Using Ancient Chinese and Greek Astronomical Data: a Training Sequence in Elementary Astronomy for Pre-Service Primary School Teachers

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Abstract

A lot of researches have been carried out all over the world, that promote history of science as a powerful science teaching tool. Because the ways of choosing and using historical elements depends on teachers' or researchers' educational purpose, any attempt to support a single model-to-use seems difficult and probably irrelevant. However, specific intentions may reflect specific and prescriptive terms of using historical materials. This work aims to enlighten this aspect. It is an attempt to organize a particular use of the history of science (just as Monk and Osborne did 25 years ago) which takes place in the teaching of astronomy in primary school. Here, ancients' Greek and Chinese historical elements are chosen and organized according to specific educational and conceptual constraints that include the construction of the quasi-parallelism of the solar rays reaching Earth surface, and the spontaneous modeling of the propagation of the Sunlight leaning on divergent rays. This leads to an original teaching sequence were historical elements are mixed up with non historical ones. This organization (called "historical-based educational reconstruction") forms the support of a pre-service training session developed for future primary school teachers. This session aims to provide future teachers with elementary cosmological knowledge (parallelism of the Sunrays, shape and size of the Earth, Sun-Earth distance…), to provide some reference marks of history of ancient cosmologies (spherical and flat Earth) resulting from two distinct contexts, and to approach some aspects associated with Nature of Science (NOS). Specifically, we emphasize the reliability of two different models that appear to be consistent with the same class of experimental data. One of these consistent models is close to students' spontaneous way of modeling the situation. This proximity favors a free discussion on the status of hypotheses and on the status of error, on the role (often minimized) of inductivism, on the role (often promoted) of measurements in science and in science education. One original aspect of this work is to run a model today invalid until it produces some numerical results in order to show how complex it is to invalidate a consistent model. The sequence has been implemented with 5 pairs of students. From a pedagogical point of view, it favors an active participation of the students and has been evaluated positively. This may be seen as a way of addressing the confidence of pre-service teachers to teach primary science and technology. Another way of addressing the 'confidence issue' was the use of a constructivist strategy using peer discussion in an environment which encouraged students' questioning.