

Using normalized opinions obtained from interactive online feedback to stimulate critical thinking and reinforce learning

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Abstract

It is well-known that feedback and active learning are relevant. Today we can obtain feedback in real-time and promote active learning using various online tools. Some time ago, in a blended class, I noticed that several questions that appeared on the screen with correct (and incorrect) answers were changed interactively after the answers appeared on the screen (but are not closed), some to 100% to one of the non-correct answers. This effect is a well-known result of consensus. After this result, I used it to discuss critical thinking, online shaping opinions and spreading wrong ideas, and, also, for reinforcing learning. This method can sum to methodologies for using feedback as a formative tool.

Keywords: *online answering, shaping opinions, reinforcing learning*

1. Introduction

It is well-known that feedback is very relevant [1]. It is also very well known that active learning is more efficient than passive learning [2]. Today, there exists an enormous variety of tools, a colossal amount of information, as well as a myriad of pieces of evidence, available on this and other subjects (see, e. g., [3] and a review on evaluation [4]).

Distance teaching was employed and discussed for a long time. There also exists an immense number of reviews and books on the subject (e. g. [5]) and in its assessment (see e. g. [6]). Also, concerns with this type of teaching are old [7]. Due to the pandemic situation, various "emergency remote teaching tools" were employed. Although, here is not the place to enter into the discussion between "online teaching" and "emergency remote teaching," the former was thoroughly used, in particular in universities worldwide (see, e. g., [8]). Moreover, the massive adaptation generated various changes and improvements. When things returned to the normalized situation, many people reflected on their practices and possess now better materials and strategies. Also, online teaching can be an excellent tool for constructivist theories, and there are a lot of materials and tools waiting to be employed.

Learners build their knowledge based on ideas they already have. This sentence is somehow a truism but can be very productive in the form of constructivism and co-constructivism (including also social interactions) theories. Along these lines, the cognitive and neuroscience-informed educational methods are promises that appear not to be fulfilled [9-13]. However, this result is probably an illusion mainly due to: (a) thousand of years of selecting the best practices [14] and tens of years of using these ideas (this leaves a few spaces for improvement on the best practices [3]); (b) there are false expectations and myths around neuroscience ideas [13]. Nevertheless, these ideas and theories are powerful for explaining how the best things work and the worst fail, and, also, to identify good practices and select better methods. For example, you can notice the words shared with computational tools: "deep learning." It is also not by accident that based on these ideas, a valuable tool was introduced in education: "computational thinking." Various other examples can be presented where the development of new tools, the evolution of ideas and thought, the accumulation of evidence and information, or the particular circumstances, originate new tools.

The traditional methods of teaching in universities (lectures, seminars, tutorials, and laboratories) can be supplemented with online resources. It is well known that lectures can be very ineffective; the reasons for continuing to exist are mainly practical and sometimes can also be paternalistic, as identified long ago [16]. Although the more student-centered formats of seminars, tutorials, and laboratories can be more effective, these forms of teaching are used for centuries (when the number of students in universities was small and can be highly motivated). Nevertheless, the so-called "traditional teaching" will continue to be used and can be efficient when the instructors use the best practices, leaving time for the students to question and actively learn [15]. Active learning and feedback can also be used for preparing for realistic scientific tasks, such as peer-review [16-18]. A note of caution must be made: most of these questions apply to the first years of university. Post-doc



and research methods, central in universities, although much more massified (see, e.g., [19]), are not expected to change, but can benefit from having more critical and prepared students.

It is also well-known that ego-centered feedback in teaching is very ineffective when compared to task-centered feedback [20]. Also, it is well-known that it is somehow absurd to foster an abstract skill called “critical thinking” without handing on anything concrete to be critical about (see [21] - as noted by one of the authors of this old book: the aims of philosophy are understanding and clarification, and this can be very useful).

2. Methodology and results

In classes, specially blended or online ones, I use online polls (e.g., [22]) with four possibilities of answers. After (or before) presenting a subject, I ask the students to use the mobile phone or the computer to answer questions; and the results appear on the screen. Usually, this feedback is done based on fixed answers. Then, I discuss with students the results and stimulate them, in small informal groups, to discuss their particular answers. Also, I can ask them to explain their choices, before (or after) the correct answer appears. Also, I allow them to change their online answer after this discussion. The consensus is very important and usually leads to correct answers [23] (a review and several other topics related to online feedback can be found in this reference).

Feedback, as a formative tool, was shown to be very effective in several works [24-30]. In this work, the use of online feedback not only as a formative tool on the subjects to be studied but also to stimulate concrete critical thinking, reinforce a healthy skeptical attitude in science, and use it to show how consensus in science is obtained. One time, I presented the results but do not close the pool. So, during the process of discussion, the answers changed. They are expected to change for the correct ones, but in this case, they changed for the wrong one. A consensus was attained, but a wrong one. Probably the students, with doubts, expect their colleagues to be right and answered as them, changing their answers. This gives me the opportunity to talk about the scientific consensus that can sometimes be attained on a wrong idea, and the way scientists work. Strong consensus in science is obtained after various studies were made and a thorough discussion is done. To have a correct scientific attitude, students and the public have to be skeptical at first. So, I propose to use, among the myriad of tools and techniques that exist to obtain feedback online, the possibility of changing the answers at the same time you talk or some activities are done with the students.

3. Conclusions

In this work, very short revisions have been made on feedback in teaching, neurosciences in education, and blended and online teaching, as well as, on online feedback. These can be useful to understand the present situation and the future of education. Based on the previous experience of the author, it is proposed to use, among the myriad of tools and techniques to obtain online feedback, the possibility of showing the change in answers obtained online during the activities, and use the results to discuss in concrete some problems, like critical thinking and consensus in science.

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