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Digital support for university guidance and improvement of study results

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Abstract

This paper will analyze Orient@mente, a project developed by the University of Turin since the 2014/2015 academic year. The project's main purpose is to support students in their choice of the most appropriate university study course. An educational model for university guidance has been developed and applied in the creation of a self-paced MOOC. It is provided through a learning management system integrated with an advanced computing environment, an automated assessment system and a web conference system. In the platform students can find accessible activities such as interactive resources, information, orienting material about 15 scientific courses, automatically graded tests, review courses.

As a result, the University of Turin has recorded enrollment growth in scientific courses. Students' feedback has shown high appreciation of these innovative teaching methods and digital devices for learning Mathematics and other scientific subjects.

In the next future, the University of Turin is interested in extending a similar service oriented towards other courses, especially courses which provide a highly selective admission test and requires a specific background of knowledge.

Peer-review under responsibility of the organizing committee of HEAd´16

Keywords: automated assessment; learning management system; self-paced MOOC; testing; university guidance; virtual learning environment.

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1. Introduction

The degree course choice decision is a fundamental moment of life, as it will affect one's entire future. According to a report on the state of education in Italy, presented last year by the Italian Ministry of Education, University and Research (MIUR, 2015), the percentage of students who enrolls at University right after the conclusion of upper secondary education is about 49% and it has registered a slight decrease during the last 5 years. Moreover, the study path undertaken often proves to be harder than expected: only 55% of students pass more than half of the first-year exams and the 18% do not pass any of them. These results are even more alarming if we focus on scientific faculties: the percentage of students who collect more than half of the credits after the first year decreases to 47% and the 21% is not able to pass any exam. In 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)

If we consider that, especially in the scientific area, the admission to several courses is subject to passing a test or satisfying a list of minimum prerequisites, it is clear that Italian students need both a stronger preparation and a stronger self-awareness in order to succeed in their choices.

In 2014/2015 academic year the University of Turin developed Project Orient@mente: a self-paced MOOC provided through an open online platform, strategically aimed at encouraging students to make their career and study choice more consciously. The project has been realized thanks to a funding from the Ministry of Education, University and Research (MIUR) and has been supported by the Managing Director of the Regional School Office (USR) of Piedmont and by several high school executives (USR Piemonte, 2015).

2. Objective and beneficiaries

The main goal of Orient@mente is to support students, in particular foreign and Italian students attending the last two years of high school, in the choice of the most appropriate university study course, fostering a more aware decision of their study career. That would help students to succeed in the first exams and would prevent them from quitting university by the first year. The project is also aimed to support students in the preparation of the screening test based on previous knowledge required to enter the courses without numerus clausus, or in preparation of the admission test for courses with numerus clausus. This will make them eligible to attend the courses and take the exams they are interested in.

While acting on students, Orient@mente will also bring benefits to Universities, by reducing the rate of university dropouts after the first year and by improving the results of exams. An additional purpose of the project is to support courses without numerous clausus in their intent to have a more selected range of students enrolled. Orient@mente is also inserted in a plan of action undertaken by the University of Turin for the dematerialization and digitalization of learning processes aimed to reduce costs and improve the efficiency of university resources.

3. Strategies adopted

The project is developed starting from extensive use of new technologies. Orient@mente can benefit from – and meanwhile feed – the research performed by the University of Turin on e-learning and automated assessment of learning and for learning (Brancaccio, et al., 2015) (Barana, Marchisio, & Rabellino, 2015). In particular, a learning management system integrated with an advanced computing environment, an automated assessment system and a web conference system is the right asset for the online activities offered in the MOOC used by 15 university courses currently included in the project: Biotechnology, Chemistry and Chemical Technology, Physics, Computer Science, Mathematics, Mathematics for Finance and Insurance, Production and Management for Bred and Wild Animals, Materials Science and Technology, Biological Sciences, Agricultural Science and Technology, Forest and Environmental Sciences, Geological Sciences, Natural Sciences, Herbal Techniques, Food Technologies.

The MOOC is reachable at the following url: http://orientamente.unito.it/. The services platform, conceived for both Italian and foreign students, is open to everyone and accessible using credentials from the most popular social networks among the students such as Facebook, Google, Linkedin and Windows Live.

The processing of personal data follows the 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, 2003)

3.1. Educational model

The services offered are designed with the purpose to implement an educational approach theorized to be an instrument for orientating students towards more aware and suitable choices (Domenici, 1998). Specifically, the model includes:

- a package of reliable and relevant information about the university courses currently included in the project. Besides an overview of all the courses, approved by a commission of teachers belonging to each department, Orient@mente is able to offer the possibility to talk through web conference to selected teachers or tutors just graduated in the course of interest, and to ask for further information and advice;
- tools for verifying one's preparation and attitude for the main subjects of the university courses, in particular automatically graded tests of basic Mathematics, advanced Mathematics, Logic, Physics, Chemistry, Biology, Earth Science, Comprehension of scientific texts; besides being indicators of one's preparation, online tests serve the major purpose of developing and strengthening knowledge and skills useful to face the desired study path. In fact, after attempting a test, students get an immediate feedback of correct and incorrect answers, which also provides links to the appropriate review material (Luik, 2007). Moreover, mathematical questions are algorithmically generated, so that the system is able to display different numbers and data for every new quiz. As a result, students can repeat the test finding new questions which are similar to the previous in the structure but different in data. Thus, they are forced to repeat the reasoning;
- an area dedicated to the revision of basic knowledge of Mathematics, Biology, Chemistry and Physics. This area contains review courses particularly useful to make up for deficiencies before repeating the tests or before the first-year university lectures. The structure of the review courses has been carefully designed in order to facilitate students' learning path. It is organized in modules and sub-modules; each module contains, following a regular pattern, didactic resources both in written and in multimedial format, interactive discovery activities, examples of exercises, problems and applications, final tests. The schedule of every review course is depicted in a mindmap available at the beginning of the course. The clear structure of the courses allows students to self-organize their learning and to find activities and contents of their interest;
- activities which encourage self-assessment and self-organization. Assessed exercises are a good training to understand one's personal limits and strengths, which is crucial in the choice of the study course. It has also reflection on the management of time, key ingredient for the success in the university exams. Attending the e-learning review courses also promotes self-organization, as students can decide upon their pace of learning (Ferrari, 2011). The whole platform is "self-paced", in the sense that everyone is let free to make use of its contents according to one's needs.

3.2. The integrated platform

The model presented above is implemented on top of the learning management system Moodle, enhanced with the integration with several selected instruments.

The online tests are created and distributed through the integration of Moodle with Maple T.A., an automated testing system particularly suitable for scientific disciplines. It is based on a mathematical engine which allows to implement algorithms for the randomization and the creation of complex variables. With Maple T.A. it is possible to build multiple-choice quizzes, useful to simulate the admission tests, as well as open questions which accept complicated mathematical formulas as answers: the system is able to determine the mathematical equivalence between the students' answer and the correct one.

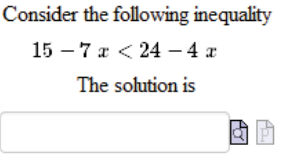

Fig. 1. Example of a mathematical open question with algorithmically generated numbers

These kinds of quizzes are excellent for strengthening skills and developing competences (Wiggins, 1998) (Barana & Marchisio, 2015). The platform includes more than 50 tests and has a repository of about 2000 different quizzes involving relevant issues of basic knowledge.

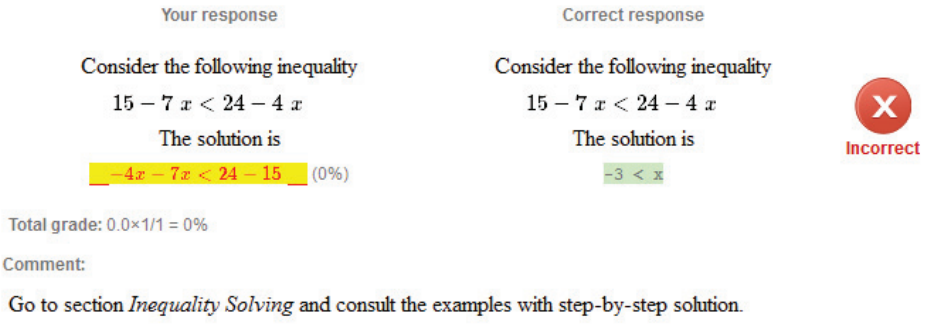

Fig. 2. Grading and feedback of a wrong answer to the question of Figure 1.

The Moodle gradebook records all the results of Maple T.A. tests and other Moodle activities. This is a useful tool for students to register and check their improvements.

Besides Maple T.A., Moodle is also integrated with the web-conference system Adobe Connect. During the three months before the first session of University admission tests, It has been used to organize online meetings to talk with tutors. The participants could communicate through voice and chat, share contents and visualize the tutor's desktop on their device. The total amount of tutoring offered by Orient@mente in the second half of the year 2015 was 150 hours (10 hours per university course).

Availability is a key feature of the entire platform, for several reasons. Firstly, the tests and the online courses are open to and free for everyone who would possibly be interested. Thus, students can begin to prepare for their university choice decision since the 4th year of high school, and they can also go back to the MOOC's contents afterwards, during university years, when they will need to refresh basic knowledge and to integrate it with the new experience. All the resources in the platform may be consulted through any internet device at any time. Moreover, the several ways through which contents are displayed in the online courses and the different learning styles offered can help students to find the resources which better meet their attitudes (Hattie & Yates, 2014). Lastly, the entire platform has adopted the font "EasyReading", a high-legibility font specific for people with.

4. Achievements and social impacts

Orient@mente started in July 2015 and about 4000 users registered in the platform in the first 4 months of activity, which is the period when, in Italy, University admission tests usually take place and enrollments are open.

Nevertheless, also in days far from university enrollment, the platform registered a continuous activity. 4214 is the total number of users registered in the platform updated to the 14th of January 2016.

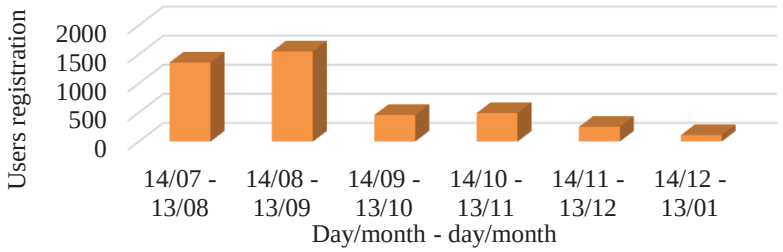

Fig. 3. Users registration in the platform Orient@mente from 14/07/2015 to 13/01/2016

A preliminary analysis of collected data shows that 46% of users come from Piedmont, 52% of users come from the rest of Italy and 2% are from foreign countries. As shown by the following graphics, which prove the liveliness of the platform and the test usage level, 8001 registrations to the testing areas in the different disciplines occurred until the 13rd of January 2016.

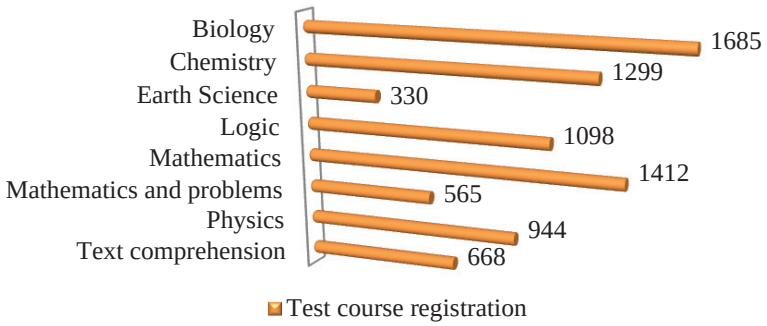

Fig. 4. Test course user registrations in the period 14/07/2015-13/01/2016.

At the end of every disciplinary test area we placed a brief optional survey useful for two purposes. Firstly, it detects the level of appreciation of Orient@mente: 95% of the answers to the question “Do you consider Orient@mente a useful service offered by the University of Turin?” was “Yes”. Secondly, it collects suggestions for the Project itself: often this feedback has helped to improve the materials.

As a prompt result, the University of Turin has recorded enrolment growth in scientific courses, with an average increase of 15%, in contrast with the recent Italian and European trend of decrease in enrolment.

The project entails a strong social engagement. Students are led towards their university choice decision and receive a better preparation to apply for and face university. This has significant social implications, as this will positively affect citizens lives and their future working opportunities. Moreover, the new digital guidance can even be benefited by students living in the suburbs, by foreign students and immigrants in general, and by people with poor economic conditions or other difficult conditions: it requires only a traditional internet connection (not broadband) and a not too old digital device (such as a smartphone or tablet). Lastly, high schools can also benefit from proposing Orient@mente activities to their students during the final years.

5. Conclusions

Through their feedbacks, students asked for a similar service oriented towards other courses, such as the Medicine course which provides a highly selective admission test and requires a specific preparation. In the next future, the University of Turin is interested in extending this service towards different directions:

- the creation of overviews and tests for liberal arts courses;
- the arrangement of linguistic sections in order to facilitate foreign students and immigrants who wish to study in the Italian universities. This will result in a better comprehension of Italian language in different domains of expertise, such as the economic one.

The online university guidance and support offered by Orient@mente is aimed at assisting students, but also allows the university to better utilize human resources, such as teachers and tutors, and financial resources potentially used for activities that would be performed at every single school. Furthermore, the platform allows a broader diffusion of participation in the activities, and more personalized study schedules with higher standards of quality. An increase in students' motivation and a strong decrease in university dropouts by the first year are also expected.

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