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PROJECT-BASED LEARNING AS AN APPROACH TO DEVELOP CRITICAL THINKING SKILLS: A LITERATURE REVIEW

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Abstract

Project-Based Learning is a learner-centered approach, which is known as one of the ways that facilitates the development of professional competencies and promotes learners' critical thinking skills. This paper provides a selective review of the literature and the analysis of the studies on Project-Based Learning (PBL) in the field of foreign language education and critical thinking skills including the main concepts, key components and a learning process within PBL. PBL has a strong theoretical support from the foreign literature, and most of the researchers understood and implemented it as an approach to foster critical thinking skills in the reviewed studies; however, not all of them complied with its essential elements proposed as "Gold Standard of PBL". Particularly, the analysis of the selected studies in PBL sphere revealed that most of the researchers did not take into consideration the requirements of the last and main stage of the PBL as "Public product", that demands the projects to be presented in front of the alternative audience. Even though, the final products were designed within these projects, they were not performed out of the classroom, which in its turn is opposite to the policy of rigorous "Project-Based Learning".

Keywords: PBL, critical thinking skills, foreign language education.

Project-based learning(PBL) is an inquiry-based method that enables students to obtain essential skills and to develop personal qualities needed for success in a future life (Bell,2010; Larmer et al., 2015). The primary objective of PBL is to contribute to in-depth learning and to facilitate the acquisition of 21st-century skills and competencies (Condliffe et al., 2017), the achievement of which will be realized through planning the project, asking deep questions, solving the problems, working in collaboration and creating the artifact (Blumenfeld et al.,1991). According to Larmer et al., (2015) the current world context forced educators to consider the PBL approach not only from the point of providing with high-quality knowledge, but moreover to reveal its opportunities in practicing the skills which are necessary for "college, career, and life success". Therefore, it can be stated that the wide interest toward the investigation of PBL in the education system starts from the 1990s (Thomas,2000) and since this period, a number of studies were dedicated to the use of PBL, throughout of which there were revealed the positive effects of the PBL on students' various abilities such as writing and speaking skills, creative and critical thinking skills, motivation and problem solving (Chiang&Lee,2016; Cash,2017; Fragoulis,2009; Rachmawati et al.,2017; Nugroho et al., 2019; Putri et al.,2019; Isik&Gucum,2013). These studies demonstrated that PBL might be successfully implemented to develop the abovementioned matters. Particularly, taking into account the significance of the critical thinking which were claimed as one of the essential 21st-century skills in contemporary education (Saleh,2019; Lai,2012) several studies (Asari,2014; Cash 2017; Dimmit,2017; Maro&Nurbatra,2013; Mutakinati et al.,2018; Rochmahwati,2015) were focused on the investigation of the relationship between the PBL and critical thinking skills and in accordance with the analysis of the present studies it can be stated that PBL and critical thinking skills are

closely related to each other. However, the topic of the development of critical thinking skills through PBL not thoroughly investigated in the Kazakstani context yet. Therefore, this article is aimed to focus on recently published works investigated in foreign societies and to analyze the contribution of PBL to the development of critical thinking skills in these studies. In addition, this article might serve as a basis to further investigation of the given topic in the local context, which in turn will organize the research taking into consideration the methods used in previous studies, its findings and gaps. In order to understand the relationship between the PBL and critical thinking skills, this study will start the revision from the concept of the PBL that links to the history of the approach and to the "proposed as "Gold Standard of PBL". The seven essential project design elements designed by Buck institution of Education (BIE,2015) play a crucial role on the learning process within PBL and successful implementation of the abovementioned standard will lead to the development of 21st-century skills (Larmer et al.,2015, cited in Smakova, 2020).

Literature Review

History of the PBL

The history of the emergence of the PBL approach connects to the works of Dewey who was curious about the influence of the experiences on the process of gaining knowledge (Pecore,2015). His "experiential learning theory" was opposite to the traditional teaching methods, which were focused on teaching students to collect the theoretical knowledge based on the textbooks and considered as a necessary tool for being prepared for future life; however, Dewey's theory suggested that students learn through being involved in real-life situations that allow them to gain experiences useful for the implementation in future circumstances (Roberts,2003). The theory was afterward popularized by Kilpatrick, the author of works related

to project education such as “Project Method”, “Foundations of Method” the main theory of which were based on ‘child-centered” concept of learning (Knoll,2012). The “Child-centered” learning theory suggested learners’ independence in choosing the topics which are interesting for them, thus stimulating the growth of responsibility on own educational processes. Mergendoller et al., (2006) also considered that the development of the PBL might be described by the following three stages which had an impact on the establishment of this approach in the current form.

1. The first stage, related to the theory of John Dewey who considered the problems as “the vehicle for curriculum instantiation”.
2. The second stage, related to the cognitive and constructivist theories which were focused on investigating the essence of the problems and problem-solving processes.
3. The third stage, related to the Problem-based approach, that for the first time, was implemented in Canadian medical university with the involvement of medical students who proposed the problem and its solution as a central matter in a medical environment.

The current concept of PBL was established by BIE which defined the approach in their official website (www.bie.org) as “a teaching method in which students learn by actively engaging in real-world and personally meaningful projects” and proposed the seven essential steps which construct the essence of the PBL, the steps that differentiate the PBL from other types of projects.

Gold Standard: Essential Project Design Elements

Numerous studies investigated the effectiveness of PBL and the benefits which can be gained with the help of this approach; however, not many studies revealed the actual difficulties that students and teachers experienced with the implementation of PBL (Tally, 2009). According

to Tally (2009) the difficulties in implementing the PBL were related to distinguishing the project-based learning from problem-based learning, thus leading to the use of these approaches interchangeably and incorrectly. The thorough review of already existing literature and research raises a suggestion that there is a possibility of local and foreign teachers, dealing with uncertainty in differentiating between the "doing project" with rigorous "Project-based learning", and that can seriously hamper the proper use of PBL. BIE designed seven essential stages of PBL which compared to the "dessert project" requires higher-order thinking skills to solve problems concerning the project, as well as indicated these steps as peculiarities of PBL in order to differentiate the approach itself from doing the project (Larmer,2015). Planning and designing the project under indicated features, may facilitate the achievement of the target goals in learning and develop 21st-century skills which alongside with various abilities include critical thinking skills (Smakova, 2020). Therefore, the below-mentioned seven essential steps should be taken into account while organizing the project process within the PBL approach, which consists of the following matters:

1. *A challenging problem or question*- which means that the project starts with identification of the actual problem or the question which is required to be solved and answered. This step claimed as "heart of the project" since it focuses on the real problem or question, which is useful not only for gaining the knowledge but moreover for implementing the findings to solve real problems interesting for learners (Larmer, 2015).
2. *Sustained inquiry*-which means that the project requires the learners to be engaged in asking questions, searching for the necessary resources in order to find an appropriate solution. Students may use not only traditional methods such as reading books or searching information through the internet but combine it with "real –world" activities as

interviewing experts or audience which will be useful in creating the final product (Larmer, 2015).

3. *Authenticity*-which means that the problem or question should be taken from a student's real life, or should be related to authentic problems that people face in their daily lives. It is assumed that solving the real-life problems, will facilitate students' increase of motivation toward learning (Larmer, 2015).
4. *Student's voice and choice* - is one of the significant stages of PBL because it illustrates the student-centered position of the approach. This stage means that students are responsible for planning their projects and making decisions concerning the PBL. Providing students with the opportunity to make choices individually and express their opinion through these choices, will train their leadership skills and prepare them to be good problem-solvers and initiative person in the future (Larmer, 2016).
5. *Reflection*-the process in which students and teachers discuss and reflect on the process of the project, on tasks that have been completed, problems that have been raised while working on the project, and ways of solving these difficulties. Reflection allows making connections between the students' personal view and the project process, thus leading to the development of self-confidence and increasing of the knowledge and skills(Cody,2018)
6. *Critique&Revision*- the important process which allows students to revise and improve their products and process through receiving, giving the feedback, and applying this feedback in practice.
7. *Final Product*- is a key component of the PBL, in which students perform the results of their works and findings to their research questions, in the form of video, website, blog,

podcast (Taylor, 2017) or other solution out of the classroom. The role of the technology in this case, is also important since learners use it not only to search information, but to design the aforementioned materials as well (Taylor, 2017). This is a main and final stage of PBL process, in which students' "motivation, responsibility, creativity, 21st century skills, language proficiency and cultural competencies" are expected to be improved (Smakova, 2020).

Rochmahwati (2015) stated that the "final product" as one of the elements of PBL that contributed the improvement of the critical thinking skills of his participants. Particularly, the video in which there was recorded the "teaching practice scenario" created by students for the final product, allowed students to reflect on their works; analyze the project; receive feedback from the teacher; and finally evaluate the project, thus he concluded that critical thinking skills had been improved. Even though, the final product enabled students to evaluate and create the project, as it was mentioned by the researcher, the fact the final product was not performed out of the classroom for alternative audience, gives the grounds for considering that essential elements of PBL were not properly implemented whereas Larmer (2015) connected the importance of the public presentation with growth of motivation, responsibility, thus leading to gaining deep knowledge about the project and improving of students' self-confidence.

Another research conducted by Cash (2017) indicated that evaluating and creating processes which students generally experience throughout the final stage, well suited to higher-order thinking skills according to Bloom's Taxonomy which the researcher indicated as a paradigm of the critical thinking in his study.

Critical thinking skills

According to the analysis of the definitions related to critical thinking skills, it can be stated that the following statement "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action" perfectly defines the critical thinking skills (Scriven & Paul, 2007 as cited in Snyder&Snyder,2008). According to Judge, Jones & McCreery (2009), critical thinking skills alongside with analytical thinking skills are necessary capacity for all students, because it provides students with the opportunity to create "well-constructed argument" which they will implement in every aspect of their education. This is similar to the idea of Asari (2005) who also considered that the importance of critical thinking skills is determined by its necessity to continue education at a higher level. He considered that critical thinking skills might be promoted through both: problem –based and project-based learning methods in which students should plan, decide, compare, and evaluate the solution. Shakirova (2007) (as cited in Dimmit, 2017) also indicated the importance of critical thinking in the education sphere, since it enables "to deal effectively with social, scientific, and practical problems". The study provided by Cash (2017) assumed that higher-order thinking skills as analyzing, creating, evaluating according to the contemporary version of Bloom's Taxonomy connects with the stages of the PBL approach which also engages students to deal with the abovementioned skills while working on the project. To sum up, there are a lot of definitions of critical thinking skills, which might be varied according to which type they belong to (Lai, 2011). The first group refers to a philosophical approach which focuses on Socrate's, Plato's, Aristotle's point of view who analyzed a person's qualities and characteristics and were curious

about what the person may produce under the ideal circumstances. The second referring to a cognitive psychological approach considers critical thinking from both perspectives as how people think and what kind of skills may produce critical thinker. The third type refers to an educational approach, and this type connects with Bloom's taxonomy and higher-order thinking skills, the most used tool for integrating critical thinking skills nowadays (Kennedy et al., 1991 as cited in Lai, 2011).

Previous studies

One of the relevant studies dedicated to PBL and critical thinking skills was conducted by Cash (2017) who investigated the impact of PBL on students' critical thinking skills by comparing the control group with the traditional method of teaching and treatment group with PBL instruction at South Carolina University, US. Students were appointed to investigate the topic "Ethnic conflicts: Removal of Native Americans in which the treatment group with PBL instruction come across with analyzing, discussing, reflecting, and evaluating matters. The final product created by students was the individual page in Wiki space where students uploaded all of the investigated materials. The measurement of the extent of students' critical thinking skills, was identified with the help of pre and post-tests, which were provided between the two groups. According to the test results, the performance of the control group was much better in the pre-test, but the treatment group demonstrated a tremendous outcome in the post-test. Thus, the author concluded that the PBL has positively influenced students' critical thinking skills, despite the fact the t-test which was implemented to measure the effect of the improved critical thinking skills illustrated the lack of statistical significance. Cash (2017) suggested that the low size of statistical significance is because of the small number of participants, and if the study had involved rather more students the statistical data would have been higher. Finally, Cash (2017)

indicated that dealing with authentic experience leads to the contribution of critical thinking skills. This is in line with the opinion of Maro & Nurbatra (2013) who claimed that PBL enhances critical thinking skills in three cases in which the researchers alongside with discussion and collaboration describe the importance of real-life situations that impact students' behavior and thought. According to the researchers, real life situations allow to deal with various opposing ideas that help students to consider the issues from the objective point of view rather than subjective. As for the discussion, the researchers stated that it occurs as a result of a student-centered environment where the teacher is a facilitator, and students have to "ask and clarify" questions which make their thinking skills more active (Leary, 2003 as cited in Maro&Nurbatra, 2013). Finally, it was claimed that the process of collaborative inquiry enables students immerse into a deep investigation of the questions in order to find solutions and thereby solve the problems of the project process alongside with peers (Stripling et al., 2009 as cited in Maro&Nurbatra, 2013)

The study provided by Rochmahwati (2015) who employed the observation and interview tools in order to identify the impact of the PBL on critical thinking skills also concluded that the discussion process is a way to improve critical thinking skills in which students constantly have to answer for the questions as "Why do you think so?" "How did you learn this?" "What do you think about?" which forces them to think critically. The teacher by asking such questions directed students to think more deeply about the question rather than answering immediately and giving the unconsidered response. It allows considering that asking the appropriate questions and orienting the students to think, search, analyze the response from the various angles is a way to promote critical thinking skills. For instance, Mergendoller (2013) while answering the question "Does Project-based learning teach critical thinking skills" explained that the "driving question"

which students consider throughout the project is one of the ways to students' growth of critical thinking. However, the questions are expected to be truly "driving" that not only for searching information via google in order to find an appropriate answer but moreover to engage students in "attentive, careful, and reflective" thinking on the question and to consider its various explanations, analyze, compare and evaluate the findings. He criticized the stereotype that PBL and critical thinking are similar notions and indicated that PBL should be organized constructively taking into consideration the opportunity to reflect, analyze, evaluate and receive feedback which as it is believed can improve critical thinking skills.

One of the meaningful research in this area was provided by Eldiva & Azizah (2019) who reviewed the literature conducted during the period of 2010-2018, which investigated the impact of PBL on students' achievements with special needs such as physical, intellectual, and behavioral. The researchers assumed that ability to think critically is important for both ordinary students and students with disabilities equally, and the latter is needed for them in order to "understand the others' opinions and make own decisions". Therefore, the researchers distinguished five various papers and analyzed how PBL in these studies influenced students' critical thinking skills. According to the findings of the research, the growth of students' critical thinking skills is reflected in the students' ability of expressing own thought, constructing questions, answering the questions, and identifying problems.

The analysis of the literature demonstrated that PBL mostly being implemented not only in the Humanitarian sphere of Education but in Science Technology Engineering Mathematics (STEM) sphere also. This study conducted by Sayekti (2020) implemented PBL with a STEM approach to create teaching materials in the form of "LKPD", which is supposed as media or project, that will improve students' critical thinking skills in Mathematics class. According to the

researcher, the model applied to the development of the research process was called “ADDIE” that includes four steps such as “Analysis, Design, Development, Implementation, and Evaluation”. In the “Analysis” phase the students gathered information about teachers’ and students’ needs concerning the materials which were realized through observation and interview tools. As the next step, “LKPD” that included materials, concept map, worksheets, and activities expected to improve students’ critical thinking skills was created. Unfortunately, detailed information regarding the another phase was not provided, which made it difficult to analyze the content, findings, and conclusion of the study. However, according to the researcher, the conclusion of the present study was as follows: “students critical thinking is low, the materials need to be interesting; activities expected to be authentic; PBL with STEM approach might improve critical thinking skills but materials should be relevant to students’ character and learning model”. To sum up, absence of information concerning some significant terms as “LKPD”; lack of explanation related to project process; absence of information concerning the types of tests applied in this study to measure critical thinking skills; lack of information concerning the participants; unclearly organized structure and content of the study might be listed as some of the obstacles for comprehension of the given study.

Another example of applying PBL in the non-humanitarian sphere of Education is the study conducted by Permana &Chamisijatin (2019) who implemented the PBL approach through blended-learning in the histology course of Biology class at University of Muhammadiyah, Malang. The researchers indicated that the model used in this study was “CAR” designed by Kemmis & McTaggart (1995) which included classroom actions as Planning, Implementation, Observation, and Reflection. The study was conducted in two Cycles, the results of which were compared and according to that it was concluded that students demonstrated better performance

in Cycle 2. Therefore, the researchers stated that PBL might be implemented as a method to improve students' critical thinking skills. As for the steps of the learning phase, the researchers described the following stages:

1. In this phase, students were given the problem, to which they were expected to establish research questions
2. In this phase, students were expected to create the project that should have solved the given problem
3. In this phase, students should have worked on their schedule and plan their actions, so it could be completed in time.
4. This phase was for monitoring since the teacher had observed the project process
5. This phase was for evaluating the works by the teacher
6. This phase was for reflection and reviewing the students' projects. In this stage, students were tested online in order to identify whether the students discovered solutions for the given problem.

According to the analysis, it can be stated that the present study compared to previously described research concerning the STEM approach in Mathematic class, had followed the elements of rigorous PBL much better. For example, there was an established research problem that was authentic, from students' lives, students were given the time to driving the questions and further was expected to find a solution for the given problem. However, the key component of the PBL in form of "Public product" was not performed and considered in front of the audience which in turn deprived students of the opportunity to present, discuss, evaluate the project.

Conclusion

To sum up, it can be concluded that PBL is a learner-centered approach which engages learners in authentic situations that allow them to gain knowledge through experiences, nevertheless, when it comes to professional competencies and promotion of critical thinking skills it requires the certain standards and elements to be properly implemented in order to gain the target goal. The results of the analysis revealed that almost all of the researchers in the analyzed studies understand PBL as an approach to improve critical thinking skills, and most of them indicated the importance of the ability to analyze, to reflect, to evaluate, to create as the main elements of the discussion and the inquiry processes that improve critical thinking skills. However, each researcher followed a certain method to identify the contribution of the PBL on the improvement of critical thinking skills in the form of pre-post tests, observation, comparing the learning Cycles and other methods. Most of the reviewed studies implemented several steps of the *seven essential project design elements* as Sustained inquiry, Authenticity, Reflection, Final product; however, not all of them included the steps of the abovementioned standard completely. Especially, the researchers did not take into consideration the requirements of the last and main stage of the PBL as "Public product", even though final products were created by students, nevertheless, they were not performed out of the classroom which is opposite to the policy of PBL.

References

As'ari, A.R. (2014). Ideas for developing critical thinking at primary school level. In *International Seminar on Addressing Higher Order Thinking: University of Muhammadiyah Makasar*.

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The clearing house*, *83*(2), 39-43.

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational psychologist*, *26*(3-4), 369-398.

Cash, C. E. (2017). The Impact of Project-Based Learning on Critical Thinking in a United States History Classroom.

Condliffe, B., Visher, M. G., Bangser, M. R., Drohojowska, S., & Saco, L. (2016). Project-based learning: A literature review. *New York, Ny: Mdrc*.

Cody, A. (2018). Making time for reflection in Our Projects. Retrieved from https://www.pblworks.org/blog/making-time-reflection-our-projects

Chiang, C.L., & Lee, H. (2016). The effect of project-based learning on learning motivation and problem-solving ability of vocational high school students. *International Journal of Information and Education Technology*, *6*(9), 709-712.

Dimmitt, N. (2017). The power of project based learning: Experiential education to develop critical thinking skills for university students. In *CBU International Conference Proceedings* (Vol. 5, pp. 575-579).

Judge, B., Jones, P., & McCreery, E. (2009). *Critical thinking skills for education students*. Great Britain by TJ International Ltd, Padstow, Cornwall.

Eldiva, F. T., & Azizah, N. (2019, April). Project Based Learning in Improving Critical Thinking Skill of Children with Special Needs. In *International Conference on Special and Inclusive Education (ICSIE 2018)*. Atlantis Press.

Fragoulis, F (2009). Project-based learning in the teaching of English as a foreign language in Greek Primary Schools: From Theory to Practice. *English Language Teaching, 2*(3).

Isik, Ö., & Gucum, B. (2013). The effect of project based learning approach on elementary school students' motivation toward science and technology course. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *28*(28-3), 206-218.

Knoll, M. (2012). I had made a mistake": William H. Kilpatrick and the project method. *Teachers College Record*, *114*(2), 1-45.

Lai, E.R. (2011). Critical thinking: A literature review. *Pearson's Research Reports*, *6*, 40-41

Larmer, J. (2016). Gold Standard PBL:Student Voice &Choice. Retrieved from https://www.pblworks.org/blog/gold-standard-pbl-student-voice-choice.

Larmer, J. (2015). Gold Standard PBL: Essential Project Design Elements. Retrieved from https://www.pblworks.org/blog/gold-standard-pbl-essential-project-design-elements

Larmer, J., Mergendoller, J., & Boss, S. (2015). *Setting the standard for project based learning*. ASCD.

Maro, R.K., & Nurbatra, L. H. (2013). Building Critical Thinking Behavior of Middle School Students through Project Based Learning.

Mergendoller, J. R., Markham, T., Ravitz, J., & Larmer, J. (2006). Scaffolding project based learning: tools, tactics and technology to facilitate instruction and management. *Buck Institute for Education Novato, California USA*.

Mergendoller, J. (2013). Does project based learning teach critical thinking. *Recuperado de https://www. bie. org/blog/does_pbl_teach_critical_thinking*.

Mutakinati, L., Anwari, I., & Kumano, Y. (2018). Analysis of students' critical thinking skill of middle school through stem education project-based learning. *Jurnal Pendidikan IPA Indonesia*, *7*(1), 54-65.

Nugroho, W.F., & Anugerahwati, M. (2018). Project-Based Learning: Enhancing EFL Students' Speaking Skill through Vlog. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, *4*(8), 1077-1083.

Pecore, J.L. (2015). From Kilpatrick's project method to project-based learning. *International handbook of progressive education*, 155-171

Permana, F.H., & Chamisijatin, L. (2019). Project-based learning through edmodo: improving critical thinking and histology concepts. *Biosfer: Jurnal Pendidikan Biologi*, *12*(1), 58-69.

Putri, S, Sumiati, Larasati,L(2019). Improving creative thinking skill through project-based-learning in science for primary school. *Journal of Physics: Conf. Series, 1157* (2019). doi:10.1088/1742-6596/1157/2/022052

Rachmawati, D., & Asmara, C. H. (2017). Reading and Writing: Development of Project-Based Learning (PBL) Approach. In *International Conference on English Language Teaching (ICONELT 2017)*. Atlantis Press.

Rochmahwati, P (2015). Fostering Students' critical thinking by project –based learning. *Journal on English as a Foreign Language, 5*(1)

Roberts, T. G. (2003). An Interpretation of Dewey's Experiential Learning Theory.

Salehi,S.E.(2019).Critical Thinking as a 21st century skill: conceptions, implementation and challenges in the EFL classroom .*European Journal of Foreign Language Teaching*,*4*(1), ISSN: 2537 - 1754 ISSN-L: 2537 – 1754,doi: 10.5281/zenodo.2542838

Smakova, K.(2020).Promotion of self-regulated learning in project-based approach. *Bulletin of Kazakh national women's teacher training university* no1(81), pp 106-113, available at: http://vestnik.kazmkpu.kz/images/arhiv/2020/%D0%92%D0%B5%D1%81%D1%82%D0%BD%D0%B8%D0%BA_1_2020.pdf

Snyder, L.G., & Snyder, M. J. (2008). Teaching critical thinking and problem solving skills. *The Journal of Research in Business Education*, *50*(2), 90.

Tally, T. (2015). The challenges of implementing project based learning in the 21st century classroom

Thomas, J.W. (2000). A review of research on project-based learning. http://www.bie.org/research/study/review_of_project_based_learning_2000

me.