AggiornaMenti: an INFN project for the education of junior high school science teachers

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Junior high school (scuola media) represents the weakest sector of the education system in Italy and perhaps in other countries. This is largely due to the absence of a specific formation of the teachers during their academic studies, at variance with what occurs for the primary school. This holds also for the teaching of science in general and of physics in particular. In most cases science teachers have a master degree in biology or maths and have to cover a huge program, touching in principle all disciplines of hard and life sciences for which, during their past studies, they did not receive a specific formation neither at the level of the content nor of the didactic methodology. As a result, teachers, perceiving the weakness of their formation, tend to avoid addressing in their lectures important aspects of physics and do not adopt more stimulating approaches than a traditional frontal lecture.

Furthermore, students of this age (11-13) are living a period in which they have to perform choices which will influence the rest of their life. Hence, offering them the opportunity to discover the beauty and importance of science, permeating any aspects of everyday life, may have an even stronger social impact than outreach activities devoted to high-school students, usually focused on more advanced topics of modern physics.

Finally, most schools have very limited laboratory equipment in their science classrooms, rarely exploited for an experimental learning of STEM disciplines. Hence, as INFN researchers occasionally called to collaborate with single schools, a few years ago we decided to collect our experiences and to transform this limitation into an opportunity, planning experimental activities which can be carried out in any contest - even in the absence of a laboratory, exploiting cheap materials which can be found at home by any student - but which have the potential to let the students discover by themselves how science enters into any aspect of everyday life.

This approach to the teaching of science (and physics in particular) requires an appropriate training. Hence, in fall 2017 a first edition of the INFN “AggiornaMenti” program started in Torino, a course on a cooperative “learning-by-doing” approach to the teaching of science devoted to junior high school teachers. After that first edition AggiornaMenti has become a national INFN project supported by the INFN outreach commission which currently involves 10 local sections of the institute across Italy. Each year, even during the pandemic in which the activity was carried out mostly in online format, about 100 science teachers have attended our education program, which includes hands-on activities covering any aspect of classical physics: mechanics, fluid dynamics, thermodynamics, acoustics, optics, electromagnetism...Whenever possible experiences displaying the connections of physics with life and earth sciences are proposed. Since 2021 the project has offered also an online coding school on Scratch and Arduino proposed by the INFN-Ferrara section (about 30 participants/year) which can be attended by the participants of the other local editions or also as a standalone module.

Our hands-on approach to the learning of science, based on practical activities carried our in small groups, is suited to valorize a broader range of skills than a traditional frontal lecture and this led some of the participant teachers to partially change the evaluation criteria of their students: the most brilliant in studying a book are not necessarily the most brilliant in solving a practical problem occurred during an experiment. Beside making the students discover new skills, this mixing of expertise is also what is necessary in any scientific collaboration.

During these years fruitful collaborations with other social and educational agencies like Fondazione Golinelli (www.fondazionegolinelli.it), Next-Level (www.next-level.it) and Laboratorio Scienza (www.laboratorioscienza.it) have been established, which provided us a precious help in planning the activities and in establishing connections with networks of schools, in particular in territories characterized by a strong social fragility.
A general overview of our project can be found in our webpage aggiornamenti.to.infn.it, currently under upgrade.

Our YouTube channel (https://www.youtube.com/channel/UCuN0rpzvEuC57HDFoBrumGA) and our Facebook page (https://www.facebook.com/AggiornaMenti-1873114119437696) contain public multimedia materials produced over these last years, in particular during the pandemic period in which the demand of online contents accessible to the schools suddenly increased.

In this talk the INFN "AggiornaMenti" program devoted to the education of junior high school teacher will be presented, showing also the results of a feedback survey among the participants of the past editions of the project. Ideas and suggestions from analogous experiences carried out in other countries are welcome.

In-person participation
Yes

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