A transversal educational proposal for prospective primary teachers: the theme of Time

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Abstract. Time is a transversal topic that plays a fundamental role in anybody experience and represents a natural conceptual bridge between common sense ideas and scientific knowledge.
Two classes of Perspective Primary Teachers (PPT) at the Universities of Udine and Verona were introduced to the theme of Time in interdisciplinary activities organized in two parts: **(a)** they discussed various educational and multidisciplinary approaches aimed to deal with different aspects of Time; **(b)** they explored and experimented various instruments for time measurement. Data analysis shows the relevant aspects that PPT recognize critical issues for children in understanding the meaning of time.

1 Introduction

The theme of Time represents a comprehensive, naturally transversal topic, which offers many educational opportunities to deal with different kind of experimental and exploratory activities, since it is part of anybody experience [1]. Time is naturally linked to the real world and represents a conceptual referent to bridge common sense ideas to the scientific one in a multidisciplinary perspective [2].

Physics education for Prospective Primary Teachers (PPT) in Italy does not include multi-disciplinary activities (which are offered only as initiative of scientific area university teachers) and transversal topics such as Space and Time are rarely treated, even if they are fundamental in PPT professional work. This doesn't address the lack of scientific competence that PPT need to solve [3-7]. In this context, two classes of Perspective Primary Teachers (PPT) of the Italian Universities of Udine (120) and Verona (30) were introduced to the theme of Time in interdisciplinary activities organized in two subsequence parts.

2 The learning path on TIME

In the first part of the learning path proposed in this paper, PPT discussed various educational and multidisciplinary approaches (in different contexts including Philosophy, Poetry, Art, History) aimed to deal with different aspects: irreversible phenomena, cyclic phenomena, sequence of actions in every-day life, words related to time. Irreversibility was introduced through examples of real life, such as a falling leaf, a broken glass, a drop of ink that spreads, a quantity of hot water that cools. The measurement of time was distinguished from the concept of time. In order to discern between evolutionary and periodic processes, different phenomena have been examined. The key concepts treated during this first part were: time, instant, interval, examples of short and long time intervals.

The periodicity was proposed through the analysis of daily life (day, week, month and year) with the corresponding construction of the wheels of Time and the measure of Time in history.

The theme of Time had been proposed also in transversal terms (Mathematics, Italian, History, Philosophy, Art and Physics) through the analysis of the conceptions about Time of some philosophers like Heraclitus, Aristotle, Augustine, Hegel, Hiddeger and Prigogine.

In the second part, PPT explored the informal context of GEI exhibition (Games, Experiments, Ideas) [8-10] set up by the Unit of Research in Physics Education (URDF) of Udine and experimented various instruments for time measurement: gnomons, hourglasses, oscillating fluids, pendulum.

3 Planning and implementing an educational path on time with primary school pupils

After the two above described parts, 8 Prospective Primary Teachers from the University of Udine chose the theme of Time for a teaching intervention module with primary school pupils. In their opinion, Time is fundamental **(i)** because "*it is related to every-day life*" (6/8), **(ii)** "*it is in the national ministerial directives and allows projecting transversal and interdisciplinary paths*" (5/8) and (iii) "*it allows children to orient themselves in a temporal perspective*" (4/8).

They involved a total number of 128 pupils, three classes of second grade students, four classes of fifth grade students and one class of pre-school students. The way the 8 future primary teachers decided to plan their educational path on the theme of Time was investigated through a detailed analysis of their final reports.

Data analysis on the 8 intervention modules shows that PPT adopt the proposed examples creating new learning paths in which irreversibility and time measurement are interrelated and in which the main learning goals are addressed adopting active learning strategies and inquiry approach.

4 Concluding remarks

Transforming knowledge into practice is one of the most difficult and important tasks for future primary school teachers, which involves appropriation and re-elaboration of the knowledge of the didactic proposals analyzed. It requires the contextualization choices and the creation of the learning environments. This task is very difficult as it relates to transversal topics, which are multidisciplinary conceptual referents.

The analysis on the 8 educational paths proposed by PPT to primary pupils shows: a) the difficulties encountered by PPT and their needs; b) the topics and the methods resonant with their perspective; c) the strategies adopted and d) how they under-evaluate the coherence of path developing in real classroom context.

On the other side, the proposals of PPT confirm that the formative intervention module ensured that PPT were able to address the main learning goals related to the theme of Time.

5 References

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