

academic discipline of the history of science. So what is unique to now? There are challenges in the current economic crisis- where objects are not seen as direct, efficient or effective conduits of explanation in the rigid didactic sense; hence their very existence in national collections is threatened. The longer-term effect of economic pressure can lead to a view where the teaching of science can be seen as the one and only contribution of a science museum. However, there are opportunities also unique to now. The omnipresence of electronic information was, as recently as ten years ago, seen as a way of replacing real objects. However, the live experience, as it is in music, has re-entered the public conscience and 'the real thing' has retained, perhaps even increased its significance. The complexities of science and its effect on all our lives calls for overviews only possible with an historical perspective, hence the objective and detached assessments of the historians and philosophers are more necessary now than ever before. The paper will explore the history of the dualism of science museums, and argue that the potential for the future presentation of science as culture is particularly promising.

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THE HISTORY AND PHILOSOPHY OF CHEMISTRY AS A FOUNDATION FOR TEACHING CHEMISTRY

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Within the last twenty years, philosophy of chemistry has emerged as a distinct discipline within the philosophy of science. Because the field is relatively new, the role of the philosophy of chemistry in chemistry education and chemistry education research has not yet been established. This paper describes a research project in which a historical context is used to teach grade 11 chemistry students the topic of gas behaviour. The goals of the project are to add a student voice to the HPS literature and to determine if a curriculum using the history and philosophy of chemistry as a foundation has an effect on student achievement and their understanding of chemistry. The developed topic focuses on two main areas of the philosophy of chemistry: epistemology and linguistics. A series of interactive historical vignettes will be presented to students. Students' perceptions of their learning environment will be measured to determine if this approach improves their impressions of the science classroom. Their learning will be assessed on an achievement test which measures both their conceptual understanding and their performance with standard chemistry problems. Finally the students' views of the nature of science, and more specifically chemistry, will be measured.

A SEVEN-YEAR PROFESSIONAL DEVELOPMENT JOURNEY FROM LEARNING NATURE OF SCIENCE (NOS) TO TEACHING NOS*

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In the first section of the proposal, we provide some background of the science curricular

reform in Hong Kong, in which the role of nature of science (NOS) has become more prominent. In relation to this, we summarise in the second section, our effort in the past decade in preparing science teachers to develop their students' understanding of NOS. We then describe in the third section the design and implementation of a series of physics lessons by the second author, Lay, on the topic *light wave* which demonstrated a high level of NOS understanding and pedagogical competency of him. In the lessons, he made use of the historical development of the controversies about the nature of light to integrate teaching of related NOS ideas with the teaching of the key physics concepts in interference and diffraction of light, and application of electromagnetic wave. The NOS ideas embedded in historical episodes were covered in an interconnected manner: (1) contrasting subjectivity of science (theory-laden observation/inference/explanation, co-existence of more than one scientific models in explaining observations or natural phenomena, submission to authority in the scientific community) to objectivity of science (evidence-based and empirical nature of science, scientists' conversion from the belief of particle model to wave model of light); (2) brief introduction of peer review process and its relationship to the establishment of scientific knowledge; (3) how an established scientific model may be replaced by another one. By referring to the detailed records of the professional training experienced by Lay and his own reflection of his experience at a number of incidents during his seven-year long journey of learning how to teach NOS, we come to identify several critical events and processes which prompted considerable advancement in his pedagogical content knowledge in teaching NOS, expansion of his teaching repertoire and uplifting his philosophy of science education. Specific linkages of his advancement in learning to teach NOS are connected to certain important and critical training components that he experienced since he first learned the term NOS in his teacher training education seven years ago. Though identifying important features which result in considerable growth of Lay in teaching NOS, we wish our experience can serve as good references for science educators in planning training programmes in enhancing teachers' confidence and competency in teaching NOS.

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HISTORICAL STUDY AND REGISTRATION OF THE USE OF EXPERIMENTS IN EDUCATION DURING THE 18TH AND THE 19TH CENTURY. THE CASE OF GREECE

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The specific characteristics of the 18th century, concerning the study and teaching of physical sciences, was the use of mathematics in the solution of physical problems as well as the use of scientific experiments in teaching and research. The advances in physics, as well as in chemistry and biology, resulted into a rapid development of technology and industrial production during the last quarter of this century and the beginning of the next. In the same time an enhanced experimental research can be detected, and a resulting increase of its applications can be observed. So, the way from theoretical to practical thought through experimental work and technology was also one of the main features of the