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Ph.D Thesis "**New technologies and Physical Activity Sciences: experimental apporaches in educational context**" - *Abstract*

The development of new technologies to support Teaching has grown significantly lately. Computer science technologies created more effective and flexible models of learning and teaching than the standard ones. Nowadays, many informatic technologies are used in teaching contexts such as educational software, electronic resources, learning management systems for e-learning and digital learning environment. In this scenario, nevertheless, technologies have been used in different ways according to the different teaching contexts. In fact, it is possible to identify their use in teaching approaches to address purely scientific subjects, such as the teaching of mathematics, physics or chemistry. In the humanities, it is already possible to observe a moderate use of new technologies; in sports and physical activity new technologies are barely used. A student who plays sports develops better his physical and cognitive profile: that's why the use of new technologies in sports and physical activity education can help students in their growth. In this thesis I try to demonstrate how some information technologies can integrate standard teaching approaches in sports and physical activity subjects. Furthermore we propose the use of specific digital instruments to assess students' performances. These instruments were classified according to their applicability during the evaluation stage and to the input/output requirements and their physical and technological characteristics. The most significant scientific papers and researches on physical activity for young and adult people were accurately studied in order to understand whether new technologies were effective and not invasive in teaching contexts. Moreover in this work I encode physical activities using MET – Metabolic Equivalent Task code that define the amount of energy expenditure (EE) for each individual performance; this way to evaluate the physical activities has been accepted by all sport scientific communities. All the values defined by MET were collected in a scientific compendium. Once the study and the analysis of the compendium was finished, I focused on the development of Intelligent Tutoring System – ITS – that can be used to evaluate sport and physical activities in school contexts. ITSs have a modular structure which is composed by four elements; Expert Model, Pedagogical Model, Student Module and Interface. In my research I implemented only the "Student Module" system, whose use is suitable to assess students' performances in school contexts. In order to get assessment results as real as the ones gotten by teachers, I implemented some AI technologies, such as Fuzzy Logic and Neural Networks. The output of this element will be a mark linked with the physical activity performance. This platform has been evaluated by simulation and experimental techniques. The evaluation session took place in a middle school of Enna: pupils were asked to carry out a program of physical activities implemented by their teacher while playing "EA Sports Active" videogame using Nintendo Wii, a wireless interactive games console, and wearing a Nike accelerometer linked to an Apple iPod. I decided to use the Nike accelerometer because its sensor can detect accurately energy expenditure levels. At the end of this exercise pupils were asked to plug their iPod into my PC, where I had previously installed the Student Module system. The Student Module system evaluated properly energy expenditure levels during pupils' physical activity compering the expected energy expenditure, predetermined by MET, and the ones given by the Nike sensor. The results I got confirmed that the teachers' evaluations and the ones provided by the Student Module were almost the same. It means that pupils and students can always evaluate their physical activity performances even if they are not in school contexts: it can help them in terms of self-assessment of their own performances keeping an objective attitude towards them.