

# Scrum Methodology and Digital Storytelling in Physics Education to engage students on Relativity

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**Abstract.** This paper describes an educational experiment performed on Italian students of the last year of High School where the SCRUM methodology and Digital Storytelling were exploited together to introduce the study of Relativity. Informal approach of Digital Storytelling and a collaborative learning practice cooperated to overcome the epistemological difficulties of a rigorous approach.

## 1 Introduction

The introduction of the study of modern Physics in the last year of High School entailed many epistemological problems and gave rise to the need to revise the educational approach about all the topics requiring an advanced mathematical knowledge. Hence the idea of approaching this topic in an informal way rise to look for a new way of communicating, which could produce a greater emotional involvement of the children and could also be an opportunity to further study.

## 2 Methodology and activities

### 2.1 Scrum methodology

Scrum methodology [1] is based on the recent theories of cooperative learning, which stimulates cognitive development in social contexts. Logical and reasoning skills grow in interaction with peers and with more experienced people [2]. By interacting with peers, students perform a deeper cognitive processing and can recognize and remove his own confusion [3]. Furthermore, working in groups increases the capacity for critical reasoning.

### 2.2 Digital Storytelling

Digital Storytelling, a story realized with digital tools (web apps, webware) consists in organizing contents selected from the web in a coherent system, supported by a narrative structure, in order to obtain a story consisting of multiple elements of various formats (video , audio, images, texts, maps, etc.). The effectiveness of this type of communication is based on

the highly gratifying character of a narrative approach, on the fact that it offers easier access to abstract and complex concepts, on the ability of the narrative approach to generate networked knowledge and combinatorial creativity.

### 2.3 Activities

The introduction to Relativity was the vision of "Einstein and Eddington", a British single drama released in 2008. The vision was followed by a discussion in the classroom through appropriately prepared question-stimulus and a metacognitive questionnaire. Furthermore, the students, divided into small groups, had to rework the highlights of the film.

The real challenge of the teacher was about linking the ideas transmitted by the movie with the disciplinary contents. One of the most curious effects of the theory of Relativity is the contraction of space-time as a function of velocity. This is a concept that we do not experience every day whose theoretical treatment may be difficult for high school students. To explain the concept, Einstein himself uses a paradox, known as the paradox of twins, using a plot that can appear to be science fiction, also because it uses a language and images quite typical of science fiction. The students reproduced the paradox of the twins in a new fashion and adapted it to a comic strip.

## 3 Conclusion

Digital Storytelling was proved to be a useful tool to introducing rather complex physics concepts but, on the other side, it was not exhaustive. Its teaching efficiency was evident in the possibility of introducing some concepts in an informal way but, after the engage, the rigor of an accurate mathematical formalization was necessary. In this case, the story and the following representation through the comic strips were very effective to explain Lorentz transformations, to repeat the concepts of inertial and not inertial reference system, the concept of space-time up to a hint to some more elaborate concepts of General Relativity. The skills promoted by the production process of a Digital Storytelling are multiple [4] and connected to the four fundamental characteristics of this cultural artifact: storytelling, mediality, sociality, personalization. Besides skills in research, in problem solving and in evaluation were obtained. The Scrum methodology allowed students to develop collaborative skills and encouraged the development of problem posing and solving skills. It also shows several aspects: psychological, perceptual, linguistic and practical. We have always tried to activate the processes of argumentation and conjecture to favor the transition from intuitive notions and operating levels to forms of deductive thought and to abstract or virtual levels. Quantitative data complete the experiment attesting the improvement of students and the acquisition of new skills.

## References

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