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Processo Seletivo para o Programa de Pós-Graduação *Stricto Sensu*
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CADERNO DE QUESTÕES

Exame de Suficiência em Língua Inglesa
2ª Etapa

ATENÇÃO!
Não abra este caderno antes de ser autorizado pelo fiscal.

Você está recebendo um **CADERNO DE QUESTÕES** e um **CADERNO DE RESPOSTAS.**

O **CADERNO DE QUESTÕES** consta de **4 (quatro) páginas**, numeradas sequencialmente, incluindo espaço para rascunho.

O **CADERNO DE RESPOSTAS** consta de **3 (três) páginas** numeradas sequencialmente.

A resposta deverá ser escrita na folha destinada a cada questão.

Esta é uma prova dissertativa contendo **5 (cinco) questões**, com o valor total de **10 (dez) pontos**.

INSTRUÇÕES

1 Ao receber autorização para abrir este caderno, verifique se a impressão, a paginação e a numeração das questões estão corretas. Caso ocorra qualquer erro, notifique o fiscal.

2 Para qualquer tipo de rascunho, somente será permitida a utilização das folhas constantes do CADERNO DE QUESTÕES. Não é permitido ao candidato destacar qualquer folha deste caderno.

3 O desenvolvimento das questões só será considerado se transcrito a caneta esferográfica de tinta azul ou preta, para o espaço destinado à resposta de cada questão no CADERNO DE RESPOSTAS.

4 NÃO será permitido ao candidato nenhum tipo de consulta.

5 Evite rasuras no CADERNO DE RESPOSTAS.

6 Será eliminado do Processo Seletivo o candidato que efetuar qualquer registro que possa identificá-lo no Caderno de Respostas.

7 Você dispõe de 2 (duas) horas para fazer esta prova.

8 Você só poderá sair do local de realização da prova decorridos 60 (sessenta) minutos do seu início.

9 Os 3 (três) últimos candidatos permanecerão sentados até que todos concluam a prova ou que termine o seu tempo de duração, devendo retirar-se juntos.

10 Ao término da prova, entregue ao fiscal o CADERNO DE RESPOSTAS e o CADERNO DE QUESTÕES.

11 Será eliminado do Processo Seletivo o candidato que dispensar tratamento inadequado, incorreto ou descortês a qualquer pessoa envolvida no Processo Seletivo, bem como perturbar, de qualquer modo, a ordem dos trabalhos relativos ao referido processo.

12 Você só poderá levar o CADERNO DE QUESTÕES se sair do local de realização da prova nos 30 minutos que antecedem o seu término.

O texto a seguir refere-se ao ensino de ciências baseada em métodos de investigação. Leia-o e responda às questões propostas em português:

Enquiry-based science teaching

Around the world, substantial resources have been invested in improving science education, in reforming curricula, and in building science teachers' skills. In particular, teachers have been encouraged to use enquiry in their instruction of science content. In the United States, the National Science Foundation, the American Association for the Advancement of Science and the National Research Council invested considerable resources towards the achievement of that goal. The (National Research Council (United States), 1996) education reform document advocated that science teachers should engage students in thinking about science as enquiry. This document described a range of instructional approaches, from open enquiry where students take the lead in identifying science problems, raise questions, design experiments, record observations and develop a solution to the problem, to more structured enquiry, where teachers define the topic and procedures to follow.

Science enquiry first appeared in the debate over the nature of learning and teaching in the work of leading theorists like Jean Piaget, Lev Vygotsky and David Ausubel. Their work on the philosophy of learning was later known as constructivism (Cakir, 2008; Minner, Levy and Century, 2010).

Through scientific enquiry, students should develop a critical way of engaging with science. They should be able to acquire a deep understanding about a topic, develop a coherent scientific method, and ultimately provide a robust answer to the question under investigation (Crawford, 2007). However, the implementation of enquiry-based science teaching is fraught with challenges.

The first challenge relates to the definition of enquiry-based teaching. For instance, minimally guided discovery, project-based learning, and enquiry learning are sometimes lumped under the same heading even though the level of teacher involvement might differ from one practice to another. This results in the application of blanket criticism of strategies that, in practice, are very different from one another (Hmelo-Silver, Duncan and Chinn, 2007). The absence of a common definition, and the continuous evolution of that definition, highlight the challenges of determining what constitutes scientific enquiry (Duschl et al., 2007; Furtak et al., 2012).

When it comes to unguided discovery, criticism has focused on the lack of structure in the construction of knowledge. According to critics, novice learners do not have the extensive knowledge or training of professional scientists. When scientists formulate a hypothesis they draw on a body of knowledge built over a long period of time. In contrast, students lack this knowledge, and can only rely on a patchy understanding of scientific principals and on a short-term memory that could become overloaded with new information (J. Sweller, 2003, 2004). The increased load of information, in turn, prevents the accumulation of real knowledge (J. Sweller, van Merrienboer and Paas, 1998; John Sweller, 1999).

Another critique advanced against constructivist practices has focused on the shift of emphasis from learning the content of a discipline towards experiencing the procedures of that discipline (Handelsman et al., 2004) – a shift that could ultimately lead to a rejection of instruction based on the facts in favour of extensive practical work. According to (Kirschner, 1992; Kirschner, Sweller and Clark, 2006), this excessive focus on process neglects the differences between how science is practiced (epistemology) and how science is learned (pedagogy).

Moreover, learning science happens in a school context. Therefore, it is expected that the success of a certain teaching practice will depend on the contextual sensitivity of that practice. For instance, successful enquiry-based learning requires a positive school environment, discipline, equipment and personnel, sufficient instruction time, and a school leadership that encourages scientific enquiry in addition to well-trained teachers who are capable and willing to implement this strategy. In contrast, teacher-directed instruction might require less of these resources. The contextual sensitivity of enquiry-based learning also implies that what takes place in a classroom (the performative form of a practice) might diverge substantially from the abstract, or ostensive, form of the practice.

In addition, the implementation of enquiry-based science instruction requires the teacher to relinquish some control over the classroom in favour of the students. The success of this approach needs a different set of skills and attitudes than a teacher-driven lecture. In fact, a lecture is more akin to a scripted performance; enquiry-based instruction is more about improvisation and adaptation. In this sense, the successful adoption of these practices depends on teachers' capacity and willingness to enact enquiry-based teaching (McGinnis, Parker and Graeber, 2004; Newman et al., 2004), on teachers' attitudes towards the practices(Windschitl, 2003), and on the existence of a school culture, supported by parents, students and education authorities, that encourages scientific enquiry (McGinnis, Parker and Graeber, 2004).

The fact that enquiry-based teaching has not been largely adopted by science teachers could also be attributed to the lack of conclusive evidence on its positive effect on student outcomes. For instance, (Strijbos, Kirschner and Martens, 2004) and (Mayer, 2004) cast doubt on the efficacy of unguided enquiry-based teaching by arguing that such practices limit the role of the teacher and allow students to engage in self-guided activities of dubious value. (Mayer, 2004) reviewed a number of foundational experimental studies dating back to the 1960s and contrasted unguided enquiry approaches with teacher-guided instruction. Invariably, the author found that a guided approach was better at building knowledge without completely refuting the merits of enquiry when it is combined with teacher guidance. This evidence is corroborated in studies focusing on problem-based learning and enquiry learning (Hmelo-Silver, Duncan and Chinn, 2007). In both types of learning, students learn content and discipline-specific processes. Both approaches rely on authentic problems and questions and could be combined with teacher-directed instruction (Krajcik, Czerniak and Berger, 1999; Schwartz and Bransford, 1998). Positive evidence in favour of problem-based learning was found by (Dochy et al., 2003), and in favour of enquiry learning by a number of controlled experiments (Geier et al., 2008; Hickey, Wolfe and Kindfield, 2000; Lynch et al., 2005). A recent report by McKinsey also found evidence that students who receive a blend of enquiry-based and teacher-directed instruction have the best outcomes (Chen et al. 2017).

When it comes to PISA, the preliminary results of the 2015 round uncovered a negative correlation between enquiry-based science teaching and performance in science even after accounting for student and school socio-economic profiles (OECD, 2016b). On the other hand, using PISA 2012 data, (Echazarra et al., 2016) found that a combination of teacher-directed instruction, team work and cognitive activation were necessary to improve performance in mathematics.

In this section, PISA 2015 data is used to investigate the association between enquiry-based science teaching and student outcomes in science. Different methodologies are used in order to decipher the negative relationship described in Volume II of the PISA 2015 initial report (OECD, 2016b). In particular, the analyses consider both cognitive and non-cognitive science outcomes instead of focusing only on the former. They explore the interactions between enquiry-based teaching and the school environment, differences in the benefits of such teaching practices, depending on student proficiency in science (e.g. top performers might benefit more from scientific enquiry) and on the branch of science being taught (e.g. chemistry, biology), and whether enquiry is more useful in helping students engage with more difficult science tasks.

Reference

Mostafa, Tarek, Echazarra, Alfonso & Guillou, Hélène. The science of teaching science: An exploration of science teaching practices in PISA 2015. **OECD Education Working Paper No. 188**. ISSN: 19939019 (online). https://doi.org/10.1787/19939019

Questão 01 (2 pontos)

Explique o método de ensino de ciências baseado em investigação.

Questão 02 (2 pontos)

Qual(is) crítica(s) é(são) direcionada(s) a esse tipo de metodologia?

Questão 03 (2 pontos)

Cite duas condições necessárias para que um professor possa utilizar essa metodologia?

Questão 04 (2 pontos)

Como os autores relacionam a aprendizagem baseada em investigação com a aprendizagem baseada em problemas?

Questão 05 (2 pontos)

O texto cita pesquisas com o uso do PISA 2012 e do PISA 2015. Em que consistem esses estudos?

RASCUNHO