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Fostering students questioning through Moodle: does it work?

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Abstract

Literature describes several aspects that should be taken into consideration when developing strategies to foster student questioning through online discussion forums. Considering those aspects, two different forums were implemented on Moodle to foster the questioning of 1st year undergraduates attending two broad foundation chemistry courses at the University of Aveiro (Portugal). This paper describes those forums, analyzes the perceptions of four selected students about them and discusses what changes can be made in future studies to foster student questioning through online forums. Data was collected through records of online interactions on the forums, interviews, focus groups and the researchers' diary.
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1. Introduction

In today's education there is a call for the development of higher-order thinking skills and conceptual understanding (Lau & Yuen, 2010). Several authors hold that the development of the students' questioning skill has the potential to enhance several higher cognitive level capacities, such as critical analysis, problem solving and creative thinking (Hofstein, Navon, Kipnis & Mamlok-Naaman, 2005).

Most students in western societies are very prone to use digital technologies outside school and find them extremely attractive. Facing the wide range of teaching opportunities that multimedia tools give to educators, it is every teacher's duty to make the best use of them to enhance their students learning.

For this paper we focus on online discussion forums. Our purposes are to (i) describe aspects reported in the literature that should be taken into consideration when developing strategies to foster student questioning through an online forum, (ii) describe two forums projected to foster student questioning that were implemented online in two first year chemistry courses at the University of Aveiro (Portugal), (iii) analyze the students' perceptions about those forums and (iv) discuss what changes can be made in future studies to foster student questioning online.

2. Important features of online forums to foster student questioning

Large format classes, such as first year broad foundations courses, are not ideal learning environments and can create obstacles to students' intention to ask questions. In these types of classes, student-generated questions are

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often rare and they frequently come from a minority of the students (Colbert, Olson & Clough, 2007). Online technologies can be used to engage students and to provide a safe place where students can pose their questions and clarify their doubts (Colbert, Olson & Clough, 2007). However, as highlighted by Lonn, Teasle and Krumm (2011), the integration of tools themselves does not determine whether learning happens or not. So, an effort must be made to take advantage of, and reinvent, the use of such tools to optimize the learning opportunities of students.

Colbert *et al.* (2007) have verified that providing an online forum in which students were encouraged to ask questions about course content, although time-consuming, was helpful in promoting the learning of the material and students readily participated in it. Besides, tools that enable asynchronous communication, such as forums, can promote students' reflection as they can take the time they need to adequately formulate their doubts. This time for reflection is a key feature that should lie behind every posed question. Therefore, for this study we have decided to focus only on online forums.

Before designing, implementing and facilitating an online discussion forum, key success factors of online forums addressed in the literature were identified. From that analysis emerged essential aspects to consider when designing a course to be mediated through an online forum. Those aspects will be henceforward described.

As a starting point, an **effective interface design** is a crucial tool for the optimal use of discussion forums in online learning (Nor, Hamat & Embi, 2012). Being effective depends a lot on the circumstances, on the purposes for using the discussion forum and on the use that is made.

The **nature of the task** set by a teacher in an online forum is another aspect to have in mind, as it could be a possible factor that leads to different questioning behaviors among students. In fact, as the nature of the task becomes more open-ended and demands more justification, it affords more space for students to engage in a wider range of questioning behaviors (Tan & Seah, 2011).

Online facilitators, such as teachers, should be aware that **misunderstandings** are more frequent in online communication, mostly on that that is established in online tools that don't include video interactions, such as forums. This is due to the fact that these tools do not reveal non-verbal interaction, gestures or facial expressions. As each student may interpret the requirements differently, it is important to clarify any lack of face-to-face interaction and define the objectives of each task as clearly as possible (Calongne, 2002).

Compared to discussions in class, asynchronous online discussions usually require a **longer time frame** to process because participants need more time to read and reflect, prepare responses and type in the responses in written texts (Wang & Woo, 2007). However, this need for more time, shouldn't be seen and an inconvenience, but rather as an **opportunity**. By having more time to reflect on the matter before exposing their doubts, the questions that students pose are more likely to be of a higher cognitive level than those that they pose impulsively as a short-sighted reaction of what they have just heard and without having proper time for thorough reflection.

Despite that online forums do not require attendees to be present, learners and facilitators are required to review the discussions and respond to them in a timely fashion (Calongne, 2002). Students want answers from the teacher as soon as possible (Calongne, 2002), so **short time** for response is an aspect to take into consideration. As teachers are unlikely to be able to pay attention to the online forum all the time, the chosen system should provide **automatic notifications** to catch the teacher's attention (Lin, Hsieh, Chuang, 2009). The Moodle meets this requirement.

An obvious feature that was emphasized by Colbert *et al.* (2007) was that it is absolutely necessary to **answer all the questions** that students pose online. That is very respectful to students and they feel that any questions that they may pose will be answered, which gives students' an incentive to keep on asking through the discussion forums and, thus, makes the time the teachers devote to answer students' questions worthwhile.

The facilitator **must monitor the discussion forum from time to time** in order to maintain the quality of the discussion (Lin *et al.,* 2009). Still, whether the instructor should be more active and assume a visible part in the forum discussions to increase student involvement and participation in the course, or if he/she doesn't need to respond to every student post but instead should determine the appropriate time to jump in, make a comment, ask another question, or redirect the discussion is debatable (Mazzolini & Maddison, 2007).

Being aware that students rarely ask questions related to course content in large-format classes, **incentives must be given to encourage student-generated questions.** Colbert *et al.* (2007) investigated the use of an online discussion forum as a mechanism to encourage students' questions in an introductory biology course and they

attributed an extra credit as an incentive, for those students who used the online forum to pose at least 4 or 5 meaningful questions during each semester.

3. Online forums to foster the questioning of 1st year undergraduates

3.1. Setting The Scene: The 1st Year Chemistry Courses

The two forums were designed to be used by a class of 1st year students at the University of Aveiro (Portugal) and were both implemented throughout two semesters. During the 1st semester students attended the course Elements of Physical Chemistry (EPC) and in the second General Chemistry (GC). Each of these two courses combined traditional classes (lectures, laboratory classes and tutorials) and online interactions enabled by Moodle.

3.2. Implemented online forums

The two online forums that were implemented were *'Questions and answers in Chemistry'* and *'Brainteasers'*. *'Questions and answers in Chemistry'* online forum was created having in mind the encouragement and facilitation of students' questioning. Students could use it to ask questions related to the topics taught during lectures and/or practical laboratory sessions. Questions related to everyday phenomena with a chemical background were also welcomed. All questions and answers were made available online to all the students enrolled in both courses. The *'Brainteasers'* online forum was planned to encourage students to ask questions and suggest possible explanations for specific phenomena. All these phenomena were problem-based cases, designated by brainteasers or challenges, and were based on real life situations with a social, ecological or technological impact in society.

4. Students perceptions about the effectiveness of the forums to foster their questioning

Despite that students voice is noticeably often absent from the majority of academic research and practice (McMahon & Zyngier, 2009), paying attention to, and understanding, students' perceptions about pedagogical approaches are vital to improve the forthcoming researches.

Table 1. Students' common opinions concerning the effectiveness of the forums

Common opinions	Excerpts of students references during the interviews and focus groups
Time for response in classes was faster to get an answer than through the forums	*I think it is easier to pose our questions orally in class, to get an answer immediately, and the issue be solved straight away.*
Receiving an answer orally gives students the possibility to clarify any aspect, which isn't clear at first	*I prefer to get an answer orally, than written on the Moodle, because orally it is more personal. It is easier to understand, if another question emerges immediately after getting a response. It is easier to clarify us.*
Rejection of visibility before the class	*I think that students are influenced by the fact that whatever is written on Moodle is sent to everyone's e-mail. (...) I prefer to send an e-mail directly to the teacher. Maybe there is that unconscious notion of the group's opinion.*
Receiving regular e-mails with every new interaction on Moodle keep students alert	*I would regularly read what appeared in my e-mail account, but I didn't visit the Moodle.* *I was forced to follow the challenges that were being inserted on the Moodle's forum, because they were immediately sent to my e-mail.*
Lacking technical skills to interact with Moodle was rejected by most students	*It is a platform very easy to accede, easy to understand how it works and I believe it had many advantages, such as enabling question posing, download of materials (...)*
If the Moodle was used to post regular activities, students would use it regularly and interact more	*I haven't visited the EPC Moodle as many times as I did for other courses, because other courses have all the material on Moodle. (...) Regarding GC and EPC, the material that we need is included in the book and in the guidebook* [delivered to students in printed format at the beginning of the semester].
Moodle is an advantage for students to get a succinct answer	*On Moodle the answers we get are perhaps more succinct than those we get orally in class, because the answers in class (...) usually include a lot of information and we end up loosing the content of the question that had been initially asked.*
Online participation not being considered for assessment	*If it* [participation on Moodle] *was considered for evaluation (...), the number of questions would increase dramatically.*

Research findings highlight that it is important to involve students in their own learning and give them freedom to express the motivating factors for their learning (Fielding, 2001). For this study we have considered the perspectives of four students about the discussion forums implemented on Moodle, which arouse from interviews and focus groups conducted with students.

As not all the students equally embraced the same questioning strategies we conducted interviews and focus groups with four of the students enrolled in both courses. Regarding selection criteria, as the interviews were conducted during the 2nd semester, we selected students according to their grades during the 1st semester – we chose those with better grades. Additionally, we selected only those that had attended the first class, during which the benefits of questioning were thoroughly presented to students. Gender balance was also considered. Of this selection resulted 2 of the most successful male students and 2 of the most successful female students.

From the students feedback emerged 8 common opinions systematized on Table 1. Each of these aspects is exemplified with quotations from the interviews and focus groups and further discussed.

5. Discussion

If we judge the effectiveness of the online discussion forums by the number of questions posed by students, we can consider that the forums were flawed. Students didn't ask many questions during lectures and asked even fewer through the forums. As a result emerges that the way the two forums were designed and implemented needs to be improved to effectively foster student questioning. Students' perceptions and suggestions were found to be very pertinent and arose some ideas for improvements that are very likely to be taken into consideration in future studies.

In what concerns **time for response**, we believe that this aspect could be, to a certain extent, overcome, if there was at least one teacher permanently online to answer students as fast as possible. By realizing that teachers had a more permanent participation on the forums, students would more promptly notice its usefulness. Obviously this would result in an increasing demand of teachers' dedication time for each course, not easy to accomplish.

The way the forums were implemented didn't allow the possibility to **clarify immediately any aspect** of the teachers' answer, which wasn't clear at first. On the contrary, receiving an oral answer allowed further questioning. Sometimes an answer given by the teacher may not be enough to clarify a students' original question and can result in a series of subsequent questions. Having a teacher permanently online could also help overcoming this issue.

Concerning the **rejection of visibility before the class**, when students posted a question all those enrolled in the course would receive an e-mail with the corresponding question and author. In fact, as previously noticed by Yu & Liu (2009), it is important to create a psychologically safe online learning space for learners engaged in question-posing related activities. Considering the students' rejection of visibility before the class, we may conclude that as students' had their identity revealed, they interpreted the Moodle as a psychologically unsafe environment. The stimulus for the raise of constructive discussions among students on the contents of the course was one of the objectives that we initially aspired for when we implemented the forums. So, it was extremely important that students could see each other's posts, to be able to interact with each other online. In an attempt to overcome these psychological constrain, we considered the possibility of making students identity visible to the teachers and researchers, but invisible to their peers, maintaining the posed questions visible to all. However, the technical department of the university guaranteed that it was an impossible customization to make on the forums on Moodle.

Receiving regular e-mails with every new interaction on Moodle kept students alert to each other's comments and many relied only on those notifications of interactions that were sent to their e-mail accounts every time anyone posted anything on the forums. This e-mail notification is a customization to uphold in further studies.

Not surprisingly, **lacking technical skills** wasn't a problem for most students. But still, an explanation of the Moodle presented to students on the first lecture is to keep, as there was still one less digitally literate student who admitted during the interview having had trouble dealing with Moodle.

Another common aspect mentioned was that if the **Moodle was used to post regular activities**, such as exercises, class presentations, assignments or evaluation grids, students would be forced to visit it regularly and consequently ended up interacting more in each task, and ultimately would interact more on the forums and pose more questions. We recognize and have verified that we need to incite more students' involvement to foster their

participation on Moodle. Despite that the content of the guidebook should certainly be made available, the means by which it is delivered can be modified. If students use more the forums to ask questions when they have to download materials throughout the semester, teachers can reformulate the way they deliver information and post it online.

Regarding the impression that the Moodle is an **advantageous tool for students to get a succinct answer**, if all students perceive the effectiveness of the forums to get a well-organized, accurate and succinct written answer for their questions, in such a quick manner and without having to cross-check data from other resources, they would consider its usefulness and would thus start using it more often. Therefore, for further studies we consider that it would be extremely important to highlight it in the first class.

Observing **online participation not being considered for assessment**, Colbert *et al.* (2007) have encouraged student-generated questions by offering students a small amount of "extra credit" of their final course grade. Before implementing the two forums we also considered it. However, we expected that such an incentive would result in a high number of very low cognitive level questions. For this study, we were not only interested in increasing the number of questions posed by students, but we were also looking for an increase in the cognitive level of every raised question. We, thus, recommend for further studies that if students' questions posted on the forums are going to be considered for assessment purposes, attention must be paid to the selection criteria of the relevant questions.

We are just taking the first steps to foster student questioning in asynchronous learning environments. Students are not accustomed to pose questions to teachers through online forums and they are still situating themselves. They shouldn't be as informal as they usually are in common online forums, but they should be confident enough to pose any question that occurs to them. Educators, on their turn, also need to reformulate their practices and teaching strategies for them to fit into any of the uncountable emerging new technologies.

Acknowledgements

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