

PRESERVICE SECONDARY SCIENCE TEACHERS' TEACHING PROPOSALS TO ADDRESS A SOCIALLY ACUTE QUESTION

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Teaching about socially acute questions seems beneficial for different aspects of student learning and its use in classrooms can be encouraged by including it in future teachers' training. This paper analyses teaching proposals made by preservice secondary teachers to address the socially acute question of the dominant model of meat production and consumption. The analysis was carried out in terms of the phases addressed for the inquiry and the conceptions of knowledge and pedagogical strategies adopted. The results show that the proposals are focused on information gathering and analysis, highlighting the controversies (engaged conception of knowledge) with the aim to develop critical thinking by teaching students to argue through the exploration of different positions on the SAQ (critical pedagogical strategies). The educational implications of these results are discussed in this work.

Keywords: Socially acute questions, Preservice secondary science teachers, Teaching proposals

THEORETICAL FRAMEWORK

Socially Acute Questions (SAQ) are uncertain issues that generate controversy among specialists in the relevant fields and society, challenge social practises and are the subject of significant media coverage (Simonneaux, 2008). SAQ education contributes to learning about the nature of scientific, social and professional knowledge and to learning high-level cognitive procedures and thus to the development of critical thinking (Simonneaux & Simonneaux, 2012). In this sense, it is important to introduce preservice teachers to the design of teaching proposals on SAQ in order to encourage their inclusion in their future teaching practices, as well as to identify those aspects in which they present the greatest deficiencies when designing proposals. In this work, we focus on two relevant and related frameworks for analysing the PSTs design skills. On the one hand, Simonneaux and Simonneaux (2012) identify the main aspects that characterise the stakes chosen by teachers when addressing SAQ within the perspective of sustainability, two of them being the conceptions of knowledge and the pedagogical strategies (Table 1).

Table 1. Conceptions of knowledge and pedagogical strategies. Adapted from Simonneaux and Simonneaux (2012).

Conceptions of knowledge	
Universal	Knowledge is seen as truth and science produces a single (and experimental science-centred) model of how the world works, prioritising quantitative methods.
Plural	Several paradigms can exist simultaneously within a scientific field and the notion of truth is distanced.
Engaged	Controversies are highlighted, examining uncertainties, possible risks and potential changes they may induce. Scientific knowledge is questioned and the variety of actors involved in scientific debates is recognised.
Contextualised	It considers a scientific production in a given local context. It is mostly interdisciplinary knowledge and integrates the knowledge produced by local actors.
Pedagogical strategies	
Doctrinal	The teacher delivers the content of instruction, leaving very little opportunity for communicative interaction with a view to achieving a clearly defined and identifiable objective.
Problematising	The focus is on the cognitive activity of the learners. The teacher's goal is for students to actively construct an issue and develop a line of reasoning rather than finding a single solution.
Critical	It aims to develop critical thinking by teaching students to argue and evaluate knowledge and different positions on complex environmental issues that carry uncertainties and risks.
Pragmatic	It is based on involving students in an activity, such as project-based learning, with the aim of stimulating student action by confronting them with real problems that are not shown within a theoretical framework that selects empirical data.

On the other hand, Simonneaux et al. (2017) propose a theoretical and methodological framework on the SAQ enquiry from a sustainability perspective that includes five phases. These phases, not necessarily following a

sequential order, are: information gathering and analysis; reflexivity/subjectivity of the investigators; making explicit and constructing reasoning; possible responses and actions taken; and reporting on research.

AIM OF RESEARCH

The aim of this paper is to analyse the teaching proposals of preservice secondary science teachers (PSTs) to address the SAQ of the dominant model of meat production and consumption with secondary students (Cabello et al., 2023), using the frameworks proposed by Simonneaux and Simonneaux (2012) and Simonneaux et al. (2017).

RESEARCH METHOD AND DESIGN

This is a multidimensional, non-experimental study, with a mixed approach (Creswell, 2014). 33 Biology and Geology PSTs at the University of Malaga (Spain) participated in this study. Their background was in science careers, mainly Biology and Biochemistry, and 12 of them had a Master's degree in science fields. The training programme carried out was organised in the following stages:

1. Presentation of the SAQ and the working method: in the 1st session, the PSTs were organised into eight small groups and each group was provided with eight documents about the SAQ, which included different perspectives about it.
2. Analysis of the SAQ: the PSTs had five days for working on the documents for collecting information that would be used in the 2nd session for building a controversy map. Each group built a map using the MURAL platform (mural.co).
3. Presentation and discussion: the maps were presented and discussed in class and compared with a map developed by experts (QSV ENCIC, 2022).
4. Design of teaching proposals: in the 3rd session, each group designed a proposal to address this SAQ with secondary students. The proposals were presented and discussed in the 4th session.

For the analysis of the teaching proposals, slide presentations, additional documents and the notes taken by the teacher during the presentations were collected. The following aspects were analysed in each activity of the teaching proposal designs: a) the phases of the inquiry (Simonneaux et al., 2017), and b) the conceptions of knowledge and teaching strategies (Simonneaux & Simonneaux, 2012).

FINDINGS

Regarding aspect a), none of the groups address the five phases in their proposals and the pedagogical work is mainly focused on information gathering and analysis (Table 2). This phase and the reflexivity/subjectivity of the investigators are the only ones addressed by all the groups. Reporting on research is very little dealt with and only one activity is reported for possible responses and actions taken.

Table 2. Number of activities designed to address each phase of the inquiry in each group.

Phases of the inquiry	G1	G2	G3	G4	G5	G6	G7	G8	Total
Making explicit and constructing reasoning	0	1	1	2	3	1	1	2	11
Information gathering and analysis	4	2	3	2	5	3	3	1	23
Reflexivity/subjectivity of the investigators	1	1	2	1	1	1	1	4	12
Reporting on research	1	1	2	1	0	0	0	1	6
Possible responses and actions taken	0	0	0	0	0	0	1	0	1

As for aspect b) (Table 3), the most commonly used combinations are engaged conceptions with critical strategies, and contextualised or engaged with problematising.

Table 3. Number of activities designed included in each conception of knowledge and each pedagogical strategy.

	Universal	Plural	Engaged	Contextualised
Doctrinal	3	0	1	0

Problematising	3	0	8	11
Critical	0	0	19	0
Pragmatic	0	0	0	2

DISCUSSION OF FINDINGS AND IMPLICATIONS

The findings of this study show that the PSTs do not focus the proposals as an inquiry process, as defined by Simonneaux et al. (2017), being their proposals mainly focused on information gathering and analysis. They mainly show engaged conceptions of knowledge and adopt critical pedagogical strategies. These findings are important because they indicate the main aspects on which the preservice teachers training programs for addressing SAQ with a perspective of sustainability should be focused, being one of them the importance of reporting the research results and the possible responses and actions to be taken. These aspects are related to how the PSTs face SAQ, closer to the students' conceptual understanding of scientific content than to the civic engagement and activism (Bencze et al., 2020). The results of the most used combinations of conceptions of knowledge and pedagogical strategies reinforce this hypothesis, since they show approaches close to what Simonneaux and Simonneaux (2012) call educational configurations of situated problematisation and critical thinking, but not of action.

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