 3 points out of 5 by the 80% of the interviewed who used the testing area. Conversely, from the answers to the question "Did the orienting path influence your choice of study program?", which has an average of 2.1 out of 5, it emerges that Orient@mente was used mainly for strengthening students’ choice, rather than to choose a University

course. This is evident also from the answers to the question “How can Orient@mente be improved?”: 69% of the interviewed asked for “more tests”, while about 35% asked for “more video lessons”, 38% for “more topics” and 36% for “more orienting activities”.

During the a.y. 2015/2016 a meaningful increase in the access to the Italian university system has been registered: statistics show that more than half of the students who finished high school enrolled to university in Autumn 2015. This trend is growing, after several years of negative trend. At the University of Turin the enrollments to scientific courses increased by 15%, while the average increase in Italy is about 2% (MIUR, 2016). Orient@mente could have had a considerable positive influence.

The Project is a virtuous example of mutual entailment between the academic world and social networking. While students are guided to face their academic choice decisions, the University monitors and try to meet the students’ needs. Furthermore, every owner of a common internet connection (not broadband) and a not too old digital device (such as a smartphone or tablet) can take advantage of the digital guidance certified by the University. It is clear that also other institutions, such as high schools, can benefit from the Project services, as they can be used by teachers for orientation activities, and also from the outcomes, since a higher number of high school students who successfully completes a university degree increases with no doubt the high school credit.

In the light of the initial appreciation and success and in line with the scope of the Project - namely the continual improvement of the services offered - in a.y. 2015/2016 the project was extended to 2 more courses, Philosophy and Strategic Sciences, raising the number of courses involved to 17.

The project Orient@mente is also listed in the library of strategic goals for the current year by the University for the middle-management annual target goals, confirming again the perceived value of this project.

Conclusions

The Project is expanding towards several directions. First of all, since some of the information of the orienting MOOCs can change every year, the Project will continue to keep it updated. Thanks to its effectiveness, Orient@mente is starting to engage also University courses outside the scientific area, such as Economy and Foreign Languages, Psychology and Political Sciences. Moreover, there is the intention of including a MOOC for General Culture to the testing courses.

An important action that will be considered is to extend the monitoring action to the realignment courses: a questionnaire will be added to each of these MOOCs, similarly to what has been made for the orienting ones. They will

be oriented to collect a feedback about the appreciation and completeness of the learning materials proposed. The results of the admission tests and the information on the provenance of university students who use the services of Orient@mente could be correlated to the survey's outcomes.

In the future Orient@mente will also contain open access university courses in e-learning modality, which are currently in development. Far from the re-alignment courses, such MOOCs will be full university courses that could be totally delivered online.

Orient@mente also includes other projects which are currently in progress:

1. ATTRASS, which is addressed to foreign students who are interested in attending courses at the University of Turin or any other Italian university. Its main objectives are to facilitate their inclusion at the University and in the city and to help them in their university career.
2. Digital Archive Erasmus, dedicated to students who are interested in joining the Erasmus program: a new Category of MOOCs - named Internationalization - will contain useful resources and activities collected from outgoing and incoming Erasmus students of the previous academic years, such as information about the Universities and cities involved, interviews to students and representatives, contacts and statistics.

Lastly, Orient@mente opened many possibilities of research in several directions: strengthening connections with other social university e-learning environments, the role of the automatic assessment in improving of learning, how to extend of similar opportunities to other disciplines.

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