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ABSTRACT

PBL tutors in medical schools worldwide are a diverse population of faculty (subject-expertise, employment status and tutoring experience). Tutors often receive a common initial training program followed by structured support. This study aims to understand tutor motivation, challenges and support needed, the relationship between them, and whether a common training and support program is understood as effective. Tutor data (n =50) were analyzed based on age, gender, background, experience, employment status and campus location. The study revealed evidence that a challenge for tutors is what disrupts their motivation. Thus, a relevant support mechanism is needed to reestablish or maintain this motivation. Specifically, the motivator "interaction with students" correlated with challenges "management of group dynamics," "student adherence with PBL rules," and "professional behavior of students"; while motivator "educational value of PBL" correlated with "student adherence with PBL rules," "professional behavior of students," and "student information and expectations of PBL". Furthermore, tutors benefited from peer reviews and opportunities to provide feedback while their needs diverged in terms of content and assessment-related support, motivation and management of group dynamics. Thus, implementation of a framework for restructuring the tutor support system is necessary paving the way for an individualized support system.

Keywords: collaborative instruction, problem-based learning, PBL tutors, faculty training and development, tutor diversity

Introduction

Problem-based learning (PBL) curricula have flooded medical education as their value has increasingly been acknowledged (Fan et al., 2018). Key characteristics of the PBL process include the use of small groups and a PBL tutor or facilitator. Much discussion exists on the definition of an ideal tutor and opinions vary. The primary discussion orbits around two components: (1) content knowledge, which refers to the educational background or subject matter expertise of the tutor (i.e., specific knowledge relating to the topic taught); and (2) facilitation skills, which refers to the ability of the tutor to manage group dynamics effectively and use their social congruence. These characteristics enable tutors to be more supportive and empathetic, thus encouraging an open and positive learning environment in an informal manner (Schmidt & Moust, 1995; Watson et al., 2017). Furthermore, some researchers consider subject expertise to be an important contributor to PBL (Groves et al., 2005; Schmidt & Moust, 1995) while others argue that management of group dynamics is more important (Dolmans et al., 2001), and yet others argue that both are necessary (Groves et al., 2005). Other key skills and tutor characteristics include effective identification and use of questions planted as triggers for learning in cases to focus learning; the ability to promote collaborative construction of knowledge; the ability to motivate student learning; time-keeping; and the application of cognitive congruence strategies, thus effectively presenting to the students (Azer et al., 2013; Boelens et al., 2015; Hendry, 2009; McCrorie, 2010; Papinczak, 2012; Steinert et al., 2006; Watson et al., 2017; Williams et al., 2011). All of these skills are not necessarily innate, and tutors may require extensive initial and on-going training programs.

To add to the challenges of training programs to meet tutor needs, PBL tutors are often a diverse group of faculty in regard to content expertise (i.e., medical personnel or professionals from other disciplines, tutoring experience and employment status) (Finucane et al., 2001; Maudsley, 2002; McLean & Van Wyk, 2006; Salinitri et al., 2015; Van Wyk & McLean, 2007; Vogt et al., 2017). With internationalization of medical programs, an additional layer of complexity is added ensuring that there is congruence in delivery and quality of the curriculum. While medical schools have tried to train their own faculty to undertake this role, it is not uncommon to hire part-time faculty to ensure that a large pool of suitable tutors is available (Finucane et al., 2001; McLean & Van Wyk, 2006). This of course involves other concerns that relate to faculty commitment, reliability and effectiveness (Joiner & Bakalis, 2006; Papinczak, 2012). Based on the above, one may wonder how this diverse and evolving population can be kept motivated and well-equipped to deal with challenges arising in PBL.

Undeniably, the development of PBL tutors is key to the successful running of a PBL-based curriculum. To that end, initial and ongoing support and training are required to ensure that curriculum delivery is of high quality and uniformity. A variety of training techniques and programs have been suggested (Azer et al., 2013; Bosse et al., 2010; Coffin, 2013; McLean & Van Wyk, 2006; McLean et al., 2008; Salinitri et al., 2015; Steinert et al., 2006; Vogt et al., 2017; Young & Papinczak, 2013). These training techniques and programs may include feedback from students and peers, reflective practice, trainees who roleplay as students, tutor observation and interactive videos, and interdisciplinary training workshops amongst others (Garcia et al., 2017; Hendry, 2009). Arguably, the initial training is most important, especially for new programs that will adapt their curriculum to incorporate PBL. Even these training programs vary considerably in content and duration, with two-day workshops being predominant (Coffin, 2013; Grand'Maison & Des Marchais, 1991; Grasl et al., 2020; Vogt et al., 2017; Wetzel, 1996). All other workshops that deal with ongoing support and development are also important. Most of these training programs and techniques have shown to be successful in improving tutor performance, but studies that compare different methodologies are limited.

Most of the suggested programs do not indicate that differential training was provided, with the exception of peer feedback, and they may inadvertently bypass individual tutor needs (Garcia et al., 2017). However, the existing PBL tutor diversity in worldwide curricula may necessitate individualized training plans. Therefore, the question becomes, how do we identify, and even predict, individual tutor needs? To accomplish that task, we must look at how tutors fit into different subgroups rather than treating them as homogeneous. We must also understand what motivates them, what they find challenging and what support they need. This idea is further discussed, below.

Theoretical framework of the Study

The theoretical framework for this study is the narrative alignment between motivation, challenges, support and the MCS (motivation, challenges, support) cycle model for PBL tutors, which indicates a linear relationship between these three parameters (Constantinou & Nicolaou, 2018). That is, the type of motivation determines the experience of a challenge and the type of support needed.

We initially relied on Tremblay et al.'s (2001) study, which was a qualitative survey of PBL tutors' motivation, challenges and support. The study showed that PBL tutors were

motivated by working with students and by their enjoyment of tutoring. Other motivators were working with a small group of students, helping with students' learning, personal learning and development, and helping other tutors grow. Challenges included a lack of the employer's support, time constraints, student evaluation methods and student recognition. The PBL tutors also valued support in terms of training, changes in evaluation methods and improvement of time commitment. Based on these results, we aimed to explore more thoroughly the same parameters with the use of focus groups. We also wanted to examine relationship between these parameters (Constantinou & Nicolaou, 2018) which were not investigated in Tremblay et al.'s (2001) study. To achieve this goal, we conducted four focus groups with a total of 21 participants. During the focus groups, tutors were asked similar questions used by Tremblay et al. (2001), such as "Why do you tutor?", "What do you like/ do not like about tutoring?", "What difficulties do you have?", "What support do you have which is helpful and what other support do you need?", "Does feedback from students and peers help you in any way?", etc. The detailed results of the focus groups are analyzed in Constantinou and Nicolaou (2018). The definitions of motivation, challenges, and support used in the focus group study (and this study) are somewhat generic and based on Tremblay et al.'s (2001) use of the terms. Motivation refers to what has encouraged individuals to become tutors. This definition reflects the "type of motivation" or stimulus that urges behavior (Vansteenkiste et al., 2006). Challenges refer to difficulties faced during tutoring, while support encompasses mechanisms of enhancing tutors' skills (Tremblay et al., 2001).

Many studies have explored motivation, challenges and support separately. For example, research has identified that internal or intrinsic motivation is more important than external motivation. More specifically, Kandemir and Gür (2009) found that the main internal motivators include interaction with students, the role of teaching, and teachers' attitudes towards their discipline. Han and Yin's (2016) review of relevant studies of teachers' motivation revealed that the factors which motivated teachers were numerous: autonomy, professional development, professional relationships and ties, working environment, institutional support, intellectual stimulation, benefits, level of stress, career structures, repetitiveness, opportunities for research, and students' attitudes and behavior (Han & Yin, 2016). These studies indicated that autonomy and self-development were among the most popular motivators. In a study by Vermote et al. (2020), these motivators were associated with more student-friendly approaches, such as guiding. An interesting finding in this study showed that demotivating factors, like highly controlled teaching and work, were linked with approaches

such as domineeringness. Research that supports this finding highlighted the importance of intrinsic motivation for academic and emotional development, productivity, satisfaction, and increased engagement (Cho & Perry, 2012; Froiland et al., 2012; Grant, 2008). By the same token, research on the challenges teachers experience has been illuminating. Common challenges include negative social attitudes, problematic educational policies, lack of training, insufficient tools and resources, lack of time, problematic communication, and personal beliefs and attitudes (Khong & Saito, 2014). Teachers' needs and suggested support ranged from adjustment and time to training, mentoring, more autonomy and so forth (Khong & Saito, 2014; Vermote et al., 2020).

Despite the wealth of research on motivation, challenges, and support as separate experiences of teaching and learning, we did not find any studies which have explored the relationship among these three parameters. Because of this gap in the literature (as already indicated), we explored qualitatively the relationship between motivation, challenges, and support in a focus group study (Constantinou & Nicolaou, 2018). This study revealed a "narrative alignment" showing that the tutors' views about motivation aligned with what they found challenging and what they understood as the most suitable mechanism for support. For example, many tutors explained that interacting with students was their main motivation, but they found challenging the need to adjust their approach every time they tutored a different group. For support, tutors considered peer review as a way to develop skills and adjust effectively. To make sure that such narrative alignment was dominant, we isolated all coded material per tutor, and two researchers checked the trend independently. We identified the narrative alignment between motivation, challenges and support in the expressed experiences of 17 out of the 21 tutors who participated in the four focus groups. Our conclusion was that the tutors did not consider all difficulties to be challenging, only what disrupted their motivation. As a result, they understood as supportive anything that helped re-establish their motivation. Therefore, motivation was the tutors' driving force for understanding the challenges they faced and the support they needed.

From this interesting finding, we developed a theoretical model for tutor development: motivation, challenges, support cycle (MCS cycle). At the recruitment stage, tutors can be motivated from the beginning based on PBL's structure and philosophy, through intensive training and observation of other experienced tutors. Then, tutors' motivation can be gauged before they are selected for tutoring. Tutors should also be encouraged to self-reflect and consider any challenges they experience after tutoring for some time. Based on

their challenges, tutors can select the most appropriate support mechanism available for dealing with challenges and, as a result, maintain their motivation to tutor.

In this study, we used the narrative alignment and the MCS cycle model as a general theoretical framework for a quantitative understanding of PBL tutors' motivation, the challenges they face, and the support they need, as well as any relationship among the three parameters. Based on the findings from the focus groups, we constructed the questionnaire used in this study, as described below.

Method

Institutional Setting and PBL Tutor Training

The first two years of St. George's University of London MBBS graduate entry program, which is delivered on the main campus in London and at the University of Nicosia Medical School, are PBL-based. The curriculum is delivered using a hybrid PBL approach and is identical in content and duration in both locations. In Year 1, students are given a new PBL case to work on every week. Approximately, 4-5 cases are used to cover a specific organ system (e.g., cardiopulmonary system) per module. Each case revolves around a patient suffering from a specific disease (e.g., pulmonary embolism) and is completed in three sessions. Students receive support related to the case via supplementary teaching such as lectures and small group work (e.g., clinical and communication skills sessions). In Year 2, the same pattern continues for half of the year where cases are interspersed between blocks of clinical placements. As in Year 1, the PBL cases are supported with lectures and small group workshops. In our program we use progressive release long case PBL. This means that a case is completed in three PBL sessions following the Maastricht Seven Jump model (Albanese, 2010). The nature of the program creates a need for a considerable number of PBL tutors. The pool of tutors is comprised of full-time (FT) faculty—who tutor as part of their teaching responsibilities or because they show an interest in PBL—and part-time (PT) faculty who are recruited to deliver PBL blocks. As such, the PBL tutors are quite diverse and come from a variety of backgrounds. Specifically, the tutor pool includes clinicians, basic scientists (e.g., biochemists, immunologists, engineers) and social scientists (e.g., sociologists, psychologists, ethicists). The training program and subsequent support they receive is common. Upon recruitment, tutors attend a two-day initial training workshop, followed by an ongoing support schedule that includes pre-PBL briefings, peer reviews and mentoring, amongst others (Table 1).

Initial Training	On-going support)
Two-day training workshop (PBL, assessment, group dynamics, experiential workshop, role-play)	Pre-PBL briefings
	Annual debrief
	Peer reviews (per semester and as requested)
	Academic PBL Lead
	Mentoring by a senior tutor (only for cases that require it)
	Annual evaluation
	Handbook

Table 1. Overview PBL tutor training program and support

Participants

PBL tutors in Nicosia (n = 51) and London (n = 20) were invited to participate in the study. Of those invitees, 42 responded from Nicosia (82.3%) and eight (40%) from London. Novice tutors were defined as individuals who had up to a year of tutoring experience. For analysis purposes, young PBL tutors were <39 years of age and middle-aged tutors were >40 years of age. The age range of the tutors was 26-67 years. Demographic characteristics of participants are shown in Table 2.

Instrument Design

PBL tutors were invited to participate in focus groups to discuss and evaluate their experience as PBL tutors. A semi-structured focus group guide was constructed using open-ended questions evaluating the tutor experience. From the focus groups, four main themes of PBL tutoring emerged as important domains: (a) motivation, (b) challenges, (c) support and training, and (d) feedback on and improvement of the system. Analysis of the focus groups formed the basis for the framework of this study. This framework is discussed in the introduction section of this paper and the focus group data is discussed in detail in the paper of Constantinou and Nicolaou (2018). The focus group analysis formed the basis for the construction of the questionnaire, which would subsequently enable the collection of data from a greater number of participants. Statements within each domain were derived from the analysis of the focus group as well as from the literature (Albanese, 2010; Azer et al., 2013; Finucane et

al., 2001; Hendry, 2009; Kindler et al., 2009; Lee et al., 2012; Papinczak, 2012; Tremblay et al., 2001). Before distribution of the questionnaire, face-validity was established by providing the questionnaire to three PBL experts to read and evaluate whether the content effectively captured the study topic. In this study, tutors were asked to rate each statement on a scale of 1-5, in which 1 = Strongly disagree and 5 = Strongly agree (in terms of motivation, challenges, support and training, and feedback). Tutors were also asked whether they would like different forms of additional support. Answers to this question were rated on a scale of 1-7, in which 1= Not at all and 7 = A great deal. At the end of each domain, tutors were given the opportunity to provide section-specific qualitative feedback that would give better understanding of the scores either on the domains or the individual items/statements.

Scales were constructed by totaling the individual items of each domain, thus creating a numeric scale variable. Internal consistency of each scale was calculated by using the Cronbach's alpha coefficient (α). Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale. A general accepted rule is that α of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater indicates a very good level (Gliem & Gliem, 2003). Analysis of our data showed that values of Cronbach's alpha coefficient for internal consistency for all scales (Motivation, Challenges, Support and Training, Feedback, Additional Support) were between the range of 0.630 and 0.720. This result indicated an acceptable level of reliability in all scales.

Statistical Analysis

Associations between tutor characteristics and the different themes (different domain items or constructed scales) were tested using a t-test (in case the independent variable had two categories) or a one-way ANOVA (in case the independent variable had >2 categories). The following tutor characteristics were used: gender, age (both as a continuous variable and as a categorical variable, <39 and >40 years of age), academic background (basic science / clinical science / social science), degree (PhD & Postdoc / BSc & Masters / medical degree), experience in PBL (novice/experienced), and employment status (full-time/part-time). We have additionally performed correlation analysis for determining pairwise Spearman correlation coefficients between different question items of interest. For the analyses using the scales as the dependent variables, a p-value of <0.05 was taken as evidence for a statistically significant association (i.e., significant at the 5% level). Due to multiple independent tests, we also conducted correction for multiple-testing using the False Discovery Rate (FDR) approach, for both the association between

participant characteristics and the scales and between each participant characteristic and the individual question items. Whenever needed, negative-framed items were reversed so they represented only positive results. All analyses were performed in IBM SPSS v.24 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp).

Comments Analysis

We relied on General Inductive Approach to organize and code the qualitative data. Thomas (2006) described the process of inductive coding as labeling text to create categories and organizing these categories for interpreting the results. To ensure quality of coding, a double-blind procedure was followed whereby author 1 and author 3 coded the comments independently (Guest et al., 2006) and met to refine and finalize the results. In addition, the identified categories were reported in percentages.

Bioethical Approval

The study was approved by the Cyprus National Bioethics Committee and St. George's University of London Ethics Review Board. All participants signed an informed consent form.

Results

Participants

Study participants were recruited in Nicosia and London as described in the Methods section above. Most of the respondents were female (64%). The tutor's background ranged from social sciences (n = 14) to basic sciences (n = 23) to clinical sciences (n = 13). The demographics of the participants are described in Table 2, below.

Motivation

The first section of the questionnaire dealt with the motivation behind tutoring and included five items. Overall, our tutors exhibited a high level of motivation with no campus specific identifiable differences (21.54, Motivation Scale: 5 - 25.0; lowest – highest, Table 3). Further analysis (Table 4 and Supplementary Information (SI) Table 1) indicated that PT faculty scored higher overall on all motivators as compared to FT faculty (PT: 22.6, FT: 20.0). The scale also pointed to a gender difference, with female tutors being more motivated to perform PBL than male tutors (F: 22.3, M: 20.2) (Table 3, SI: Table 2). Finally, we noted a trend in more experienced tutors and PBL tutoring motivation (22.1 VS 20.5, SI: Table 3).

Characteristic		
	n	%
Gender		
Male	18	36
Female	32	64
Age (*n* = 39)		
20-39	24	62
≥40	15	38
Background		
Basic Sciences	23	46
Clinical Sciences	13	26
Social Sciences	14	28
Degree		
PhD & Postdoc	20	40
BSc and Masters	18	36
Medical Degree	12	24
Experience in PBL		
Novice	19	38
Experienced	31	62
Employment Status		
Full-time	23	46
Part-time	27	54
Country		
Cyprus	42	84
UK	8	16

Table 2. Demographic characteristics of the study participants

Individual items, reported in Table 3, indicated that the most prominent overall motivator for PBL tutors was the interaction with the students (4.78 + 0.51), which was also voiced in the comments section (29% of comments in the section). The educational value of PBL came a close second, (4.62 + 0.60) with faculty commenting, "I enjoy facilitation and the sharing philosophy." The lowest motivator for tutors was income (3.24 + 1.42); however, not surprisingly, PT faculty found this factor to be somewhat important (PT: 3.78, FT: 2.47) (SI: Table 1). Another key motivator indicated in FT faculty comments was that tutoring was required as part of their duties (57% of FT comments). One tutor stated, "I tutor because it is an obligation of my job." An additional motivator identified by respondents was that PBL is a "good way to review general medicine," and "…improve my medical knowledge…" (24% of comments). Both the Cyprus and UK campuses indicated a high level of motivation (Table 4).

Challenges faced in PBL

Perhaps the most important component of PBL tutoring that highlights areas for training and support is found in the challenges faced by the tutors. The questionnaire addressed this component by incorporating 13 items that included, amongst others, group dynamics, student motivation, scientific content, and cultural diversity. As indicated by the overall challenges scale, the tutors found PBL challenging on different levels (33.60; Challenges Scale 13-65; not challenging to very challenging, Table 3).

Overall, the tutors did not report difficulties with case content; they found the support material to be useful (3.98 + 0.84) and were able to prompt students appropriately. However, subgroup analysis indicated that different groups faced different challenges. Specifically, PBL tutors with a background in social sciences found the case content and maintaining student motivation more challenging than did clinicians or basic scientists (Q3 B: 2.35, C: 2.69, S: 3.64, Q8 B: 2.87, C: 3.38, S: 3.93) (SI: Table 4). This thought is also featured in the comments section with a tutor stating that "most students… lose their excitement and motivation following several PBL tutorials and thus make it harder for us (tutors) to keep them interested." In five out of 27 (17%) comments, student motivation was featured as a challenge. Furthermore, tutors were satisfied overall with student behavior and adherence to guidelines.

Female tutors and tutors at the Cyprus campus found student assessment more challenging (F: 3.44, M: 2.78, Cyprus: 3.36, UK: 2.38) (SI: Tables 2 and 5). Not surprisingly, tutors at the Cyprus campus also indicated that language may sometimes be a barrier, which was not the case for the UK (Cyprus: 3.00, UK: 1.88) (SI: Table 5). Similarly, while FT faculty were satisfied with student expectations of PBL, PT faculty were

Measure	N	Mean	S.dev	Cronbach's α-coefficient
MOTIVATION				.688
1. I tutor because I enjoy teaching.	50	4.38	1.03	
2. I tutor because it offers me income.	46	3.24	1.42	
3. I tutor because I enjoy the interaction with students.	50	4.78	0.51	
4. I tutor because I find the process intellectually stimulating.	49	4.49	0.79	
5. I tutor because I believe in the educational value of PBL.	5	4.62	0.60	
Motivation Scale (Scale: 5-25, Range: 11-25)	46	21.54	3.12	
CHALLENGES				.665
1. Overall I found the cases difficult to understand.	50	1.82	0.63	
2. Overall I found the tutor notes very useful.	50	3.98	0.84	
3. Following the science is a challenging part of PBL.	50	2.80	1.16	
4. Managing group dynamics is a challenging part of PBL.	50	3.42	1.21	
5. I have a hard time identifying the correct prompting questions.	50	1.88	1.02	
6. Students most commonly adhere to PBL rules.	49	4.08	0.79	
7. Students respect clinicians more than non-clinicians.	49	3.24	0.97	
8. Keeping students motivated can be challenging.	50	3.30	1.07	
9. Medical students behave in a professional manner.	50	3.68	0.82	
10. PBL student assessment can be challenging.	50	3.20	1.13	
11. Student cultural diversity can be a source of conflict.	50	2.70	1.13	
12. Student's native language can be a barrier in PBL.	49	2.82	1.13	
13. Students are adequately informed and have clear expectations of PBL.	50	3.84	1.06	
Challenges Scale (Scale: 13-65, Range: 24-46)	47	33.60	5.86	
SUPPORT AND TRAINING				.630
1. The initial 2-day training workshop adequately prepared me for tutoring.	49	4.02	0.80	
2. The briefing sessions are not very useful.	48	2.02	0.96	
3. The annual debrief sessions are not very useful.	48	2.13	0.91	
4. The peer reviewers offer good support.	48	4.19	0.73	
5. The mentoring system is useful (if applicable).	29	3.83	0.66	
6. The tutor handbook is a very useful tool.	50	3.92	0.99	
7. I am overall satisfied with the mechanisms of support.	50	4.32	0.65	
Support and training scale (Scale: 7-35, Range: 20-34)	28	28.11	3.05	

Table 3. Demographic characteristics of the study participants

FEEDBACK				.720
1. The quality of student feedback is low.	49	2.33	0.92	
2. The quality of feedback received by peer reviewers is high.	49	4.18	0.73	
3. My feedback is used to improve the curriculum (PBL cases).	50	3.36	0.96	
4. There are no adequate mechanisms in place to provide feedback.	49	1.80	0.79	
5. My feedback is used to improve the PBL process.	48	3.56	0.87	
6. Additional training sessions (based on tutor needs) would be beneficial.	49	3.65	0.95	
7. The structure of the briefing sessions is conducive to my tutoring.	45	3.49	1.08	
8. I would find the pairing up with another tutor (co-mentoring) useful.	48	3.27	1.11	
Feedback scale (Scale: 8-40, Range: 17-38)	41	29.29	4.36	
ADDITIONAL SUPPORT				.689
1. Reflective practice (evaluate and discuss own performance in a critical manner leading to self-improvement)	49	5.73	1.41	
2. Observing other PBL tutors (peer-observation)	49	5.63	1.54	
3. Workshops addressing specific areas (group dynamics, prompting etc.)	49	5.59	1.38	
4. Annual appraisal of performance.	49	5.63	1.27	
Additional support scale (Scale: 4-28, Range: 14-28)	48	22.54	4.04	

Table 3 cont. Demographic characteristics of the study participants

not equally satisfied (FT: 4.26, PT: 3.48) (SI: Table 1). Finally, novice tutors indicated that group dynamics were challenging as compared to more experienced tutors (Novice: 3.84, Experienced 3.16, SI: Table 2). Notably, the tutors highlighted that maintaining the PBL process may be challenging (31% 9 of 29 comments). According to comments, students seem to relax and not adhere to guidelines (facilitation vs. teaching, ground rules, prompting, time constraints amongst others). Furthermore, other comments indicated challenges with management of group dynamics (14%), age and language-related concerns (14%), and assessment (10%).

Support and training

Regarding the effectiveness of tutor support, while PBL tutors indicated that they felt overall satisfaction (4.32 + 0.65), none of the individual items were scored as high

(Table 3). This finding was also indicated by the Support and Training Scale (28.11; Scale 7-35; not at all to very well supported, Table 5). Specifically, tutors were most satisfied with peer reviews and annual debriefs (4.32 + 0.65, 2.13 + 0.0.91 (neg Q)). Social scientists were the least satisfied with the initial training session, while clinicians found it satisfactory (S: 3.64, B: 4.00, C: 4.46, SI: Table 4). Finally, tutors at the Cyprus campus were overall more satisfied with available support, as indicated by the Support Scale (Cyprus: 28.8, UK: 25.5, SI: Table 5)

Feedback and improving the system

The last section of the questionnaire dealt with feedback from different sources (students, tutors) and whether it led to the improvement of the system in place. Overall, the tutors were moderately satisfied, as indicated by the Feedback Scale

(29.29; 8-40; not satisfied to very satisfied, Table 3). PBL tutors provided feedback both on PBL curriculum (case material) and the PBL process, and they felt ample opportunity was available to provide feedback (1.80 + 0.79 (neg Q)). They were unsure, however, whether their feedback was used to improve the system (3.56 + 0.87). This feeling was also indicated in comments by tutors who expressed this uncertainty (n =4 of 7, 57%). In terms of feedback received by colleagues and students, tutors questioned the value of feedback received by students (2.33 + 0.92 (neg Q)). Peer reviews were better received by tutors, although tutors at the Cyprus campus appreciated it more (Cyprus: 4.29, UK: 3.63, SI: Table 5). Considering the academic background of the tutors, clinical scientists were overall more satisfied with feedback mechanisms.

In terms of system improvements, tutors overall neither agreed or disagreed with adding additional training sessions, but PT faculty tutors agreed it would be useful (FT: 3.35, PT: 3.92) (SI: Table 1). Social scientists, but not clinicians, agreed that co-mentoring would be useful, while basic scientists remained neutral (B: 2.95, C: 3.08, S: 3.93, SI: Table 4). When options for additional support were offered (reported in Table 3), tutors felt positive toward the use of reflective practice (i.e., evaluation and discussion of one's own performance in a critical manner, leading to self-improvement) (5.73/7.00 + 1.41) as well as an annual appraisal of performance (5.63/7.00 + 1.27). The tutors also remained open to observing other tutors (5.63/7.00 + 1.54) as well as attending workshops to address specific needs (5.59/7.00 + 1.38).

	Motivation[a]	Challenges[a]	Support and Training[a]	Feedback and Improvements[a]	Additional Support[a]
Gender	$n = 46$	$n = 47$	$n = 28$	$n = 41$	$n = 48$
Male	20.2	32.0	26.9	29.5	22.2
Female	22.3	34.5	28.7	29.2	22.7
p value	.028**	.16	.15	.85	.68
Age	$n = 36$	$n = 38$	$n = 21$	$n = 32$	$n = 38$
20-39	22.0	34.6	28.8	29.3	23.2
≥40	20.5	31.4	27.0	31.0	22.6
p value	.20	.10	.17	.31	.63
Academic Background	$n = 46$	$n = 47$	$n = 28$	$n = 41$	$n= 48$
Basic Science	21.1	32.7	27.8	27.4	21.8
Clinical Science	21.6	32.7	28.0	31.0	23.5
Social Science	22.3	36.3	28.5	30.6	22.7
p value	.53	.17	.88	.041**	.48
Degree	$n = 46$	$n = 47$	$n= 28$	$n= 41$	$n = 48$
PhD & Postdoctoral	20.8	34.1	29.1	28.1	22.8
BSc and Masters	22.3	32.6	27.6	29.9	21.9
Medical	21.5	34.4	27.8	30.6	23.1
p value	.39	.68	.50	.29	.69

Table 4. Demographic characteristics of the study participants

Employment status	n = 46	n = 47	n= 28	n= 41	n= 48
Fulltime	20.0	32.8	29.3	29.1	22.8
Part time	22.6	34.3	27.4	29.5	22.4
p value	*.004**	.39	.10	.80	.72
Experience in tutoring	n = 46	n = 47	n = 28	n = 41	n = 48
Novice	20.5	34.2	28.6	29.2	22.6
Experienced	22.1	33.2	27.8	29.3	22.5
p value	.09	.59	.53	.94	.93
Country	n = 46	n = 47	n = 28	n = 41	n = 48
Cyprus	21.2	34.3	28.8	29.2	22.7
UK	23.0	30.4	25.5	29.8	21.6
p value	.15	.09	*.015**	.75	.50

Note. aMotivation Scale: 11-25, Challenges Scale: 24-46, Support and Training Scale: 20-34, Feedback and Improvements: 17-38, Additional Support 14-28.

** Nominally statistically significant results. Following correction for multiple testing (FDR method), statistical significance was lost due to small sample size.

Table 4 cont. Demographic characteristics of the study participants

Relationship between motivation, challenges and support

We conducted correlation analysis to identify any relationship between the three main components of the questionnaire—namely motivation, challenges and support—in accordance with our theoretical framework and the MCS cycle model (SI: Table 6). To check for such a relationship, we focused on the two motivators which clearly reflected the narrative alignment and the MCS cycle, namely motivator 3 (interaction with students) and motivator 5 (educational value of PBL). These two motivators were correlated with the challenges that could potentially disrupt motivation and with support mechanisms that could potentially protect or reestablish motivation. More specifically, motivator 3 was correlated with challenges 4 (management of group dynamics), 6 (student adherence to PBL rules) and 9 (professional behavior of students); and support mechanisms 1 (initial two-day workshop), 4 (peer reviews), and 9 (mentoring system); and the additional support mechanism 3 (specialized workshops). Motivator 5 was correlated with challenges 6, 9 and 13 (student information and expectations of PBL) and the same support mechanisms as motivator 3.

Based on the findings, motivator 3 is negatively correlated with challenges 6 and 9. This result means that the tutors who were motivated by student interaction found non-adherence to PBL rules and unprofessional behavior by students to be a challenge. An interesting discovery is that motivator 3 moderately correlated with support mechanisms 4 and 5 and weakly correlated with mechanism 1. This finding means that tutors motivated by student interaction considered peer reviews, mentoring and the two-day initial workshop as important for dealing with challenges and maintaining their motivation. Another interesting fact is that tutors who were motivated by student interactions did not find group dynamics a challenge (challenge 4), and the additional mechanism of a workshop to deal with difficult cases (including group dynamics) was noted as useful. This result possibly occurred because the tutors who were highly motivated by interaction with students had confidence to cope with group dynamics and did not feel the need for relevant training session. In support of this explanation, no correlation was found between motivator 3 and additional support mechanism 3 (specialized workshop to handle difficult cases including

group dynamics), which indicates that tutors did not think they needed such support—possibly due to their confidence in handling group dynamics.

Motivator 5 was moderately corelated with challenges 6, 9 and 13. This correlation indicates that the tutors who were motivated by the educational value of PBL found non-adherence to PBL rules, unprofessional student behavior and student information and expectations of PBL to be a challenge. Support mechanisms 1, 4, and 5 and additional support 3 were moderately correlated with motivator 5, which shows that tutors considered these mechanisms important for restoring or maintaining their motivation. Another possible motivator, which could potentially correlate with specific challenges and support mechanisms, is motivator 4. This motivator relates to the intellectual challenge of PBL. Weak correlations were identified with challenge items 1 ($r=.149$) and 2 ($r=-.174$) indicating that tutors may find case content difficult and have issues with tutor notes. No correlations were identified between this motivator and support. Based on this analysis, we can conclude that exploring the relationship between motivation, challenges and support partially supports the MCS cycle model and further investigation is warranted.

Discussion

The literature suggests that PBL tutor training is integral in effecting PBL delivery. However, there are a limited number of recent studies addressing PBL faculty training holistically (initial and ongoing). In addition, the diversity of PBL tutors is often not addressed and neither is the relationship between tutors' motivation, challenges and support. The current study shows that in the utilization of a diverse group of tutors, their training and development needs are equally diverse. Furthermore, a relationship exists among motivation, challenges faced and support needed. We considered a number of variables as descriptors of diversity, including age, gender, background, employment status, experience and campus location. In this study, tutors were generally motivated to perform their tasks and were overall satisfied with the components of the support system. Still, they faced individual challenges that a tutor support system should take into consideration. Specifically, social scientists found PBL content challenging, while PT faculty found student assessment and student knowledge of PBL process challenging. Not surprisingly, novice tutors indicated that group dynamics posed a challenge for them. Furthermore, motivation and perceived challenges differed by gender, with female tutors being simultaneously more motivated and faced with more challenges. As far as feedback mechanisms are concerned, tutors were satisfied with peer reviews but not with student feedback. Some observed differences among campuses, regarding student assessment and language, may be attributed to the diversity of the tutors in each country as well as the diversity of the student body.

Motivation behind PBL tutoring

An important aspect of any job is motivation. A study that explored the relationship among motivation, challenges and support indicated that motivation is linked with challenges faced and support mechanisms required (Constantinou & Nicolaou, 2018). This finding suggests that in the design of a training and development program tutor motivation may be used as a predictor of future needs. The current study explored what motivated a PBL tutor to engage in this line of work. The primary motivator for the tutors was the interaction with the students, as previously noted (Papinczak, 2012). An important requirement for any PBL-based curriculum is the trust in the education value. Herein, and as previously reported, tutors perceive PBL as a valuable educational method independent of tutor experience, suggesting they did not lose interest with time (Maudsley, 2002). The lowest motivator for all tutors was income, although it was more important for PT tutors. In general, PT faculty were more motivated to facilitate PBL most likely because they chose to tutor, while FT faculty may tutor as just one of the many duties they perform. In general, FT faculty appear to be typically less enthused about tutoring as PT faculty (Finucane et al., 2001); however, exceptions to the rule are found in FT faculty who volunteer for PBL tutoring.

Challenges faced in PBL

A primary aim of this study was to divide the PBL group into specific subgroups, instead of a unified body, and determine whether their needs varied. One of the most effective methods to identify needs is to look at the challenges participants face. This group of tutors was very diverse (Table 2), which is common in other medical schools around the world (Dent et al., 2017; Finucane et al., 2001; Maudsley, 2002). Not surprisingly, the challenges they faced were equally as diverse and followed specific subgroups, as described in more detail below.

Novice tutors identified the management of group dynamics as one of the challenges they experienced, which is not unusual in a PBL setting. In two independent studies, Lee et al. (2012) and Kindler et al. (2009) identified common issues relating to group management and proposed solutions, which would be a useful source for novice tutors who often encounter problems with group dynamics. Although our more experienced tutors did not note this factor as a problem, O Doherty et al. (2018) found that 20% of their expert tutors faced challenges with group dynamics.

Contributing to literature on content expertise for PBL tutors, our results indicated that handling content was more challenging for tutors with a social science background as compared to clinicians and basic scientists. Tutor content expertise is a long-debated aspect of PBL, having both advantages and disadvantages. From one perspective, content experts are more likely to divert from facilitation to teaching. On the other hand, non-experts may not adequately explore the topic even though they can minimize content guidance (Albanese, 2010; Gilkison, 2003; Groves et al., 2005). Our data indicate this is an area that requires attention when reevaluating and redesigning the PBL training component. Even medical practitioners who are considered content experts may struggle with content and spend a lot of time in preparation (O Doherty et al., 2018). Still, in terms of student ability to identify learning outcomes and overall performance, tutor expertise does not directly represent an advantage or a disadvantage for the students (Grasl et al., 2020; Park et al., 2007). The study also looked at PT faculty as a subgroup. Interestingly, Papinczak (2012) conducted a study specifically looking at PT tutors and reported that they regularly feel marginalized as they are often not informed regarding other student activities. As such, they may see gaps that may or may not truly exist. In agreement with this paper, the PT faculty in the present study felt that students did not have a clear perception of PBL, which was not the case with FT faculty. This idea may be a result of FT faculty being more involved in the running of the medical program and being more familiar with curriculum, assessment and information provided to the students. As a result, the FT faculty are likely more able to judge the students overall. The PT faculty also need a more holistic view of the student, which is an area that should be addressed in every program. Alternatively, a lack of student motivation in the PBL curriculum may be possible, as previously demonstrated (Chng et al., 2015; De Grave et al., 2002; Yew & Yong, 2014). Although plausible, our data neither support nor oppose this idea.

FT faculty also noted they felt better able to assess the students than their PT counterparts. Previous reports have shown that tutors may struggle with assessment and often exhibit assessment variability, indicating that facilitator assessment may be unreliable. This finding led some groups to design and implement workshops to address assessment and feedback (Baroffio et al., 2007; Dalrymple et al., 2007; Sa et al., 2019). An important approach may also be in the training of students to identify and receive feedback, which may ensure a better outcome (Baroffio et al., 2007). We have identified in our group that student assessment may be an area in which additional training may be needed, as examiners vary in their assessment and facilitator assessment may be unreliable.

Language was raised as an issue at the Cyprus campus but not at the UK campus, which is likely related to the student population attending the course. Students at the Cyprus campus come from many different countries as compared to the UK campus, where most students are from the UK and are native English speakers. Another important challenge identified by some tutors is maintaining student motivation and consistently following the best-practice PBL process. This challenge may be attributed to different factors: student lack of experience with PBL and accompanied skepticism; average-performing students; a loss of interest due to over-exposure, years of engagement in PBL; or a lack of engagement due to access to notes from previous years (Chng et al., 2015; O Doherty et al., 2018). A tutor's ability to motivate students is a key characteristic required for effective PBL tutoring, which cannot be disregarded. In fact, a lack of motivation has been identified as an important inhibitor to student learning (Chng et al., 2015; De Grave et al., 2002; Yew & Yong, 2014). One way to achieve student motivation is through a blended PBL approach and the incorporation of technology into the classroom. This approach is something we used in Year 2 and others have successfully implemented as well (Woltering et al., 2009). Technology allows for the incorporation of media files as well as other resources, and it also allows for a variety of outcomes based on the group's choices. As such, the students become more involved, which may heighten their interest.

Tutor motivation can also play a role in keeping students interested and aligned with best PBL practices. One observation shows that as years progress, changes in tutorial practice and tutor behavior might arise due to routine and relaxing of rules. As such, faculty development efforts must anticipate changes and amend or preempt them (Baroffio et al., 2013). In this study, non-content experts, especially social scientists, found students to be less motivated than content experts. Therefore, an argument can be made regarding students' comfort level with the material, with expertise being relevant to their motivation.

Support, feedback and additional training

The cornerstone of skill and process improvement is evaluation and reciprocal constructive feedback. The tutors in the present study felt that ample opportunities to give and receive feedback were provided; however, all opportunities were not equally valued. Specifically, PBL tutors were overall satisfied with the available support mechanisms, showing preference for annual debriefs and peer reviews. On the other hand, they questioned the validity of student feedback. Furthermore, although they stated they provided feedback,

they did not seem satisfied with how their feedback was used. This result may act as a deterrent for the future provision of quality feedback.

The tendency of PT faculty to show a preference for debriefs as a support mechanism may further support the notion that they may feel under-valued and under-supported (Joiner & Bakalis, 2006; Papinczak, 2012). A debrief is an opportunity to have one's voice heard, and this is clearly something that PT faculty seek. This does not necessarily apply to FT faculty, who have other opportunities to provide and obtain feedback through course meetings and student evaluations in their other academic or administrative capacities.

Peer reviews, on the other hand, have a dual role: the promotion of self-reflection and improvement which can also be used for faculty appraisal purposes. If peer reviews have a clear focus, they may become important tools for encouraging excellence in facilitating learning. On the other hand, if perceived as threatening, the opposite effect may arise (Sullivan et al., 2012). These tutors valued peer feedback, which as previously shown, may be a constructive tool for encouraging good teaching practices (Garcia et al., 2017).

Student feedback has been frequently used to evaluate educator performance, even though one argument states that a 'consumer' mentality exists amongst students and that they often do not differentiate between instructor concerns and expectations defined by the system (Emery et al., 2003). The tutors here did not find student feedback particularly useful, which corresponds with previous suggestions that student feedback may be an ineffective method for tutor improvement (Hendry, 2009). Others believe though that student feedback is indeed valuable, and faculty should be encouraged to engage with it (Golding & Adam, 2016). As such, schools might consider different ways of obtaining valid feedback from students rather than disregarding it altogether.

An area identified as important in offering support, but requires re-structuring, is the morning briefing sessions, especially for the content experts. These sessions may take different forms, but they usually include a briefing on the case and the questions that may be used to guide the students. This structure makes sure the curriculum is delivered as uniformly as possible in all groups. In agreement with our data, Azer et al. (2013) noted that morning briefings would be mostly useful for non-content experts as they are the ones who indicated they found content to be challenging.

The best way to address inadequacies is through training, and as such, tutors' perceptions on additional training were investigated. In general, all tutors were receptive to additional training to improve their tutoring skills. Not surprisingly, novice tutors were more positive to additional training as compared to their experienced counterparts. Additionally, some tutors supported co-mentoring as a form of training,

indicating that strong co-worker support may also contribute to affective commitment, as also reported by Joiner and Bakalis (2006) in their study of commitment of casual academics.

Relationship between motivation, challenges and support

This study has partially supported the narrative alignment and the MCS cycle model and the findings of the qualitative analysis of focus groups. For example, the analysis showed that motivator, "interaction with students," correlated with challenges, "management of group dynamics," "student adherence with PBL rules," and "professional behavior of students." A similar pathway has been observed for motivator, "educational value of PBL," which correlated with "student adherence with PBL rules," "professional behavior of students," and "student information and expectations of PBL." These two motivators were also linked with support mechanisms, "initial two-day workshop," "peer reviews" and "mentoring system." In addition, these two motivators were moderately correlated with other challenges and support mechanism as per the results section in this paper.

The findings reveal that motivation is the driving force for understanding what is challenging and whether support is needed. This outcome means that tutors do not perceive any difficulty as a challenge unless it disrupts their motivation. Then, they seek those support mechanisms which are going to reestablish or maintain their motivation (Constantinou & Nicolaou, 2018). Although the study did not rely on a theory of motivation or "self-determination theory," it seems to reflect findings from other studies which showed that intrinsic motivation (e.g., inherent interest or satisfaction with the activity itself), as opposed to extrinsic motivation (e.g., reaching an outcome independent from learning), is associated with deeper engagement with learning and results in better understanding (Vansteenkiste et al., 2006). More studies have highlighted the importance of intrinsic motivation. For example, Froiland et al. (2012) discussed that intrinsic motivation resulted in academic and emotional development. Interestingly, Grant (2008) found that intrinsic motivation led to greater commitment and productivity, while Cho and Perry (2012) found that intrinsically motivated employees were more engaged and more satisfied. In the case of PBL tutors, the two main motivators, "interaction with students" and "educational value of PBL," could be classified as intrinsic because tutors were motivated to tutor out of genuine interest. As a result, they focused on challenges which disrupted their genuine interest or sense of satisfaction. Tutors then delved deeper into the appropriate support mechanisms to maintain or re-establish their interest and satisfaction. In other words, tutors who were intrinsically motivated were deeply engaged with mechanisms of their

development. This finding is an important contribution to the literature and future research because it shows that such a relationship might be at play. This result should be studied further with a larger sample, not only with PBL tutors, but with other teachers and tutors in other parts of an education program. To the best of our knowledge, the relationship among motivation, challenges and support has not been explored. The findings from this study have implications for human resources in general and the recruitment, training and development of employees.

This study has also shown the need for a deeper investigation among the types of motivation, challenges, and support. More specifically, what is the relationship between intrinsic and extrinsic motivation and challenges and support? Is an intrinsic motivation, such as interaction with students, more likely to be associated with specific challenges than an extrinsic motivation, such as tutoring for money? Does this same intrinsic type of motivation determine a certain type of support that an extrinsic type does not?

Limitations

A limitation of the current study is the inherent limitation of questionnaires, which involves self-reported information. This drawback increases the chance of information bias. In addition, the small sample size made statistical correlations challenging. However, because our data generally follow similar patterns as the literature, this limitation is not a major concern. Furthermore, a shortcoming of the study was in the lower response rate at the UK campus as compared to the Cyprus campus.

Conclusions and proposals for the future for PBL tutors' development

Teaching and tutoring success may be partly attributed to aptitude; however, this outcome is not always the case. An interesting study by Williams et al. (2011) indicated that development of PBL tutors is not one-size-fits-all, and may require additional and longer training for some tutors to acquire key skills, such as social congruence, expertise and cognitive congruence (Williams et al., 2011). Indeed, faculty development remains one of the key identified contributors to academic success, and evidence suggests that individual faculty need different support (Hatem et al., 2011; McLean & Van Wyk, 2006; McLean et al., 2008). Steinert et al. (2006), in a Best Evidence Medical Education (BEME) guide, noted that context is key in regard to faculty (Steinert et al., 2006). As such, it seems that adherence to one particular training program, such as the ones frequently offered for PBL tutors, may not be ideal and individualized support may be the way forward (McDowell et al., 2014).

Restructuring of existing training and support sessions and additional workshops

In this study, tutors followed the same training and support program and indicated overall satisfaction with the training and support provided. This standardized program was to ensure that all students have a similar experience and a fair assessment; its value should not be disregarded. Also, when modifications are suggested for any program, budgetary and staff constraints should be taken into consideration, as well. As such, it is imperative that most of the training sessions and refreshers, which are already in place, still address common needs and adapted where possible. Adaptations may indeed be necessary, as shown in the investigation of subgroups: additional needs surfaced that had important implications for staff training and development. Below, we propose some modifications:

(i) One of the key findings from the literature and our own study is the value of the initial training as well as refresher sessions (Coffin, 2013; Grand'Maison & Des Marchais, 1991; Grasl et al., 2020; Vogt et al., 2017; Wetzel, 1996). These sessions may benefit from interdisciplinary interactions that allow tutors to improve their skills. Indeed, an article by Vogt et al. (2017) indicated that interdisciplinary PBL tutor training was related with better outcomes as compared to traditional trainings. Non-content experts could benefit from this as it incorporates more practical training and more case-studies.

Based on the literature discussed above and our own findings, we also suggest that workshops targeted to specific groups may also be beneficial and more likely to be attended as ongoing development. These workshops may include the following characteristics:

(ii) morning briefings that are content specific, targeted to non-experts, as identified by us and the literature,

(iii) workshops addressing management of group dynamics that are targeted at novice tutors, as identified by our group,

(iv) increase information flow and involvement of PT faculty in other processes, as identified by us and the literature,

(v) re-introduce middle-aged or more senior tutors to PBL to maintain standards and perhaps enhance motivation, as identified by the literature,

(vi) adequately train students and promote a culture where tutor diversity is not only accepted but valued. The later point is significant both for medical students and students in other disciplines as they will frequently need

to work with an interdisciplinary team. Accepting diversity should be one of the key values instilled in students early on.

(vii) Also, to keep tutors engaged and motivated, a reward system could be used as an incentive for all tutors. A monetary incentive could also be given for PT faculty (Coffin, 2013; McLean & Van Wyk, 2006; Paslawski et al., 2013).

(viii) Furthermore, to address the growing use of technology in the classroom, the use of technology in PBL should also be addressed and clarified. This area also warrants further investigation as to its benefits.

(ix) Finally, based on our findings, the additional components should be tailored to the needs of a diverse tutor population, which will aim to enhance support systems and broaden tutor understanding and appreciation of the PBL process.

Individualized Support

Notably, in the current study, the most valued mechanisms of support were those that catered to individual needs. Those mechanisms include (1) peer reviews which (as clearly outlined above) are highly rated and (2) the use of a mentoring system. The latter is offered only to assist struggling faculty by assigning a mentor to support them. Based on this finding, we propose that a need exists for individualized support for the improvement of our tutors in general. Some suggestions are provided, below:

(i) Peer support and co-mentoring may be useful, as our data suggest.

(ii) Alternatively, the mentoring scheme may be formatted into coaching or instructional mentoring, which involves reflection and discussion with an experienced member of staff (Garcia et al., 2017; Huston & Weaver, 2007). In terms of support, the tutors here indicated that reflective practice would be beneficial. This approach can be facilitated through the use of programs that extend over time, as previously suggested by faculty and students (Papinczak, 2010; Steinert et al., 2006).

(iii) In addition, the fostering of a community of practice in PBL would allow for more peer support and reflective practice (Coffin, 2013; O Doherty et al., 2018). This approach would also be very important for PT faculty who are not as involved. It will allow them to become part of the PBL community, resulting in minimized feelings of marginalization, which may be demoralizing (Papinczak, 2010).

Significance of PBL tutor training for student learning

An important consideration is whether making these changes will result in improved student experience and performance. Can students even detect the gaps we have identified, here? The literature suggests the answer to this question is "yes." In fact, students have rated tutors with no PBL training significantly lower than the ones who were trained. Students can go beyond the simple identification of a tutor as "good" or "bad," but they may also identify specific tutor weaknesses (content expertise, active participation, evaluation, etc.) (Chung et al., 2011; Dolmans et al., 2006). As such, it is integral that tutor needs are identified that will enable better student learning or at least create a better learning experience. Furthermore, no matter what the debates in the field of PBL tutor training, the literature is clear on the need for training for the PBL tutor. This fact is strengthened by data which indicates that training tutors actually improves student performance (Leary et al., 2013).

In conclusion, a more effective approach would include a combination of structured and formal training supplemented with other approaches that are more personal. Methods such as peer audit and observation will allow tutors to be supported based on their needs, as suggested by our tutors and others.

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SUPPLEMENTARY INFORMATION

Table 1

Association between employment status and different PBL-related outcomes

	Full-time	Part-time	p-value for difference
MOTIVATION			
1. I tutor because I enjoy teaching.	4.26	4.48	.455
2. I tutor because it offers me income.	2.47	3.78	.001
3. I tutor because I enjoy the interaction with students.	4.65	4.89	.100
4. I tutor because I find the process intellectually stimulating.	4.18	4.74	.013**
5. I tutor because I believe in the educational value of PBL.	4.48	4.74	.126
Motivation scale	*20.0*	*22.6*	*.004**
CHALLENGES			
1. Overall I found the cases difficult to understand.	1.70	1.93	.200
2. Overall I found the tutor notes very useful.	3.96	4.00	.858
3. Following the science is a challenging part of PBL.	2.70	2.89	.563
4. Managing group dynamics is a challenging part of PBL.	3.48	3.37	.758
5. I have a hard time identifying the correct prompting questions.	1.96	1.81	.630
6. Students most commonly adhere to PBL rules.	4.30	3.88	.061
7. Students respect clinicians more than non-clinicians.	3.32	3.19	.638
8. Keeping students motivated can be challenging.	3.48	3.15	.283
9. Medical students behave in a professional manner.	3.83	3.56	.248
10. PBL student assessment can be challenging.	2.96	3.41	.160
11. Student cultural diversity can be a source of conflict.	2.74	2.67	.824
12. Student's native language can be a barrier in PBL.	2.86	2.78	.795
13. Students are adequately informed and have clear expectations of PBL.	4.26	3.48	.008**
Challenges scale	*32.8*	*34.3*	*.39*
SUPPORT AND TRAINING			
1. The initial 2-day training workshop adequately prepared me for tutoring.	4.00	4.04	.874
2. The briefing sessions are not very useful.	2.00	2.04	.896
3. The annual debrief sessions are not very useful.	2.18	2.08	.696
4. The peer reviewers offer good support.	4.05	4.30	.248
5. The mentoring system is useful (if applicable).	3.92	3.76	.550
6. The tutor handbook is a very useful tool.	4.13	3.74	.166
7. I am overall satisfied with the mechanisms of support.	4.35	4.30	.784
Support scale	*29.3*	*27.4*	*.10*

FEEDBACK

1. The quality of student feedback is low.	2.26	2.38	.644
2. The quality of feedback received by peer reviewers is high.	4.18	4.19	.987
3. My feedback is used to improve the curriculum (PBL cases).	3.30	3.41	.710
4. There are no adequate mechanisms in place to provide feedback.	1.61	1.96	.120
5. My feedback is used to improve the PBL process.	3.64	3.50	.595
6. Additional training sessions (based on tutor needs) would be beneficial.	3.35	3.92	.032**
7. The structure of the briefing sessions is conducive to my tutoring.	3.30	3.64	.299
8. I would find the pairing up with another tutor (co-mentoring) useful.	3.14	3.37	.485
Feedback scale	*29.1*	*29.5*	*.80*

ADDITIONAL SUPPORT

1. Reflective practice (evaluate and discuss own performance in a critical manner leading to self-improvement)	6.05	5.48	.166
2. Observing other PBL tutors (peer-observation)	5.70	5.58	.790
3. Workshops addressing specific areas (group dynamics, prompting etc)	5.45	5.70	.536
4. Annual appraisal of performance.	5.64	5.63	.985
Additional Support scale	*22.8*	*22.4*	*.72*

** Nominally statistically significant results. Following correction for multiple testing (FDR method), statistical significance was lost due to small sample size.

Table 2

Association between gender and different PBL-related outcomes

	Men	Women	*p-value for difference*
MOTIVATION			
1. I tutor because I enjoy teaching.	4.28	4.44	.603
2. I tutor because it offers me income.	2.59	3.62	.015**
3. I tutor because I enjoy the interaction with students.	4.56	4.91	.017**
4. I tutor because I find the process intellectually stimulating.	4.22	4.65	.072
5. I tutor because I believe in the educational value of PBL.	4.56	4.66	.576
Motivation scale	*20.2*	*22.3*	*.028**
CHALLENGES			
1. Overall I found the cases difficult to understand.	1.67	1.91	.199
2. Overall I found the tutor notes very useful.	3.67	4.16	.048**
3. Following the science is a challenging part of PBL.	2.61	2.91	.394
4. Managing group dynamics is a challenging part of PBL.	3.39	3.44	.894
5. I have a hard time identifying the correct prompting questions.	2.00	1.81	.539
6. Students most commonly adhere to PBL rules.	4.28	3.97	.186
7. Students respect clinicians more than non-clinicians.	2.94	3.41	.111
8. Keeping students motivated can be challenging.	3.17	3.38	.516
9. Medical students behave in a professional manner.	3.89	3.56	.179
10. PBL student assessment can be challenging.	2.78	3.44	.045**
11. Student cultural diversity can be a source of conflict.	2.67	2.72	.878
12. Student's native language can be a barrier in PBL.	2.56	2.97	.222
13. Students are adequately informed and have clear expectations of PBL.	4.11	3.69	.176
Challenges scale	*32.0*	*34.5*	*.16*
SUPPORT AND TRAINING			
1. The initial 2-day training workshop adequately prepared me for tutoring.	4.00	4.03	.894
2. The briefing sessions are not very useful.	1.88	2.10	.463
3. The annual debrief sessions are not very useful.	2.44	1.93	.060
4. The peer reviewers offer good support.	4.06	4.25	.410
5. The mentoring system is useful (if applicable).	3.70	3.89	.459
6. The tutor handbook is a very useful tool.	3.83	3.97	.646
7. I am overall satisfied with the mechanisms of support.	4.33	4.31	.915
Support scale	26.9	28.7	.15

FEEDBACK

1. The quality of student feedback is low.	2.28	2.35	.781
2. The quality of feedback received by peer reviewers is high.	3.94	4.31	.079
3. My feedback is used to improve the curriculum (PBL cases).	3.50	3.28	.447
4. There are no adequate mechanisms in place to provide feedback.	1.56	1.94	.105
5. My feedback is used to improve the PBL process.	3.72	3.47	.331
6. Additional training sessions (based on tutor needs) would be beneficial.	3.50	3.74	.395
7. The structure of the briefing sessions is conducive to my tutoring.	3.50	3.48	.960
8. I would find the pairing up with another tutor (co-mentoring) useful.	3.12	3.35	.483
Feedback scale	29.5	29.2	*.85*

ADDITIONAL SUPPORT

1. Reflective practice (evaluate and discuss own performance in a critical manner leading to self-improvement)	5.67	5.77	.800
2. Observing other PBL tutors (peer-observation)	5.83	5.52	.492
3. Workshops addressing specific areas (group dynamics, prompting etc)	5.28	5.77	.230
4. Annual appraisal of performance.	5.44	5.74	.435
Additional Support scale	22.2	22.7	*.68*

** Nominally statistically significant results. Following correction for multiple testing (FDR method), statistical significance was lost due to small sample size.

Table 3

Association between experience and different PBL-related outcomes

	Novice	Experienced	*p-value for difference*
MOTIVATION			
1. I tutor because I enjoy teaching.	4.05	4.58	.078
2. I tutor because it offers me income.	2.88	3.45	.194
3. I tutor because I enjoy the interaction with students.	4.74	4.81	.642
4. I tutor because I find the process intellectually stimulating.	4.44	4.52	.764
5. I tutor because I believe in the educational value of PBL.	4.53	5.68	.395
Motivation scale	*20.5*	*22.1*	*.09*
CHALLENGES			
1. Overall I found the cases difficult to understand.	1.84	1.81	.848
2. Overall I found the tutor notes very useful.	3.74	4.13	.112
3. Following the science is a challenging part of PBL.	2.74	2.84	.767
4. Managing group dynamics is a challenging part of PBL.	3.84	3.16	.053
5. I have a hard time identifying the correct prompting questions.	1.95	1.84	.719
6. Students most commonly adhere to PBL rules.	4.05	4.10	.840
7. Students respect clinicians more than non-clinicians.	3.11	3.33	.428
8. Keeping students motivated can be challenging.	3.26	3.32	.852
9. Medical students behave in a professional manner.	3.53	3.77	.304
10. PBL student assessment can be challenging.	3.05	3.29	.474
11. Student cultural diversity can be a source of conflict.	3.47	2.84	.272
12. Student's native language can be a barrier in PBL.	3.11	2.63	.157
13. Students are adequately informed and have clear expectations of PBL.	3.89	3.81	.778
Challenges scale	*34.2*	*33.2*	*.59*
SUPPORT AND TRAINING			
1. The initial 2-day training workshop adequately prepared me for tutoring.	3.89	4.10	.388
2. The briefing sessions are not very useful.	2.00	2.03	.908
3. The annual debrief sessions are not very useful.	2.35	2.00	.204
4. The peer reviewers offer good support.	4.16	4.21	.824
5. The mentoring system is useful (if applicable).	4.00	3.74	.315
6. The tutor handbook is a very useful tool.	4.05	3.84	.426
7. I am overall satisfied with the mechanisms of support.	4.21	4.39	.359
Support scale	*28.6*	*27.8*	*.53*

FEEDBACK

1. The quality of student feedback is low.	2.28	2.35	.781
2. The quality of feedback received by peer reviewers is high.	4.26	4.13	.548
3. My feedback is used to improve the curriculum (PBL cases).	3.32	3.39	.803
4. There are no adequate mechanisms in place to provide feedback.	1.79	1.80	0.964
5. My feedback is used to improve the PBL process.	3.44	3.63	.474
6. Additional training sessions (based on tutor needs) would be beneficial.	3.79	3.57	.428
7. The structure of the briefing sessions is conducive to my tutoring.	3.56	3.44	.739
8. I would find the pairing up with another tutor (co-mentoring) useful.	3.22	3.30	.816
Feedback scale	29.2	29.3	.94

ADDITIONAL SUPPORT

1. Reflective practice (evaluate and discuss own performance in a critical manner leading to self-improvement)	5.28	6.00	.084
2. Observing other PBL tutors (peer-observation)	6.05	5.37	.129
3. Workshops addressing specific areas (group dynamics, prompting etc)	5.72	5.52	.620
4. Annual appraisal of performance.	5.61	5.65	.929
Additional Support scale	22.6	22.5	.93

Table 4

Association between background and different PBL-related outcomes

	Basic Sciences	Clinical Sciences	Social Sciences	*p-value for difference*
MOTIVATION				
1. I tutor because I enjoy teaching.	4.30	4.31	4.57	.722
2. I tutor because it offers me income.	3.10	3.33	3.38	.823
3. I tutor because I enjoy the interaction with students.	4.74	4.85	4.79	.836
4. I tutor because I find the process intellectually stimulating.	4.50	4.31	4.64	.556
5. I tutor because I believe in the educational value of PBL.	4.48	4.69	4.79	.289
Motivation scale	*21.1*	*21.6*	*22.3*	*.53*
CHALLENGES				
1. Overall I found the cases difficult to understand.	1.70	1.69	2.14	.075
2. Overall I found the tutor notes very useful.	3.83	3.75	4.36	.144
3. Following the science is a challenging part of PBL.	2.35	2.69	3.64	.003**
4. Managing group dynamics is a challenging part of PBL.	3.52	3.23	3.43	.794
5. I have a hard time identifying the correct prompting questions.	1.70	1.92	2.14	.437
6. Students most commonly adhere to PBL rules.	4.00	4.38	3.92	.263
7. Students respect clinicians more than non-clinicians.	3.30	3.33	3.07	.736
8. Keeping students motivated can be challenging.	2.87	3.38	3.93	.011**
9. Medical students behave in a professional manner.	3.57	4.08	3.50	.123
10. PBL student assessment can be challenging.	2.96	3.15	3.64	.197
11. Student cultural diversity can be a source of conflict.	2.70	2.69	2.71	.998
12. Student's native language can be a barrier in PBL.	2.65	2.77	3.15	.444
13. Students are adequately informed and have clear expectations of PBL.	3.70	4.15	3.79	.455
Challenges scale	*32.7*	*32.7*	*36.3*	*.17*
SUPPORT AND TRAINING				
1. The initial 2-day training workshop adequately prepared me for tutoring.	4.00	4.46	3.64	.026**
2. The briefing sessions are not very useful.	2.09	1.50	2.36	.064
3. The annual debrief sessions are not very useful.	2.33	2.23	1.71	.129
4. The peer reviewers offer good support.	4.00	4.42	4.31	.224
5. The mentoring system is useful (if applicable).	3.67	4.00	3.90	.534
6. The tutor handbook is a very useful tool.	3.61	4.15	4.21	.118
7. I am overall satisfied with the mechanisms of support.	4.30	4.38	4.29	.917
Support scale	*27.8*	*28.0*	*28.5*	*.88*

FEEDBACK

1. The quality of student feedback is low.	2.59	1.92	2.29	*.114*
2. The quality of feedback received by peer reviewers is high.	4.04	4.31	4.31	*.455*
3. My feedback is used to improve the curriculum (PBL cases).	3.17	3.38	3.64	*.362*
4. There are no adequate mechanisms in place to provide feedback.	1.91	1.77	1.64	*.619*
5. My feedback is used to improve the PBL process.	3.24	3.77	3.86	*.071*
6. Additional training sessions (based on tutor needs) would be beneficial.	3.55	3.62	3.86	*.630*
7. The structure of the briefing sessions is conducive to my tutoring.	3.43	4.00	3.15	*.151*
8. I would find the pairing up with another tutor (co-mentoring) useful.	2.95	3.08	3.93	*.025***
Feedback scale	27.4	31.0	30.6	*.041***

ADDITIONAL SUPPORT

1. Reflective practice (evaluate and discuss own performance in a critical manner leading to self-improvement)	5.77	5.54	5.86	*.836*
2. Observing other PBL tutors (peer-observation)	5.45	6.31	5.29	*.174*
3. Workshops addressing specific areas (group dynamics, prompting etc)	5.41	5.85	5.64	*.665*
4. Annual appraisal of performance.	5.32	5.85	5.93	*.296*
Additional Support scale	21.8	23.5	22.7	*.48*

** Nominally statistically significant results. Following correction for multiple testing (FDR method), statistical significance was lost due to small sample size.

Table 5

Association between country and different PBL-related outcomes

	Cyprus	UK	p-value for difference
MOTIVATION			
1. I tutor because I enjoy teaching.	4.29	4.88	.139
2. I tutor because it offers me income.	3.21	3.38	.769
3. I tutor because I enjoy the interaction with students.	4.74	5.00	.183
4. I tutor because I find the process intellectually stimulating.	4.44	4.75	.316
5. I tutor because I believe in the educational value of PBL.	4.55	5.00	.051
Motivation scale	*21.2*	*23.0*	*.15*
CHALLENGES			
1. Overall I found the cases difficult to understand.	1.79	2.00	.383
2. Overall I found the tutor notes very useful.	4.05	3.63	.198
3. Following the science is a challenging part of PBL.	2.74	3.13	.393
4. Managing group dynamics is a challenging part of PBL.	3.45	3.25	.670
5. I have a hard time identifying the correct prompting questions.	1.93	1.63	.447
6. Students most commonly adhere to PBL rules.	4.02	4.38	.253
7. Students respect clinicians more than non-clinicians.	3.24	3.25	.987
8. Keeping students motivated can be challenging.	3.43	2.63	.051
9. Medical students behave in a professional manner.	3.64	3.88	.468
10. PBL student assessment can be challenging.	3.36	2.38	.022**
11. Student cultural diversity can be a source of conflict.	2.83	2.00	.055
12. Student's native language can be a barrier in PBL.	3.00	1.88	.009**
13. Students are adequately informed and have clear expectations of PBL.	3.83	3.88	.920
Challenges scale	*34.3*	*30.4*	*.09*
SUPPORT AND TRAINING			
1. The initial 2-day training workshop adequately prepared me for tutoring.	4.00	4.13	.692
2. The briefing sessions are not very useful.	2.00	2.13	.740
3. The annual debrief sessions are not very useful.	2.08	2.38	.402
4. The peer reviewers offer good support.	4.24	3.86	.201
5. The mentoring system is useful (if applicable).	3.82	3.86	.894
6. The tutor handbook is a very useful tool.	4.07	3.13	.011**
7. I am overall satisfied with the mechanisms of support.	4.36	4.13	.362
Support scale	28.8	25.5	.015**

FEEDBACK

1. The quality of student feedback is low.	2.37	2.13	.505
2. The quality of feedback received by peer reviewers is high.	4.29	3.63	.016**
3. My feedback is used to improve the curriculum (PBL cases).	3.31	3.63	.402
4. There are no adequate mechanisms in place to provide feedback.	1.71	2.29	.076
5. My feedback is used to improve the PBL process.	3.51	3.86	.339
6. Additional training sessions (based on tutor needs) would be beneficial.	3.60	4.00	.300
7. The structure of the briefing sessions is conducive to my tutoring.	3.41	3.88	.296
8. I would find the pairing up with another tutor (co-mentoring) useful.	3.30	3.13	.687
Feedback scale	29.2	29.8	.75

ADDITIONAL SUPPORT

1. Reflective practice (evaluate and discuss own performance in a critical manner leading to self-improvement)	5.73	5.75	.974
2. Observing other PBL tutors (peer-observation)	5.67	5.43	.709
3. Workshops addressing specific areas (group dynamics, prompting etc)	5.61	5.50	.840
4. Annual appraisal of performance.	5.73	5.13	.220
Additional Support scale	22.7	21.6	.50

** Nominally statistically significant results. Following correction for multiple testing (FDR method), statistical significance was lost due to small sample size.

Table 6

Correlations (r*) between motivators 3 and 5 and challenges and support

				Motivator #3 I tutor because I enjoy the interaction with students.	Motivator #5 I tutor because I believe in the educational value of PBL.
	Item	r	*n*	r	*n*
Challenges	4. Managing group dynamics is a challenging part of PBL	-.370	50	-	-
	6. Students most commonly adhere to PBL rules	-.153	49	-.240	49
	9. Medical students behave in a professional manner.	-.242	50	-.232	50
	13. Students are adequately informed and have clear expectations of PBL.	-	-	-.208	50
Support	1. The initial 2-day training workshop adequately prepared me for tutoring.	.248	49	.342*	49
	4. The peer reviewers offer good support.	.319*	48	.416**	48
	5. The mentoring system is useful (if applicable).	.314	29	.460*	29
Additional support	3. Workshops addressing specific areas (group dynamics, prompting etc)	.251	49	.357*,	49

*p<.05