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Introduction to Clinical Sciences — self-resolving clinical problems in small groups — perception of course participants — pilot study

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Abstract: Background: Problem-based learning is a method of acquiring knowledge and competences on the basis of work on the problem. Medical universities use the PBL method more widely in the course of teaching future physicians, in the CMUJ classes using the PBL method were introduced in the third year of studies, as a part of the Introduction to Clinical Sciences.
Methods: At the end of course, the students voluntarily filled in a questionnaire (17 questions concerning various aspects of the course). A total of 105 questionnaires were analyzed. Statistica 12.0 program was used for this analysis.
Results: 95.5% of respondents positively perceived the way of conducting classes in the form of PBL and considered them to be in line with their expectations (81%). 80% of respondents confirmed the usefulness of classes in acquiring knowledge and integrity with pre-clinical subjects. Divided opinions were expressed by the respondents as to the benefits and satisfaction from independent presentation and teaching of other students, 34.3% rather emphasized the benefits, while 28.6% expressed a negative opinion.
Conclusions: The study confirmed usefulness of classes conducted using the PBL method, both in terms of deepening the knowledge and repetition of already gained knowledge, as well as beneficial reception of classes by students. The course may be modified in the future by increasing the number of cases.

Keywords: Problem Based Learning, students' opinion on PBL, teaching methods.

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Introduction

Problem-based learning (PBL) is a method of acquiring knowledge and competences on the basis of work on the problem. This method encourages students to analyze and seek solutions on their own [1]. The roots of this teaching method date back to 1960

and come from Mc Master University in Hamilton (Barrows). Effectiveness of this method in teaching medical subjects has been proven [2].

The main assumptions of this method are based on an independent work of the course participants consisting in the analysis of clinical problem. Cooperation with other students has an important role in the analysis process. Information should be combined with previous knowledge from different sections of the curriculum, which is important for understanding and solving the current problem. Analyzing the problem enables, on the one hand, to consolidate the knowledge already acquired and, on the other hand, to combine it with new information. This method is particularly important in the age of XXI innovation — nowadays the availability of tablets, smartphones and social networks have a significant impact on communication and knowledge acquisition — the PBL method uses access to the latest, current data and enables to rely on the latest guidelines. The method changes the student's and teacher's role — the student, being at the center of problem, seeks a solution by himself, and the teacher acts as a coordinator of the whole process, assists and guides the participants. Medical universities increasingly use the PBL method in teaching future physicians, especially in pre-clinical subjects [3–6].

Despite many positive aspects of this teaching method — such as the ability to play the role of a clinician, developing the independence of future doctors, appealing and thus consolidating the knowledge already acquired, as well as the transfer of theory to the practical ground — potential problems may arise during the classes. Particularly important in the course of teaching may be the participants' character — shy people may have a problem with assuming a new role, a problem with active participation in the discussion. Emotional issues can be another problem, the discussion can be influenced by e.g. personal experiences of the course participants. This particular method of teaching develops not only knowledge but also influences the social development of the participants, hence the possible different perception of the way in which classes are conducted. Data on the impact of PBL method on a large group of Polish students has not been sufficiently researched so far.

Introduction to Clinical Sciences has been conducted at the Medical Department of Collegium Medicum since 2010. A long period of time has enabled to conduct observational research focused on the perspective of students in 2015–2018.

Material and Methods

Classes in the introduction to clinical sciences are attended by students of the third year of a six-year cycle of studies — classes are conducted parallel to pathophysiology and synchronized to address similar issues. Students work in small groups of 8–10 people. The main aim of these classes is independent work of the participants and

independent solving of clinical problems based on the knowledge from pre-clinical courses under the supervision of an instructor.

The ICS course is a cycle of 8 clinical cases, each of which is divided into three classes lasting 2 hours and 15 minutes. Each case is divided into about 6-8 parts, which chronologically introduce students to the patient's medical history. The task of course participants is to jointly analyze the following parts of a given case — writing down the obtained information, discussing the presented symptoms in the context of topics processed into pathophysiology, proposing an initial diagnosis, proposing and then discussing possible diagnostic tests (both laboratory and imaging) and their impact on further treatment. After a full analysis of case fragment, the students receive another part of prepared scenario — responding to their planned diagnosis and again within "brainstorming" they analyze obtained data. Most often, during this study, one person was selected as a secretary, who recorded common conclusions, and often the group chose one leader to lead the discussion. At the end of first and second classes, each participant, together with the group, determines the subject of multimedia presentation, which will be presented to everyone in a week's time during the next classes. Presentations should last about 5 minutes, prepared reliably, in accordance with the current literature and current guidelines — the evaluation of conducted presentations includes not only the diligence of preparation and manner of presentation but also the selection of literature sources. Academic teacher also took part in the classes, who plays the role of supervisor and coordinator — his role is limited to guiding students during the discussion, help and observation of classes, while trying to intervene as little as possible in the independence of a learning group. It is recommended that the whole cycle of classes is conducted by the same teacher, it is essential that the teacher does not change in one case.

During the classes, students are assessed for their involvement in discussion, substantive value of their statements, cooperation, as well as prepared and presented presentations.

Methodology of this study assumed one-time, voluntary filling in the questionnaire after completion of the full cycle of 8 clinical cases, i.e. after 75 hours of the course — participation in the study was voluntary and required signing an informed consent, the questionnaires were fully anonymous. A total of 105 students who attended ICS courses between 2015 and 2018 were analyzed. The survey included 17 questions on various aspects of course evaluation, most of questions were closed — giving the possibility of a single choice, and some left the possibility of free speech or adding their own observations. The study was approved by the Bioethics Committee No. 122.6120.225.2016.

Model of Questionnaire

Dear student,
We would like to kindly ask you to fill out the following questionnaire. It is aimed as assessment of your experience with Introduction to Clinical Sciences course. Should there be anything outside of questions that you would like to communicate to us please do so either at the end or at any other place that you find appropriate.
Thank you in advance for your time and thoughtful responses.

1. Do you think the subject Introduction to Clinical Sciences (ICS) allows you to understand the meaning of learning basic sciences such as anatomy, biochemistry, physiology?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

2. Do you think that ICS integrates knowledge of basic sciences with clinical knowledge?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

3. Did ICS allow you to gain knowledge and learn new topics?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

4. Did the course help you to recall basic science knowledge?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

5. Do you liked the way of teaching during ICS course?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

6. Did ICS course help you to get some understanding of your role as a physician?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

7. During the course you were asked to prepare several short presentations to teach your colleagues and share your knowledge. Did that give you satisfaction?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

8. Did ICS course motivate you to learn and explore knowledge in various fields different then you main interest area?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

9. Did ICS help you acquire skills in teaching other students?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

10. Did ICS classes help you learn how to prepare and present a presentation?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

11. Do you think the tutor led ICS classes in accordance to your expectations?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

If not, what would you change? .....

12. Do you think this subject is needed in the curriculum of medical studies?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

13. Do you think that the cases discussed in the ICS classes are interesting?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

14. Do you think you're wasting time by taking part in ICS classes?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

15. Do you think that more clinical cases should be discussed at the ICS classes (course should be longer)?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

16. Do you like the way of teaching we use at ICS (principles of PBL)?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

17. Are ICS classes optimally integrated / synchronized with the pathology?
□ Definitely yes □ Rather yes □ Yes / No □ Rather not □ Definitely not

Results

A total of 105 surveys were analyzed. The questions included in the survey can be grouped into four categories.

Influence of the method on the course participant's own knowledge

The first four questions concerned the influence of PBL method on strengthening the knowledge already acquired and deepening the students' own knowledge. The vast majority, as many as 80% of respondents stated that classes with the PBL method contributed to understanding of the meaning of pre-clinical subjects (51.4% answered affirmatively, and 28.5% definitely affirmatively). More than half of students also gave a positive opinion on the question of deepening their knowledge and getting to know new issues, as well as repetition of the knowledge they had already acquired. The least negative answers in this category were given to question number 2 — do classes in the ICS integrate knowledge of pre-clinical sciences with the clinic — no one gave a definitely negative answer, and only 2.86% of respondents answered that "rather not", in this question the dominant answer was "rather yes", which was chosen by 44.76% (Fig. 1, 2).

Fig. 1. Question number 3 Did ICS allow you to gain knowledge and learn new topics?

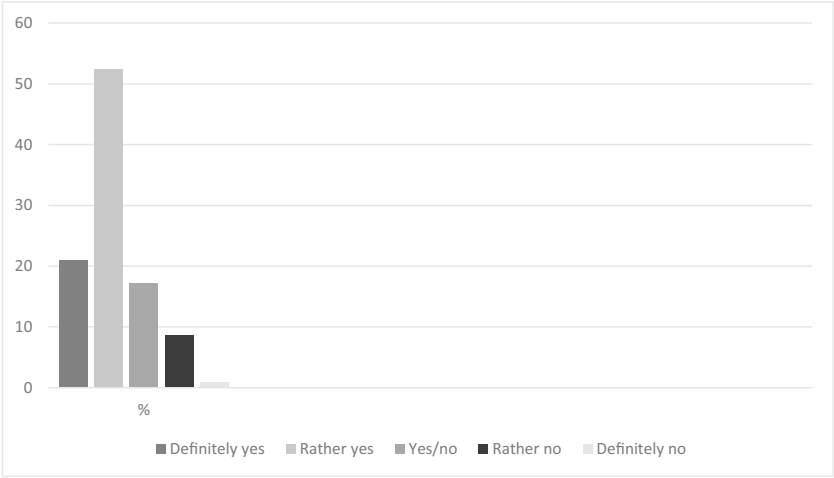

Fig. 2. Question number 4 Did the course help you to recall basic science knowledge?

Acceptance of the very method and method of teaching

Questions 5, 11 and 16 concerned the perception of PBL method by Polish students and assessed the assistant's way of conducting classes.

"Rather yes" was a dominant answer in terms of satisfaction with the method of teaching (74.3% of the total answers "yes" and "rather yes", including the dominant ones from the whole group of 55.2%). Question 16 concerned the acceptance of problem-based method of teaching and here again nobody answered "definitely not", while 95.5% of students liked the method of teaching ("definitely yes" and "rather yes" — both 47.6% each). Question 11 summarized the assessment of assistant's work, which was also positively perceived: the vast majority of respondents positively perceived the way of conducting classes in the form of PBL and considered them to be in line with their expectations — "definitely yes" was chose by 18.1% and "rather yes" by 62.9% (Fig. 3).

Fig. 3. Question number 11 Do you think the tutor led ICS classes in accordance with your expectations?

Student's own work

The third category consists of questions 6 to 10, summarizing the attitude of course participants to the need to prepare a presentation, to present it to other participants, and to take on the role of a teacher.

Respondents shared their opinions on the benefits and satisfaction of preparing presentations and teaching other students — the most answers were "rather yes" by 34.3% and "definitely not" by 28,6%. As many as 62.9% (including "rather yes" by 49.52%) of students positively assessed the possibility of taking on the role of a doctor. By answering the question 9, students expressed doubts as to the usefulness of method for teaching others — practically 30% answered "rather yes", "yes", "no" and "rather no", while more than half of students favorably supported the impact of classes on learning to prepare multimedia presentations (56.2% of the respondents declared "rather yes" and "definitely yes") (Fig. 4).

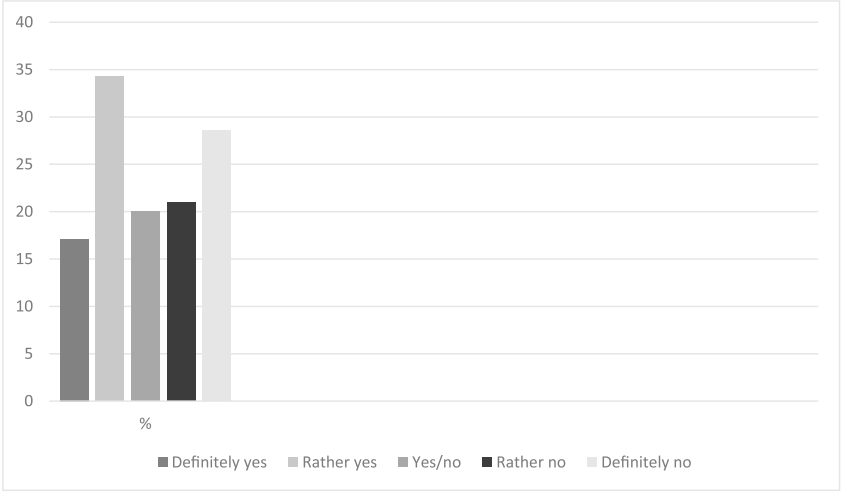

Fig. 4. Question 7 During the course you were asked to prepare several short presentations to teach your colleagues and share your knowledge. Did that give you satisfaction?

Overall assessment of the course

The last group of questions (12, 17, 15, 13, 14) evaluated the overall assessment of the course in relation to its integrity with the curriculum.

The most positive answers (48%) were given to the question on usefulness of ICS subject (Fig. 5).

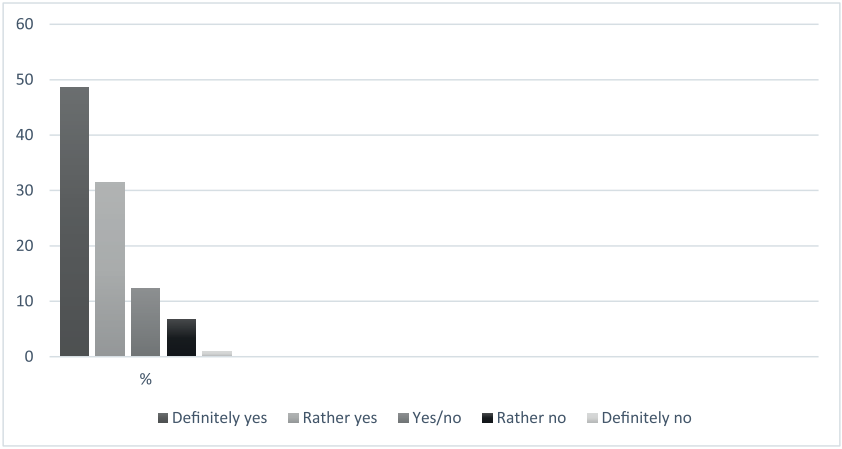

Fig. 5. Question number 12 Do you think this subject is needed in the curriculum of medical studies?

For the majority of surveyed participants, the number of discussed clinical cases was insufficient — in favor of "definitely yes" and "rather yes" options were 29.5 and 25.7% respectively (i.e. 55.2% in total). In most cases discussed within the ICS are considered interesting ("definitely yes" was 13.3% and "rather yes" 53.3% — only 3.81% chose "definitely no"). Participants were also positive on the subject of material synchronization with already completed courses (Fig. 6).

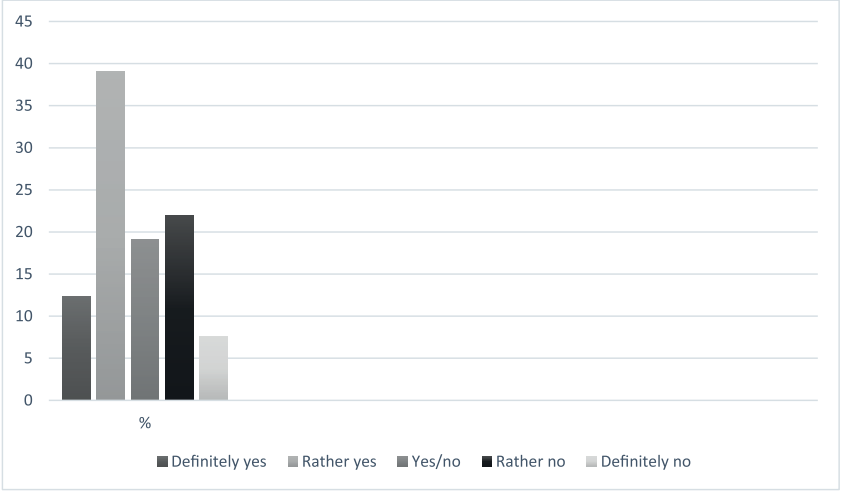

Fig. 6. Question number 17 Are ICS classes optimally integrated / synchronized with the pathology?

Discussion

Critical thinking in medical subjects has been recognized as a skill that is not innate and intuitive but must be acquired and practiced in the course of studies — it is the key to solve clinical problems. This problem has already been highlighted in the literature and widely discussed, it is considered to be one of the key concepts in education [7]. Experimental studies have shown positive results from learning strategies based on PBL problems [8, 9]. In the meta-analysis of 16 studies (in a diverse population — the United States, Turkey, China and South Korea) trying to assess the effectiveness of teaching strategies — it was possible to prove the positive impact of PBL method on the development of critical thinking in nursing students [7], this was confirmed by earlier studies [8, 9] — scientists undertook the evaluation of isolated PBL method and it was the only learning strategy (apart from the strategy of thought maps, simulation classes, reflexive writing) for which the effectiveness was statistically significantly confirmed. The usefulness of this method was confirmed by Polish students in the present study, who also recognized the PBL learning method as good for learning new data and an effective repetition method of previously learned topics. Learning through the PBL strategy motivated students to think critically, generate their own ideas, and helped them acquire the knowledge and skills required to become competent physicians [10]. Another study published at the end of 2018 also confirmed the positive impact of this method both on the acquisition of knowledge and soft skills. Students in Saudi Arabia emphasized the impact of PBL on the acquisition of knowledge and the impact on the learning process, and these results were also consistent with this study. According to the available literature, the PBL method provides students with better skills of critical thinking, reasoning, team building, communication, independent learning and summarizing skills than traditional lectures [11]. According to Surif *et al.*, the PBL can also improve soft skills, has a positive impact on student motivation and cooperation [12]. Hmelo-Silver *et al.* also stressed the importance of communication and the ability to help group members, to cooperate in negotiating the relevance of addressed issues [13]. Results of our study are consistent with available literature — additionally, they emphasize the possibility not only to acquire new knowledge, but also to consolidate the information already obtained, which had not been the subject of research so far.

While Polish students expressed their positive opinion on taking the role of a teacher and on the effectiveness of such a method of learning, a lot of controversy aroused independent preparation of presentations. It has been proven that PowerPoint presentations increase the effectiveness of memorizing and make it easier to understand new knowledge in comparison to classical lectures [14, 15]. Respondents were divided on whether preparing a presentation at home gave them satisfaction — the most negative answers were given to this question — this was probably due to the

need to devote a lot of time and search for professional literature, as well as the lack of experience in presenting work in a larger forum. This theory fits in with the proven thesis that the greater satisfaction from independently prepared presentations and their presentation on a forum have students prepared technically for this, who participated in computer courses [16]. The survey conducted on Polish students showed that they do not feel confident as teachers for their peers, while more than half of them appreciated the opportunity to develop proficiency in preparing multimedia presentations, which will certainly pay off in later education.

The role of teaching with PBL method in the teaching of medical students has also been proven, e.g. the usefulness of method has been confirmed in a recently published study conducted during ophthalmology classes [17]. Learning with PBL method is a concept that has existed for decades, but its implementation in the education of medical students is slowly progressing. Given the nature of the doctor's work, PBL is a logical step towards developing students' ability to synthesize and integrate basic concepts into clinical medicine. The one-year program in pre-clinical teaching was introduced in Harvard's study program — the program received positive feedback from students and was, in their opinion, considered an effective method of learning [18]. Students in particular stressed the possibility of synthesizing the knowledge they had previously gained — transition from pathogenesis and pathomechanism of the disease, by making a final diagnosis and attempting to undertake causal treatment. They were able to use the theoretically acquired information in practice, and in case of the lack of knowledge, they could search for necessary data. In addition, they positively emphasized possibility of multidimensional thinking and above all independence in solving a clinical case [18].

Students' opinions on the potential problems of this method have also been highlighted — working in a group can sometimes reduce individual entities, the problem can evolve in a direction indicated by the majority of students and someone who does not agree with their opinion will remain unsatisfied — may not be able to fully express their opinion [19]. Clinical experience also influences the development of discussion and the direction of work of the whole group, which may contribute to less unification of classes. Also the questionnaires filled in by students of the CMUJ confirmed positive perception of this method, particular usefulness in consolidating, synergy of knowledge already acquired and the possibility of becoming a practitioner, which in the future will translate into better care for the patient. Polish students found the course necessary and interesting, which is in line with the cited literature [20, 21]. It seems that classes conducted using the PBL method have fitted in well with the program of pre-clinical subjects, are liked by students and play an important role in combining purely theoretical subjects with practical classes which are to begin.

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None.

Conflict of interest

None declared.

References

1. *Donner R.S., Bickley H.*: Problem-based learning in American medical education: an overview. Bull Med Libr Assoc. 1993 Jul; 81 (3): 294–298.
2. *Schafer M., Georg W., Muhlinghaus I., Frohmel A., Rolle D., Pruskil S., Heinz A., Burger W.*: Experience with new teaching methods and testing in psychiatric training. Nervenarzt. 2007 Mar; 78 (3): 283–293.
3. *Neville A.J.*: Problem-based learning and medical education forty years on. Med Princ Pract. 2009; 18 (1): 1–9.
4. *Cendan J.C., Silver M., Ben-David K.*: Changing the student clerkship from traditional lectures to small group casebased. J Surg Educ. 2011; 68 (2): 117–120.
5. *Skrzypek A., Stalmach-Przygoda A., Dębicka-Dąbrowska D., Kocurek A., Szopa M., Górski S., Szeliga M., Małecki Ł., Grodecka A., Cebula G., Nowakowski M.*: Wybrane metody dydaktyczne stosowane w edukacji studentów medycyny w Zakładzie Dydaktyki Medycznej Uniwersytetu Jagiellońskiego Collegium Medicum. Co nowego w dydaktyce medycznej? General and Professional Education. 2018; 1: 26–32.
6. *Skrzypek A., Szeliga M., Jagielski P., Perera I., Dębicka-Dąbrowska D., Wilczyńska-Golonka M.*: The modified Peyton approach in the teaching of cardiac auscultation. Folia Med Crac. 2019; 59 (4): 21–32.
7. *Oliveira L.B., Díaz L.J., Carbogim F. da C., Rodrigues A.R., Püschel V.A.*: Effectiveness of teaching strategies on the development of critical thinking in undergraduate nursing students: a meta-analysis. Rev Esc Enferm USP. 2016 Apr; 50 (2): 355–364.
8. *Kong L.N., Qin B., Zhou Y.Q., Mou S.Y., Gao H.M.*: The effectiveness of problem-based learning on development of nursing students' critical thinking: a systematic review and meta-analysis. Int J Nurs Stud. 2014 Mar; 51 (3): 458–469.
9. *Yuan H., Williams B.A., Fan L.*: A systematic review of selected evidence on developing nursing students' critical thinking through problem-based learning. Nurse Educ Today. 2008 Aug; 28 (6): 657–663. doi: 10.1016/j.nedt.2007.12.006.Epub 2008 Feb 11. Review.
10. *Zahid M.A., Varghese R., Mohammed A.M., Ayed A.K.*: Comparison of the problem based learning-driven with the traditional didactic-lecture-based curricula. Int J Med Educ. 2016 Jun 12; 7: 181–187. doi: 10.5116/ijme.5749.80f5.
11. *Ibrahim N.K., Banjar S., Al-Ghamdi A., Al-Darmasi M., Khoja A., Turkistani J., Arif R., Al-Sebyani A., Musawa A.A., Basfar W.*: Medical students preference of problem-based learning or traditional lectures in King Abdulaziz University, Jeddah, Saudi Arabia. Ann Saudi Med. 2014 Mar–Apr; 34 (2): 128–133.
12. *Surif J., Ibrahim H., Mokhtar M.*: Implementation of Problem Based Learning in Higher Education Institutions and Its Impact on Students' Learning 4th. Int Symp Probl Learn 2013. 2013; 66–71.
13. *Arneson H., Ekberg K.*: Evaluation of empowerment processes in a workplace health promotion intervention based on learning in Sweden. Health Promot Int. 2005 Dec; 20 (4): 351–359. Epub 2005 Sep 16.

14. *Susskind J.E.*: Powerpoint's Power in the Classroom: Enhancing Students' Self-Efficacy and Attitudes. Computers and Education. 2005 Sep; v45 n2: 203–215.
15. *DeBord K.A., Aruguete M.S., Muhlig J.*: Are Computer-Assisted Teaching Methods Effective? Teaching of Psychology. 2004; 31 (1): 65–68.
16. *Nouri H., Shahid A.*: The effect of Powerpoint presentations on student learning and attitudes. Glob Perspect Account Educ. 2005; 2: 53–73.
17. *Atta I.S., Alghamdi A.H.*: The efficacy of self-directed learning versus problem-based learning for teaching and learning ophthalmology: a comparative study. Adv Med Educ Pract. 2018 Sep 4; 9: 623–630.
18. *Chang B.J.*: Problem-based learning in medical school: A student's perspective. Ann Med Surg (Lond). 2016 Nov; 22; 12: 88–89.
19. *Skrzypek A., Cegielny T., Szeliga M., Jabłoński K., Nowakowski M.*: Different perceptions of Problem Based Learning among Polish and Scandinavian students. Is PBL the same for everyone? Preliminary study. General and Professional Education. 2017; 3: 58–64. ISSN 2084-1469.
20. *Ibrahim M.E., Al-Shahrani A.M., Abdalla M.E., Abubaker I.M., Mohamed M.E.*: The Effectiveness of Problem-based Learning in Acquisition of Knowledge, Soft Skills During Basic and Preclinical Sciences: Medical Students' Points of View. Acta Inform Med. 2018 Jun; 26 (2): 119–124.
21. *Skrzypek A., Perera I., Szeliga M., Jagielski P., Dębicka-Dąbrowska D., Wilczyńska-Golonka M., Górecki T., Cebula G.*: The modified Peyton's approach and students' learning style. Folia Med Crac. 2020; 60 (2): 67–80.