Chapter #15

MOOCS FOR BRIDGING THE SCHOOL - UNIVERSITY GAP

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ABSTRACT
This chapter presents an update of the MOOC orientation strategy implemented by Federica Web Learning, Centre for Innovation, Experimentation and Diffusion of Multimedia learning at the University of Naples, Federico II since January 2019 and already published in the same year. A solid orientation strategy is designed to support students in their university choice and prepare them for the intellectual demands of university life and study. According to OECD, graduate numbers in Italy increased in 2019 from 20% to 28% (25-34 age range), and Italy has high numbers of post-graduate degree holders. However, overall graduate numbers are still relatively low compared to other European member states and dropout rates continue to be high, as do the numbers of students changing degree course after one or two years of study. In line with the updated DEAP, Digital Education Action Plan (2021-2027), and Italian Ministerial recommendations, the Federica MOOC-based orientation strategy explores ways of bridging the gap between school and university in a 3-pronged approach designed to address students' choice of degree subject and university; preparation for university entrance exams and difficult modules; and last but not least, raising student self-awareness to help them adapt to change as they shape their future.

Keywords: MOOCs, freshman orientation.

1. INTRODUCTION - DEGREES TO PLUG THE SKILLS GAP?

Orientation is a crucial phase for school-leavers as they face major decisions about their future, and whether to aim for a university degree or not and, if so, in what subject. The global jobs market is a fast-changing and unpredictable place, and it is getting harder for students to choose a degree that will make them career-ready in a world where "8 - 9 percent of 2030 labor demand will be in new types of occupations that have not existed before" (Manyika et al., 2017, p, 12) and OECD statistics predict that "15.2% of Italian workers may see their job being automated and another 35.5% may see it significantly overhauled in the next ten years" (OECD, 2019). EU and OECD data confirm that demands from the jobs market are shifting towards more complex, non-routine tasks and non-cognitive skills as a result of digitalization and globalization. On average, shortages are the strongest in the "knowledge of Computers and Electronics followed closely by substantial demand for Judgment and Decision-Making Skills and Verbal Abilities (written expression and comprehension and oral expression)"[1]. A recent World Economic Forum report stated that although Italy has good culture and civic literacy, critical thinking and problem-solving skills, its citizens have poor foundation skills, including literacy, numeracy, scientific and financial literacy (World Economic Forum, 2018). And despite the need for increased digital skills in Italy, women continue to be

[1] https://skillspanorama.cedefop.europa.eu/en/useful_resources/oecd-skills-jobs-database-2018

under-represented in ICT education, with only 13% of ICT students being female in Italy in 2016. (Eurostat, 2018a).

School-leavers, both male and female, may well be tempted to try and choose a degree subject that aims, in some way, to plug one of these skills gaps. In Italy and elsewhere. On the other hand, the value of humanities degrees is also being re-recognized, as was recently evidenced by Microsoft executives amongst others: "as computers behave more like humans, the social sciences and humanities will become even more important… (as they) can teach critical, philosophical and ethics-based skills that will be instrumental in the development and management of AI solutions" (Business Insider, 2018).

2. VALUE OF TERTIARY EDUCATION

Whichever department or subject area students may choose however, one thing still holds true. University degrees continue to be the main currency for the jobs market and, in general, increase a student's chances of employability. In America, for example, employment rates are 89% for students with a bachelors or higher degree compared to 59% for those without (NCES, 2020). Italy is following this trend with educational attainment continuing to grow. More Italian students have MAs than in many other European countries and even though Italy still has a higher than EU average number of NEETs, people with degrees are less likely to be unemployed long-term (OECD Education at a Glance, 2020).

Although many school-leavers are thus encouraged to think that a university degree is the best next step, statistics regarding drop-out rates amongst university students would seem to indicate that a significant percentage of students continues to leave university without a degree (Eurostat, 2018b) and that 19% of Italian students graduate only after changing subject and course, and 27% take a year longer to complete and then regret their choice of degree (Almalaurea, 2015 and 2020).

This has a "scarring effect in the form of greater marginalization and negative labor market outcomes" (Sosu, & Pheunpha, 2019, p. 1) and thus significant consequences for individuals, institutions and society. Although the reasons for university dropout are many and varied, "students' intellectual capability to cope with the academic demands of university study is one of the most significant risk antecedents consistently identified across the literature" (Sosu, & Pheunpha, 2019, p. 2). And in Italy Anvur reports that, for example, in Industrial Engineering, 19% of students have abandoned their studies at 3 years from registration and 27% at 6 years, and overall, on a National level, dropout rates are at 12.2 % for 3yr bachelors, at 5.9 % for 2yr MAs and 7.5% for 5 or 6yr Combined degree programs, meaning an overall dropout rate of approx. 25% (Anvur, 2018).

In June 2020 the Ministry of Education and the Ministry of Universities and Research (MIUR) sent out a public letter to remind schools and teachers "that access to opportunities and initiatives for orientation remained a priority even in the emergency situation engendered by Covid-19"[2] and the consequent transition to remote learning. They stress that economic hardship resulting from the pandemic could discourage families from continuing to finance their children's education post-secondary school, whereas a supply of graduates and differently qualified citizens will be indispensable to the social and cultural growth of Italy post-pandemic.

[2] Note on "Attività di orientamento alla formazione post-secondaria". [Orientation activities for post-secondary education]. June, 22, 2020

The issues of a difficult transition between school and university have been broadly discussed in the literature, but "it is argued that the topic is still largely under conceptualized, and under researched", which is significant when "its interpretations variously inform policy, research and practice in the field and that despite a growing level of interest in higher education…" (Ferreira, 2018, p. 3). It is extremely important to understand the transition from school to university because "the process presents academic challenges, personal and social challenges, administrative challenges and even academic challenges (Ferreira, 2018, p. 3).

This chapter makes a key contribution to the literature in proposing a MOOC-based orientation strategy as a cost- effective and subject-agnostic approach to exploring and easing this transition.

3. EFFECTIVENESS OF MOOC-BASED ORIENTATION STRATEGY

MOOCs have seen a huge increase in user numbers both pre- and post-pandemic, totaling over 120 million worldwide by July 2020. It is recognized that learning technologies can provide structured learning pathways with clearly mapped stages, engaging and relevant multimedia content that allows for flexible access, interaction within local or global classrooms and involvement in group projects as well as individual and personalized learning. At the same time, predictive analytics improve content quality in subsequent iterations of any course, and can also flag issues that help identify at-risk students. A MOOC-based orientation strategy could therefore be, as reported in our previous paper, an effective tool for:

> a) raising awareness of degree content in different subject areas to enable school-leavers to make a more informed choice, especially in popular degree subjects that are not necessarily included in school syllabuses, like psychology, law, engineering, communication sciences etc.). MOOC lessons also give a taste of the university classroom, with clear indications of teaching style and approach, as well as expected performance and attainment levels via the accompanying assessment activities;
>
> b) providing preparatory or remedial study content in specific areas to boost learning and fill the knowledge-gaps, thus reducing the possibility of students finding themselves unable to cope with the level of intellectual difficulty posed by university study.

The main areas for a MOOC strategy then are twofold: the first is to provide useful tools and links to help students choose the right degree for them. The second is to provide preparation for university study in the sense of "filling in the knowledge gaps" using specific subject MOOCs. A third prong of the strategy that is currently being proposed at Federica Web Learning is to use MOOCs to:

> c) improve students' levels of self-knowledge and awareness, to render them more resilient in the face of the major changes that university and its associated study, as well as the future workplace, pose for them.

In all cases it would seem that orientation strategies require the support of the teacher for successful implementation. Already in 2014, the Italian Ministry for Education published national guidelines for lifelong orientation which recognized the important role that schools had in "helping people develop their own identity and make the right decisions regarding their personal and professional life, as well as facilitating the match between demand and

supply in the jobs market"[3]. Many schools already had a Head of Orientation who is responsible for orientation initiatives and approaches, nominated as a result of a former Ministerial decree in 2004. The commitment of the teachers as disseminators and multipliers is central to the uptake of online learning initiatives like MOOCs, which might otherwise remain hidden on the Web.

In the recent ministerial letter mentioned above, it is suggested that students need to able to hear first-hand accounts of successful university experiences and subsequent successful careers from students who have gone before them, and the ministry encourages teachers to offer this, and pledges to offer support to technological solutions that offer this kind of orientation initiative.

4. COVID-19 AND UNPRECEDENTED USE OF TECHNOLOGY

During the first wave of the global pandemic in Spring 2020, teaching and learning activity were transitioned online across the globe, highlighting the digital readiness of individual countries to guarantee continued education to their populations in terms of infrastructure, content and management. The recently-published Digital Education Action Plan (2021-2027) (European Union, 2020), outlines the European Commission's vision for high-quality, inclusive and accessible digital education in Europe in the wake of the first wave of the pandemic. It highlights the importance not only of addressing the digital divide but also of providing digital skills training for students, as almost 60% of the respondents had not used distance and online learning before the crisis and more than 1 in 5 young people across the EU fail to reach a basic level of digital skills. Participation in MOOCs, where the instructional design incorporates a range of online learning and interaction tools, is considered a valid way of enabling students to gain experience and expertise in the digital environment. The DEAP also highlights the importance of shareable quality asynchronous learning content of the type that MOOCs offer, that can be accessed by teachers for use within flipped classroom models and by students in self-learning mode. The public letter issued by the Ministries of Education in Italy and mentioned above, also insisted on the importance of MOOCs, stating that "it is necessary that students, especially those in their final year of high school, are made aware of existing online platforms where University providers deliver content that is useful for orientation". The letter also mentions the importance of providing motivational, vocational and self-assessment so that students can analyze their own inclination and motivation and compare their own skills and abilities in terms of the stated pre-requisites for any course of study. Small, single university MOOC initiatives started to emerge in response to the pandemic to help schools during the forced closure. One example is the University of Urbino, with an accredited, multidisciplinary, communication MOOC comprising 10 lessons, to increase school students' cultural know-how, including digital theory and digital learning during the period of enforced closure.[4] University Ca'Foscari, Venice also offered online courses, but closed, to develop transversal competencies and soft skills for university orientation.[5]

[3] Article on the website "Orizzonte Scuola": Il ruolo dei docenti nel percorso di orientamento universitario. [The role of teachers in university orientation]. Retrieved January 13, 2020 from https://www.orizzontescuola.it/il-ruolo-dei-docenti-nel-percorso-di-orientamento-universitario-ecco-la-guida-alla- scelta-del-corso-di-laurea-di-edises.

[4] L'Università di Urbino per le Scuole Superiori https://mooc.uniurb.it/wp/didattica-aperta-per-le-scuole/

[5] Futurelearn offers a collection of courses, specifically designed for students aged 16-19, with the purpose of giving an overview and a sample of different universities and university subjects that they may be interested in, in order to choose the right degree, university or career (January 2019).

5. INSTITUTIONAL INTEREST IN MOOCS FOR SCHOOLS

There are signs that institutional interest in MOOCs for schools has continued since our last paper. The new European Commission President, Ursula von der Leyen, has updated the Digital Education Action Plan and is encouraging an increased use of MOOCs in the area of digital skills to "get Europe up to speed (Techcrunch, 2020) and the H2020 project UP2U[6] aims to bridge the gap between secondary schools and higher education & research by better integrating formal and informal learning scenarios and adapting both the technology and the methodology that students will most likely be facing in universities. In the same period, June 2019 – July 2020, the French national MOOC initiative, FUN, significantly increased its Orientation offer. The FUN platform is now offering 31 orientation MOOCs of which 20 are new, fruit of the MOOCFOLIO project[7] financed by the French Government. The aim is to enable students to "1) choose the right degree 2) reinforce their knowledge and bridge the gap between school and university". The Italian EduOpen University Consortium has also now inserted a section on its homepage entitled Orientation, and offers 30 introductory courses in aspects of maths, physics, statistics, law and other popular university subject areas. On the other hand, the leading European and American OPMs that offered the university preparation initiatives we reported in our previous paper (Merciai & Kerr, 2019) have made no specific further investment in orientation. Futurelearn now offers a section called Study Skills instead of the going-to-university section1 which includes courses like *A Parent and Supporter's guide to University entry* and *Live Smart: Your essential guide to living at University* both from the University of Reading and *How to learn online* from the Open University UK. In the US; the Harvard-MIT provider, edX, still offers the section on its website called "Get College Ready. Get Ahead. Get Learning" (https://www.edx.org/high-school with specially designed courses from top high schools and universities to help students prepare for Advanced Placement (AP®) Exams and CLEP® Exams, as well as introductory-level courses to help get ahead of the game. The number of courses available in this section seems to have reduced from 50 to 13 however. The Coursera platform has started to offer support to pyscho-social and emotional aspects of degree choice, and the important of self-knowledge for a successful university study and life experience. Notable examples are the course in *Global adolescent health*, from the University of Melbourne and *Know thyself - the value and limits of self-knowledge* from the University of Edinburgh. The Khan academy continues to stand out for its offering of learning tools primarily for school-age students, and teachers, also in relation to the pandemic (e.g. a section on "How to motivate students who are distance learning during COVID"). It also provides services, such as mentoring for parents and teachers and other tools dedicated to helping students navigate college admissions, career choices, personal finance and entrepreneurship. In Italy, the Polytechnic of Milan, through its platform Pok (Polimi Open Knowledge), benefits from the instructional design experience of one of the most advanced multimedia teams in Europe to help create a bridge with university learning. Their courses are realized with the idea of facilitating preparation on some key subjects such as mathematics or physics, or some specific topics for each Master's degree, responding to the transition needs between two different levels of study.

[6] UP2U project. Retrieved January 8, 2020 from https://up2university.eu
[7] MOOCFOLIO project on FUN platform. Retrieved January 8, 2020 from https://www.mooc-orientation.fr

The University of Torino in Italy offers 20 open access courses via its Start@UniTO project, in conjunction with the San Paolo Company. These are aimed at final year High school students with a view to better aiding student choice of course.

As reported in our previous paper, the Federica Web Learning Centre has been experimenting with the use of meta-MOOCs for bridging the gap between school and Higher education since 2019. These place the emphasis on the first of the main MOOC strategies identified above, that is, they offer chunks of the major degree courses offered at national level, and thus enable students to experience the university classroom and content and standards first-hand. The role of the teacher as multiplier was fundamental to the success of this project, as the initial point of contact was with individual class teachers who chose to adopt this series of orientation mini-MOOCs as a classroom activity and involved the class in the creation of their own digital artefacts as a project outcome. 8452 local students in the Naples area followed the meta-MOOC project in 2019. As teaching and learning continue in the online space as a result of the global covid-19 pandemic, these mini MOOCs could see wider leverage as the asynchronous content within a fully online flipped classroom mode of delivery where video-conferencing software provides the "face-to-face" element.

"The issue of student transition to university is on the radar of many stakeholders involved, evidenced by: some university departments offering taster learning days or conferences for final year High School students; learned societies holding "bridging the gap" days to learn what it is like at university" (Ferreira, 2018, p. 1); and establishing ambassador schemes where current university students visit schools; local GA branches providing support for students and links with universities through their activities; and some discussion from some teachers and academics in the discipline (Ferreira, 2018), to mention just some examples, but there is potential for involvement from a broader spectrum of organizations to be involved.

6. MOOCS AS PREPARATION FOR UNIVERSITY ENTRANCE

In a new extension to the Federica MOOC Orientation activity, and in line with the second of the main MOOC strategies identified above, the Federica Web Learning Centre has recently started a collaboration with Cisia (Consortium Interuniversity for Integrated Access Systems). The Cisia is a non-profit consortium, comprising 50 Italian Public universities, whose role is primarily to aid university access and orientation, by creating, administering and marking university admissions tests. Their role also includes the development of tools on the part of their consortium members, to plug freshmen knowledge gaps in a bid to reduce repeated failure in all-important modules of the course and thus reduce potential dropout rates. The MOOC initiative is a valuable addition to their toolbox.

The Cisia/Federica Web Learning collaboration consists in offering specific online courses - on the Federica platform - to help students prepare for university entrance exams to those faculties where stringent selection procedures are in place. These MOOCs can also serve as remedial learning content for struggling first year students.

The Italian Ministry for Universities and Research, first with the PLS and then with the POT projects (Plan for Science Degrees and Plan for Orientation and Tutoring) (MIUR) published open Calls to Universities to design and produce learning content for final year school students in the 6 disciplinary areas where gaps had been identified: Basic Maths; Physics; Chemistry; Biology; Logic; Text Analysis and Comprehension and Italian Language Skills. The design and development of MOOCs to improve baseline knowledge in these key areas is specifically mentioned in the Ministerial Decree. The aim is to boost interaction

between schools and universities to improve levels of college readiness on the part of school-leavers and with the overall objective to:

- increase university enrolment rates;
- promote awareness in choice of degree;
- reduce dropout rates;
- support students in completing degrees within the recommended time-frame.

Within this Ministerial initiative, the Cisia consortium is committed to designing effective self-learning and self- assessment tools, and MOOCs will make a valuable contribution to this orientation and tutoring activity on their part. The Federica Web Learning/Cisia collaboration, which focuses on the production of new introductory MOOCs to improve baseline knowledge for better university access and performance, is already under way. It includes establishing guidelines for effective MOOC design and creation with a national committee of stakeholders. The first phase of the joint initiative saw the creation of a set of courses in Basic Mathematics for the following subject areas: Engineering and Science, Agricultural science, Economics and Pharmacy. Maths was identified by the universities and teachers involved in the project as being one of the most significant hurdles for students on these degree courses, and according to OECD statistics, Pisa performance for mathematics and science shows poor performance for Italy compared to its European counterparts (OECD, 2012).

The design of the courses was aimed at a school-leaver audience and enables them to explore and clarify basic concepts in 10 lessons. Numerous videos, texts and formative assessments accompany the student through the theory and practice of functions, equations, logarithms, geometry and other fundamental aspects of maths for further science studies.

Once the courses were ready, a two-pronged dissemination plan launched the initiative. Major stakeholders from both partner networks were invited to a Study Day on Technology Enhanced Learning where the courses were presented. This coincided with the launch of a dedicated page on the Federica platform www.federica.eu/cisia (April 2019) and on the Cisia platform that publicized the initiative and also provided access to the four Mathematics courses.

7. INITIAL CISIA / FEDERICA WEB LEARNING PROJECT RESULTS

The initiative was launched with four related courses in basic mathematics that were differentiated according to the specific needs of four popular degree courses. They met with success in terms of student numbers as reported in the table below, demonstrating broad interest in the topic. A significant finding was that Basic Maths for Engineering and Basic Maths for Economics attracted much higher audiences than Pharmacy and Agriculture, and it was decided in the second edition to merge the courses and offer a combined Basic maths course lasting 12 weeks.

Table 1.
Subscription Distribution to the Cisia's Courses – first wave.

COURSE	TOTAL ENROL
Matematica di Base - Ingegneria e Scienze	15.495
Matematica di Base – Economia	8.054
Matematica di Base – Agraria	1.038
Matematica di Base – Farmacia	1.210
TOTALE	**38.067**

In the second edition of the course, which opened in Spring 2020, the data demonstrated increased learner uptake during the month of April, in line with generalized increases in MOOC learning across Federica courses and other MOOC platforms as the pandemic took hold. Learner numbers then increased extensively during the months of July and August. This second peak coincides with possible preparation for university entrance exams which are held in September, and an analysis of the student demographic shows that 18% of the learners were 18 years old or below and 34% were 19 years old, and were thus conceivably trying for university entrance for a first or second time. It is also interesting to observe that 41% of learners were aged between 20 and 30 years of age, many of whom were most likely registered university students who were seeking online support for forthcoming, and

potentially difficult, university exams. One of the strategic aims set out in the recently updated DEAP is to develop higher education curricula which attract women to engineering and ICT based on the 'STEAM' (science, technology, engineering, arts and mathematics) approach. This course seems to be a good example as there were more women than men registered (51% women, 49% men). The second iteration of the course also benefited from an increased teacher presence on the class forum, so that personal learning problems or doubts about specific questions in the exercises or end-of-lesson quizzes could be addressed.

Table 2.
Subscription Distribution to the new Cisia's Course.

COURSE	TOTAL ENROL
Matematica di Base – New Edition	12.270

The Federica Web Learning/Cisia collaboration will be extended in the forthcoming months. The Ministerial letter (quoted above) encourages "the activation of orientation projects that are the result of synergies between upper secondary schools and higher education institutions to reduce the academic gap in competences between leaving school levels and required university levels. It would be opportune to offer certification for these credits which learners who intend to continue their studies could subsequently exchange for university credit (CFUs)". The Federica Web Learning/Cisia courses already offer certificates of attendance, for free, to students who successfully complete 80% or over of the course, and are therefore already on their way to achieving this ministerial goal.

8. FUTURE EXTENSION OF MOOC STRATEGY TO VOCATIONAL ORIENTATION

In addition to the two routes towards orientation that Federica has already explored, and that we have presented here above, future work at the Centre will also focus on the third way; that of vocational orientation for students. The objective is to equip students with life skills that develop an awareness of self, and the changes that their lives will undergo as they enrol at university, and how this new level of understanding will enable them to achieve personal goals and fulfilment. This is one of the overall objectives of one of the most significant and wide- reaching POTS under way - that of Engineering, which involves 41 Universities. The University of Naples Federico II is heading this group, due to its research and teaching excellence in this area, and Federica Web Learning, as a consequence, will incorporate experimentation of this approach to orientation in future MOOC initiatives.
A National Day of Study devoted to tools and ideas for vocational orientation, was already organised by Federico II in November 2019, touching on subjects like *New directions for an inclusive and sustainable futur*e; *Policies, practices and pathways towards more active student orientation*.[8]

9. CONCLUSION

A two-pronged MOOC strategy for Orientation has been implemented effectively by Federica Web Learning in the last twelve months: preparation for university choice via the Meta-MOOC initiative, and knowledge enhancement via the CISIA initiative.
A forthcoming change of platform interface will give greater space and visibility to these orientation initiatives, that respond to the needs and expectations of the digital generation by speaking and using their language. These existing orientation activities will be reinforced and extended. New experimentation will move in tandem with the University Engineering POT, adding a third prong to the orientation strategy, that of vocational orientation and life skills.

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