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Problem based small group learning in anatomy of physiotherapy students: internet versus conventional dissection method of learning

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Abstract

Background: The traditional method of learning through dissection with the help of a facilitator and the benefit of small-group interaction takes an upper hand in understanding the clinical and surgical aspects of Anatomy, although the Internet delivers well-accepted educational materials quickly and effectively. The main objective behind this quantitative analytical study was to determine the effectiveness of a problem-based small - group learning (PBSGL) intervention of Physiotherapy (BPT) students conducted via internet and the conventional dissection method, in a randomized controlled trial.

Methods: All the 64 BPT students were sensitized about the Anatomy of Cubital fossa as a regular theory class, and the basics of the topic was discussed. These 64 students were randomly assigned to a study group (*n*=32) and a control group (*n*=32).The control group (C-group) were made to do dissection of cubital fossa by regular conventional method with the help of a facilitator followed by group interaction whereas, the study group (S-group) were given the same topic to study via the internet but without the help of a facilitator and without the benefit of small-group interaction.

Results: The outcome measures included the qualitative feedback from the learners through the multiple choice questions (MCQ) test. The results of the two methods were analyzed and statistically compared and evaluated, looking into the feasibility, key to success, utility of internet-assisted education from an education and evaluation perspective.

Conclusion: The statistical result of the MCQ tests revealed a significant difference between the study group and the control group. From our study we can conclude that PBL with small group interaction using the conventional dissection method with the help of a facilitator to solve the problem is a useful learning tool than the internet learning method devoid of a facilitator and group interaction.

Keywords: Problem based learning; Small group learning in medical education; Digital media and technologies in medical education.

Introduction

Problem based learning (PBL) is now being used in a wide range of disciplines and educational levels worldwide. Considering that in the recent years admissions in Medical Colleges is taking place in large numbers, the PBL in small groups helps the students and instructors to gain a foothold in the field of Anatomy, the tutorial hours can be fully utilized for this purpose.

The student learn to solve the problem by immediately applying their knowledge, by working in small groups the students improves their interpersonal skills, making new friends and increases their creativity to solve complex problems.

Through the PBL group experience, health professional students can engage in the meaningful learning of subject matter, develop effective problem-solving skills, learn about teamwork and identify the learning goals.[1]

The use of technology in PBL remains under-researched: the use of internet devices (mobiles, laptop computers, smart phones, tablets, electronic book readers, etc.) have increasingly been used by the students during PBL tutorials in recent years, probably due to their decreasing cost and the widespread availability of Wi-Fi connectivity anytime and anywhere on campuses.[2]

Originated in 1960s at McMaster University Medical School, Canada, PBL is essentially a collaborative, constructivist, and contextualized learning and teaching approach that uses real-life problems to initiate, motivate and focus knowledge construction.[3]

PBL has taken on a myriad of definitions, pushed in part by institutions wanting to refine their particular approach. The most recent definitions identified the following key components of PBL:

- Ill-structured problems are presented as unresolved so that students will generate not only multiple thoughts about the cause of the problem, but multiple thoughts on how to solve it.
- A student-centered approach in which students determine what they need to learn. It is up to the learners to derive the key issues of the problems they face, define their knowledge gaps, and pursue and acquire the missing knowledge. Teachers act as facilitators and tutors, asking students the kinds of meta-cognitive questions they want students to ask themselves.
- Authenticity forms the basis of problem selection, embodied by alignment to professional or 'real world' practice.[4]

Materials and Methods

A group of 64 Physiotherapy students of first year, at JSS Medical College, Mysore, India were explained about the objectives of the study and written informed consent forms duly signed by the students were taken prior to the study. All the 64 students were sensitized about the Anatomy of Cubital fossa as a regular theory class, the basics of the topic was discussed. These 64 students were randomly assigned to a study group (*n*=32) and a control group (*n*=32). The control group (C-group) were made to do the dissection of the Cubital fossa by regular conventional method with the help of a facilitator and were given the benefit of small-group interaction, whereas, the study group (S-group) were given the same topic to study via the internet by browsing the various videos on dissection of the Cubital fossa, but without the help of the facilitator and without the benefit of small-group interaction. The outcome measure included the qualitative feedback from the learners through the multiple choice questions (MCQ's) test. The results of the MCQ test were analyzed and statistically compared, looking into the feasibility, key to success, utility of the internet-assisted education from an education and evaluation perspective. The duration of the study was four weeks.

Observation and Results

The internet group (S –group) consisting of 32 students (*n*=32), and the control group (C – group) consisting of 32 students (*n*=32), a total of 64 BPT students were assessed following the MCQ'S test for 5 marks. The total scores were graded as follows:

Good (G): 4, 5 marks;
Average (A): 3, 2 marks;
Bad (B): 0, 1 marks, not attempted.

Table 1: Results of S - group

Good (G)	08	25.0%
Average (A)	18	56.25%
Bad (B)	06	18.75%

Table 2: Results of C – group

Good (G)	09	56.25%
Average (A)	07	43.75%
Bad (B)	00	0%

It was observed that the Good students of C - group had performed slightly better than the S – group, among the Average students the S – group had performed better than the C – group and among the Bad students the C – group show zero percentage than the S – group.

Table 3: Comparative Results of Good and Average grades of S and C groups

G + A (S group)	26	81.25%
G + A (C group)	32	100%

The results of Good and Average grades put together shows that the C-groupare 100% better performers than the S-group (81.25%). The Bad performers in C-group is zero percent whereas, in the S-group it is 18.75%. From this we can observe that the group of Anatomy students who were exposed to the regular conventional method of dissection with the help of a facilitator followed by small group interaction to solve the problem were better performers or learners than the students who were exposed to the internet without a facilitator and no group interaction. In our study it was noticed that, the control group were highly confident about their performance, the conventional method of dissection with the help of a facilitator followed by the small group interaction before the MCQ test motivated them to increase their knowledge about the subject matter, and they were very much focused to the problem and were determined to solve it. Whereas, the study group had difficulty in understanding the problem because they were lacking confidence and communication skills, without a facilitator and small group interaction they were socially isolated, many had problems with internet accessibility and technical problems, and were not able to solve the problem. Their focus on the subject was constantly getting distracted while browsing the internet due to other areas of their interest.

Discussion

Problem based learning (PBL) provides a framework for building critical thinking, interpersonal skills, and teamwork. PBL is a student – centered method of teaching in which the students are encouraged to think their way through complex problems. Here, the instructor acts as a facilitator who helps them to solve the problem. The PBL begins by dividing the students into small groups, and each group is given a problem to solve. In our study we divided the students into two groups, S- group was to solve the problem through internet without group interaction and the C-group was to solve the problem through regular conventional dissection method followed by group interaction. Having gained the information they need, the students then apply their knowledge to solve the problem. In our study they were given multiple choice questions to assess their ability to solve the problem and were statistically evaluated.

The benefits of PBL includes: it increases motivation, promotes self-directed learning, it is a student-centered approach, it helps to develop lifelong learning skills and helps to understand better learning process and promotes interdisciplinarity. The various risks of PBL include: it takes longer time and needs planning, less content of the knowledge is learned, creating a suitable problem scenarios is difficult.[5]

The internet is more frequently becoming a part of our daily lives, and its presence in medical education is unmistakable. The internet has both advantages and disadvantages. The advantages include: distance learning is possible; flexible scheduling; easily updated perpetual resource is always available; individualized learning is possible; learning exercises like interactive models and multimedia (colour, sound, videos, photos, graphics and animations) can enrich the student's knowledge; and it facilitates the assessment and documentation of educational objectives.

The disadvantages of Internet learning in PBL include: social isolation leaving them devoid of face-to-face small group interaction; devoid of building up of interpersonal relationships and communication skills; it is expensive and many institutions do not have internet accessibility; the multimedia distracts the learners and actually decreases learning; the video clips frame rate and colour do not seem to impact satisfaction or understanding of the subject matter; poor instructional design and technical problems.[6]

Whether in the original PBL or in similar approaches, small group learning and collaboration are essential[7]. To solve problems, students work in small groups to elaborate and negotiate ideas, and construct joint explanations[7,8]. From an instructional design perspective, small group learning can achieve several important goals of PBL, for instance, constructing an extensive and flexible knowledge base, developing effective problem-solving skills, and becoming effective collaborators[9]. Recently, most studies reported anecdotal findings or used self-report surveys to study students' perceptions. Ethnographic methods such as observations and interviews in naturalistic settings are needed to yield rich findings that can inform PBL researchers and practitioners in health professions education.[10] PBL promotes the activation of prior knowledge and its elaboration. Evidence is reviewed demonstrating that these processes actually occur in small-group tutorials and that the processing of new information is indeed facilitated by discussion of a relevant problem. Thus, a cognitive process called epistemic curiosity (or intrinsic interest) is enabled.[11] It has been argued that effect size (ES) seen with PBL have not lived up to expectations (0.8-1.0) and the theoretical basis for PBL, contextual learning theory, is weak.[12]

It is important to determine whether PBL best matches the human reasoning process .It has been revealed that there is a strong association between the case-based reasoning and problem-based learning models, and thus PBL is a successful teaching method that should be encouraged by medical schools.[13] The principles of PBL is to put learners in a particular situation, and then to give them a task or challenge as a source for learning, and arrange it to be of a kind similar to work with which they will be confronted in their professional future. The tutorial group has proved to be an optimal teaching arrangement, for PBL, where the group's task is to evaluate and define different aspects of the problem.[14] It has been observed that there were significant differences in the development of students' critical thinking dispositions between those who undertook the PBL and the lecture courses.[15]

Conclusion

To sum up, PBL is a highly effective technique that leads to students who are both self-directed and capable of applying concepts to solve a variety of problems. Motivated to learn and ready to use teamwork to solve problems, PBL produces professionals who are already prepared to work with others in order to solve complex problems. PBL is easily adaptable to any discipline, and it encourages active engagement among peers. From our study we can conclude that PBL with small group interaction using the conventional dissection method with the help of a facilitator to solve the problem is a useful learning tool than the internet learning method devoid of a facilitator and group interaction.

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