TEXTO 1

Quantifying the social costs of nuclear energy: Perceived risk of accident at nuclear power plant

Nuclear power is a contentious subject in energy policy. It supplies base-load energy with low operational costs and does so without CO2 emissions, a feature that appeals to the international community in tackling climate change. However, the technology is plagued by apprehension related to radioactivity. Because of concerns about nuclear accidents and the handling and storage of spent fuel, nuclear power has long been controversial among the public. Safety risks have typically been considered the most challenging external costs of nuclear power (e.g., Kessides, 2010).

For these reasons, in most countries, the licensing process for nuclear power is subject to political control and, to ensure risk management, production is strictly regulated by nuclear safety authorities. We study the costs to society of the risks of nuclear power plant accidents. These costs are considerably harder to quantify than the costs of storage of spent fuel (Davis, 2012). How should such external costs be assessed? Two salient elements must be considered in doing so. The first is the objective probability of accidents at nuclear power plants. These probabilities are small, but the consequences of a large-scale catastrophe are potentially vast and long-lasting. Interestingly in this regard, private insurance companies will not provide full-coverage insurance against accidents. This policy can be attributed to a choice made in the beginning of nuclear programs worldwide to implement a rule strictly limiting civil liability in order to allow the growth of the nuclear industry (Faure and Fiore, 2009).

In the case of an extreme emergency, clean-up and compensation to victims for damage and injury are ultimately the responsibility of government. The second element is the impact on welfare of the perceived risks of a nuclear power plant accident. This is the focus of our paper. As the probability of a large-scale accident is very small, but the resulting damage may be enormous, the likelihood of an accident and the scope of the ensuing damage may become confounded in people's minds and result in exaggerated perceptions of risk. It is thus likely that the perceived risks of an accident deviate from the objectively estimated probabilities and may play a weightier role in final decisions on licenses for new nuclear reactors, for example. Moreover, politicians' decisions may be influenced by their own risk perceptions, their views of their constituents' perceptions and the opinions of citizens or voters at large.

We introduce an analytical framework for measuring the social costs of nuclear power resulting from perceived risks of a nuclear accident. Our investigation of risk perceptions reveals insights into their welfare consequences, which become capitalized in political decisions in licensing processes. In earlier work, Salanie and Treich (2009) have provided an economic rationale for over-regulation when risks are misperceived and citizens make choices according to their beliefs. We show analytically that if people's risk perceptions affect their stand on nuclear power, biased perceptions of accident probabilities pose a cost to society. These costs show up in two forms: unnecessary anxiety due to misperceived or exaggerated risks of existing reactors and, where licenses for new nuclear reactors are not granted, delayed or totally lost energy production. Understanding people's risk perceptions can help reduce expenditures, delays and enmity, and improve risk management and social welfare. Based on the welfare components identified in the

analytical model, we measure perceived risks of nuclear accident using surveys targeting the general public in Finland. Finland is a particularly interesting country in **which** to study nuclear power and risk perceptions. During the past 30 years, there has been a parliamentary vote on licenses for new nuclear reactors every decade, and the risks of nuclear power have been discussed in public debates in connection with each vote.

Moreover, one of the world's most keenly followed and latest reactor technologies, the European Pressurized Water Reactor (EPR), has been under construction in Finland for over ten years. As the media frequently reported the opinion polls on nuclear power conducted in connection with each vote in Parliament and, more recently, have covered delays in the start-up of energy production at the new reactor, the public is familiar with the issue of nuclear power. We investigate the extent to which the public's risk perceptions affect their stand on nuclear power and their stated behavior in a putative referendum on new reactor licenses. A recent study has investigated the effect of the Fukushima nuclear accident on the risk perception of residents near a nuclear power plant in China (Huang et al., 2013). We measure perceptions of risks based on responses to multiple survey items eliciting perceived risks in the context of a referendum-type vote on nuclear power licenses and in the context of personal risks in everyday life. As we have responses to several risk questions and risk rating scales, we can observe the use of the risk scale in separate items by every individual and control for the risk perceptions when explaining preferences in voting.

We study the impacts of a set of demographics and risk perceptions on voting for or against license applications for new nuclear power reactors in Finland, and provide well-identified evidence on whether perceived risk or fear of accident affects voters' preferences. In the survey, the wording of the vote on license applications was exactly the same as the one used in the Finnish Parliament in July 2010. Obviously, those who oppose nuclear power are likely to perceive its risks high. This raises the concern of reverse causality. We show that our results on the impacts on voting of perceived risks of a nuclear accident are robust to a series of specification checks. In particular, our instrumental variable estimation strengthens our confidence in perceived risk of accident being a strong determinant of respondents' voting decision. Moreover, we validate our model of hypothetical voting by analyzing the observed voting behavior of the members of Parliament who voted on the reactor licenses in Parliament in 2010. There, too, predicted perception of the risk of an accident turns out to be a statistically significant determinant of voting decision. Finally, drawing on the survey data, we can estimate how important a factor risk perceptions are for calculations of the social costs of nuclear power.

Still, nuclear power continues to be a highly contested issue in energy policy. Our results show that risk perceptions increase the social costs of nuclear power considerably, and provide a case for policies that mitigate real risks and reduce fear. Although one should be cautious when drawing conclusions for other countries from the experience in Finland, we believe that the results of our study may significantly improve the understanding about the risk perceptions and their importance in the external costs associated with energy production and implications for policy making in other countries.

1.O texto aborda o tema dos custos da indústria de produção de energia nuclear
a) em face dos desafios que ameaçam a segurança da população.
b) devido a sanções políticas controversas.
c) porque os custos de estocagem do combustível superam os custos com a segurança.
d) apesar da baixa probabilidade de acidentes recentemente.

2. De acordo com o texto, na eventualidade de acidentes nas usinas nucleares,
a) o governo assume os riscos adotando rígidas medidas para inibir o crescimento da indústria nuclear.
b) a responsabilidade recai sobre a comunidade internacional que rege as sanções nucleares.
c) as companhias de seguro se isentam da cobertura total dos gastos causados pelos danos.
d) existe um pacto entre o governo e as companhias de seguro para a compensação às vítimas.

3. Na análise de probabilidade de riscos em usinas nucleares, o texto avalia
a) a extensão dos danos causados no caso de acidentes.
b) as consequências da percepção de riscos pela população.
c) somente os acidentes em larga escala como o de Fukushima.
d) a viabilidade da reconstrução de novas usinas após os acidentes.

4. Leia os enunciados abaixo.
A percepção exagerada dos riscos de acidentes pela população pode
I. prejudicar as decisões de construção de novas usinas nucleares.
II. se distanciar das estimativas prováveis de acidentes.
III. incentivar a proliferação de usinas nucleares.

Estão corretas
a) I e II.
b) II e III.
c) I e III.
d) I, II e III.

5. Com base na percepção dos riscos pela população, o texto se propõe investigar
a) prioritariamente, os níveis de ansiedade desnecessária expressa pela população.
b) a manutenção dos reatores que apresentam defeitos.
c) a influência da opinião dos eleitores para o veto dos políticos quanto à construção de usinas.
d) formas de prever redução de gastos em relação aos riscos de acidentes.

6. A escolha pela Finlândia como objeto de estudo relatado no texto se deu porque
a) é o país com o maior número de reatores no século 21.
b) a participação da população quanto às usinas nucleares está presente nas discussões políticas.
c) é o local que, pela distância geográfica, abriga a realização dos testes nucleares.

d) nos últimos 30 anos, é o país que priorizou o consumo de energia nuclear.

7. A questão central do texto se debruça sobre os riscos das usinas nucleares **EXCETO** no caso de
a) reduzir gastos.
b) evitar atraso no funcionamento de novas usinas.
c) dissipar totalmente a probabilidade de radioatividade.
d) aprovar licenças para construção de novas usinas.

8. De acordo com o texto,
a) na Finlândia, a posição dos políticos frente à questão das usinas pode influenciar os eleitores.
b) a análise sobre a percepção de riscos só tem importância para a Finlândia.
c) o EPR (*European Pressurized Water Reactor*) está em pleno funcionamento há 10 anos.
d) no caso de catástrofes, a percepção de riscos nucleares amenizará a consequência dos danos.

9. A palavra ***still*** no trecho "***Still,*** *nuclear power continues to be a highly contested issue in energy policy*", introduz a noção de
a) negação.
b) causa.
c) consequência.
d) contraste.

10. A palavra ***which*** no trecho "*Finland is a particularly interesting country in* ***which*** *to study nuclear power and risk perceptions,"* se refere a
a) nuclear power.
b) country.
c) nuclear accident.
d) perception.

GABARITO

1. A
2. C
3. B
4. A
5. D

6. B
7. C
8. A
9. D
10. B

TEXTO 2

Tactics for preclinical validation of receptor-binding radiotracers

Suzan Z. Lever, Nuclear Medicine and Biology, Volume 44, January 2017, Pages 4–30

Radiotracers serve as scientific tools for biomedical research in nearly all fields, including neuroscience, neurology, psychiatry, oncology and cardiology. The diagnostic radiopharmaceutical counterparts are invaluable for answering clinical research questions concerning human health and disease by the non-invasive nuclear imaging techniques of positron emission tomography (PET) and single photon emission computed tomography (SPECT).

Radiopharmaceuticals can interrogate enzyme function, neurotransmitter function and receptor status, define organ physiology and pathophysiology, and can visualize and quantitate the abnormal brain deposits (β-amyloid, τ protein) associated with Alzheimer's disease. Nuclear imaging studies can also reflect the competition between a radiopharmaceutical and a non-radioactive ligand at specific biological recognitions sites. Such "occupancy" studies inform on mechanisms and dosing protocols, and require the radioligand to be sensitive to this molecular interplay.

Validated radiotracers are now indispensable aids for reducing the time and lowering the cost of developing new drug entities within the pharmaceutical industry. Nuclear imaging can also elucidate modes of drug action. The role of imaging in drug development for neurodegeneration has been discussed and a recent review, focused on the role of PET in the development of new drugs to treat heart failure, exemplifies the power of molecular imaging in this regard. The extensive biomedical advances made possible by radiopharmaceuticals and nuclear imaging are exemplified by over 150 books and review articles within the last three years. These scientific works can be general, focused on specific radionuclides or on particular organ systems.

evaluation of Questions to be answered through the use of radiopharmaceuticals change over time. In the 1970's, pioneering work on visualization of neuroreceptors by autoradiography prompted the question of whether or not neuroreceptors might also be imaged in living human beings. The question was answered in the early 1980's by PET and SPECT brain imaging of dopamine D_2 and muscarinic receptors in human beings using [^{11}C]-*N*-methylspiperone ([^{11}C]-NMSP) and [^{123}I]-quinuclidinyl benzilate ([^{123}I]-QNB), respectively. In the ensuing years, the questions have become more complex, and dependent on clinical disease state. When advances in instrumentation, radioligand synthesis and mathematical modeling are combined, imaging is likely to provide answers. A challenge for the field is the following conundrum: as the specificity of a radiopharmaceutical increases, applicability for truly "personalized medicine" increases; **however**, the overall impact on patient care decreases if the indications for use are too narrow.

There is a reticence of governmental organizations such as the United States FDA to approve radiopharmaceuticals for broad indications without compelling proof of diagnostic accuracy and clinical utility. A recent success is the 2011 approval of [^{123}I]-ioflupane (DaTSCAN) to assist physicians in patients presenting with neurodegenerative disorders. At this time, however, the β-amyloid imaging compounds Amyvid™ and Vizamyl™ have limited approvals in the United States for a scan to *exclude* a diagnosis of Alzheimer's disease (AD). Additional clinical trials will determine if the indication can be broadened to include a diagnosis of AD. On the horizon, PET imaging of human histone deacetylase with [^{11}C]-Martinostat should yield valuable information for understanding the emerging field of neuroepigenetics.

11. Segundo o texto, os marcadores radioativos
a) são mais valorizados na pesquisa clínica.
b) são usados na pesquisa biomédica em todas as áreas.
c) são utilizados em novas técnicas de imagem não-invasivas.
d) têm aplicabilidade na neurociência e na oncologia.

12. De acordo com o texto, são funções dos radiofármacos, **EXCETO** a
a) alteração dos depósitos cerebrais anormais associados ao Alzheimer.
b) definição da fisiologia do órgão.
c) definição da patofisiologia.
d) identificação de depósitos cerebrais anormais.

13. De acordo com o texto, está correto afirmar que
a) a aplicação dos marcadores radioativos na produção de novos fármacos foi reduzida na indústria farmacêutica.
b) a tomografia por emissão de pósitrons (PET) desempenha um papel fundamental no tratamento clínico em cardiologia.
c) as pesquisas recentes com radiofármacos mostram um vasto progresso na biomedicina.
d) o modo de ação dos medicamentos só pode ser entendido por meio de imagem nuclear.

14. Leia os enunciados abaixo.

Segundo o texto, o uso de radiofármacos

I. foi ampliado, modificado e tornou-se mais específico ao longo dos anos.
II. poderá responder às questões mais complexas quando combinado com modelos matemáticos e instrumentação.
III. será totalmente ineficaz no caso de uma medicina mais personalizada.

Está (ão) correta (s)

a) apenas a I.
b) I e II.
c) apenas a II.
d) II e III.

15. O texto informa que órgãos governamentais
a) exigem provas convincentes para o tratamento de doenças neurodegenerativas.
b) hesitam em liberar novos radiofármacos para o tratamento do Alzheimer.
c) são cautelosos na aprovação de radiofármacos.
d) tendem a restringir a maioria dos novos radiofármacos.

16. Na frase: "(...) **however**, the overall impact on patient care decreases if the indications for use are too narrow.", a palavra ***however*** introduz a ideia de
a) conclusão.
b) consequência.
c) contraste.
d) dúvida.

GABARITO

11. D
12. A
13. C
14. B
15. C
16. C

TEXTO 3

Inhibition of viability of microorganisms in [^{18}F]-labeled radiopharmaceuticals

G. Jörg, Nuclear Medicine and Biology**,** Volume 44, January 2017

The general preparation of pharmaceuticals that are applied to the patient parenterally by injection, requires specific infrastructural and organizational measures, which are defined by national and international regulatory statutes, issued by the corresponding authorities. These statutes describe the frame, within **which** the production of pharmaceuticals has to take place, e.g. clean room environment, organization of personnel, quality control of the product and so forth. These statutes are commonly referred to as GMP, which stands for the concept of good manufacturing practice.

Radiopharmaceuticals are substances that are labeled with an unstable (radio) nuclide in the course of the chemical preparation. The nuclide's radiation is the active ingredient and the radiopharmaceutical can be used either diagnostically or therapeutically, depending on the type of nuclide and on the type of its radiation. The nuclide decays according to its physical half-life, limiting the range of time the radiopharmaceutical can be applied to the patient. Typical radiopharmaceuticals used in diagnostics, known as PET (positron emission tomography), are labeled with [^{18}F]-fluorine (half-life $T_{1/2}$ = 109 min), [^{11}C]-carbon ($T_{1/2}$ = 20 min) or [^{13}N]-nitrogen ($T_{1/2}$ = 10 min). The half-life demands special consideration, because time for treatment of the bulk and quality control of the product before application to the patient is very limited.

There is one particular parameter in the class of injectables, which is of considerable importance: sterility. The half-life of radiopharmaceuticals imposes limitations on the procedures of sterilization. Thermal treatment as sterilization in the final container might be possible only in case of [^{18}F]-radiopharmaceuticals that are thermally stable. In case of other nuclides, sterilization in the final container is too time consuming. And testing of sterility of radiopharmaceuticals before application to the patient is not possible in any case, because it takes several days for the results to be available.

17. Conforme o texto, a produção de fármacos
a) age em conformidade com o Food and Drug Administration.
b) é mais segura quando se trata de radiofármacos.
c) pode falhar em relação à qualidade higiênica constante do produto.
d) segue normas regulatórias internacionais.

18. Um dos problemas abordados no texto, em relação aos radiofármacos, considera
a) sua meia-vida curta.
b) sua eficácia no diagnóstico.
c) sua dificuldade de fabricação.
d) seu efeito colateral no paciente.

19. Sobre o controle de esterilidade dos radiofármacos, o texto informa que eles
a) apresentam limitação no processo de esterilização.
b) devem ser testados antes da aplicação no paciente.
c) não precisam ser esterilizados porque o processo é demorado.
d) precisam sempre passar por um tratamento termal no frasco final.

20. Na frase: "*These statutes describe the frame, within **which** the production of pharmaceuticals has to take place, e.g. clean room environment, organization of personnel, quality control of the product and so forth.*", a palavra **which** refere-se a
a) authorities.
b) frame.
c) production.
d) statutes.

GABARITO

17. D
18. A
19. A
20. B

TEXTO 4

Pre-university students' conceptions regarding radiation and radioactivity in a medical context

Pier T. Siersma et al, International Journal of Science Education 2021, VOL. 43, no. 2, 179–196

An X-ray at the dentist, radiation therapy at the hospital, a malfunctioning nuclear power plant–in one way or another, nowadays nearly everyone is confronted with radiation and radioactivity. However, radiation and radioactivity are difficult to understand because we cannot feel them with our senses. We develop our own conceptions of radiation and reasons based on our experiences and the information that we receive from others, be they parents, the media, or peers. Probably because everyone is confronted with radiation and radioactivity and they thus play an important role in modern society, this has become a compulsory topic in physics education worldwide.

To be able to teach the topic of radiation and radioactivity, teachers need to know not only the physics but also the pedagogical difficulties of teaching about radiation and radioactivity. It was only in the second half of the twentieth century that radiation and radioactivity became a topic in educational research. The first educational research paper about radioactivity was published by Riesch and Westphal (1975). They studied how students adjusted **their** mental images of matter to incorporate the existence of ionizing

radiation. After the nuclear disaster at Chernobyl in 1986, radiation and radioactivity received more attention in educational research. Three prominent examples of investigations carried out in the aftermath of this disaster were: Lijnse et al. (1990) studied students' ideas about radioactivity as it is addressed in mass media; Boyes and Stanisstreet (1994) research covered children's conceptual knowledge of the sources and the perceived dangers of radiation and radioactivity; and Eijkelhof et al.'s (1990a) investigation of the influence of mass media on students' ideas about radiation and radioactivity.

The overarching research question in this research was: 'What do students know, or think they know about radiation and radioactivity?'. The aim of the research presented here was to find out what conceptions students have about radiation and radioactivity. The focus of this article is on all student's beliefs and conceptions that differ from scientific theory. Our first step was to develop an overview of what is already known about the difficulties students have with respect to radiation and radioactivity. We researched student conceptions, conceptions that do not correspond with prevailing scientific theories, that have been found in research about radiation and radioactivity among upper-level secondary school students.

Our first research question thus was: 'What conceptions are upper-level secondary students known to have about radiation and radioactivity?' Students' conceptions are influenced by **their** experiences, just as research and education are influenced by society. The Chernobyl disaster is an example of the influence of society on research. As a result of Chernobyl, for decades public discussion about radiation and radioactivity centered around the possibilities of nuclear disasters. Educational research, likewise, focused on the same aspects of radiation and radioactivity. Compared with other subjects, significantly less research has been conducted into conceptions regarding radiation and radioactivity.

Only five of Duit's (2009) 550 articles about student conceptions referred to conceptions with regard to radiation or radioactivity. Moreover, following changes in society and in the research, high school physics curricula evolved accordingly. The first high school physics courses that included radiation and radioactivity as topics focused on the principles of radiation and radioactivity. During the cold war, the focus in school education shifted toward the dangers of radiation and radioactivity. In more recent years, the context in which radiation and radioactivity are taught in secondary schools has shifted further towards benign applications, for example, medical imaging (e.g. X-ray and CT scanning) and medical treatments (e.g. radiation therapy and positron therapy). Little educational research has been done to investigate students' conceptions of radiation and radioactivity with regard to a medical context.

None of the five publications about students' prior knowledge of radiation and radioactivity investigated the medical context. As conceptions depend on the context, it is important to look into students' existing conceptions about radiation and radioactivity within the context in which radiation and radioactivity are taught, and this context has recently changed. For example, in the USA, the Next Generation Science Standards (Council, 2012; States, 2013), proposes the teaching of the principles of wave behavior and wave interactions with matter in the context of medical imaging. In the UK, a significant proportion of the physics curriculum focuses on the medical, industrial, and commercial use of these principles. In the Netherlands radiation and radioactivity concepts are now taught in the context of medical applications.

There are multiple views on the nature of student conceptions and how to deal with student conceptions, to achieve conceptual correctness. The similarity between these views is that teachers need to know what existing student knowledge is because the development of knowledge is a process during which students assimilate new, scientific information into prior knowledge, which can cause hybrid conceptions or misconceptions. For teaching radiation and radioactivity effectively, it is important to know which conceptions appeal most to students. The teacher then can anticipate potential conceptual problems and hybrid ideas.

We did not find research in this literature search that focused on student conceptions in a medical context in secondary schools. Conceptions related to medical applications of radiation and radioactivity were investigated to some extent with other types of students. Mubeen et al. (2008) studied medical students' knowledge of ionizing and non-ionizing radiation, and Freudenbergand & Beyer (2011) studied the perceptions of radiation risk held by medical students and non-radiologic physicians. This research revealed conceptions about X-ray radiation: that gamma rays are less hazardous than X-rays; X-rays stay for hours in the air in an X-ray department; and, after completing X-ray examinations, objects in the room emit radiation. Along with these conceptions, patients informed about and treated with, radioactive medicine also showed a high level of distrust in radioactivity (Freudenberg & Beyer, 2011; Mubeen et al., 2008) and are ill-informed about the risk involved (Ricketts et al., 2013; Sin et al., 2013). However, none of these studies involved secondary school students. **Therefore**, we looked into the differences in conceptions between secondary school students and medical students, as well as patients who have had experience with medical treatments.

Many of the conceptions of secondary school students were not found in research with medical students or patients. Moreover, only one of the conceptions found with medical students was already known from research outside the medical context. It is not clear whether medical students do not have the most common conceptions because of their higher levels of education, or that the conceptions were not found because the studies in which medical students were involved focused on conceptions related to medical applications.

1) De acordo com o texto, os conceitos de radiação e radioatividade
   a) devem ser ensinados pelos pais.
   b) possuem um papel importante na formação do aluno.
   c) são conteúdos considerados difíceis de ser entendidos.
   d) são tópicos comumente abordados pela mídia.

2) Conforme o texto, os estudos de Eijkelhof et al. e de Boyes and Stanisstreet abordaram

a) os impactos dos danos ambientais em Chernobyl e a influência da mídia na concepção dos alunos sobre radioatividade.

b) a percepção dos perigos da radioatividade e a influência da mídia na concepção dos alunos sobre radioatividade.

c) a sensibilização quanto à exposição à radiação ionizante e a percepção dos perigos da radioatividade.

d) os impactos dos danos ambientais em Chernobyl e a forma pela qual os meios de comunicação abordam a radioatividade.

3) Segundo o texto, a pesquisa de Siersma et al objetivou investigar

a) a concepção dos alunos sobre radiação e radioatividade.

b) até que ponto as concepções dos alunos são influenciadas pela sociedade.

c) se o ensino sobre radiação e radioatividade corresponde às teorias científicas predominantes.

d) se os alunos do ensino médio sabem discorrer sobre os principais conceitos de radioatividade.

4) O texto informa que por décadas

a) debateu-se a adequação do currículo de Física no ensino médio.
b) discutiu-se sobre a possibilidade de desastres nucleares.
c) ensinou-se acerca das aplicações terapêuticas da radiação.
d) pesquisou-se os conceitos dos alunos sobre radiação e radioatividade.

5)O texto menciona que nos Estados Unidos

a) é sugerido que o currículo escolar enfoque o uso comercial da radiação.

b) estabeleceu-se que é necessário promover a correção conceitual das informações científicas.

c) preconiza-se o ensino de conceitos de radiação e radioatividade por meio de imagens médicas.

d) privilegia-se o ensino da aplicação industrial da radiação.

6) O estudo de Siersma et al sugere que os professores devam

a) conhecer os conceitos mais atrativos para os alunos.

b) atualizar seu entendimento sobre os conceitos de radiação e radioatividade.

c) comparar os conceitos antigos e os atuais sobre radiação e radioatividade.

d) ensinar os fundamentos conceituais e os avanços educacionais na área de Ciências.

7) Leia os enunciados abaixo.

Segundo o texto, o estudo que investigou as concepções relacionadas a aplicações médicas de radiação e radioatividade entre os alunos do ensino médio foi o estudo de

I. Freudenbergand Beyer.
II. Mubeen et al.
III. Siersma et al.

Está (ão) correta (s)

a) I e II.
b) I.
c) II e III.
d) III.

8) O estudo de Siersma et al informa que as concepções mais comuns relacionadas às aplicações médicas de radiação e radioatividade

a) não são ensinadas para quem tem alto nível de escolaridade.
b) não são mencionadas em estudos com alunos de medicina.
c) são conhecidas tanto pelos alunos do ensino médio quanto os de medicina.
d) são ensinadas aos estudantes de medicina.

9) No trecho "**Therefore**, we looked into the differences in conceptions between secondary school students and medical students, as well as patients who have had experience with medical treatments …", a palavra ***therefore*** introduz a noção de

a) contraste a algo mencionado anteriormente.
b) causa de algo mencionado anteriormente.
c) consequência de algo mencionado anteriormente.
d) negação a algo mencionado anteriormente.

10) A palavra **their** destacada *no trecho* "They studied how students adjusted **their** mental images of matter " e a palavra **their** destacada no trecho "Students' conceptions are influenced by **their** experiences " referem-se, respectivamente, a

a) mental images e experiences.
b) mental images e students.
c) students e students.
d) students e experiences.

GABARITO

1. C
2. B
3. A
4. B
5. C
6. A
7. D
8. B
9. C
10. C