

**ReProTool Version 1.0 Managing Learning Outcomes  
- A Useful Tool for Erasmus Co-ordinators, Employers and  
ENIC/NARIC Networks**

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**ABSTRACT**

*This paper presents ReProTool Version 1.0, a tool which provides the means and ensures that academic curriculum design/re-engineering takes place considering various student-centered learning pedagogical methods and input from industry (employers, professional associations). The tool focuses on the Bologna Process and Learning Outcomes (LOs). LOs express what a student/graduate is expected to be able to do after completing a programme/course of study. Employers can therefore identify what knowledge, skills and competences an applicant poses and match them to their own requirements, thus making a more informed decision when employing people. Furthermore, LOs provide the means for comparing programme and course contents and thus assist in the comparability and recognition of degrees. They are therefore, a useful tool on the hands of Erasmus Co-ordinators and ENIC/NARIC networks.*

**1. INTRODUCTION**

The Bologna process (European Commission Education and Learning, 2008) aims at developing a European Educational Framework of standards, definitions and concepts so as to provide the basis for European countries to transform their educational system according to this framework. This will result in comparability/compatibility of the various European educational systems which will then result in collaborations amongst educational institutions, exchanges of students and teachers within Europe and transparency and transferability of qualifications, all being very important when looked from the point of view of Erasmus co-ordinators, prospective employers and ENIC/NARIC networks.

One of the first and most important concepts developed by the Bologna process is the European Credit Transfer System (ECTS) that provides the framework for measuring the student workload in courses/modules/programmes and thus calculating the credits of these courses/modules/programmes. Another important

concept recently introduced is the concept of the Learning Outcomes (LOs) (Kennedy et al. 2006), which allows courses/programmes to be expressed in terms of what a learner/student is expected to know by the end of the course/programme. Employers will thus be able to identify what students are able (or at least should be able) of doing after completing their programmes/courses. Furthermore, by studying descriptions of studies expressed in terms of LOs and thus comparing with what they expect graduates to be able to do, employers could provide input for the re-engineering of programmes taking into consideration industry requirements. When it comes to Erasmus co-ordinators, LOs assist in the comparison of programmes and courses since they provide a common framework/platform for expressing the programmes/courses aims and objectives looked at from the student point of view. Last but not least, ENIC/NARIC networks are also provided with a common framework/platform for evaluating levels and degree qualifications.

The European Qualifications Framework (EQF 2010) provides the basis for mapping the National Qualifications Framework (NQF) of each European country to this framework, thus transitively, mapping each country's educational system to another country's system. Examples of such NQFs are the Irish NQF (Irish 2010) and the UK NQF (UK 2010). The EQF and all NQFS are expressed in terms of LOs.

All the aforementioned concepts/standards are based on the fundamental philosophy of the student-centered learning model, according to which the learning process should be built focusing on the student and not the teacher and the teaching process (teacher-learning model). The student workload calculated by both students and teachers leading to the course/programme ECTS, and the development of the Learning Outcomes of the courses/programme viewed from the student perspective, ensure that the student has an active role in the development and re-engineering of academic curriculum. Student-centered learning moves away from traditional teaching environments through which students are spoon-fed with information provided by the teachers and utilizes teaching/learning methods/techniques, through which students assume an active role and teachers become facilitators and co-coordinators of the student learning process, rather than information providers. Such methods/techniques include amongst others, problem-based learning, simulation exercises, group projects, research work, etc.

The rest of this paper is organized as follows. Section 2 explains how Learning Outcomes support student-centered learning. Section 3 explains the need for ReProTool. Section 4 presents version 1.0 of the tool. Finally, Conclusions presents our current and future work.

## **2. LEARNING OUTCOMES**

Learning Outcomes (LOs) and the writing of course syllabi using ECTS provide the chance to teachers to rethink the course/programme curriculum from the student perspective and reconsider the content of the course as well as the delivery (teaching/learning) and assessment methods, soliciting feedback from various

stakeholders, amongst others industry, employers and professional associations. Rethinking of the curriculum and its delivery is a lengthy process carried out periodically by universities in order to adapt programmes of study with current research issues, state-of-the-art developments and industry demands. This process is usually carried out manually without using a customized software tool. The tool proposed herein is a tool which aims at automating many tasks carried out manually and thus improves the re-engineering process of programmes of study.

One recently developed methodology for programme re-engineering and quality assurance is the Tuning Methodology (Gonzalez and Wagenaar, 2008). The methodology conforms to the Bologna Process directives and provides the framework for design and development of academic programmes. According to the Tuning Methodology, the first stage in designing a new programme is to build its profile, which includes among others, its aims and objectives, as well as the LOs. In order to make sure that the LOs are achieved, the Tuning Methodology utilizes various matrices that relate the LOs with the various courses.

Currently, the Tuning Methodology has been adopted by many universities both in Europe and in Latin America (Beneitone et al., 2007; Keravnou-Papailiou, 2006). TunTool (Pouyioutas, 2009; Pouyioutas et al. 2010), is the first software tool that was proposed to support the methodology and automate some of the tedious tasks that the users of the methodology have to perform. ReProTool is basically a new version of TunTool that incorporates LOs as defined in EQF in terms of knowledge, skills and competences.

### **3. THE NEED FOR AUTOMATION AND REPROTOOL**

When building the degree profile of an academic programme, one needs to define its LOs. Ideally, existing definitions could be utilized rather than reinventing the wheel. Thus, one could select as many LOs (Knowledge, Skills, Competences) from a pool of such resources and then modify and add new ones accordingly. This not only would reduce the effort needed for building the programme profile, but also and more importantly perhaps, it would create programmes that are compatible to a certain extent (of course one may argue that this compatibility would have a drawback such as reducing creativity and innovation). There is currently no database of LOs that would allow downloading of these resources. The creation of such a database would allow one to select and use them as part of the programme profile under development, thus benefiting from the aforementioned advantages.

Another time-consuming and tedious task one faces is the verification that the programme's LOs are met by at least one course of the programme. Matrices could be constructed and checks could be made in order to accomplish this. Furthermore, if one needs to find the LOs achieved by a course or the courses that achieve a particular LO, s/he should consult the hard copy or electronic matrices and produce manually in both cases the required information. This happens because there is no database to store the relationships between LOs and courses. A software tool based on such database could produce automatically the required information.

Furthermore, the database could store for each course its own LOs, its assessment methods, its learning methods and the expected student workload. This basically would automate the completion of the student forms which are used to calculate the student workload and thus the number of the ECTS of the course, reducing even more the time and effort needed for building further the programme components. The automation would also allow what-if analysis and perform workload and ECTS recalculations very fast and error-free. The system would also check the semester breakdown of the programme of study in terms of the 30/60 ECTS requirements per semester/year. When it comes to the student calculations of their workload during a course and therefore the course ECTS, the system would allow the fast processing of all student forms and would produce average workloads for each course and each LO of a course, and the average ECTS of the course, as estimated by the students.

All the aforementioned advantages of automating the application of the methodology used for designing/developing academic programmes of study clearly indicate the need for the tool. ReProTool, provides a database of resources (programmes, courses, LOs, etc.) that can be accessed and shared by many users.

#### **4. PROTOOL VERSION 1.0**

ReProTool supports three main user types, and thus provides three password-controlled authorised areas, namely programme coordinators, faculty members and students. The system also supports a system administrator area. The welcome screen interface allows users to login using their login name and password in one of the aforementioned areas.

##### **4.1 System Administrator Area**

The System Administrator area provides the administrator the tools for managing (creating/editing) the end-users of the system and assigning them authorization privileges. Thus, the administrator is responsible for the maintenance of the data pertaining to institutions, programmes of studies, faculty, co-ordinators and students (Figure 1). Figure 2 shows how the administrator can set the number of hours for 1 ECTS (ranging from 25 to 30).

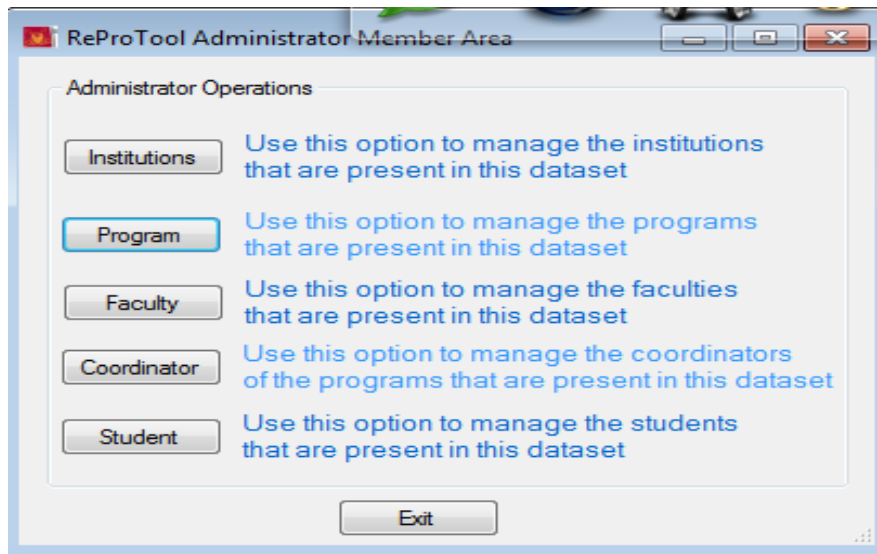


Figure 1: The System Administrator Area

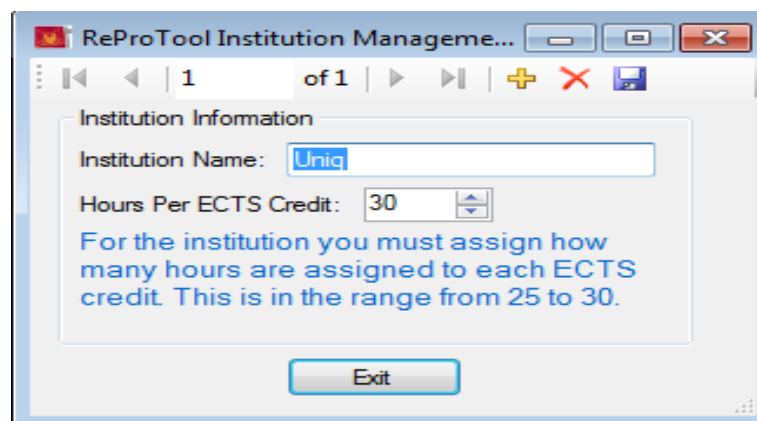


Figure 2: Setting the Hours for the ECTS (Institutions)

#### 4.2 Programme Coordinator Area

The Programme Coordinator area assists academic faculty to set up programmes. The first interface screen provides programme coordinators a list of programmes for which they are responsible. Once selecting one of the programmes, the coordinator is redirected to the specific programme's screen interface that allows one to create/edit courses and assign them to the programme under consideration. The tool allows the co-ordinator to select LOs or create new LOs and assign them to the programme (Figure 3). Furthermore the screen interface supports a Reports menu choice that allows the generation of reports including amongst others, LOs of a course, LOs of a programme vs. the programme's courses, LOs of a programme

not covered by any course and a Programme's total ECTS and Semester's total ECTS.

The screenshot shows the 'ReProTool Coordinator Member Area' for Philippos Pouyioutas. It features a 'Your Information' section with fields for User Name (philippos), Program Name (Computer Science), Password, and Password Again, along with an 'Update Password' button. The 'Courses in Program' section includes a list of 'All Courses' (comp111, comp112, comp113, comp114) and a list of 'Courses in Program' (comp112, comp114), with 'Add ->', 'Remove <', and 'Edit Courses' buttons. The 'Program Learning Outcome in Program' section includes a list of 'All P-LOs' (Software Development, Use Open Source Software, Problem Solving, Group Work, Independent Work) and a list of 'P-LOs in Program' (Software Development, Problem Solving, Group Work), with 'Add ->', 'Remove <', and 'Edit P-LOs' buttons.

Figure 3: Setting Programme's Courses and LOs

### 4.3 Faculty Member Area

The Faculty Member area provides a screen interface that allows faculty to access the courses that they teach (Figure 4) and thus they are authorized to modify. Once a faculty member chooses a course, s/he is redirected to the screen interface shown in Figure 5 that prompts the completion of the Course ECTS Calculation Teacher form. This form lists the course's LOs, the associated educational activities (teaching/learning methods), the assessment methods and the estimated student workload (number of hours) that students are expected to spend on each LO. The total student workload in hours and thus the total ECTS of the courses are automatically calculated. The Reports menu choice allows one to access and compare with the student estimated workload and ECTS and hence make any amendments if needed.

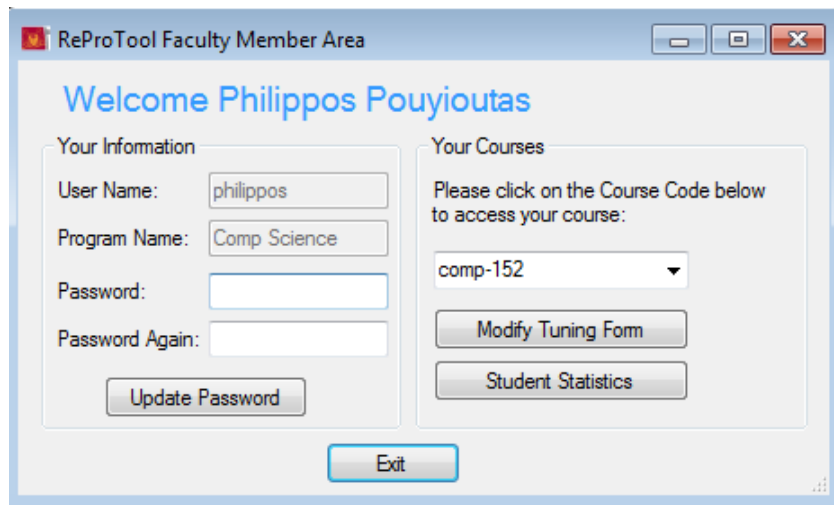


Figure 4: The Faculty Member Area for Selecting a Course.

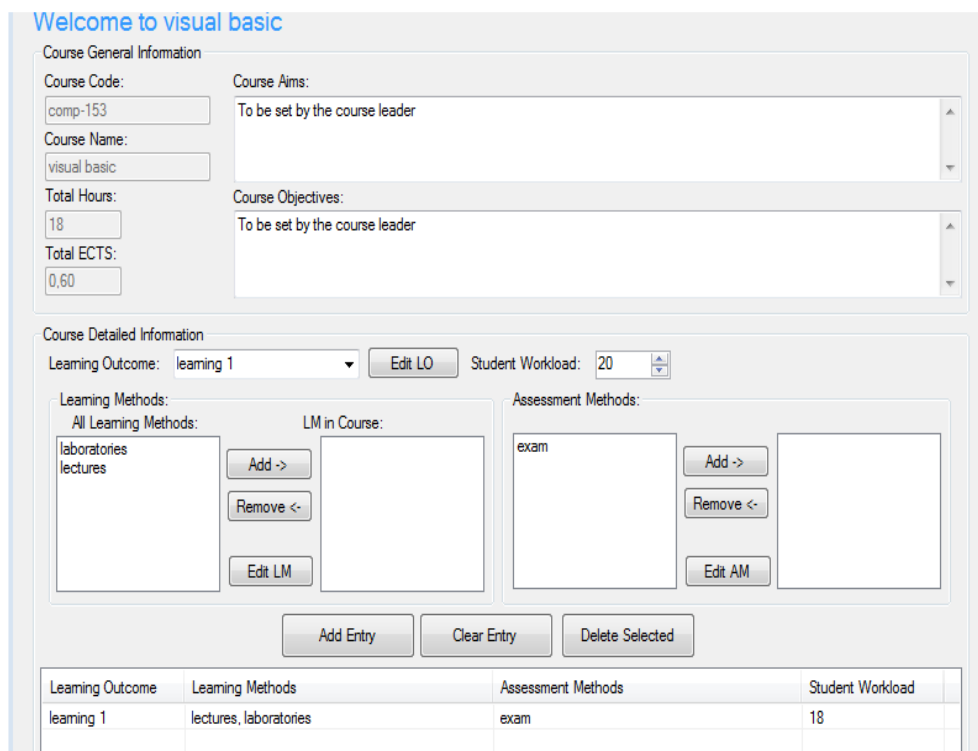


Figure 5: The Faculty Member Area for Assigning Learning Outcomes.

#### 4.4 Student Area

The Student Area mainly provides a screen interface, which allows students to record the number of hours they spend every week in a course. The total number of hours is automatically calculated by the system and displayed on the form. The system also calculates the average total number of hours spent by all students in the course and thus calculates the average student workload that is translated into the course ECTS as estimated by the students. At the time of writing the paper, this is under development.

#### CONCLUSIONS

This paper has presented the ReProTool which can be used for the re-engineering of academic curriculum using the Bologna Process directives. The use of the tool in designing and developing academic programmes using Learning Outcomes and ECTS syllabi, forces academicians to rethink from the student perspective the curriculum content and the teaching/learning methods and techniques and from the employers perspective, the expected knowledge, skills and competences that graduates should have in order to enter the job market. The concept of Learning Outcomes is currently at the center of attention of any development regarding ECTS and play a crucial role in the understanding and comparability of programmes and courses across institutions. Furthermore the concept is also important when it comes to recognition of qualifications across Europe. Therefore any tool that supports learning outcomes indirectly provides help to Employers, Erasmus Co-ordinators and NARIC/ENIC networks. The tool is still under development, thus not all functionality described herein is currently available. We expect to have the full functionality implemented by December 2010.

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