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EchemTest® AT UPPER SECONDARY SCHOOLS

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ABSTRACT *– The succesful implementation of on line EchemTest® General Chemistry Self Evaluation Sessions has fostered their extension to upper secondary schools. In this paper we discuss in some detail the motivations and its first implementation at the Donegani technical Institute of Crotone, IT, thanks to the support of the Test Centre (TC) of the University of Perugia and the establishing of a Local ECTN Advisor (LEA) at the School.*

1) OVERCOMING CONCEPTUAL AND OPERATIONAL ECHEMTEST® DIFFICULTIES

The G. Donegani Industrial Technical Institute (ITI) of Crotone has a specific vocation for chemical disciplines. Because of this, when the Virtual Education Community (VEC) standing committee of the European Chemistry Thematic Network (ECTN) Association and the Educational Division of the Italian Chemical Society agreed on extending the use of the on line EChemTest® Self Evaluation Sessions (SES)s to the students of the upper secondary schools, ITI volunteered to participate to the project (http://ectn.eu/communication/newsletter-2/). As a result, one of us, Daniele Maggiore (DM), was appointed as Local ECTN Adviser (LEA) and both authors (DM and Ermanno Lasta (EL)) and their colleagues (either teaching Chemistry and Chemical technologies courses or running the analytical, organic, instrumental and electro chemistry laboratories) delivered ad hoc additional lectures on the fundamental knowledge and applications of chemistry in order to have students overcome possible competence gaps with respect to the ECTN core chemistry syllabus (http://www.chem-learn.com/wp-content/uploads/2021/04/echemtestsyllabus.pdf). The first part of the lectures focused on the theoretical concepts whilst the second one was devoted to the discussion of the difficulties related to the proposed chemical applications. In the initial phase of the approach to the problems to be handled the students were helped to reflect on the problem itself in order to solve the proposed task. Over time, the students were increasingly driven to target their efforts at solving the considered tasks by themselves by working in small groups and learning together. The outcomes of such cooperative learning method showed that they had assimilated the relevant concepts and had become able to apply them.

2) OVERCOMING DISTANCE LEARNING DIFFICULTIES, ACHIEVEMENTS AND FORWARD LOOKS

Both DM and EL paid significant efforts to track down students who could be at-risk of either lagging back or giving up and disappear. Students in “distance learning” regime are most likely to be in such situation because they might lack at home of a suitable place to work. In addition, in recent times, they had also to overcome the severe stress caused by the Covid-19 pandemic. To mitigate such effect DM and EL (the upper and lower row lhs pictures of Fig. 1) standardized the on line teaching modules so as to have each class unit to last about one hour. The unit started always with a warm-up activity fostering students' motivation and concentration. As a net result, during the EChemTest SESs run on line last

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March 31st through the Perugia TC, four students (out of the six of the Figure) qualified for getting the General Chemistry 2 (GC2) Individual

Fig. 1 - (from top left to bottom right): Prof. Daniele Maggiore, Pietro Amabile, Elisabetta Marullo, Erika Criniti, Leonardo Cristofalo, Prof. Ermanno Lasta, Fernanda Belen Parrilla, Simone Staglianò

Proficiency Certificate (IPC) while the remaining two did it at the next session in June. A result of that kind is important not only because GC2 is an individual qualification higher than that needed for the admission to the Eurobachelor Chemistry courses at University level but also because it encourages the Donegani ITI (as well as other secondary schools) to move ahead and generalize such experience with the consequent standardization of methods and practices.

3) ECHEMTEST$^+$ AND THE PROSUMER SCHEME

The adoption of the above-mentioned collaborative model, however, in the education sector means much more than a practical advance in encouraging students to access molecular science higher level studies. The distinctive feature of knowledge is, in fact, its increase (with no limits both in quantity and in sharing) through learning processes. For this reason, modern economies are evolving rapidly towards "learning economies" in which the various steps involved in the elaboration and usage of both tacit and explicit technological knowledge as a common good are understood as a means for achieving innovation. It is one of the main, if not the most important, driver of economic growth, especially in the most developed economies [1]. As a matter of fact, the dynamism of learning economies is largely based on the education mechanisms enhancing a fruitful participation of knowledge users to its production according to the so-called **prosumer** model [2]. The prosumer scheme is, indeed, the model on which the VEC committee of ECTN has built its European system of TCs located at some member Universities aimed at promoting and assessing chemical knowledge [3]. In such scheme the TCs, after signing the relevant ad hoc agreement, can act not only as **users** of the EchemTest® SESs (to evaluate students to admit, reduce dispersion, assign research tasks, etc.) for their home University, but also as **producers** of such services on behalf of ECTN or other members and third parties. At the same time, ECTN itself can act not only as user of the EchemTest® SESs when relying on TCs to carry out dissemination and advertising activities and when using TC experts for building libraries,

but also as producer when coordinating and supporting central and peripheral TC activities. In this respect upper secondary schools, by acting both as Agencies and as "drivers" of the preparation of the students to take the EchemTest® SESs, candidate themselves to play the role of Associated Test Institute of the ECTN Association which though not being allowed to become member institutions (at present reserved to Universities) can still play an active role producing services for it (like for example in correcting and translating some Q&A databases, producing MOOCS and Learning Objects, contributing to dissemination activities, etc.).

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