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Online review courses as preparation for first term remedial exams

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Abstract

At *Universidad Carlos III de Madrid* we have developed a review course (R-Course) with a SPOC structure intended for students who failed the first term regular exams. The purpose of the course is to help students prepare for the remedial exams at the same time they study the second term courses. The R-Course is implemented in an Open-EDX platform that holds digital documents, both theory and solved exercise videos, platform integrated exercises, and forums. The content of the course is divided in videos of less than 10 minutes in length, allowing students to include the R-Course in any schedule and making it compatible with the second term courses. Interactive platform integrated exercises have been devised under different types of methodologies to increase the motivation of the students, and the platform forums give students and tutors a space to discuss and interact for a well-rounded academic experience.

Keywords

SPOC, online course, remedial exams.

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1. Introduction

Within the last years MOOCs, Massive Open Online Courses,(Cormier 2008, Daniel 2012) have spread through the teaching system across the globe as a tool for educating a major amount of people on different topics and at different academic levels. The utility and efficiency of these courses is a matter of discussion since the very beginning of their existence(Vardi 2012). Opinions vary between considering MOOCs as a powerful tool to increase dramatically the reach of university teaching or considering them the beginning of the end of the academic system (Breslow et al. 2013). As a natural evolution of MOOCs, or maybe as a possible origin of them, SPOCs (Small Private Online Courses) are also used as a teaching method but, in this case, since the target of these courses is naturally reduced (in opposition to MOOCs), one of the most common environments of their implementation is the Universities (Fox2013).

Whereas MOOCS are usually free, or at least they have a free modality choice, SPOCs are often pre-paid experiences as means of restricting the number of participants or funding the courses (Pomerol et al. 2015). Whatever the reason is, the reduced amount of participants is considered crucial for the improvement in the academic level for these courses, and a higher quality is a must if they belong to a university environment. There are similarities between MOOCs and SPOCs (Reinhardt 2014) but one of the most important differences between them is that the first are usually developed focusing on the desired topic and releasing it to the public in order to attract students, whereas SPOCs are developed focusing on an already known target, and the content of the course is designed to cover a specific need that the target requires.

The specificity of the content of the SPOCs makes them a potential solution for specific problems; despite this being a good issue, it also has a major drawback, the budget required to prepare this type of courses is significantly higher than in MOOCSs and the resources, both human and material, required for the design, performance, and support of the courses are more numerous, along with the time needed to develop new material. These are the causes of the non-free character that SPOCs usually have, or maybe just the consequence of the specificity of the courses. These reasons might be the main disadvantage in the development of SPOCs as a standard academic tool.

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EISSN: 2341-2593

2. Difficulties and Proposed methodology: Review Courses (R-Courses)

2.1 Difficulties

Since *Lisbon Recognition Convention* in 1998, the starting point of unification of the higher education system in Europe, and the so called *Bologna Process* in 1999 (Bologna 1999, Caddick 2008), numerous structural reforms have been carried out to achieve the *European Higher Education Area* (EHEA), a unified frame for the European university academic system (Hinojo et al.2005).

One of the less regarded consequences of these reforms is the modification of the academic calendar in many countries, especially in Spain (MECD 2003, BOE 2007,CRUE 2009). Before the unification of the systems, the Spanish university academic system was established so that the standard periods for the first and second terms in a degree were from September to February and from February to May respectively, and their corresponding remedial exams were held in September(see figure 1 a)). The current calendar has important differences compared to the previous one; for instance, the period in which remedial exams were usually held (September) has been moved to June(CRUE 2009).This change caused the extinction of the two month period (July and August)that students traditionally had to prepare for remedial exams, in exchange for a very short period of up to a few weeks between the second term regular exams (held in May) and the remedial exams (held in June) (see figure 1 b).

The reduction of the study period for the preparation of the remedial exams is one of the worst disadvantages that students find in the current system, and could be one of the causes for failure in some courses, especially in the first course subjects. As a consequence of the reduction of this period, the students prepare their remedial exams during the second term while attending the lectures of that term and preparing for those courses' exams. That situation presents a very obvious asymmetry: first term classes are over and usually no further support is given to prepare them, while second term courses have a complete calendar of lectures, and teachers can guide the study process.

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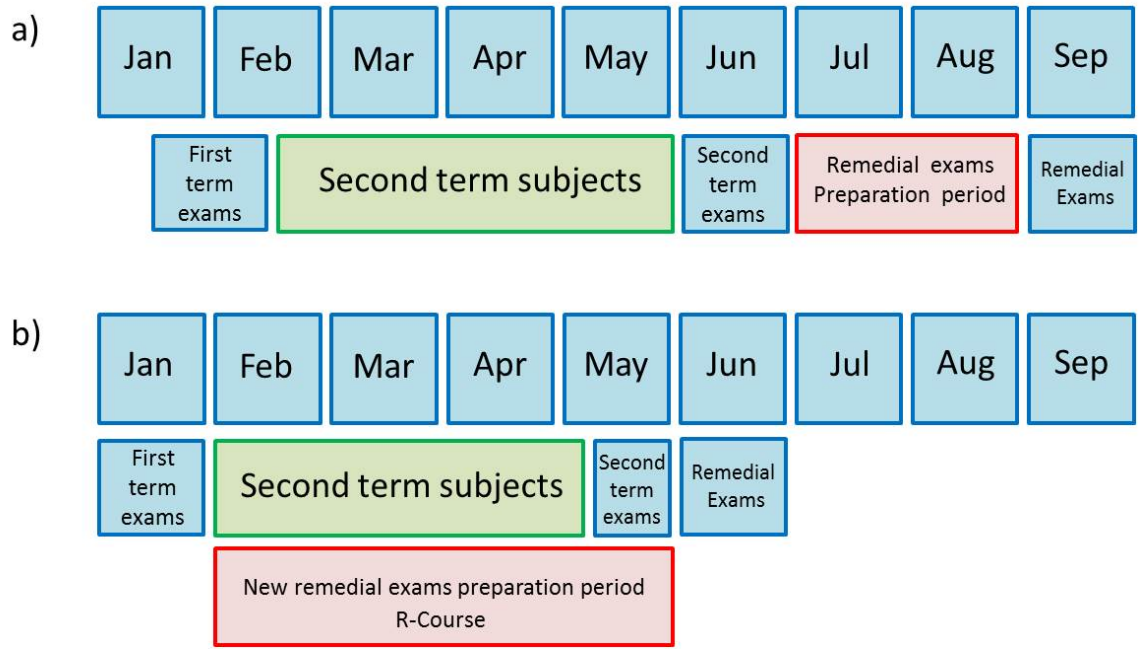

Figure 1. a) Academic calendar previous to the unified frame for the European university academic system. b) Academic calendar after to the unified frame for the European university academic system.

2.2 Proposed methodology: Review Courses (R-Courses)

As a solution for this asymmetry between first and second term courses during the second term, and as a study tool for the students who failed the first term regular exams, at the *Universidad Carlos III de Madrid* we have developed online review courses called R-Courses (where the "R" stands for *Review*, and may be translated as "Cursos R" in Spanish) with the philosophy of SPOCs inside of a project that contains different MOOCs and SPOCs (Delgado Kloos et al. 2014).

These courses target students who failed the first year's first term regular exams in several Engineering bachelor degrees: Industrial Electronics and Automation, Mechanical Engineering, Industrial Technologies, Energy Engineering, and Electrical Power Engineering (next editions of the course will cover all the engineering degrees from the University). First year students are the most suitable candidates for these courses since they are still getting used to the University system and the adaptation process from High school to University makes them vulnerable to certain mistakes, which entail poor performance in first term exams. The subsequent disappointment often makes them get

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even worse results in the second term. Thus, first year courses are those in which students perform worse, making them one of the main reasons for the students to drop out of University studies (Cabrera et al.2006, Alvarez et al. 2006). In this line, our R-Courses cover two needs: they provide students with a tool set to improve their grades, and they give an instrument to the University to minimize the number of students who leave their studies.

In the first year of implementation of these courses, the University decided to focus on the subjects that most first year students have trouble with, namely Physics I (mechanics and thermodynamics) and Algebra. These are two of the most failed subjects and two of the subjects that make the students leave their studies after failing the six chances they have to get a passing grade in any subject, so they are the perfect test for Review Courses.

3. Structure, content and tutorship of the R-Courses

3.1 Structure

Since the target students found the conventional approach unsuccessful, in order to achieve the main purpose of the R-Courses (help students pass the remedial exams), a different approach of the content must be used, including, at the same time, all the elements that the subject had during the first term, both theoretical and practical (exercises). The following structure corresponds to the Physics I R-Course developed by the authors of this work, which might be slightly different for each R-Course.

As the R-Courses are oriented as a SPOC and the content is hosted in an online platform (Open-EDX platform, (Kolowich 2013)), it is obvious that the content will be focused on videos, documents and platform integrated activities. The characteristics of this content will influence directly the result of the course. Since the main problem that students in the R-Course face is that they are also attending second term courses, they must manage their time in doing many activities. Therefore, the smaller the modules of the course, the better they will include them among other activities. Consequently, the content has been divided into short topics in contrast to the structured content of a regular subject, where lectures are divided in periods of 50 minutes. Following this principle, all the lessons are divided in less than 10 minutes length theory videos so a complete part of any topic can be reviewed any time the students have. In the same line, the theoretical notes provided to support the theory videos are short, simple and condensed, in order to allow students to go over the content of a topic quickly.

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In order to develop a well-rounded course, numerous exercises have been also added to the R-Course. These exercises of the course are not a compilation of the exercises of the first term subjects because that will be against the spirit of the R-Course, which it is supposed to face the subject from a different viewpoint. New exercises have been developed for the R-Course focusing not only on covering the subject, but also on correcting the main mistakes that students made during the first term. Since solving exercises usually takes time, it cannot be expected that students dedicate only a few minutes to this activity. In order to speed up this activity, around half of the exercises are fully solved in concise videos of less than 10 minutes in length. Thanks to these videos, with fully detailed and explained solutions, students become more skillful and are able to solve the rest of the exercises more comfortably, later they can also check their solutions thanks to the resolution of those problems that are available in the online platform that holds the video content. All the exercises are provided to the students at the beginning of the week with the title “docent material of the week”.

Using this content (theoretical notes and theory videos, and solved and proposed exercises) a full course of 14 weeks has been developed to guide students in their process of preparing their first term remedial exams. Despite the guidance, students have to make a big effort to prepare the exams and follow the R-Course, so some feedback has to be given to them in order to let them know that they are improving. Because of this, during the 14-week course, 4 mock exams are held in the platform, including the content of the previous 3 to 4 weeks. These exams consist of a classical exam-type exercise list that is provided to the students, which are supposed to solve it without help. Then, they can check their solutions with the online platform (as they were doing with normal exercises during the course) and have their feedback. These exams are not supervised and students are placed in a situation in which they could think about cheating, none the less since the result of the exam is a non-binding evaluation of their work, in opposition to the tense atmosphere of a classical exams, students learn to properly face exams or other trials with an easier attitude helping them to face a real exam.

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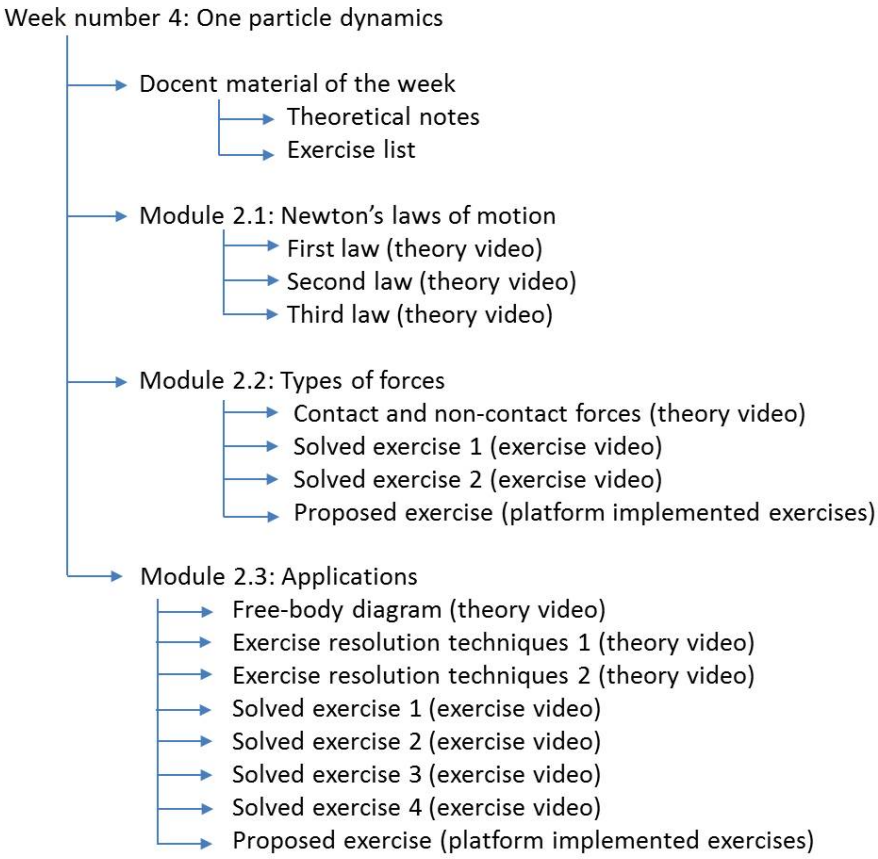

Figure 2.Structure and content of a week of the R-Course.

As an example of the cited structure, Figure 2 shows the structure of the fourth week of the Physics I R-Course. The topic of the week is "One particle dynamics" and is divided into different modules such as "Newton's laws of motion", "Types of forces", and "Applications". The "docent material of the week" is composed of 7 pages of theoretical notes and an exercise list of 11 exercises. Different amount of theory and exercise videos are present on each module. This week has a total of 13 videos (7 theory videos and 6 exercise videos) with a total length of 75 minutes. In the two last modules a total of 7 exercises are uploaded to the platform to be solved interactively by the students.

The structure of the course has been proposed in a way that students may take advantage of its guided process and well scheduled distribution of the content. The course is supposed to be attended during the whole term, and the way of following it is explained at the beginning. These instructions are essential, as the philosophy of the R-Course is

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different than the regular classes. This is a summary of the instructions for a week of the course:

- Access and download the digital documents of the week's material ("docent material of the week").
- After going over the theoretical notes, try to solve all the exercises on the exercise list.
- Watch the video content (theory videos and solved problems videos) comparing the obtained solution for the exercises with the one in the videos.
- Check the rest of the solutions in the online platform integrated exercises.
- In case some theoretical parts were not understood or in case some exercises were wrong, go over the "docent material of the week" and the videos again until everything are understood and solved properly.
- In case a mock exam is scheduled in that week, go over the digital documents again and solve the mock exam. Check the solutions with the ones on the platform after solving it.

Contents are released every week, so that the student has an orientation as to the adequate pace of preparation, but after release they are open during the whole second term, until the week after the remedial exam.

As can be seen from these instructions, there is a major difference between the regular course in the degree and the R-Course. In the latter, students have already attended the regular classes, having a certain degree of knowledge about the subject. Although that knowledge was not enough to pass the subject, some skills have been already acquired (along with some errors or mistakes). The main purpose for asking students to solve the exercises just after going over the "docent material of the week" and without having watched the video content is to make them realize what their level on that particular topic is and to let them know what skills they have and what they lack. This strategy promotes also an active approach to the subject, which is essential for a real learning.

Regardless of the result of their first attempt with the exercises, watching the video content improves their knowledge about the topic and allows them to focus on important points. The solved exercise videos allow students to check if their solution was the most

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appropriate or, in case they were not able to solve a certain exercise properly, show how to solve it. With all the video content, students are provided with all the tools to acquire the necessary skills and knowledge needed to face all the exercises and mock exams, and in case that more in-depth study was needed to face them, they could go over the content as many times as needed.

3.2 Content

Theoretical part

As previously mentioned, the theoretical part of the course is composed of theory videos and theoretical notes. Theoretical notes are based on notes for the ordinary course, but have been adapted to the structure and approach of the review course so that students can save time when going over them looking for some information.

All the theory videos have been recorded specifically for the course, with a total running time of more than 11 hours, but duration is kept nearly always under 10 minutes (with an average length of 7 minutes). As already explained, the primary reason for this is to allow for a more flexible visualization schedule, but is also intended in order to focus on a single topic, in contrast to the long duration of regular classes (usually two sessions of 50 minutes in a row). This concentrates students on a single objective and improves their understanding, and it is also very convenient to save time when students want to solve specific doubts that could arise when studying certain topics.

Yet another reason to parcel the content in small units is the typical low attention span for videos. Taking this into account, additional effort has been made to engage the viewer, using a variety of resources (animated handwriting, PowerPoint-like parts, animations, cartoons that ask questions on behalf of the students, etc).

The theory videos cover all the syllabus of the Physics I course, but not only their length is more reduced compared to the first term classes but also their content is focused on concepts the students usually have trouble with and on the main points they usually do not understand. This issue is very important since students in the R-Course have already failed one of the exams; this probably means they lack understanding of the basics of the subject. Thus the emphasis is put on the conceptual difficulties.

http://dx.doi.org/10.4995/muse.2015.3687
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Practical part

The practical part is composed of exercises, which are provided to the student in the form of an exercise list. As previously mentioned, all the exercises have been developed specially for the R-Course. Besides covering the whole subject, they have been designed and presented in the exercise list in a way that students find a constant increase in difficulty. This sequential increase of difficulty avoids students to face difficult exercises before having solved basic ones, preventing them to get frustrated and drop the course.

In addition to this, the problems usually are module specific and focus on a single information item allowing students to acquire a specific piece of knowledge. In the case of problem-solving videos, this is also complemented with some appointments (that are placed in their own sections inside the videos) to clarify some points or to emphasize the importance of certain parts of the problem or the solution process.

In order to motivate students to not simply watch the videos but also understand them, sometimes some questions are asked when a certain concept is being treated. In that moment, some optional answers are given (some of them containing the most common mistakes) and after a short time the correct answer is provided and explained. This allows students to check if they understand what they are watching.

The exercises not solved in the videos, i.e. the proposed exercises, follow the same structure of the solved ones, and in most of the cases they are variations of the ones solved in the videos. This way the students can use what they have learned from the videos to solve the rest of the exercises in case they were not able to solve them at the beginning of the week when the exercises list was provided.

In order to make the exercises less repetitive, and due to the different nature of the exercises, several types of exercises are available in the platform. This makes the R-Course a little bit more “friendly” to avoid lack of motivation. This variety of exercises goes from just filling fields with numerical solution or an expression, to “drag and drop” pictures or names over a figure, or even multiple-choice test-like exercises.

Mock exams

While the exercises from the “docent material of the week” are single module focused, mock exams contain a mixture of exercises from the topics treated in the latest weeks of the course. Moreover, as going further in the R-Course (so more topics are explained) the exercises in mock exams combine more topics to force students relate the content from

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different weeks (such as “single particle kinematics” and “single particle dynamics” or “single particle dynamics” and “rigid body dynamics” in the case of Physics I).

This combination of contents is an evolution of the content towards a more realistic exercise that could be found in a real exam such as the remedial exam that is the final target of the R-Course.

3.3 Tutorship

Even when the full course is well structured and the understanding of the content does not depend on external resources, there is a need for students to have access to tutoring in order to guide them through the SPOC and to solve any question that could arise relative to the content or to the online platform. Because of this, tutorship is available during the whole length of the course and is provided at several levels of interaction.

The first grade of interaction is the availability of an online forum integrated in the online platform. The topics in the forum can be created from each module of the course using a “discussion tool”. By using this tool, the question or comment from the student can be seen and accessed by the rest of the students and tutors in the same page the related resource is, and also in the forum page itself. Thanks to this, when students access a new content, they can check the comments that students who previously accessed that content wrote; and the tutors have access to all the comments in the forum page for global access to all of them. Using these topics of the “discussion tool”, the students can answer their doubts among them under the supervision of tutors that can join in the discussion if needed to correct some incorrect answer to the comments.

The second grade of interaction is the direct contact with the tutors via email. This closer approach allows students to ask questions to the tutor directly, generally to arrange a meeting in person to solve more in detail questions. This is important since conceptual questions, or questions that involve a fair amount of mathematics, may be hard to treat in a forum. Personal contact with the tutor may also be motivating and reassuring for the student.

The third grade of interaction is the periodic meetings in which all the students are summoned for a purpose. These sessions are scheduled near the mock exams dates and generally after them, to discuss the main problems that could have arisen during the exam and provide feedback. A specific topic in the forums are open a week before these

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sessions in order to allow students to propose specific questions they would like to be treat in the sessions.

The addition of these three grades of tutorship to the sequential opening of the material of the course provides the appropriate guidance through the whole process of preparation for the first term remedial exams that students need during the second term in order to make both terms subjects preparation compatible.

4. Conclusions

We have developed a review course intended for students who failed the first term regular exams. The 9 modules of the content of the course, 5 modules of mechanics and 4 of thermodynamics, are split though 14 weeks. These modules consists of two different kind of contents, video content (theory and exercises) and platform integrated content (theoretical notes and exercises list). During the 14 weeks duration of the review course, the content is made public to the students sequentially to guide their preparation that is also followed by the online tutors that are available during the full course.

We propose this R-Course as a solution for one of the main problems that the Spanish university system currently have, that is the systematic failure of the remedial exams after the implementation of the united frame of the European academic system. This will not only benefit students but also Universities, since failing first year courses is one of the main reasons for students to leave their studies prematurely.

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