NEW EVALUATION METHODS BY MEANS OF OPEN SYSTEM SERVICES FOR SMARTPHONES

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ABSTRACT

This paper presents some achievements of the project entitled "Develop of open systems services for smartphones that facilitates new evaluation methods, and enhances use of immediate feedback on evaluation results obtained in tests as a creative learning tool" (acronym Done-IT) financed by European Commission. Models of learning are analysed, project aims, objectives, impact, sustainability, results and implementation are presented.

Keywords: evaluation methods, mobile device, smartphone, material testers, learning skills

1. Introduction

In the educational process students cannot verify immediately their learning during tests and exams, and the feedback is published after days or weeks.

The project entitled „*Develop of open systems services for smartphones that facilitates new evaluation methods, and enhances use of immediate feedback on evaluation results obtained in tests as a creative learning tool*" acronym Done-IT, tries to solve this challenging problem expanding material tester (MT) specialists and material engineers learning skills in Romania by testing a unique, brand new inquiry-and problem based evaluation model. The project is promoted by Sør-Trøndelag University College in Trondheim Norway (HiST) in partnership with "Petru Maior" University of Tîrgu-Mureş Romania (UPM) [8].

It is developed advanced, flexible, easy and fast to use services for 4 operative systems. Each student use Smartphones to answer and mark multiple choice tests with a number of questions. It includes an embedded automatic marking system for repeated measurement of a student knowledge. Also it is developed a new evaluation model, where the in class results are turned into a creative, collaborative, active learning process with immediate feedback.

The teacher may, for each single question to:

a) A teacher lead a verification feedback: why is the answer correct and why the other ones are incorrect;
b) A student group driven elaborative feedback discussion: the answers are displayed but they don't know which are the correct or incorrect ones;
c) An individual student lead elaborative feedback discussion: the deviation from the correct answer without addressing why it is correct and why the other ones are incorrect.

The training method is used beyond classroom in material test labs. It includes cases that verify learning through real experiments demonstrating what to do, how it works, and how the deviation will look like. The new open evaluation services may be used as examination tools within e.g. certification processes.

Material testers and material engineers frequently need to conduct visual inspections, tests and assess the quality of products in a range of mechanical fabrication process. ISO 6520 is used to distinguish 80 types of material defects like cracks and gas pores. For each type, the defects could be grouped or classified into different degrees of severity and complexity, whereby students must master knowledge of multiple characteristics of materials.

Thus in technical and science foundation courses in Europe much learning consists of the acquisition of factual information [3]. Research indicates that the typical learning styles of accounting students are not suited to the acquisition of generic skills. Learning theory is used to provide a framework to support the use of case studies as a tool to promote appropriate learning styles and thereby enhance generic skill development. Case studies, however, as a tool to promote appropriate learning styles through encouraging controllable failure attributions enhance generic skills development [1].

2. Models of learning

Wittrock presents a functional model of learning from teaching that, in contrast to structural models of schemata and knowledge representation, focuses on the neural and cognitive processes that learners use to generate meaning and understanding

from instruction. It consists of four major processes: (a) attention, (b) motivation, (c) knowledge and preconceptions, and (d) generation. Each of these processes involves generative brain functions studied in neural research and generative cognitive functions studied in knowledge-acquisition research. In this model of generative learning, the brain is a model builder. It does not transform input into output. Instead, it actively controls the processes of generating meaning and plans of action that make sense of experience and that respond to perceived realities. Within this framework, teaching becomes the process of leading learners to use their generative processes to construct meanings and plans of action [6].

According to contemporary models of learning, individuals understand and remember new material best when they elaborate on that material in some manner. In general, the quality of the elaborative-interrogation study responses did not affect learning [4]. Elaboration can take the form of adding details to the information, clarifying an idea, explaining the relationship between two or more of the new concepts, making interferences, visualizing an image of some aspect of the material, applying an analogy relating the new ideas to facilitate learning by promoting students to solve specific through-provoking questions pertaining to the material to be learned, and those questions in turn elicit relevant explanations [2]. The characteristic of the questioning strategy that accounts for these effects is the critical-thinking nature of the question prompts and the high degree of learner autonomy and independent learning within the structure of such a strategy.

Mobile devices are highly portable, easily distributable, substantially affordable, and have the potential to be pedagogically complementary resources in education. In some cases the mobile learning technology adoption was rapid, seamless, and actively driven by the students rather than the teacher [7].

Santos [4] explores how a group of undergraduate students use their mobile phones to perform informal learning activities related to the content of their courses outside the classroom. Students performed informal learning activities mostly from home, interacting mainly with classmates. It also shows that students were in control of their informal learning activities without teachers' input. However, it was found that students used only a limited number of applications but these were considered useful to their learning

3. Done-IT Aims and Objectives

The Done-IT project objective is to develop and validate: 1) new evaluation models that use creative, inquiry and problem based complex industrial production cases to facilitate an active learning by doing approach by utilizing real experiments in material tests labs. The students may improve and immediately apply their knowledge to practice (e.g. in new cases provided by the teacher) by participating in 2) verification – and elaborative learning processes, based up on creative expression and in class feedback discussions immediately after the tests is completed. Easy and fast to use 3) open Operative System evaluation and test services for Smartphones (Android, Apple, Windows and Symbian) provide automatic grading of the multiple choice tests results. Tests can be done in any classroom covered by a WI-FI network.

Done-IT aims to foster innovation by providing a new model for evaluating and expanding students learning skills and knowledge, since the results from multiple tests may easily be interconnected. Students understanding of problems are measured and collected in real time, whereby the traditional final exam is replaced by a system of multiple tests during the year. The evaluation model uses mobile devices that may easily track if students decide to change their mind in a peer instruction elaborative feedback learning process: the teacher may display the class results of a test question without explaining what the correct or incorrect results are, and let individual – or groups of students discuss the alternatives. After this Learn Active process some students may decide to change their mind and correct their feedback.

The services use advanced web technologies such as XML security, and implement XML authentication, confidentially, and integrity. A database is used for management of system operation, while data boxes for storage of data secure fast operation. Bluetooth connections may be considered instead of using Wi-Fi networks.

4. Impact and sustainability

Done-IT introduces immediate elaborative and/or verification based feedback processes and learning methodologies to students based learning by using modern mobile handheld devices.

The main target group consists of a) MT specialists and material engineers working in mechanical industry companies and b) teachers and instructors that provide training and certification to these staff groups. The teachers and instructors may work at Vocational Education and Training (VET) schools universities as employees within large mechanical industry companies, or as employees of small training institutions which typically do not have the capacity to have full time training employees

To ensure maximum impact, the project partners aim to collaborate with training and certification organizations operating with material testing. The deployment of proposed methodologies learning activities and new mobile service through formal education channels is critical for a number of reasons: most importantly for ensuring post project adoption and exploitation of results; for accurate learning needs analysis based on gaps in current

curricula; and for the establishment of an industry network for collaborative knowledge development. This includes policy makers, who will benefit from evaluation results on the relevance, applicability, acceptance, and effectiveness of proposed methodologies and mobile learning technologies.

Stakeholders are represented in the consortium, in targeted dissemination, and exploitation of partner organizational links to their sectors. Experienced teachers lead and establish learning requirements. Teachers and learners participate in learning activity design and deployment of elaborative and verification feedback loops. Finally, teachers and learners will be the focus of validation in actual learning conditions.

Software development is done in close collaboration with instructors and students. A prototype is developed and tested by end-user groups. The feedback obtained is used to improve and change the interfaces and the software. This process must be repeated several times before an intuitive, easy to use control interface has been developed. The challenge is to build a system solution that is intuitive, fast to use, while at the same time providing sufficient flexibility and easy inclusion of improvisation in elaborative and verification learning processes addressing students' tests results. The software solution will be designed for use in small and large class rooms. The technology may be used for in-class, laboratory, but also for distance training purposes, the latter being an entirely new option for elaborative feedback.

Stable software solutions will be tested in real material testing courses with evaluation of learning outcome and new training methods.

The proposed mobile learning solution use control interfaces that are designed for digital blackboards, PC or the emerging PAD's. The interfaces for Smartphones, will be designed such that they may be used in all types of training activities that may utilize elaborative and verification based feedback training processes – based up on tests as part of the learning process. This includes all kind of technical and engineering courses in VET as well as higher education, that may use problem based learning and cases in the learning environment.

The interface solutions will be designed for use in a range of process and product oriented courses that may utilize mobile learning elaborative and verification feedback process, e.g. in social sciences, medical education, mechanical industry trainers education, where it is several pathways to find an answer. Thus, the proposed technical solution as well as the new training method, has a generic nature that the consortium believes may be used widely in VET, higher education, as well as high schools and secondary schools.

The proposed new elaborative and verification based feedback training method is new and may be used in small VET or higher education classes without use of Smartphones. For large groups, however, the consortium expect that the Smartphone is a key factor in grading tests, as it is not necessary to access a computer lab anymore, and obtain student lead peer instruction interactive feedback from the whole class.

5. Results and implementation

Done-IT directly addresses the transversal policy framework by focusing on the development of new evaluation methods which require new, novel learning and teaching methods based up on active learning approaches in VET in higher education. Done-IT aims to bring evaluation closer to real world needs as in introduces didactical methodology that combines immediate feedback after tests to students by using Smartphones, and elaborative and verification based learning processes, in combination with problem solving approaches where students do real experiments at the lab. Remote, autonomous, independent learning is achieved by supporting the classes with graphical interfaces and on-line tools where students may immediately apply their knowledge to practice by elaborating and verifying ''what happens if ... '' approach in specific areas of an industrial fabrication process.

This new evaluation method develops analytical and creative thinking, whereby it has the potential of reaching a wider educational community then currently used approaches based on final exams.

Very few initiatives in the industrial sector have targeted elaboration and verification based evaluation processes in such an integrated and pedagogical sound way by identifying material testing quality criteria, defining methods of learning needs , develop provider specific measures and services, identified new skills for teachers and training personnel, and finally validated the selected mobile evaluation and training principal, as well as technical solution in an number of in-company training courses. The consortium believes that the project stimulated new implementation of know-how transfer in industry by use of mobile learning, and increase the use the new evaluation principals at the end –user site.

Done-IT addresses the modernization of the evaluation system in Europe by use of mobile learning. It facilitates improved material testing training in fabrication processes, by developing a new, creative elaborative and verification feedback learning environment through three main points of interests: 1) improve the competitiveness of European SME's by reduction of material testing production costs in a technical efficient way, 2) improve material testing management of training processes by combining real experiments with cases from industrial production processes, 3) development of new training methodologies where the learner learn through critical thinking and creative expression from

immediate elaboration or verification based feedback in multiple choice tests in a course.

Done-IT is the first step in Europe towards inclusion and deployment of elaboration and verification to students, based up on immediately feedback by using cheap (and some widely) available mobile learning tools in evaluation and grading of tests and exams during a course. It has the potential to change the way education is evaluated in Europe, in a range of disciplines and areas [5].

With the partners there is a strong industrial presence and includes other industrial beneficiaries with strong ties to the mechanical industry and industrial networks through numerous projects and developments. The experience of these partners led to the identification of inadequacies in the current training system and in the development of this proposal for effective train delivery. These partners have experience in training standards in mechanical industry, as well as experience in interacting with European networks

This industrial approach ensures that the results will be implemented in a practical industry case and that follow up initiatives can utilize the project results in similar knowledge transfer programs. The partners have broad experience in technology transfer by traditional methods and will clearly see and utilise the benefits from this consortium. The partners are also familiar with the existing training content in material testing.

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