Guest editorial

Authenticity in biology education: benefits and challenges

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This special issue of the *Journal of Biological Education* is devoted to selected papers from the European Research in the Didactic of Biology (ERIDOB) conference held in Braga, Portugal, in July 2010. The theme of the ERIDOB 2010 conference was *Authenticity in biology education: benefits and challenges*. This theme emerged from discussions that had taken place at the ERIDOB 2008 conference in Utrecht, The Netherlands. During those discussions, it had become apparent that various ERIDOB members related differently to the meaning of the term authenticity. Some believed that activities that are performed outside the classroom are authentic, while others thought that authentic activities should engage students in posing questions and designing their own paths to solve them. In this short editorial, we attempt to frame authenticity within the current literature, and to point out how the papers that were selected for this special issue contribute to our current understanding of authenticity in biology education.

Keywords: authenticity; scientific practices; inquiry; interest

Despite the fact that the term *authenticity* has become somewhat of a buzzword in descriptions of various teaching/learning interventions in science education, its use seems inconsistent and its meaning is seldom explicit. Based on the notion that knowledge is situated, being in part a product of the activity, context and culture in which it is developed and used, Brown et al. (1989) suggested that authentic activities are the 'ordinary practices of the culture' (34). They argued that authentic activity is important for learners 'because it is the only way they gain access to the standpoint that enables practitioners to act meaningfully and purposefully' (36). Indeed, attempts to make science learning better resemble authentic scientific practices have led to educational reforms at least since Dewey (1964). Numerous educational researchers have adopted authentic scientific practices, as they are practised by the scientific community, as a basis for the teaching and learning of science (*eg* Edelson 1998; Hsu, van Eyck, and Roth 2010). Buxton (2006) coined this perspective of authenticity as canonical since it is aligned with both the Western scientific canon and with the canon for science education standards in the USA (National Research Council [NRC] 2007), Europe (European Union 2006) and elsewhere.

The canonical perspective is mainly based on the comprehensive analysis of Chinn and Malhotra (2002), who argued that inquiry tasks commonly used in schools evoke reasoning processes that are qualitatively different from the processes employed in authentic scientific research. Moreover, they suggested that school reasoning tasks are based on an epistemology that differs from that of authentic science (Chinn and Malhotra 2002). Two main approaches were identified by Radinsky et al. (2001) for designing authentic curricula that adopt the canonical perspective: 'simulation' and 'participation'. The 'simulation' approach involves creating a simulation of a professional practice within the context of the classroom, by designing materials, tools, assignments and interactions that are in line with the activities of the professional community. By simulating professional practices, these designs attempt to expose students to those practices of the scientific community that are most fruitful for learning, while sheltering them from less fruitful ones. The 'participation' approach involves creating opportunities for students to participate in the actual work of a professional scientific community, thus allowing them to learn about elements of the practice that may not be

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captured in a simulation. Both approaches allow enculturation of students into the 'ways of knowing' that are commonly used in the specific scientific discipline (Radinsky et al. 2001).

Despite the obvious benefits of making science learning resemble authentic scientific practice, there is an ongoing debate over the assumption that authentic science activities can enhance students' understanding of science. For example, Hsu et al. (2010) reported that high-school students who experienced authentic science in an internship programme acquired incomplete representations of science. The debate is not simply related to situating students in authentic scientific contexts; it also relates to the lack of consideration of students' interests, perspectives, desires, and needs. A youth-centred perspective on authenticity (Buxton 2006) allows youth to explore and make use of science for their own purposes. This learner-centred approach is widely used in informal science education settings, but is less common in formal school settings, which usually place less emphasis on students' interests (Rudduck and Flutter 2000). The youth-centred approach is guided by the notion that an interested student will be prepared to expend the effort required to learn and understand science (Osborne, Duschl, and Fairbrother 2002). It should be borne in mind that the school context has been found to undermine the translation of out-of-school science experiences into school science (Brickhouse 1994), and therefore a closer examination of suitable approaches to the use of a youth-centred perspective for the teaching and learning of science is required.

A contextual perspective for authenticity in science education (Buxton 2006) includes attempts to bring together selected aspects of the canonical and youth-centred perspectives. Combining the canonical approach with the socio-cultural approach was suggested by Anderson, Holland and Palincsar (1997), and it can be exemplified in inquiry-based teaching and learning approaches (*eg* Jimenez-Aleixandre and Fernandez-Lopez 2010; Marx et al. 1997). Such approaches allow students to perform independent research, guided by their teacher, thus increasing their ownership and autonomy with time. Close involvement of the teachers is essential for the success of the learning process and requires fundamental changes in teachers' practices, in professional development, and in educational policies (Buxton 2006).

Classification of various perspectives of authenticity according to the degree of involvement of the learners, as suggested by Buxton (2006), does not cover all aspects of authenticity in science education. Shaffer and Resnick (1999) identified four perspectives of authenticity: real-world authenticity, authentic assessment, personal authenticity, and disciplinary authenticity. The personal authenticity and disciplinary authenticity perspectives are similar to the youth-centred and canonical perspectives described by Buxton (2006), respectively. However, the classification suggested by Shaffer and Resnick (1999) adds two additional perspectives to the application of the term authenticity in science education: real-world authenticity and authentic assessment. In real-world authenticity, the materials and activities of the learning environment are aligned with the world outside the classroom. This perspective is based on the notion that learners should learn by doing the same kinds of things that they do in 'real life'. In authentic assessment, the assessment is aligned with instruction such that assessment tasks are aligned with learning tasks. Those two additional perspectives can be regarded as an expansion of the youth-centred perspective of authenticity suggested by Buxton (2006), since they can reach beyond learners' interests to the learners' environment, namely the real world around them, as well as the classroom environment and what is required from them as learners. These various perspectives on authenticity are used below to classify the various papers making up this special issue on the ERIDOB 2010 conference.

Fonseca et al.'s study takes the youth-centred perspective on authenticity. Their instructional approach focuses on the use of animals as a strategy to engage students with science, enhance their motivation, and promote values such as respect, tolerance, and empathy for all living beings. Gelbart and Yarden's study is based on a canonical perspective of authenticity, and specifically on the 'simulation' approach. The study involves a web-based research simulation that makes use of authentic research practices in genetics, including use of a heuristic strategy to compare mutated and normal versions of characters at all organisational levels. Olander and Ingerman's study is contextual in nature, as it attempts to probe a new language – an interlanguage – which is a hybrid of two kinds of authentic language, the scientific and the colloquial, that come into contact in the classroom. The studies by Levinson et al. and Simonneaux and Chouchane are based on real-world authenticity, in the context of using socio-scientific issues for learning biology. Levinson et al. used various authentic sources of information, such as doctors, back pain specialists, internet searches, and anecdotes from patients who have had surgery or who are considering having surgery, to allow learners' involvement in authentic complex decision-making scenarios which draw on inter-disciplinary knowledge. Simonneaux and Chouchane's study is also canonical in nature, as it makes use of authentic gene therapy cases which allow students to face a real picture of scientific practices, understand the temporary nature of empirical evidence, grasp the uncertainties that characterise science, and develop critical rationality. Finally, the study by Zabel and Gropengiesser focuses on authentic assessment, including writing assignments on the evolution of modern whales from their terrestrial ancestors. Taken together, these selected papers represent the current scope of the use of authenticity in biology education research.

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