ATTEMPTING HYBRID MODALITIES IN PROBLEM-BASED LEARNING

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ABSTRACT: *Recent years, the Chinese government have been pouring funds into institutions of higher education, in the hope that China, over four decades' reform and opening, could someday take the lead in science and technology as well. For this reason, institutions of higher education are exploring methodologies to usher in innovation. Problem Based Learning (PBL), among others, is a tentative attempt to implementing changes in the educational models of higher education, particularly critical thinking. However, this process does not occur spontaneously, the variables in the process might decisively influence the level of achievement. This paper analyses the most important variables of the PBL and the teaching of critical thinking skills, hoping to map out possible pieces in the puzzle.*

KEY WORDS: hybrid modalities; critical thinking; higher education

INTRODUCTION

China, apart from its endeavors in economy, has been aspiring to cultivate a sustainable pool of talents to boost its independence and autonomy in science and technology, and hopefully take the lead in the near future. That explains the overwhelming money and attention steered towards the higher education. Therefore, many university institutions have reflected on their educational models with the purpose of ensuring that their graduates have the skills that will allow them to join their work environment and contribute to the solution of the different problems of the society. It is evident the educational model should provide skills that allow the new professional to deal successfully with various situations, in which s/he should, for example, demonstrate capacity to formulate judgments from the analysis of a set of facts or evidence or, make decisions about the basis of the analysis and integration of the different aspects that may be involved in a particular problem. This capacity is directly associated with the development and use of critical thinking skills, so it is possible to raise the question in what way the development of these skills can be encouraged in the educational model?

There is an important consensus of opinion suggesting that to promote the improvement of thinking skills, it is necessary to create an enabling learning environment for students to take an active role in the process. This means that they can directly explore complex problematic situations through the approach of open questions that guide discussion, the exchange of ideas and the construction of meanings. The social aspect of the learning process is also important. Therefore, it promotes the development of group activities that provide opportunities for students to reflect on their own reasoning processes, in addition

to establishing the connections and the applicability between the content of the attained learning and the real life. In this way it establishes the need for a change from an educational model traditionally focused on the content, to another focused on learning, where the student is the principal actor (Albaaly, 2012; Snyder & Snyder, 2008).

The methodological problem-based learning (PBL) proposal (Barrows, 1996) has become an attractive alternative to implementing changes in higher education models. Its effectiveness is to be assumed with the conceptual implications concerning the change of roles of the teacher and the student. The context of learning promoted by the PBL allows the development of skills not considered in traditional methods, such as collaborative teamwork, investigative capacity, self-learning and thinking skills critic (Boud & Feletti, 1997; Duch, Groh & Allen, 2001; Wilkerson & Gijselaers, 1996).

The transition from a traditional curriculum to a PBL curriculum is not a simple process. It is necessary that all the components involved: educational policies of the institution, curriculum, administrative aspects, conceptions about the teaching and learning of professors and students, among others, are involved in this transformation. The level of approach towards a pure PBL model depends mainly on the degree of autonomy that the student is allowed to have in terms of his or her own learning process. Depending on this situation the so-called hybrid modalities arise, in which some aspects of the original methodology are combined with elements that still retain more conventional characteristics.

When the model is adopted with limitations, whether pedagogical, administrative or institutional, the immediate consequence is to increase the level of control and scaffolding of the design of scenarios and processes. This means that the level of student autonomy decreases and will easily return to a more passive role in which it is unlikely to be sufficiently willing to deploy its reasoning skills. Therefore, it becomes necessary to question what are the dimensions of the teaching of thought skills that are favored in a PBL context? How does the mode of implementation of PBL influence the development of critical thinking skills?

The following sections will review these aspects, showing the characteristics of the methodology that could be considered sensitive to effectively achieve the development of critical thinking, complementing the discussion with some research results.

Features of the PBL
Problem-based learning is an educational vision that promotes open, reflective, and critical learning, with a holistic approach to knowledge that recognizes its complex and changing nature, and involves a community of people who interact in collaboration to make decisions regarding different problematic situations that they must face. Therefore, it is clear that the learning objectives go beyond the mere acquisition of disciplinary content (Engel, 1997; Hmelo-Silver, 2004; Margetson, 1997).

The context of learning in the methodology PBL promotes the interaction of different factors involving students and teachers, but maintaining the central role in the first. The teacher is not responsible for providing information, but directs and guides the student in their search, providing opportunities to develop learning and thinking skills.

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The origin of the PBL, in the 1970s, is often located at the McMaster University School of Medicine (Canada) and Howard Barrows is recognized as one of its most emblematic representatives. The theoretical bases of the PBL have been analyzed and discussed more deeply from the 1990's, however there is no unanimous position regarding them, which has caused that in the literature the model has been defined and described in a variety of forms (Gijbels, Dochy, Van den Bossche and Segers, 2005; Graaff & Kolmos, 2003; Savery, 2006). With other educational methods and, for this, the most frequent reference is Howard Barrows, who describes the central characteristics of the model as follows (Barrows, 1996; Hmelo-Silver & Barrows, 2006):

- PBL is a student-centered approach, which determines what you need to learn. It is up to the students to identify the key aspects of the problems they face.
- Learning occurs in small groups of students, who come to form a small research community, where participants listen to each other, and can work collaboratively to reach reasonable conclusions.
- The problems that initiate the process are with a certain level of uncertainty to promote reasoning among students.
- The selection of problems must be done according to their authenticity, implying that they are aligned to the professional practice or the real world.
- Teachers act as facilitators and tutors with less intervention and more metacognitive questions.

The adoption of the PBL in the different institutions, faculties and disciplines, has been realized through a process of adaptation to the own characteristics, contexts and necessities of each one of them, so it could be said that there are so many modalities of PBL. Savin-Baden (2000) describes five PBL models based on the learning objectives that guide the design of the corresponding problematic scenario. Thus, the model can be adopted in the institution as a holistic or partial curriculum approach, approaching closer to the original McMaster model, also called the pure form of PBL. The other option, which is quite frequent, is the adoption as a strategy or didactic technique in one or several modules of disciplines or isolated subjects belonging to a conventional curriculum.

The literature points as the main goals of the adoption of PBL in higher education, the following (Duch et al., 2001; Hmelo-Silver, 2004):
• Development of skills for problem solving, both in the acquisition and in the application of knowledge in different situations.
• Development of critical thinking and the ability to analyze and solve complex real-world problems.
• Development of skills for the search, evaluation and use of appropriate learning resources.
• Development of skills, values and attitudes for collaborative work in teams and small groups
- Development of skills for self-directed and continuous learning.

The PBL is not a specific program for the instruction of thought. However, its objectives and goals are a high coincidence with those of this type of programs. The process followed in the PBL model promotes the student to develop skills related to identifying problematic situations, asking questions, investigating, rationally supporting their ideas, contrasting with those of others, reformulating the problem and its strategies to address it, formulate conclusions and judgments in a reasoned and reflective way, among others. All these skills are included in most models for the teaching of critical thinking (Halpern, 1989; Facione, 2000; Ennis, 1996; Facione, 2011).

Concept of Critical thinking
Halpern (1989), one of the main representatives of this perspective, refers to critical thinking as one who has a purpose, is reasoned and directed to goals. It is the kind of thought involved in problem solving, the formulation of inferences, the calculation of probabilities and decision-making, and also involves an evaluative component.

An important aspect to consider is related to the attitude or disposition of thought. Good thinkers are motivated and willing to make the conscious effort necessary to work in a planned way, to seek accuracy, to collect information and to have persistence when the solution is not very evident or requires several stages (Halpern, 1989; Facione, 2000). For Halpern, if the skills inherent in critical thinking can be improved with teaching, the goal of this should be that students can transfer these skills to the real world outside of classroom situations. The goal is to promote the learning of conscious thinking skills, which allow us to direct one's own thinking and learning. In this sense, it proposes a model for the teaching of the skills of the thought that consists of four parts: the attitudinal or disposition component; the instruction and practice of critical thinking skills; training activities in the use of structures to facilitate transfer through contexts and, the metacognitive component used to direct and evaluate thought (Halpern, 1989, 1998).

In line of Halpern and others such as Ennis (1996), Facione (2011) and Walton (2006), the author of this paper carried out a trial program with the first-year students at Shenzhen University. The theoretical concept underlying this program assumes that thinking critically implies reflection and action to achieve our goals. Thinking critically is reasoning and making decisions to solve problems as effectively as possible. The teaching-learning strategy employed is the PBL. Students, organized in groups, participate in activities that involve reflection and discussion about problematic situations previously designed to promote critical thinking skills. The method stimulates the metacognitive processes and allows students to implement their skills, challenging with real situations, where they should seek and investigate their own answers and solutions.

The common characteristics of these models of critical thinking teaching include the use of strategies in which the student becomes actively involved, learning being the center of the process and not just the content. In addition, the evaluation modalities are consistent with the strategy followed, i.e. resources are used to intellectually challenge the student instead of being reduced to a memory or repetition exercise (Snyder & Snyder, 2008). The main characteristic of the PBL is to initiate the learning process of the students with the presentation of a challenging problem corresponding to a real or realistic situation. It is

expected that when approached, the student has the opportunity to develop a set of skills that include those of critical thinking.

PBL and Critical Thinking

Two crucial components to promote the development of critical thinking skills in the PBL methodology are the design of the problem and the development of the process.

The problem

The PBL scenario or problem constitutes the initial and motivating challenge of the learning process and must comply with a set of characteristics that ensure the student's involvement in the construction of their learning and the deployment of the skills needed to propose and support solutions. The model 3C3R, proposed by Hung (2006) consists of content, context and connection. They establish the basis of the problem, in such a way that they are directly related to the goals and learning objectives envisaged; contextualize knowledge domain and also guide students to build integrated conceptual frameworks.

The component of content must ensure proper alignment between the scope of the problem and the curricular content in breadth and depth. The scope must be adequately adjusted for the student's learning to be produced according to the objective, in terms of the area of knowledge and the intellectual skills necessary to achieve it. There must be a balance between the level of depth, complexity, and de-structuring of the problem. If solving a proposed scenario requires only basic information, the need and motivation of the student to deepen the topic disappear.

The component of context ensures that the situation raised is authentic (real or realistic) and also relevant to the professional area in which the student is formed, his personal interests or his life as a member of the society. The uniqueness of a real or realistic scenario will trigger different forms of reasoning that the student should take into account.

The component of connection makes it easier for students to integrate knowledge and to interconnect concepts in such a way as to establish a conceptual network of the topic. Often, the PBL problem is designed in stages, which will gradually and sequentially arise. Each new stage provides the student with additional information that should be related to the previous stages and that would allow him/her to rethink a proposal for a solution.

The processing components: research, reasoning and reflection, facilitate the student's conscious and meaningful involvement in his/her learning process. They are the dynamic elements of the model, as they act as activators for students to benefit from the core components, in addition to regulating the level of cognitive processes according to their capacities. The reasoning component promotes the application of acquired knowledge from research and development of problem-solving skills.

Hung (2006, 2011) presents different adjustments of the research and reasoning skills that can occur in the design of a PBL scenario. The cases that are shown correspond to extreme situations of low or high level of thinking skills and their possible combinations. The highly unstructured problems are located in the case where students must deploy a high level of research skills and reasoning. On the contrary, when there is only a limited range of

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alternatives to solutions in some scenarios, it is evident that the level of research skills and reasoning required is low.

The reflection component acts as a guiding element for metacognition, optimizes the PBL process ensuring the maximum effect of the other components. Reflection helps students not only to integrate what they have learned, but it goes beyond the scope of the problem and cultivates in students the habit of developing and using their self-directed and lifelong learning skills.

The process
The process begins with the presentation of the problem to the students. They are expected to organize their ideas regarding the situation raised, to identify their nature and the factors or aspects involved in it. After a first brainstorming, the groups of students analyze them critically, to identify the aspects that relate to their previous knowledge on the subject, as well as the aspects that they do not understand and for which they need to acquire new knowledge.

In the next stage, students are organized to search for, revise and systematize the new information. The design of the process may consider a path closer to the original model of McMaster, where the work of the groups of students is carried out in a more autonomous way, being the role of the teacher (a tutor or consultant). Other alternatives imply a greater intervention of the teacher, in the so-called hybrid modalities. These approaches are more sensitive to external factors (institutional, administrative, curricular). In general, hybrid modalities retain the working component in collaborative groups, the use of scenarios (with greater or lesser degree of complexity and structuring) and the role of teacher facilitator in a partial way, limiting itself to some moments of the process as it maintains control to some degree. The teacher usually structures the learning process through pre-designed individual or group activities, classroom demonstrations, exhibition classes, etc.

In the last stage, the group applies the new knowledge to the initial problem, verifying whether its first approaches can be rearranged or redefined according to what has been learned. They will then be able to formulate and argue their own solution proposals.

Critical thinking is not an innate skill; it requires learning, training, and practice. The learning environment in the PBL is conducive to cultivating and strengthening these skills, so these goals must be an intentional part of the process.
Facione (2011) analyses the skills for the solution of problems and those of critical thought and proposes a strategy of 5 stages, which summarizes them with the name of IDEAS (identify, determine, enumerate, assess, scrutinize). In the first stage the problem is identified and priorities are set up to address it. The student has the opportunity to use his/her skills to interpret situations, data, procedures, etc. Then it determines the relevant information, defines the context that frames the problem and deepens the understanding of it. To do this, the student must outline his/her first hypothesis, ensuring the necessary elements to reach reasonable conclusions regarding the problem. More clearly, the next step lists the alternative routes to find a solution, using the skills to identify relationships between the different pieces of information available. Finally, the whole process is carefully

examined and self-correcting whatever is necessary, applying skills to consciously monitor the cognitive activities themselves.

CONCLUSIONS

The question that has guided the development of this work has focused on highlighting the meeting points of the characteristics of the methodology PBL and the dimensions of teaching skills thinking.

The PBL scenario or problem is one of the critical components to consider for this purpose. As has been described, it is desirable that in the design of the scenario there is a harmonious articulation between the central components (content, context and connection) and the components closely linked with the skills of reasoning, research and Reflection. In this sense, the level of complexity and de-structuring goes hand in hand with the degree of autonomy that the student can have to get involved in the search for proposals of solution to the problem. However, a good design must be complemented by a process where the facilitator's work to model the good use of reasoning skills is fundamental. As has been pointed out, learning and the conscious practice of critical thinking skills should be part of the planning of teaching and as such, also of their evaluation.

It is common for the scenarios of the hybrid modalities to sacrifice the integrative and holistic nature of the pure modalities, since they must be restricted to limited learning objectives. This implies that they have less complexity and more structuring, since their development must be adjusted within certain time limit. The degree of autonomy that students can have is moderate. Although the components of content, contextualization and connection are rescued, they are the components closest to the use and development of reasoning skills that end up inhibiting the development of design and process. In this way, the principal interest of the teachers is to verify the learning of the contents and of some skills, like the one of solving of problems and, consequently, the evaluation focuses on these aspects.

The importance of teaching critical thinking skills is recognized at all levels of education. However, insufficient evidence of achievement has yet been reported in the development of these skills, particularly in university education in China. The PBL methodology is a feasible option, as long as the aspects, discussed in this paper, are taken into account in the design of the problem and the process to facilitate the learning and strengthening of these skills in the students.

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