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The role of the e-tutor in synchronous online problem-based learning: A study in a Master Public Health Programme

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Abstract

The aim of this study is to compare the role of the tutor in an online and a face-to-face problem-based learning (PBL) session to shed light on potential differences of the tutor role in both settings. In this practice-based study we compared the two groups with the same tutor undertaking the same module. Students completed questionnaires about tutor performance, student characteristics and the module. Marks on the end-of-module test were analysed. The tutor was interviewed about his expectations and experiences. One session of each group was recorded and analysed qualitatively. Results show tutor tasks appeared to be comparable in both settings with regard to "content and pedagogical content knowledge," "group dynamics," "process instruction" and "intermediary between faculty and students." The face-to-face group rated tutor performance lower than the online students. Students and tutor identified the absence of nonverbal cues as a limitation of online PBL. In online sessions the tutor additionally provided technical support and moderated the chat box. It is recommended to involve an extra person in online sessions who is responsible for technical issues. This person could also check the chat box for messages of students. Future research should focus on the necessity of an extra tutor training for online sessions.

Introduction

Problem-based learning (PBL) was developed for and is traditionally used in face-to-face settings, but demand for online PBL courses increases, with growing numbers of students requesting distance education to pursue higher degrees whilst working (Verstegen *et al.*, 2016). In recent years, the literatures available on blended learning and PBL in higher education has increased substantially (Donnelly, 2013). Improving education and practical reasons, such as joining working professionals, are reasons to implement blended learning (defined "*as a combination of face-to-face and online learning*" p. 59) (Spanjers *et al.*, 2015). Maastricht University has been actively exploring distance-based PBL groups for PBL-based master programmes to attract (international) students. It allows students from different institutions as well as countries to learn together (Verstegen *et al.*, 2016). De Jong and Verstegen (2009) found in their study the quality of the

Practitioner Notes

What is already known about this topic

- Demand for problem-based learning (PBL) courses is increasing, with growing numbers of students requesting distance education to pursue higher degrees whilst working.
- Online PBL facilitates learning on a global scale to promote not only the acquisition of knowledge and communication in English, but also understanding of the social and cultural traditions of different countries.
- Tutors in PBL have an active role in guiding students to develop frameworks for the construction of knowledge.

What this paper adds

- Tutor activities in face-to-face and online settings proved to be comparable.
- There appeared to be two extra tutor tasks in synchronous online PBL: technical support task and the chatting task.
- Discussions in face-to-face and online settings were equally successful.

Implications for practice and/or policy

- The technical support tasks that increased the burden of the online tutor might be transferred to a help desk.
- It seems safe to assume that online tutoring of PBL sessions is in good hands with a tutor who is competent to successfully perform the regular PBL tasks.
- The 'chatting' task of the online tutor adds value to group interaction/learning.

discussions can be equally good in synchronous online PBL sessions compared to face-to-face PBL sessions.

Teachers perform various roles in PBL. Facilitator of learning is one of these roles, which seems to have the highest importance. Tutors guide students to collaborate as a team, but observe students also in action during individual learning. Apart from observing tutors can intervene. They facilitate learning by asking questions and giving feedback. The role of the tutor is important (Moust, 2010).

The aim of this study is to compare the role of the tutor in a synchronous online and a face-to-face PBL session to shed light on potential differences of the tutor role in both settings.

The paper structure is as follows: firstly, we introduce traditional PBL at Maastricht University and its characteristics after which we continue with an exploration of online PBL. Secondly, we explore the role of the tutor in PBL. This is followed by the methodology and a discussion of the results from quantitative and qualitative data. Conclusions and recommendations on the role of the tutor conclude the paper.

Context and rationale
PBL at Maastricht University
In traditional face-to-face PBL at Maastricht University, small groups of 10–12 students facilitated by a tutor work on tasks (problems) using an approach comprising a fixed sequence of seven steps spread over three phases: (1) the preliminary group discussion of the task; (2) individual self-study; and (3) reporting and discussing the results of the self-study in the group. The first phase covers the first five steps: (1) identifying and clarifying relevant concepts, (2) defining the

problem, (3) brainstorming, (4) problem analysis/systematic classification, and (5) formulating learning objectives for self-study. Steps 6 and 7 are concerned with individual self-study to pursue learning objectives by consulting different sources and the subsequent group discussion of the resulting findings. Group sessions are facilitated by a tutor. One student is discussion leader and another student takes notes that are visible to the other group members. The tutor supervises the group process in which students exchange knowledge, ideas, thoughts and views concerning the task(s) (Van Til & Van der Heijden, 2009).

Exploration online PBL

Communication between students at dispersed locations is seen as an advantage of online PBL. Numerous other advantages of online PBL can be reported, including facilitating multidisciplinary learning to nurture a spirit of teamwork and mutual understanding of the roles of different professionals (Ng, Bridges, Po Law, & Whitehill, 2014). Disadvantages of online learning, such as social isolation and technical problems, have been identified as well (Cook, 2007). In a recent literature review Verstegen *et al.* (2016) concluded e-learning (includes a range of technological tools and facilities) is used to support PBL with different goals, which are: to improve student learning, enable PBL in distance learning or for research purposes. Online use of PBL can be guided and informed by different approaches to face-to-face PBL, although it cannot be presumed that PBL approaches will work in exactly the same way when delivered through different media (Savin-Baden, 2007). The form of discussion is changed when using asynchronous tools, such as discussion boards or wikis, for discussions in online PBL groups (Verstegen *et al.*, 2016). Donnelly (2013) studied the role of the tutor in a blend of face-to-face and online environments. Transcripts of online discussion boards were studied. One of the findings was "*the PBL tutor needs to be didactic and specific to overcome any ambiguity or misunderstanding*" (p. 138). The online discussion boards encouraged critical thinking and contribute to the understanding of students. De Jong and Verstegen (2009) stated that with reliable synchronous communication tools online PBL sessions could be very similar to face-to-face PBL sessions. Virtual classroom was used for synchronous discussions in online PBL groups. The role of the tutor in synchronous online PBL groups is not explicitly studied.

The role of the tutor

Moust (2010) listed as the main aims of PBL: (1) the acquisition of knowledge and insights by students concerning the domains in their field of study; (2) efficient and effective collaboration among students; and (3) the development of students as self-directed learners (Figure 1). Tutors are expected to facilitate the achievement of these aims, which gives them an important and active role in guiding students to develop frameworks for the construction of knowledge. It is important for tutors to be able to facilitate the learning process (Chng, Yew, & Schmidt, 2011; Moust, 2010). In order to fulfil these aims tutors need to be equipped with knowledge and skills to coach the group process (ie, group dynamics), the learning process (ie, process instruction) and support acquisition of the course content (ie, pedagogical and content knowledge; Moust, 2010). For effective tutoring, the tutor needs "*general pedagogical knowledge*" (see Figure 1), which refers to understanding of the main teaching and learning processes that are to be promoted in a PBL environment.

Content-specific instruction, labelled "*pedagogical & content knowledge*" in Figure 1, relates to the comprehensibility of the subject matter to students. The tutor also needs to know about "*group dynamics*" to foster a "*collaborative learning*" climate. In PBL, students are expected to regulate their own learning process, which requires planning, monitoring and evaluating (*self-directed learning*). Tutor interventions to help students become self-directed learners are included as "*process instruction*" in Figure 1. Although it is not included in Figure 1, another important tutor
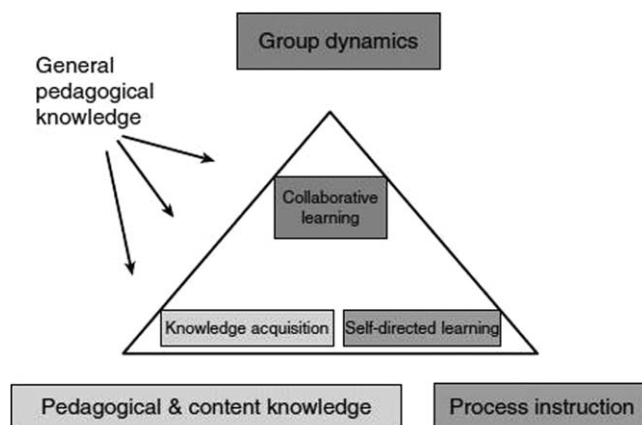
Figure 1: The tutor and the tutorial group (Moust, 2010, p. 48)

role is that of *intermediary between students and staff* (eg, the module coordinator). Table 1 presents the specific tasks of the tutor related to the concepts in Table 1.

Given the scarcity of published research on how delivery methods of synchronous online PBL impact on the role of the tutor, we compared the role of the tutor in a synchronous online setting and a conventional face-to-face setup. We sought answers to the following research questions:

Which of the roles in Table 1 does the tutor fulfil in synchronous online PBL sessions?
To what extent do the tutor roles in synchronous online PBL differ from the tutor role in face-to-face PBL?

Method
The programme and the module
The tutor role was studied during the 8-week Quality and Professionalism module (5 ECTS) of the Master of Public Health programme on Health Services Innovation (HSI) at Maastricht University. The programme is taught in English and aims to equip health professionals with knowledge and skills to meet the challenges of innovation in health care. The programme is offered as a full-time one-year programme and as a 2-year part-time programme. The module consists of five PBL tasks, to be tackled in five group sessions and five self-study periods.

Research design
The study we conducted can be conceptualised as a practice-based comparative study of the role of the tutor in face-to-face and online PBL. The researchers actively introduced synchronous online PBL sessions and the study was conducted in a real-life setting in which multiple complex variables were interacting. In many ways, the two conditions were similar (the seven steps of the PBL approach and the size of the groups). However, we did not aim to control all the variables or to test specific hypotheses. We collected and analysed qualitative and quantitative data to explore the different roles of a tutor as defined by Moust (2010).

Participants
Students
Two groups of students participated in the study voluntarily. One group attended face-to-face sessions and the other group online sessions. The full-time students in the face-to-face group were

<div align="center">*Table 1: An overview of the tasks of a tutor in a problem-based context*</div>

A. A tutor plays an active and stimulating role in a tutorial group with respect to students' learning processes (Triangle point: content and pedagogical-content knowledge).

To this end a tutor:

1. Prepares thoroughly before and during a unit;
2. Establishes, in dialogue with the group members, a code of conduct to support a constructive learning environment;
3. Facilitates students' knowledge construction process by "reading" students' prior knowledge base;
4. Listens actively to students' contributions with regard to both content and intentions;
5. Stimulates students to formulate in-depth ideas on the subject matter under discussion;
6. Helps students to organise the subject matter in meaningful structures;
7. Diagnoses the intellectual processes going on within and between students;
8. Stimulates students to reflect on what they bring up for discussion;
9. Keeps himself informed of students' opinions concerning the group proceedings; and
10. Prevents himself from dominating the discussion.

B. A tutor plays an active and stimulating role with respect to students' collaborative activities (Triangle point: group dynamics).

To this end a tutor:

1. Ensures that arrangements are made for working procedures, participation, group roles, etc., sees to it that group members act accordingly;
2. Improves the way students chair the tutorial group;
3. Tries to anticipate problematic behaviour of group members and helps them to resolve problems;
4. Evaluates group members' perceptions of the collaborative process and offers alternatives to improve collaboration; and
5. Provides feedback on the behaviour of group member.

C. A tutor plays an active and facilitating role with respect to students' self-directed learning (Triangle point: process instruction).

To this end a tutor:

1. Helps students to reflect about their knowledge acquisition during tutorial group sessions. By offering students feedback about the way they discuss subject matter, eg, how they structure, relate, apply and concretise subject matter, the tutor can make students aware of how they are learning in a collaborative setting;
2. Pays attention to the way students study outside tutorial group sessions. Tutors may bring up topics like planning, preparation for tests and reflection on strengths and weaknesses in relation to independent learning;

D. A tutor serves as an intermediary between the faculty and the students.

To this end a tutor:

1. Assists students in consulting experts as learning resources;
2. Attends tutor meetings during the unit to remain well informed about the intentions of the planning group, the problems and progress of fellow tutors and last-minute changes to the unit; and
3. Provides feedback to the members of the planning group regarding the quality of the unit book and the assignments.

Source: Moust (2010, pp. 49–50).

randomly recruited to participate in the study. Having earned a bachelor's degree from Maastricht University. The participants in the online group had bachelor's degrees from Maastricht University or other universities and were in the first or second year of the part-time master programme. These students chose especially for this online programme. Based on previous experiences with online PBL (De Jong & Verstegen, 2009), we aimed to compose an online group of seven students and a face-to-face group of the same size, although the normal size of face-to-face groups is ten to twelve students at Maastricht University.
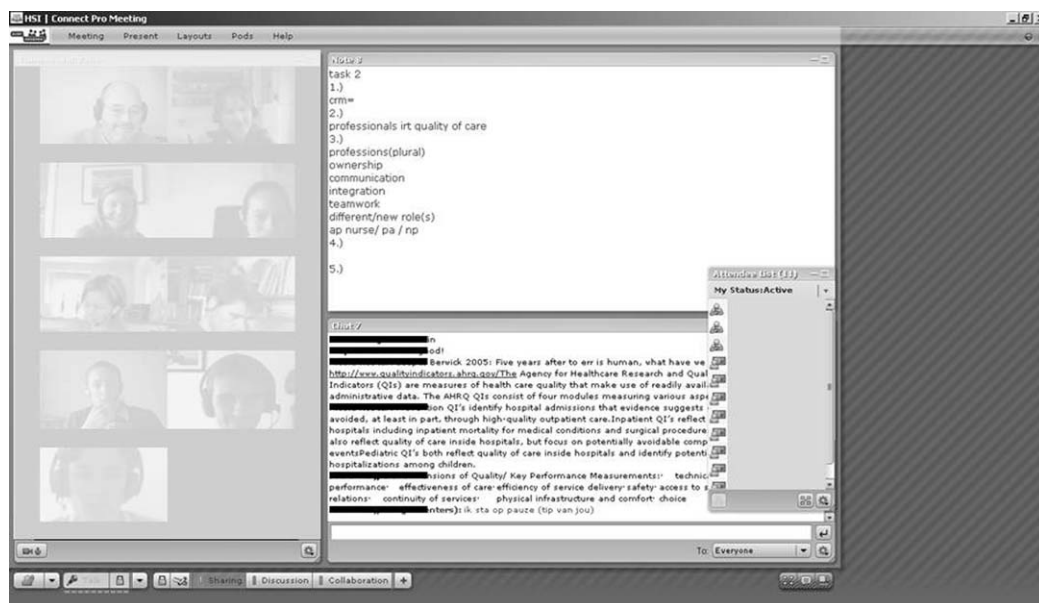
Figure 2: Preliminary discussion of a synchronous online PBL tutorial group meeting

Tutor

Both groups had the same tutor, who was an experienced PBL tutor with knowledge of the subject matter of the module and a native English speaker.

Procedure

The face-to-face group met in five weekly sessions during the module and worked according to the PBL approach described earlier. The online group started the module with a face-to-face meeting, including a social event (dinner) to allow the students to get to know one another. Also the rules for online PBL were explained and students could practise the use of the technical equipment. The remaining four sessions were conducted online, according to the usual PBL approach. For the online sessions a web conferencing tool was used (Figure 2).

Data collection

Data were collected at different points in time (Table S1).

Baseline questionnaire on student characteristics (T1)

This questionnaire was specially developed for the study and contained items about demographics. Items of students' baseline experience with PBL, level of proficiency in English and discussion skills were rated on a 5-point Likert scale with space for comments. An open question about the reason for attending the course was also included. The questionnaire was administered at the start of the first group session.

Final questionnaire on course content and setting (T2)

After the last session of the module, students were given a questionnaire containing items with 5-point Likert scales on the content of the module (five items), the technical equipment (seven items, for the online group) and open questions about the online discussions (online group).

Tutor intervention profile (T2)

The tutor intervention profile (TIP) is a validated and reliable instrument developed by De Grave, Dolmans, and Van der Vleuten (1999) to provide specific feedback to tutors. It was used to

explore different profiles of tutor interventions during the preliminary discussion and the reporting phase and was completed by the students after the last session of the module. The TIP contains 41 statements describing tutor interventions to be rated on a 5-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*) in relation to both the actual and the desired situation. The TIP items cover four dimensions: Stimulating elaboration; directing the learning process; stimulating integration of knowledge; and stimulating interaction and individual accountability. Based on the dimension scores a tutor profile is established. Each dimension can be classified as low (mean = 1–1.7), average (mean = 1.7–3.3) or high (mean = 3.3–5). The different dimensions form a profile: From a poor tutor to an excellent tutor (De Grave, Dolmans, & Van der Vleuten, 1999).

Module test marks
The end-of-module test in week 6 of the module consisted of four open-ended questions. The test marks of all the students in the two groups were compared.

Tutor interview
Before the start of the module and after the final session, the tutor took part in a semi-structured interview. The first interview was concerned with the tutor's background and expectations and the second interview with the tutor's experiences and opinions regarding the module, the PBL process and the discussions in the face-to-face and online groups.

Video recording of group sessions
The complete face-to-face and online sessions in week 3 of the module were videotaped. Week 3 was chosen because it was assumed that by that time students and tutor had become used to one another.

Data analysis
For the quantitative data, frequencies, means and standard deviations were calculated. The tutor interviews were analysed using narrative analysis to facilitate the telling of the tutor's stories and experiences related to the online and face-to-face PBL variants.

The videos of the face-to-face and online group sessions were analysed by two researchers (NdJ and DV). The principal researcher (NdJ) transcribed the utterances of the tutor and, in order to facilitate the interpretation of the role of the tutor, the utterances of the discussion leaders were transcribed as well. The number, duration and type of task of the tutor's audio and chat contributions were determined. Both researchers (NdJ and DV) coded the videos using Table 1 as the coding scheme. Each number represents a code within one of the four main concepts: content and pedagogical-content knowledge; group dynamics; process instruction; and intermediary between staff and students (Table 1). The researchers first conducted a coding trial using a video of an online PBL session not related to the study (trial phase). The results were discussed before the researchers independently coded the study videos. Differences in coding were discussed until agreement was reached. In this way, each action of the tutor was labelled using the coding scheme.

Results
Student participation in measurements and presence at video recordings
The face-to-face group started with seven students, but before the third session, one student had dropped out and one student had switched to another course. As this occurred after the second group session, these students were not replaced. Of the eight students of the online group, one was not present at the session that was recorded.

Student characteristics
The students in the face-to-face group were all female. The online group consisted of four female and four male students. Except for one male student located in Ukraine, the group members were located at different places in the Netherlands. The mean age was 31.4 years (range: 25–42; $SD = 5.9$) in the online group and 21.8 years (range: 21–23; $SD = 0.8$) in the face-to-face group. All students in the online group had a job in health care (seven currently working and one on maternity leave; mean = 29 hours a week; $SD = 8.9$ hours). They had worked in health care for an average number of 7.4 years ($SD = 4.4$ years). In the face-to-face group two students had work experience in health care (1 and 2 years respectively). With respect to motivation for doing the programme, the online group cited improvement of work practice and/or career opportunities, while the students in the face-to-face group, who had just recently earned their bachelor's degree, gave more general reasons, such as "interesting," "the study topic is important" and "a good step for the future." The students in both groups rated their English language proficiency as average or good. Nearly all online students (88%) were familiar with the Maastricht PBL approach. Four of the students were second-year online students. Of the eight online students, two had selected the course because it offered blended learning. Students rated their computer skills as average to excellent. Students had had experience with a web conferencing tool (five students).

Characteristics of the tutor and the tutor's expectations for the online group
The tutor was male, aged 47 years, and a native speaker of English. He was a full-time assistant professor at Maastricht University and had tutored PBL courses in similar fields in the UK. This was the first time he facilitated online PBL sessions. He expected the PBL concept to work well online, but was somewhat worried about technical problems. He also thought it might be difficult to prevent distractions in the online group, but expected the discussions to be easier to manage as turn taking would be easier. He expected no major effects on the role of the tutor compared to face-to-face PBL.

Results for the module and the technical equipment
Compared to the online group, students in the face-to-face group appeared to be less interested in the subject matter, and they scored lower on the other evaluation items about the module as well (Table 2). In response to the open questions, the face-to-face group commented that the problems/tasks were not clear and not stimulating and the required readings too extensive.

Online students were satisfied with the sound quality of the web conferencing tool. Technical support was rated as 3.5 (mean) or higher (1 = very poor to 5 = excellent). In response to open questions, the online students commented that during sessions nonverbal expressions were not visible in spite of using webcams, and that it was virtually impossible to make a spontaneous

Table 2: Results of the evaluation of the module on 5-point scale

	Face-to-face group (n = 5)	*Online group* (n = 8)
	Mean	Mean
The content of the module was interesting	3.2	4.3
The problems in the task were relevant	3.4	3.8
The literature was interesting	2.2	4.1
The quality of the module was good	2.6	3.8

1 = fully agree; 5 = fully disagree.

remark, because it would interrupt the discussion. Nevertheless, the students thought the face-to-face discussions did not differ in quality from the online discussions.

The average mark on the module test was 6.8 in the face-to-face group ($n = 5$; min–max: 6.0–7.3) and 6.8 in the online group ($n = 7$; min–max: 4.3–8.0). One student in the online group failed the test.

Student perspective on tutor performance: TIP
The students in the face-to-face group rated the actual tutor interventions as moderate. The resulting tutor profile (from poor tutor to an excellent tutor) was that of an "*average tutor*" (De Grave, Dolmans, & Van der Vleuten, 1999), meaning that the score of each dimension was average.

Online students rated the tutor high on: stimulating elaboration; directing the learning process; and stimulating integration of knowledge. The dimension "stimulating interaction and individual accountability" was assessed as average. (De Grave, Dolmans, & Van der Vleuten, 1999). The profile resulting from the ratings of actual tutor performance by the online students was categorised as "*all other tutors*" (De Grave, Dolmans, & Van der Vleuten, 1999). The profile could not be categorised into one of the categories (from poor tutor to an excellent tutor). The tutor adopted more than one profile.

The experiences of the tutor
Despite being new to the online format, the tutor had no difficulty facilitating the online sessions using the technical equipment provided. He indicated that student behaviour was similar in both formats. The main difference, according to the tutor, was the double task of tutoring and managing the technical equipment, which he found to be tiring. He thought he would not be able to handle more than eight students in an online setting. When technical problems occurred, he was often chatting or e-mailing with the student in question and could consequently pay less attention to the rest of the group. Nevertheless, he thought technical problems did not have substantial detrimental effects on the quality of the discussions. The tutor said it was difficult to discern on the screen who was speaking, and it took time before he was able to recognise the students' voices. As a result, the tasks of observing, analysing and stimulating students were more difficult initially.

The tutor also mentioned differences between the groups that were not specifically related to the educational format. The face-to-face group was mostly focused on passing the module, while the online group was motivated to improve their practice. The tutor enjoyed working with the latter group more, because the students were more active and motivated. He said: "*I felt I knew them (online group) a lot better; there was more cognitive presence and more unity in this group.*" A feature that occurred mainly in the face-to-face group was that students were not very good at challenging each other and the discussion leaders had difficulty eliciting knowledge from the group. In the online group, one student made few spoken contributions, but uploaded information to the pod. The tutor thought this reflected an advantage of the online set-up: "*it accommodates for students that are not so vocal; they can participate in different ways.*"

Video analysis
Trial phase of the video analysis
In the trial phase, the coding scheme was tested and some additions were made. The researchers resolved difficulties in coding content-related remarks by the tutor (eg, explanation or summary) by deciding to use code A6, arguing that the tutor was helping students to understand the subject matter. The researchers had difficulty distinguishing between codes A5 and A7, because it was hard to determine what the tutor was thinking and it was often unknown why the tutor made a

certain remark. To address this problem the two codes were merged into one code (called code A57) (Table 1). The code (A8) "*Stimulates students to reflect on what they bring up for discussion*" was extended with "*Activates students with an in-depth discussion.*" Examples were added to clarify the coding scheme.

As the researchers found that certain tasks, such as answering a language-related question, were difficult to code, the option "other" was added to each domain. Moreover, the coding scheme for the online group was extended by adding a technical option (E1: tutor helps students with technical issues) and a chat option (E2: tutor is able to contribute via chat messages) in a new domain E.

Results of the video analysis: seven steps
The total duration of the steps was comparable for both formats, 01:41:44 in the face-to-face group and 01:51:05 in the online group. The number of tutor utterances in the face-to-face group was 130 and in the online group it was 102. The majority (85% in the face-to-face group and 65% in the online group) related to step 7. The online group spent more time brainstorming (14:46 vs. 6:34) but less time formulating learning objectives (6:17 vs. 9:25). The duration of the other steps showed no substantial differences.

In the online condition the tutor posted a total of 12 chat messages (12% of the total of 102 tutor contributions). Eight messages concerned technical issues and four were content-related.

In Table S2 detailed information can be found.

Results of the video analysis: per domain (Table 1)
Most of the tutor's contributions were in domain A "*content and pedagogical knowledge,*" with the tutor asking students for their opinions ("*What do you think?*") and explaining content using examples like "*In the UK it is a statutory requirement that every hospital and every health organization such as a primary care trust has to have a patient service user group. . . .*" In the face-to-face group interventions in domain A accounted for 12.3 minutes (89%) of total tutor speaking time (excluding start talk and breaks); and in the online group this was 7.9 minutes (83%).

Before and after the seven-step approach the tutor spent about 2 minutes on "*group dynamics*" (domain B) in both groups, with remarks "*Who will be the note keeper?*" or "*I won't be here next week, because I have to be in two different conferences. . . .*"

"*Process instruction*" (domain C) took little over 1 minute with the remark (in both groups): "*We will come to that later, I think, when we look at professionalism.*" In the face-to-face group the tutor made one remark in domain D "*intermediary between faculty and students*" by referring to the tutor who had replaced him in a previous session.

Results of the video analysis: seven-step approach and domain
Most codes for step 7 were similar in both groups, except for codes A57 and A6 (Table 1), which lasted longer in the face-to-face group (A57: 2 minutes and A6: 8.5 minutes) compared to the online group (A57: 0.7 minutes and A6: 5.4 minutes).

Discussion
As research on the tutor role in synchronous online PBL sessions is sparse, we investigated the following research questions: (1) "*Which of the roles do the tutor fulfil in synchronous online PBL sessions?,*" and (2) "*To what extent do the tutor roles in synchronous online PBL differ from the tutor role in face-to-face PBL?.*" We investigated one face-to-face group and one online group in the same course.

Regarding the first research question about the tutor role in synchronous online PBL, we used the four-domain categorisation of tutor tasks proposed by Moust (2010): (A) "content and

pedagogical-content knowledge," (B) "group dynamics," (C) "process instruction," and (D) "intermediary between faculty and students." Most of the tutor's utterances were in domain A, while the number of utterances in the other domains was negligible. Apparently, students were quite familiar with the PBL process or there was no cause for utterances in these domains. Being online rather than in the same room did not seem to affect group dynamics, and there was apparently no need for the tutor to play a facilitating role with respect to students' self-directed learning (domain C).

There appeared to be two extra tutor tasks in synchronous online PBL: First, a technical support was an extra task for the tutor in the online sessions, because it was found that the tutor had to concentrate on content as well as technical issues. Kear, Chetwynd, Williams, and Donelan (2012) also mentioned that tutors in an online setting had to deal with multiple tasks and technical obstacles in response to students' emerging needs (Kear *et al.*, 2012). The tutor found the double role tiring and reported that his attention was distracted from the discussion. It seems, therefore, advisable to have a technical helpdesk to solve technical problems during online sessions. Secondly, chatting is another additional task for the tutor in online sessions. The possibility of reading and posting chat messages during the group session was an extra task, but, the tutor did not perceive this as an interruption, but as an enrichment of the sharing of knowledge. The question is whether other tutors can manage these extra tasks. Goold, Coldwell, and Craig (2010) reported a need for guidance and training of novice e-tutors.

Regarding the second research question on differences in the tutor role in synchronous online versus face-to-face PBL, the results indicate that in the two conditions the role of the tutor was comparable on several aspects. The synchronous online group sessions were conducted in a similar way compared to the face-to-face sessions. Both groups used the seven-step PBL approach that is commonly used at Maastricht University. The only visible difference was the use of technical equipment. Differences were only identified relating to the additional roles of technical support and chatting for the online tutor. Apparently, the nonverbal communication did not interfere the role of the tutor. De Jong, Krumeich, and Verstegen (2016) found that in online sessions body language is limited and participants have to wait for their turn during discussions. Behaviour can be therefore more rigid.

The tutor interrupted the face-to-face group far more often than the online group. In both groups, the majority of the tutor's contributions occurred during the reporting phase, but in the face-to-face group the tutor stimulated the students more often and helped them more to organise subject matter. We have no definite explanation for this finding, but student motivation may have played a role. The online group was eager to improve their own work practice and/or career opportunities, whereas the face-to-face students were younger and less interested in module content or more easily satisfied with the answers of their fellow students. The fact that the students in the online group were more critical of one another's contributions may also be explained by their more extensive experience as health professionals. Their professional background could have given them a better understanding of the subject matter. A final reason could be group size, with two fewer students in the face-to-face group.

The online students spent more time brainstorming (step 3), probably because they knew more about the topic due to their more extensive experience. This may also explain why step 4 (systematic classification) lasted longer in this group. The online group took less time to formulate learning goals, perhaps because they had devoted more time to steps 3 and 4.

Students in the online group expressed greater satisfaction with their tutor. The tutor felt that he knew the online students better than the face-to-face students. It is unclear whether this influenced the perspective of the students. In the first week of the module the tutor and the online students met in a face-to-face session and had dinner together. This informal social event may

have had a positive effect on subsequent learning. Results in a study by Chng *et al.* (2011) suggested that the ability of tutors to communicate informally with students and hence create a less threatening learning environment has a great impact on learning.

There appeared to be no differences between the groups in the quality of group discussions. This finding is in line with earlier research, reporting that students and tutors reacted positively to opportunities for interactive learning and teaching provided by web conferencing (Kear *et al.*, 2012). Ng *et al.* (2014) tentatively concluded that the pedagogical effectiveness is not different between online and traditional PBL, which is in line with a recent meta-analysis showing that blended learning is equally attractive and somewhat more effective than traditional learning (Spanjers *et al.*, 2015).

Limitations of the study and future research

A possible limitation of the study is the size of the groups. In further studies of online tutoring in PBL, group size should be larger. The normal size of a face-to-face group is 10–12 students at Maastricht University. In the present study, we had only five students. The tutor noticed students were not very at challenging each other what might be caused by the size of the group and this could affect the role of the tutor. Both types of groups should consist of students with similar (demographic) characteristics. The one tutor who participated in the study had no prior experience with online tutoring. He had no difficulties in performing online which could be coincidence. Future research should include a representative group of tutors to be sure an extra tutor training is not necessary.

As we analysed only one session of each type of group, it should be noted that it is difficult to draw any firm conclusions with regard to the domains proposed by Moust (2010). It may also explain why there were hardly any scores in domains B, C and D. Further research should include a longer series of synchronous online PBL sessions.

Conclusion

This study shows that tutor activities in face-to-face and online settings proved to be comparable and discussions in both settings were equally successful. This implies that, with respect to task performance, online PBL tutors have to meet the same requirements as face-to-face tutors. The "chatting" task of the online tutor can be seen as an extra task, but it adds value to group interaction/learning. The chatting task and the technical support tasks that increased the burden of the online tutor might be transferred to a help desk. It seems safe to assume that online tutoring of PBL sessions is in good hands with a tutor who is competent to successfully perform the regular PBL tasks.

Statements on open data, ethics and conflict of interest

The research was carried out within the ethical guidelines of the Faculty of Health, Medicine and Life Sciences. Before the start of the study, written informed consent was obtained from all the students while the tutor gave oral consent. The privacy of the participants was protected. In the questionnaires students did not need to fill in their names which guarantee the anonymity. The researcher was not involved in the content of the module. It ensured that students could not be disadvantaged. Findings in the recordings and interviews were only discussed in the research team (the authors of the paper).

No conflict of interest is anticipated to arise in the research.

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