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Problem-Solving Methodologies Structured On The Stages of Critical Thinking

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Abstract

Higher learning must promote the articulation between theory and professional practice, as well as develop critical thinking for problem solving and decision-making. Such objectives need adequate teaching strategies that lead to autonomy, metacognition, and self-regulation by the students. Thus, this study presents a report on the experience of using problem-solving methodologies structured on the stages of critical thinking with students enrolled in the Education Psychology discipline in a graduation course on Biological Sciences. The study was developed in three phases (argument analysis, problem explanation, and decision making) and obtained good acceptance and evaluation by the involved students. Besides being a learning strategy for these students, such experience constitutes a model to be reproduced in their teaching practice.

Keywords: Problem solution; critical thinking; teacher formation.

Metodologías orientadas para problemas a partir de las etapas del pensamiento crítico

Resumen

La enseñanza universitaria debe promover la articulación de la teoría y la práctica profesional, y también desarrollar el pensamiento crítico, volcado para la resolución de problemas y toma de decisiones. Tales objetivos necesitan de estrategias de enseñanza adecuadas y que favorezcan la autonomía, la meta-cognición y la auto-regulación de los alumnos. De esta forma, este estudio presenta un relato de experiencia del uso de metodologías orientadas para problemas estructurado a partir de las etapas del pensamiento crítico con estudiantes de la asignatura de Psicología de la Educación en el curso de licenciatura en Ciencias Biológicas. El estudio se desarrolló en tres etapas (análisis de argumentos, explicación del problema y toma de decisión) y obtuvo buena aceptación y evaluación por parte de los discentes involucrados. Además de funcionar como una estrategia de aprendizaje para esos alumnos, tal experiencia se constituyó como un modelo a ser reproducido por ellos cuando de su praxis docente.

Palabras clave: Solución de problemas; pensamiento crítico; formación de profesores.

Metodologias orientadas para problemas a partir das etapas do pensamento crítico

Resumo

O ensino superior deve promover a articulação entre a teoria e a prática profissional, assim como desenvolver o pensamento crítico, voltado para a resolução de problemas e tomada de decisões. Tais objetivos necessitam de estratégias de ensino adequadas e que favoreçam a autonomia, a metacognição e a autorregulação dos alunos. Dessa forma, este trabalho apresenta um relato de experiência do uso de metodologias orientadas para problemas estruturados a partir das etapas do pensamento crítico com estudantes da disciplina de Psicologia da Educação no curso de licenciatura em Ciências Biológicas. O trabalho foi desenvolvido em três etapas (análise de argumentos, explicação do problema e tomada de decisão) e obteve boa aceitação e avaliação por parte dos discentes envolvidos. Além de funcionar como uma estratégia de aprendizagem para esses alunos, tal experiência constitui-se como um modelo a ser reproduzido por eles quando de sua práxis docente.

Palavras-chave: Solução de problemas; pensamento crítico; formação de professores.

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Introduction

National Curricular Guidelines consider the articulation between theory and practice to be one of the principles in the formation of basic education teachers, whose profession involves internalizing and handling contents and methodologies (Brasil, 2015).

Education Psychology is a fundamental discipline in graduation courses. The educational objectives related to this discipline should not be limited to the mere acquisition of theoretical knowledge in this area. It is necessary to provide undergraduates with the capacity to employ their knowledge on teaching, learning, evaluation, relationships, and so on in their professional practices in order to solve real-life problems and make right decisions. In this context, Education Psychology – EP – is essential in the formation of education professionals really committed to personal and professional development, within a permanent educational logic.

The capacity to make decisions and solve problems by means of solid analysis and relevant arguments, which increase the probability of obtaining expected results, constitutes critical thinking (Casiraghi & Almeida, 2017; Saiz & Rivas, 2017; Saiz Sánchez, 2017). The development of critical thinking, as one of the primordial functions of higher learning (Franco & Almeida, 2017; Joly, Dias, Almeida, & Franco, 2012; Marinho-Araújo & Almeida, 2017; Veiga, Cardoso, Costa, & Jácomo, 2016), gets professionals ready for the challenges of professional practice in a society that changes constantly and rapidly and for learning permanently the indispensable competencies to succeed in today's world (Butler et al., 2012; Esteves, 2008; Pereira & Alich, 2015; Zimmerman, 2002).

The development of critical thinking in the classroom is not a simple task. One cannot expect to reach such objective by means of a methodology based uniquely on expositive, teacher-centered classes and contents in disconnection with concrete problems that need to be fixed. Thus, the use of student-centered methodologies focused on the active search for knowledge are strategies that lead to intellectual autonomy and the cognitive restructuring of students while developing metacognition and self-regulation. In this sense, educational methodologies oriented towards problem identification and problem- solving present themselves as a proposal that stimulates the development of critical thinking based on real-life situations. It does not matter if such problems are actual or anticipated(Araújo & Sastre, 2009; Ribeiro, 2010).

According to Ribeiro (2010), in problem-based learning, the "problem" is the driving force of the education process. It is used in order to start, set the direction, motivate, and keep learning within focus by means of the work of small groups developing reasoning with the help of facilitators or tutors. So far, the new acquisitions of knowledge turn into competences that consolidate more easily as they are transferred into everyday life situations.

This report presents a practice realized with a class of undergraduates in Biological Sciences, enrolled in the Education Psychology discipline during the second semester of 2017, in which the methodology was oriented towards problems and based on the stages of critical thinking.

Description of activity

The group in question was constituted by nine students distributed into groups of three, in which participants were put together by affinity. Their first task was to select a problem that occurred in the classroom during the teacher--training period (undergraduates in their last year must take the teacher-training internship) and that was related to issues concerning the classroom and the work of a teacher in general. The activity was carried on in the classroom. It took four sessions and followed the stages of critical thinking, such as argument analysis, explanation and justification, and decision making (Casiraghi & Almeida, 2017).

First, each student presented a case to the group and then the participants voted on one situation to be the focus of their teamwork. The problems were quite specific: a student who got hyperactive in the classroom; lack of motivation by some students during the classes; a teacher who repeated the same classes, assignments, and tests for years. The following step was to analyze the problem considering all aspects of the issue so that they could define the problem in general terms. The three groups raised the following general issues from the problems presented:"how to handle students with hyperactivity disorder in the classroom?"; "how to motivate students into learning?" "what to do about unmotivated teachers?". After defining the problem, it was necessary to specify the aspects involved in the problem and that needed further clarification in order to better understand the issues. This stage includes the analysis of problems and their outlines and assumes a systemic and multi-dimensional perspective of the intervenient variables. At the end of this session, students had a list of topics to research on each problem and were able to define more concretely the task of researching scientific articles on each of the problems in order to get ready for the following week.

In the second session, problem exploration and justification were the basic components. Based on the realized researches, the groups were supposed to explain the problem, in a well-grounded way, by means of trustworthy scientific sources, and to write an argumentative text on the topic. The texts, in addition, were supposed to be synthetic, and in accordance with the most important ideas and theories by the authors listed in the bibliography.

It is important to highlight the function of the teacher as mediator and facilitator at every moment by looking over group discussions, asking questions and providing explanations when necessary. Teachers should also prescribe more specific bibliographies and mentor research works. In addition, in every session students produced a text containing information about the work realized. The text was a tool for guidance in future tasks and constituted part of the students' evaluation. Subgroups were free to share, whenever they found it important, with the rest of the class some relevant

aspect of their work, which led to opportunities for students to exchange ideas and confront opposing positions.

After defining the problem and understanding its aspects and relations, the third session was time to produce a plan of action aiming at the solution of the listed problems. The groups, based on obtained knowledge about the problem, listed possible solutions and chose the ones they considered to be most adequate in order to build an intervention plan.

The final session was dedicated to sharing knowledge. The groups presented their reports on the problem they worked on and proposals for actions. There was also a moment in which the whole class conducted a discussion and reflected on the topics approached. After this activity, students were required to produce a final individual report in which each participant was supposed to reflect on their performance, the performance of the group and the activities themselves.

Results

The documental analysis of the reports presented demonstrates that the students considered the activity to be relevant, motivating and conducive to the acquisition of knowledge. Despite their unawareness of the "critical thinking" concept (such concept was approached later on), the reports mentioned argument analysis, problem explanation and, most importantly decision making and problem solution.

The following testimonials were registered in the reports: "The best thing is that I will know exactly what to do when situations like these happen again." (sic); "A positive thing about this study was learning the best way to deal with situations";"the activity was fundamental for teachers because it has provided us with tools to better understand everyday life situations and the diverse problems inherent to the teaching profession" (sic).

All students attended all moments of the activity, which shows their interest and commitment. Some of them contacted the instructor by email for further guidance during the activity period.

Final Considerations

The importance of developing critical thinking in higher education demands that teachers and institutions invest in pedagogical strategies that lead to that type of mentality. The use of educational methodologies that are based on practical problems and on the interest of students leads students to research and get to know about scientific productions of the topic and stimulates the search for solutions to problems. It is probably a valid strategy that will bear good results. Besides being a learning strategy for undergraduate students, such experience is a differentiated model that they can reproduce in their teaching practices.

One of the points most often made by the students was that the undergraduate disciplines approached different concepts and theories as well as important criticism of educational systems and processes sometimes. However, no effective proposals were presented. The activity, in order to identify problems and analyzing them adequately while proposing solutions, provided students with a strategy that can be used in different situations and contexts of their professional practices.

Concerning the development of critical thinking, Saize Rivas (2017) state that the consolidation of knowledge happens by means of practice. Thus, this experience, despite the fact that it was just a small group, brings us one great innovation, the obvious correlation between problematizing, teaching methodology, and the development of critical thinking. It is a model for other proposals of intervention and points at the necessity to investigate the effectiveness of problem-oriented methodologies in the development of critical thinking.

References

Araújo, U. F.; Sastre, G. (Orgs.) (2009). *Aprendizagem baseada em problemas no ensino superior*. São Paulo: Summus.

Brasil. Ministério da educação (2015). *Resolução nº 2, de 1º de julho de 2015 Diretrizes Curriculares Nacionais para a formação inicial em nível superior (cursos de licenciatura, cursos de formação pedagógica para graduados e cursos de segunda licenciatura) e para a formação continuada*. Brasília, DF: Conselho Nacional de Educação. Recuperado: http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=17719-res-cne-cp-002-03072015&category_slug=julho-2015-pdf&Itemid=30192

Butler, H. A.; Dwyer, C. P.; Hogan, M. J.; Franco, A.; Rivas, S. F.; Saiz, C.; Almeida, L. S. (2012). The Halpern Critical Thinking Assessment and real-world outcomes: Cross-national applications. *Thinking Skills and Creativity*, *7*(2), 112–121. https://doi.org/10.1016/j.tsc.2012.04.001

Casiraghi, B.; Almeida, L. S. (2017). Elaboração de um instrumento de avaliação do pensamento crítico em estudantes universitários. In Casanova, J. R.; Pontes-Jr, J. A.; Almeida, L. S. (Orgs.), *Atas do V Seminário Internacional Cognição, Aprendizagem e Desempenho* (pp. 30–41). Braga: Centro de Investigação em Educação (CIEd), Universidade do Minho.

Esteves, M. (2008). Para a excelência pedagógica do ensino superior. *Sísifo: Revista de Ciências da Educação*, (7), 101–110.

Franco, A.; Almeida, L. (2017). Definição e medida do pensamento crítico. In Almeida, L. S. (Org.),*Criatividade e pensamento crítico: conceito, avaliação e desenvolvimento* (pp. 107–132). Porto: CERPSI/ Centro de estudos e recursos em Psicologia.

Joly, M. C. R. A.; Dias, A. S.; Almeida, L. S.; Franco, A. H. R. (2012). Autorregulação na universidade. In *II Seminário Internacional*

"Contributos da Psicologia em Contextos Educativos" (pp. 1020–1028). Portugal: Universidade do Minho. Centro de Investigação em Educação (CIEd). Recuperado: http://repositorium.sdum.uminho.pt/handle/1822/20129

Marinho-Araújo, C. M.; Almeida, L. S. (2017). Abordagem de competências, desenvolvimento humano e educação superior. *Psicologia: Teoria e Pesquisa*, *32*(5).

Pereira, S.; Alich, V. (2015). A avaliação do pensamento crítico numa perspetiva psicológica. In Dominguez, C. et al. (Org.), *Pensamento crítico na educação. Desafios atuais* (pp. 87–98). Vila Real: UTAD.

Ribeiro, L. R. C. (2010). *Aprendizagem baseada em problemas (PBL): uma experiência no ensino superior*. São Carlos: EdUFSCar.

Saiz, C.; Rivas, S. F. (2017). Desarrollo del pensamiento crítico. In Almeida, L. S. (Org.), *Criatividade e pensamento crítico: conceito, avaliação e desenvolvimento* (pp. 133–179). Porto: CERPSI/ Centro de estudos e recursos em Psicologia.

Saiz Sánchez, C. (2017). *Pensamiento crítico y cambio*. Madrid: Pirámide.

Veiga, E.; Cardoso, E.; Costa, H. G.; Jácomo, A. (2016). A perspetiva dos alunos sobre um projeto de desenvolvimento do pensamento crítico no ensino superior. *Revista Lusófona de Educação*, *32*(32), 109–121.

Zimmerman, B. J. (2002). Becoming a Self-Regulated Learner: An Overview. *Theory Into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2

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