OPEN PLATFORM OF SELF-PACED MOOCS FOR THE CONTINUAL IMPROVEMENT OF ACADEMIC GUIDANCE AND KNOWLEDGE STRENGTHENING IN TERTIARY EDUCATION

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In the academic year 2014/2015, University of Turin started the Project Orient@mente[1], aimed to support students in the transition from high school to university. Several Massive Open Online Courses have been developed to support three main actions: guidance to the University offer, automated self-testing of basic knowledge, self-paced review of fundamental disciplinary concepts learned in high school; all of them are useful to help students

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[1] The project name comes from the fusion between the Italian words for orientation and mind, where the middle @ remembers the use of the internet.

successfully attend scientific courses of the first year of University. A key feature of the Project is the continuous open-access to the platform. Contents are built according to educational models grown thanks to the experience and the research in e-learning carried out by the University, 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 adopted methodologies are discussed, the obtained results are presented and future developments are proposed in light of relevant data collected from the platform usage and feedback received by users.

1 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 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 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; the possible interaction between users allows them to contact university students and professors to know their experience; online tests with feedback allow students to check whether they have an adequate preparation to attend first year's courses, while interactive learning materials can help them fill their gaps (Pyke, 2012).

This paper discusses the actions undertaken by the University of Turin and developed under the Project Orient@mente for the orientation of students who want to enrol to the university. The chosen asset for such a guidance is a Learning Management System (LMS), an Advanced Computing Environment (ACE), an Automated Assessment System (AAS) and a Web Conference System (WCS). MOOCs for academic orientation were created according to three main goals: making students more aware of their skills to fulfil certain academic curricula, informing students about what they are going to study and strengthening students' weaker skills. In the following paragraphs, the methodologies adopted in Orient@mente are shown and the results obtained ten months after the service went live are discussed.

2 State of tertiary education in Italy

The University of Turin addressed the need of providing students with help in their careers and study choices after considering the state of higher education in Italy. From 2010/11 to 2014/15, the percentage of students who enrolled at Italian Universities right after the conclusion of upper secondary education slightly decreased from 54,4% to 49,1%. One student out of two acquires more than half the credits (CFU) expected by the first year. In contrast, one out of four gets less than half and one out of five does not get anyone. One year after enrolment, 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 highest 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).

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 formative offer itself: the university guidance can be better designed according to feedback collected from a range of users wider than the students' community.

3 The birth of Orient@mente

The Project Orient@mente started in the academic year 2014/15, 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 at the University. Orient@mente services are hosted on a dedicated instance of the LMS Moodle integrated with a suite of specific-scope selected software: Maple ACE, MapleTA AAS and Adobe Connect WCS. Our University has a wide experience in the use of this digital asset, which is adopted in 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 in several projects at local, national and

European level (Barana & Marchisio, 2015; Brancaccio *et al.*, 2015; Barana *et al.*, 2017).

The Project started under the direction of the Department of Mathematics with the joint participation of 15 scientific University courses: 9 courses of the School of Science of Nature (SSN), 4 courses of the School of Agriculture and Veterinary Medicine (SAMEV), 1 course from the Department of Drug Science (DDS) and 1 course from the Department of Molecular Biotechnology and Health Sciences (DMBHS).

Platform development is coordinated and controlled by a team of researchers of the Department of Mathematics and of the ICT services of the Computer Science Department who are responsible for the correct functioning of the platform. University professors have been designated to select and arrange the materials to be implemented in the courses, as a guarantee of its quality.

4 Orient@mente methodologies

The platform is conceived to offer the chance to connect with existing e-learning resources of University, 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 (Walasek *et al.*, 2011). Preliminary studies and planning with managers and digital experts from the University have been carried out to define suitable instruments and methodologies. 21 students, holders of research-grants, were selected and trained by tutors of the Department of Mathematics in the use of the digital tools; they then started to create the course contents, coordinated by the referents of the University Courses involved. The platform developers and their collaborators continuously adjust the materials and the services offered on the base of feedback collected from users through specific and ever-open surveys.

Orient@mente is built according to the principles of immediateness of communications and self-explanation: users are directed to the platform from advertisements on the University websites which link to Orient@mente front page (http://orientamente.unito.it); the high structured MOOCs are equipped with mind maps of the contents and delineations about learning methodologies suggested by professors; interactive activities are self-explanatory. In addition, users are redirected to the websites of the courses of study involved for further information and specific resources.

In the platform, the MOOCs are grouped in three different areas (course categories) which correspond to the three purposes of the Project:

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

The three categories of MOOCs are implemented and updated according to their needs.

The **orienting area** consists of 15 MOOCs, one for each scientific university course involved in Orient@mente, aimed at showing students what studying a subject actually means and the career opportunities to which it can lead. They share an identical structure, composed of sections dedicated to several services: essential information about the related university course, interactive resources for helping students to be more aware of 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 course differentiates for the innovative orienting resources and guidance activities it stores, which depend 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 university, digitally exposed from the students' point of view.

The structure of the **testing area** reflects the one of the screening tests: for each scientific subject involved, a dedicated MOOC is proposed (Basic Mathematics, Advanced Mathematics, Logic, Physics, Chemistry, Biology, Earth Science, and Comprehension of Scientific Texts). MOOCs are composed of a series of tests, a preliminary guide about how to perform a test and collect results or feedback at the end, and an appreciation survey. Each test covers a range of required knowledge and skills to be mastered at different levels, in order to fit all students. About 2000 is the total amount of automatically graded questions created by the trained postgraduates under the supervision of professors.

The **realignment courses** consist of four MOOCs respectively on Biology,

Chemistry, Physics and Mathematics. Each MOOC is highly structured, composed by a list of modules (which correspond to the Moodle course sections), in turn split in smaller submodules, or lessons, which focus on a specific topic. With the purpose of making its structure clear, on 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 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 final 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. Maple allows to perform numeric and symbolic computations, geometric visualizations in two and three dimensions and to add interactive components where students can change parameters and analyse different results. Maple worksheets can be added to a Moodle page thanks to its integration with MapleNet, which allows Maple worksheets to be visualized within Moodle maintaining their interactivity.

Questions in quizzes and tests are created through MapleTA, which is integrated in Moodle. MapleTA 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. Online tests allow students to acquire confidence with modality, structure and time limits of the admission tests. Students can work independently and whenever they want: immediate automatic feedback allows them to acknowledge their level of preparation (Barana & Marchisio, 2016).

Online tutoring is performed through the integration of Moodle with the WCS Adobe Connect, which enables 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. Tutoring is carried out at fixed times, mainly close to the enrolment period. Thence, Orient@mente is not simply an illustrative archive of the formative offer of University: 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 our University 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, starting March 2016 there is a second questionnaire open to all platform users.

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. 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.

5 Results and discussion

Since the service go-live on July, 14 2015, the platform has registered a constant activity. 4657 is the total amount of subscribed users, updated to May, 23 2016. 48% of users is from Piedmont, 50% from the rest of Italy and 2% from foreign countries. During the first 4 months, that overlap the period of admission tests, an average of 198 users per week have enrolled 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, addressed to students of the last year of secondary School. Clearly, the rate of usage of the platform is different according to both the MOOC's category, subject, and type of materials stored. Orienting area collects 2460 users' subscriptions. As shown in Figure 1, the main activity was recorded during the first four months, which correspond to the opening of the University enrolments. 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 Biology and Mathematics, subjects which occur in the majority of the admission tests. Until May, 23 2016 users have submitted a total amount of 38464 disciplinary tests. Figure 2 shows the numbers of completed tests grouped by discipline.
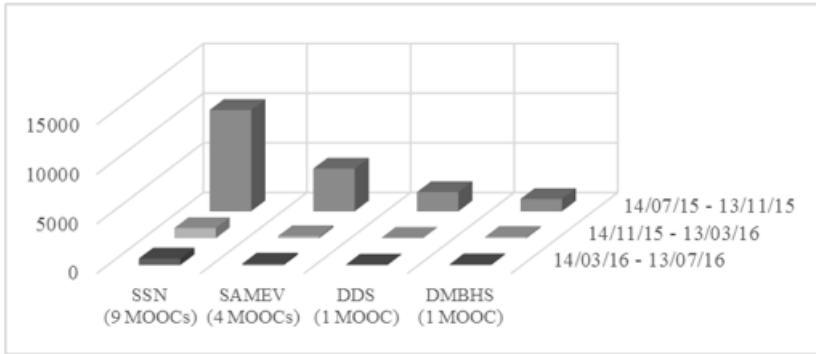
Fig. 1 - Users' activity in Orienting area's MOOCs grouped by Schools and Departments.
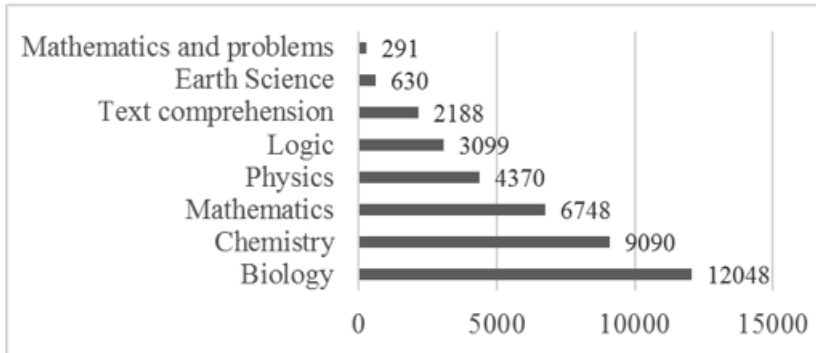

Fig. 2 - Disciplinary completed tests.

Besides the completed tests, the platform has registered other 4152 attempts to 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?". Moreover, several suggestions helped to identify some improvements 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).
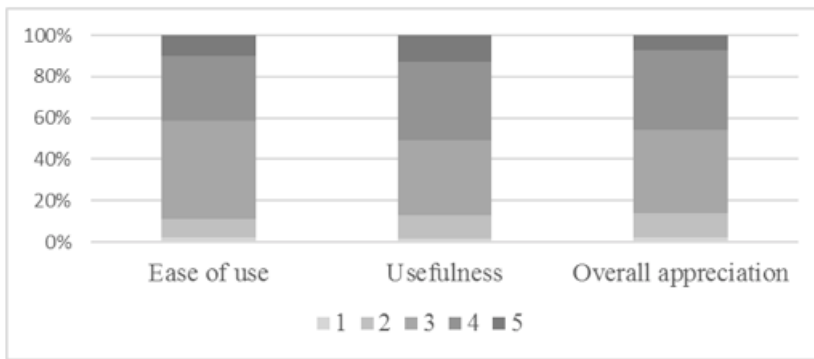
Fig. 3 - Approval of the platform.

The questionnaire inquires about users' academic career: a considerable percentage of platform users has not enrolled to a scientific course during the academic year 2015/16 (40%). However, 95% of the remaining has enrolled at our University. The feedback points out that the testing area covers the lack of a free area to verify 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?" have been evaluated with at least 3 points out of 5 by 80% of the interviewed who used the tests. Conversely, from the answers to the question "Did the orienting path influence your choice of study program?", which are on average 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 2015/16, 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 decrease. At University of Turin, the amount of enrolments 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, University monitors and tries to meet 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. Other institutions, such as high schools, can benefit from the Project services, as they can be used by teachers for orientation activities, and from the Project outcomes, since a high credit is guaranteed to the high schools whose graduates successfully complete university degrees.

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, once more confirming the perceived value of this project.

Conclusion

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. During the academic year 2015/16 the Project has been extended with 2 new orienting MOOCs: Philosophy and Strategic Sciences.

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 feedback about the appreciation and completeness of the learning materials proposed. Results of the admission tests and 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 to university courses in e-learning modality, which are currently in development. Far from the realignment courses, such MOOCs will be full university courses that could be delivered completely online.

Orient@mente also includes other projects which are currently in progress: ATTRASS and Digital Archive Erasmus. ATTRASS 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 with their university career. Digital Archive Erasmus is 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, studying the role of automatic assessment in improving learning, extending similar opportunities to other disciplines.

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