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Design of a new learning environment for training in quality assurance

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Abstract

The purpose of the paper is to present some results of the project entitled "Transfer of innovative training solutions for VET of quality professionals" (acronym TIT-us) financed by European Commission. It addresses to the need of designing new VET courses for training in quality assurance qualifications. Our approach consists in designing a very modern pedagogical methodology for training. We have demonstrated a professional training by means of Activity Based Training (ABT) learning environment, structured in 9 modules, employing a generalised quality assurance process in an organization. The main steps of the ABT training are evaluated with the Student Response Systems (SRS) methodology. The findings are the generic training sequences that are not related to any specific product. Various technological processes, from very different industries can be employed for delivery of learning material, thus creating an attractive, flexible, engaging and motivating blended educational training environment.

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1. Introduction

Historically, Vocational Education and Training (VET) have driven economic growth and productivity in

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industrialised nations [13]. As markets become increasingly global and competitive, governments are increasing pressure on VET systems to produce more highly skilled and employable workers.

According to the guidelines for the Quality Assurance of Vocational Education and Training in Europe, Quality Assurance (QA) is part of general policy-making, which means that the Quality Assurance findings are translated into school-wide measures to optimize the functioning of the institution [14].

The means by which the topic QA is introduced and taught in VET courses, depends very much on the educational background of the trainees, the nature of the courses within which the teaching is to take place, and the timescale available. The choice between provision of dedicated QA courses and integration of QA principles into courses on other aspects of curriculum must be carefully considered [5].

2. TIT-us objectives

The project *Transfer of innovative training solutions for VET of quality professionals* (TIT-us) [20] is promoted by Chamber of Commerce and Industry of Mures County Romania (CCIM) in partnership with a strong European team: HiST Kompetanse AS Trondheim Norway (HCR), Frøya videregående skole Sistranda Norway (FVGS) and Tiber Umbria Comett Education Programme Umbria, Italy (TUCEP).

The objectives of the TIT-us project are:

- to disseminate and to raise the awareness of the brand new integrated blended ABT learning environment offering flexible and sound pedagogical delivery of level specific manufacturing quality industry production process training to VET schools and SME training organizations;
- to disseminate new methods for delivering in-company skills upgrading processes that significantly reduces the costs related to competence and knowledge transfer, and enhances production competence and know-how transfer to VET schools by use of SRS technologies.

This includes:

- Educate VET instructors as Activity Based Training learning environment advisers;
- Disseminate an innovative knowledge transfer system for in-company QA training of personnel, delivered on a just-in-time basis without distance limitations with inclusion of online student response system.

The work plan involves a number of transfers of innovation and dissemination activities to be executed in Romania, Italy and Norway as well as to a number of meetings and conferences around Europe.

3. Target groups

The target groups in the TIT-us project are:

- Training organizations that provide vocational education and training within the Quality Assurance and Quality Management sector;
- Training and educational organizations that want to apply active learning and training by use of response technology into their training practices: universities, vocational education and training organizations, and high schools.

The profile of the different groups participating in the TIT-us project may be quite different depending on their roles, tasks and activities in the project. They may also have different interest of use of the project tools ABT and SRS, creating different biases to the content development and the delivery structure of the content:

- Trainers, teachers in VET: they are personnel working in the school system covering both traditional education and also lifelong learning with adult personnel for training. Their competence profile is specialist with documented competence from fabrication;
- Instructors, trainers in industry: they are personnel working in professional training centres either organized as a training institute or as a training branch in an industrial company. Their competence profile is industrial specialist or engineer with special education or experience in production;
- Trainees, students in VET: most students are in the age group of 18 – 30 years. Background will be from the school system or from public supported educational programmes. Their interest in seeking education in quality is the good employability or being promised a job in the field;
- Trainees in industry: a mixture of male and female students from all the age groups of 25 – 60 years. They

have background from industry or from other educational areas. Their reason for seeking education and training is to get more specialised in quality professions, as a first or second job.

4. Quality design in TIT-us VET courses

The basic approach we have considered for designing VET courses is the classic Deming Plan-Do-Check-Act cycle augmented with description of methodology of course delivery [7].

The quality assurance is a part of the daily VET activities and the daily VET activities cover a number of quality aspects. It is very difficult to allocate all VET activities and quality approaches to the relevant criteria, but the consequences of making a wrong decision are only limited.

Our approach for quality design of VET courses is to add to the normal Deming cycle PDCA an additional step, the methodology. In fact, each activity in VET is a quality approach which ensures quality design of VET courses. It consists of a number of decisions made within the following five steps: (Plan) to elaborate a purpose and a plan; (Do) to implement the plan; (Check) to assess and evaluate activities from the implementation step; (Act) to collect feedback and transmit to procedure for change; and to follow a certain methodology four course delivery. For each step we have shown in paper [7] the actions the VET provider has to solve in order to have an effective methodological process, but also what is the content of each step in the Tit-us project. With this support in the next paragraph is presented the quality assurance course deduction.

5. The blended educational training environment

Schools are currently in need of radical change. We exist in a culture in which fact-based knowledge dominates traditional instruction. But life requires us to do, more than it requires us to know, in order to function [9].

Over the last decades educational researchers and politicians have shown a growing interest in the concept of learning in practice, i.e. learning in the workplace. Learning in practice plays an important role in connection with lifelong learning, as the workplace is an obvious setting for realizing this aim [1].

Competency based training as a coherent model of vocation education and training with universal applicability has been criticized [8], which evidenced that he models that contribute most to VET tend to be hybrid (e.g. education/training model, training/development model), mirroring the make-up of VET itself. Models of professionalism based on the concept of ‘expertise’ are recommended as the ones most likely to produce the reflective practitioners required to enhance the status and quality of teaching in schools and colleges [6].

The Activity Based Training (ABT) methodology uses an alternative pedagogical approach to education and training of personnel in industry. The basic methodology of ABT is that the student shall be involved in the production process during the training course. He follows the production process from the beginning till the delivery of the final product.

Educational content shall be available and delivered through practical activity based learning methods o a just in time basis.

The students follow the training activities in the sequential structure of the production process, ensuring that theoretical content is directly relevant for the subsequent practical tasks in the industrial process, thus highlighting the importance of the theory when this is relevant for the subsequent practical tasks.

The training sequences are generic and it is not related to any specific product. Various technological processes, from very different industries can be employed for delivery of learning material, thus creating an attractive, flexible, engaging and motivating blended educational training environment. As a consequence, it may be adapted for use in any country where an industrial production environment is used as a model for training activities.

The product/process exemplified in training can be anything that is related to an industrial fabrication process. During the training course it will be produced by going through a sequential production process that consists of a number of steps that can be identified and be treated as standalone training elements.

A key element of experience-based learning is that learners analyse their experience by reflecting, evaluating and reconstructing it (sometimes individually, sometimes collectively, sometimes both) in order to draw meaning from it in the light of prior experience [2]. For these reasons, the local industry products can be selected as examples to be utilized in the training process, depending on the preoccupations of the target groups of trainees.

The educational material may be delivered as learning objects in various multimedia formats.

The main pedagogical advantages foreseen by ABT [10] consist in:

1) Immediate linking of theoretical training with practice;

2) Facilitation of a good theoretical training understanding and the perspective of employment in practice;

3) An on-the-job production workflow competence and knowledge transfer approach;

4) Coordinated use of blended educational training: advanced video, projections, smart boards, IT, distance learning, etc;

5) Promotion of industrial quality assurance management designs processes;

6) Increase teacher-student interaction;

7) Increased interaction between students that exchange their products during training in an internal supply-delivery process that are modelling the real industrial relations.

During the course the quality assurance will be produced by going through a sequential process that consists of a number of steps that can be identified and be treated as standalone training elements.

The production of a quality product is essential to the success of any manufacturing facility. Because of this great importance, a career in quality can be extremely rewarding. Without happy customers willing to buy a product, a company would not be able to survive [4].

In figure 1, we considered the idea of training with the ABT methodology by simulating of a quality assurance process in an organization, starting with the receipt of customer order and ending with the product delivery.

The main steps of the ABT training are evaluated with the SRS methodology [11].

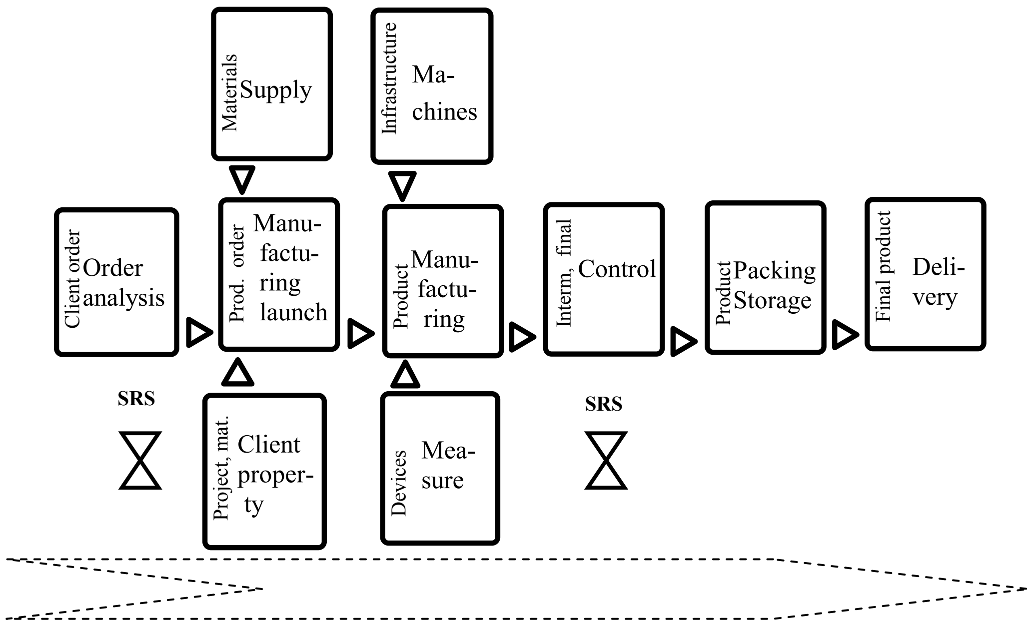

Fig. 1. Quality assurance training by means of ABT and SRS evaluation

The study modules for training in manufacturing quality assurance, the ABT activities and the ABT practical exemplifications explored by students during training, the moments of SRS evaluation [12] are represented in Table 1.

Table 1. The ABT modules for training in quality assurance evaluated by means of SRS

Module no	Module title	Quality assurance process – ABT activities	Quality assurance process – ABT practical exemplifications	SRS evaluation
1	Client order analysis	Determination and analysis of requirements for the product ordered by the customer	• Product specifications • The supply contract	8 questions
2	Client property control	Customer property incorporated into the final product analysis and acceptance	• Intellectual property • Physical property	8 questions
3	Supply	The supply of raw materials required product execution	• Criteria for selection of suppliers • Procedures for selection of suppliers	8 questions
4	Manufacturing launch	Technical and operational records in the manufacture of the product launch	• Documents launching and tracking manufacturing • Traversing launch	8 questions
5	Machinery control	Infrastructure and working environment for production	• Scheme of location • Equipment fact • Featured lists	8 questions
6	Measure devices control	Production measuring equipment assurance	• Register EMM • Data EMM • Calibration plan EMM	8 questions
7	Product manufacturing	Carrying out the production	• Procedures for work execution • Work instructions • Special processes	8 questions
8	Manufacturing / product control, intermediate and final	Production process and product monitoring	• Production control procedures • Nonconforming product control	8 questions
9	Product packing and storage - Delivery	Identification, traceability, packaging, storage and delivery of the product assurance	• Identification and traceability • Keeping product-handling, packaging, storage, protection	8 questions

The various documents available in the 9 modules can therefore be tailored to any industrial application, which is relevant for the target group that helps flexible use of theoretical material. Trainees have a better understanding and remembering of the training material when they elaborate tasks on the base theoretical material in some way connected to the real world.

ABT educational environment involves trainees by elaboration that can take form of explaining the relationship between causes and effects, adding details to the frame information, clarifying a concept, making connections, selecting an image of a material defect, applying a quality procedure to different situations, etc.

It prepares trainees for the current society which demands more individual independence in the context of work, which requires coping with uncertainty, taking calculated risks, making deliberate but informed choices [3].

6. Discussion and conclusion

Chamber of Commerce and Industry of Mures County Romania is coordinator of the project "Transfer of innovative training solutions for VET of quality professionals" (acronym TIT-us), financed by European Commission.

TIT-us is aiming at disseminating and raising the awareness of a new integrated blended learning environment to VET schools and in-company training organizations in Romania, Italy and Norway.

Our approach consists in designing a very modern pedagogical methodology for training in quality assurance.

The basic approach we have considered for quality designing of VET courses is the classic Deming PDCA cycle augmented with description of methodology. These are used for the quality assurance in the process of the VET course design.

We have demonstrated a professional training by means of Activity Based Training (ABT) learning environment, structured in 9 modules, employing a generalised quality assurance process in an organization that can be tailored to any industrial application, which is relevant for the target group. The main steps of the ABT training are evaluated with the Student Response Systems (SRS) methodology.

The findings are the generic training sequences employing the ABT learning environment that are not related to any specific product. Various technological processes, from very different industries can be employed for delivery of learning material, thus creating an attractive, flexible, engaging and motivating blended educational training environment.

Pedagogical challenges related to the new roles of the teacher and the students in the educational process have been demonstrated, by linking of theoretical training with practice and increased student-teacher but also student interaction.

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