

Motivation to learn Chemistry in massive open online courses

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Abstract

One of the key factors for any educational proposal to achieve success lies in the motivation of students. The disposition that the students have before the learning is fundamental to be able to obtain the objectives. MOOC (Massive Open Online Course) has emerged strongly in the context of university education.

The use of MOOC offers time in the classroom that can be used to do active learning activities in which teachers' role is essential, and students can review learning materials at their own pace.

*The objective of this paper was to evaluate a course about concepts. The use of a MOOC named **Introduction to Chemistry: Reactions**. It is a course for students with limited background in chemistry; basic concepts involved in chemical reactions, stoichiometry, the periodic table, periodic trends, nomenclature.*

The evaluation of the proposal was made by students of Electrical Engineers at University of Malaga, with satisfactory results.

1. Introduction

Although MOOCs are a novelty way of the transmission of information, in many respects MOOCs tend to represent a highly traditional portrait of education, in which a teacher or professor delivers lecture-based material to an audience of students. This portrait of a "typical course" is hardly unusual in most universities, as can be seen by attending a standard introductory-level course in calculus, or chemistry. At the same time, this traditional portrait has been challenged in numerous respects by various communities in the learning sciences over the past two decades [1].

MOOCs have received a lot of media attention recently [2] and yet many are skeptical of the values behind them and possible detrimental consequences [3], as well as the quality of online learning provided and whether it deserves credentialing [4]. It would be more accurate to say there is no unified "ultimate goal" for MOOCs, and one cannot generalize across institutions [5, 6] or even courses, [7, 8].

On the other hand, when discussing the benefits and draws of MOOCs, it is important to clarify one's perspective. In this work, we want to improve the learning of chemistry, and because of that the use of MOOC will be taken from the perspective of a learner, and we will evaluate the pedagogical approaches of the MOOCs. Our objective here is to evaluate MOOCs as stand-alone courses.

The majority of MOOCs involve original videos [9, 7]. These online lectures allows students to watch videos multiple times and at their own pace.

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2. Methodology

This study was created as a descriptive study in which the survey technique was used. The study was carried out during the course 2017/18. The sample consisted of 17 volunteer students from a class, at the first course of Mechanical Engineering Degree at University of Málaga, during the second semester; introductory chemistry course. The students came from a variety of socioeconomic and cultural backgrounds. The student attitudes towards taking chemistry were varied. But the vast majority of them did not love chemistry, and they were there simply because they needed to pass the exams to obtain the degree. Each student made one questionnaire about the utility of the use of MOOC in order to make easy the compression of the subject. Students' responses were analysed using a Likert scale. The scale of the test was a five point Likert type scale with a range of five options. The positive items range from 1= Certainly Disagree to 5 = Certainly Agree.

Students were surveyed anonymously at the end of the course and asked to agree/disagree with statements regarding their attitude toward various aspects of the MOOC model.

Students were offered a Likert-type scale of 1 through 5, corresponding to the following:

- 1—Strongly disagree
- 2—Disagree
- 3—Neutral: neither agree nor disagree
- 4—Agree
- 5—Strongly agree

The data collected was entered into Excel to facilitate analysis.

The questions of the questionnaire are shown in Table 1.

Table 1. Questionnaire.

1	Have you done online training activities before?
2	How many online activities have you done?
3	Is the Chemistry MOOC the first one that you did it?
4	How many MOOCs have you enrolled?
5	Why have you enrolled in this MOOC?
6	Have the objectives that have been proposed with this course been achieved?
7	Are the objectives of the course coherent with respect to the contents?
8	Did you like the presentation of the contents in the course?
9	Have these contents been good enough and rigorous?
10	Have the contents been presented good?
11	Do you consider the presented materials "useful"?
12	Have you reached the contents with the depth you expected?
13	Do you consider that the evaluation is in accordance with the materials and length of the MOOC?
14	How do you assess the use of MOOC as a source of self-learning?
15	Would you take a MOOC again?
16	What advantages do MOOCs offer from your point of view?
17	What disadvantages do MOOCs offer from your point of view?
18	Do the different resources offered facilitate the understanding of the information?
19	Indicate how many hours per module you have dedicated to the MOOC
20	Would you recommend the MOOC to a friend, partner, family ...?
21	Indicate the degree of general satisfaction with the MOOC

3. Ethical guidelines and limitations of data

Students were informed that completion of the survey was confidential, was not a requirement of the course, that data collected would be used to improve the course for students in the future, and that data collected might be used for publication purposes. Students were encouraged to respond to every statement they felt comfortable responding to, and that responses to all statements were not strictly required. The students were allowed to complete the survey without the instructor present and surveys were collected by an assistant. No personally identifying information was collected on students, other than, perhaps, that any handwritten comments were read without a third party compiling and typing them first.

4. Results and discussion

This work is based on a quasi-experimental design that compared student learning.

The result was obtained from the administered survey to the 17 enrolled students in the fall of 2018 for the purpose of understanding their opinions about the Chemistry MOOC.

Students were asked whether hearing initially about the "MOOC" approach made the course seem more or less appealing.

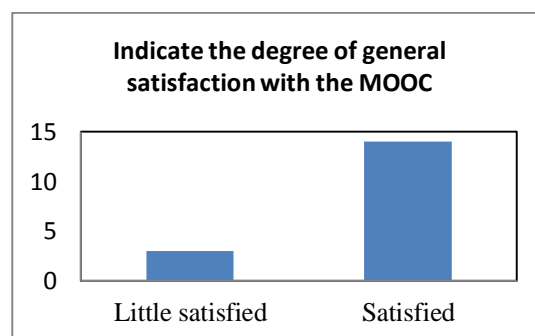


Figure 1. Degree of satisfaction with Chemistry MOOC.

The students were asked about the degree of satisfaction with the MOOC. All of them are more or less satisfied. That information indicates that the MOOC works as the researchers were interested.

The students were asked about if they considered the Chemistry MOOC a material useful to improve their learning on Chemistry easily.

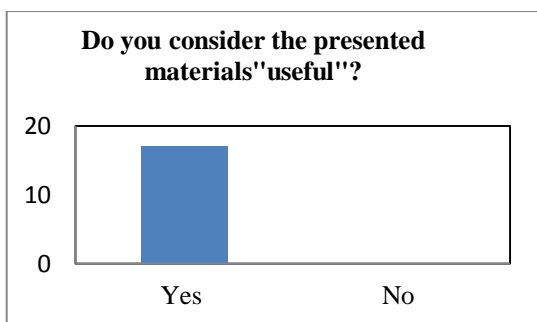


Figure 2. The MOOC material is useful.

All of them answered that the material was totally useful.

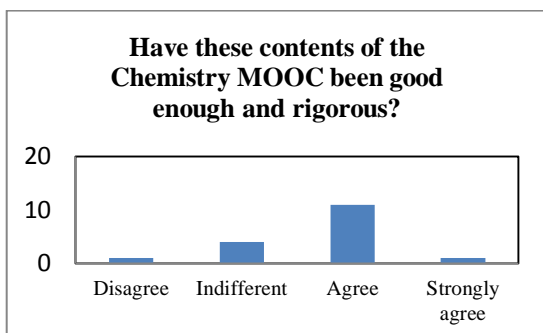


Figure 3. The Chemistry MOOC contents are rigorous and good enough.

Besides, students were asked about the contents of the course, if the contents were rigorous and adequate to the subject Chemistry at the University. A 6% of the students, one student, answered that they disagree with the statement; a 24% of the students thought in an indifferent way; 71% of the student agreed, 12 students.

Out of the 12 students whose interests in this course were not influenced when they first heard of the flipped approach, 5 ended up preferring or strongly preferring the traditional approach at the time of the survey, while 4 switched to preferring the flipped approach.

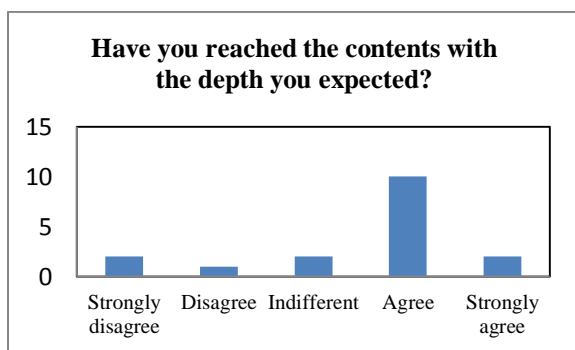


Figure 4. The contents of the Chemistry MOOC were the expected.

12 of all 17 answered the questioner thought that the contents of the course are appropriate. 2 of them answered in an indifferent way, although 3 students disagree with that question.

Finally the students were asked about if they would enroll again in the Chemistry MOOC and besides, if they would recommend enrolling on the course to some friends.

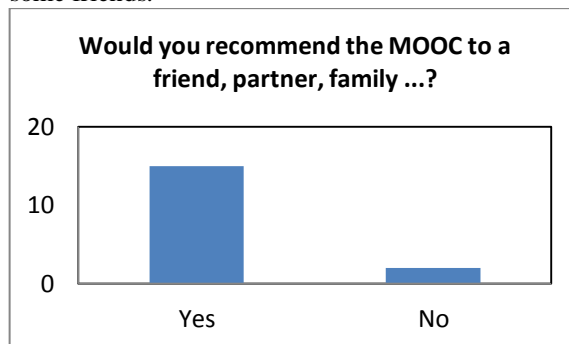


Figure 5. Number of recommendation Chemistry MOOC.

15 of all 17 agreed with the statement of recommend the MOOC to friends, partner, family....

5. Conclusions

General Chemistry MOOC produced interesting results as evidenced by a survey given to students at the end of the course. However, students also reported using the MOOC multiple times throughout the course, not only for class preparation, but also for aid in completing homework, test preparation, reinforcing concepts, and clarifying concepts. Students also found the activities that replaced the pure lecture time—quiz questions and interactive problem solving, for example—were helpful in preparing them for homework and course assessments, as well as making class time more engaging. A majority of students found the MOOC model more effective for them, while a minority was neutral on its effectiveness, and a much smaller minority indicated it was less effective for them. The Chemistry MOOC will continue to be used for the foreseeable future.

6. References

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