HOW CAN UNIVERSITIES OF APPLIED SCIENCES BETTER SUPPORT THE PROCESS INDUSTRY IN PLANNING, IMPLEMENTING, AND DEVELOPING PERSONAL PROCESS AUTOMATION SKILLS?

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Digitalization is rapidly transforming our society. Teaching and working life are changing. Although new technology plays an influential role in the information society, the most important thing is how things are done. The developed new education model makes it easier to coordinate studies with work and private life. This way, the education model also supports the development of companies' activities and functions as a learning environment.

The South-Eastern Finland University of Applied Sciences (Xamk), Häme University of Applied Sciences (HAMK) and the vocational college of Tavastia are participating in the European Social Fund Plus (ESR+) project, which is part of the Renewing and competent Finland 2021–2027 EU regional and structural policy program.

Xamk is responsible for finding out the training methods for working life-oriented studies and needs in the field of the implementation of the projects in the process automation technology in the industry, as well as developing and piloting the university-corporate life training model to satisfy the skills needs in the process automation field. In addition, process automation technology training offered to companies is being piloted.

The main goal of the Customer-oriented education model for continuous learning in engineering and technology (JATKOT) project is to develop, pilot, and introduce a working life and student-oriented continuous learning education model suitable for the fields of technology. The model closely connects the development needs of companies and the training and expertise services of universities of applied sciences and their partners. The goal of this Master's degree program was to develop a new kind of working life-oriented training model independent of place and time.

Introduction

The JATKOT project is developing a customer-oriented, genuinely competence-based model of continuous learning to provide students with a higher education degree in technology and engineering. The dimensions of the model being developed include the following: training services tailored to the needs of the workplace, competence development and the demonstration of competence at the workplace and in virtual environments, the development of workplaces as learning environments, employee involvement in the development of their competence, cooperation between the university of applied sciences and vocational education and training degree programs as a provider of regional services, tripartite performance appraisals between employees, the mentor appointed by the company and the teacher of the university of applied sciences, and equality and sustainable development (Rönkkönen & Liminka 2023). The model will be piloted in two degree programs: Construction and civil engineering and a Bachelor of Construction Management and Process Automation Engineering (Rönkkönen & Eerola 2023).

The target group of the project is employed people in the fields of technology and engineering in the Kanta-Häme and Kymenlaakso regions who need to strengthen and renew their skills. The target group also includes mentors appointed by the companies, trained to act as operators under the model that is being developed. The need for the project emerged from companies operating in Kanta-Häme and Kymenlaakso. The project is a response to the shortage of professionals in the fields of technology and engineering and the development targets of regional programs with regard to the competence development of both. The project implements the Regional and Structural Policy Program.

The implementation of the project is divided into four phases, each of which constitutes an intermediate goal. The first phase involves mapping the competence needs and creating an operating method for anticipating competence needs between companies, higher education, vocational education, and training degree programs. In the second phase, a new customer-oriented continuous learning model will be drawn up based on the mapping findings. In the third phase, the model will be piloted in selected sectors, with the results of the pilot projects being evaluated. In the fourth phase, the model will be disseminated to other technology sectors and its applicability and the needs for further development will be assessed. The project produces written and audiovisual, openly accessible information and dissemination material.

The new education model will lower the threshold for participation in continuous learning, especially for those employed, as competence development and

competence demonstration can be implemented to a significantly larger degree than before alongside work, independently of time and place, on digital platforms, taking into account the needs of the workplace and students. The education model makes it easier to coordinate studies with work and private life. This way, the training model also supports the development of companies' activities and functions as a learning environment. It supports the development of an operating culture that supports learning in companies in the region and thus promotes the continuous development of their competitiveness and operations in accordance with the changing requirements of the operational environment.

The project is being implemented as a group project. The leading implementer is the Häme University of Applied Sciences, with the co-implementers being the South-Eastern Finland University of Applied Sciences and the Tavastia Education Consortium. The project involves 12 companies in the fields that are piloted. The project will run from 1 January 2023 to 31 December 2025. The project receives funding from the European Social Fund, and the national funding authority is the Häme ELY Centre.

This publication focuses on the results of the Master's degree program at the University of Applied Sciences in South-Eastern Finland and process automation project activities. The program is designed to respond to changes in industrial production. The availability of cost-competitive energy sources and consumables needed by the industry and the readiness to work in a changing world challenges the industry's business. Automation of the process industry is one of the fields in which it is possible to ensure the preservation of own production operations in Finland and high-level project expertise for the export industry.

The scope of the education is 60 credits (credits), which is divided into core skills (25 credits), supplementary skills (5 credits) and thesis (30 credits). Mainly, core competence and supplementary competence study courses are scheduled for the first year of study and the thesis for the second year.

The core competence consists of the following courses:

- Process automation projects in production facilities, 5 credits
- Measurement, control, and adjustment design, 5 credits
- Technical communication, 5 credits
- Mathematical methods in automation, 5 credits
- Process industry control technology, 5 credits

Methods

The research was carried out using a survey. The survey was sent to 14 students participating in the studies and we received answers from 13 students.

The questions were:

1. What kind of expectations did you have regarding education?
2. How did the education meet your expectations?
3. How should the contents of the study courses be developed, or do they currently serve education?
4. How could the education be developed in general?

The qualitative material was reviewed, and conclusions were drawn.

Results

The survey was sent to 14 students, and answers were received from 13 students. A summary of the answers is presented in Table 1.

Table 1. Survey results.

Questions	Answers
What kind of expectations did you have regarding to education?	– The students would form a mutually supportive community from which there is help for learning.
	– The necessary theory is reviewed considering the students' different backgrounds.
	– deepens knowledge of process automation projects and their different phases, tools, and methods for project management.
	– I applied for the studies to get more information about process automation. My previous education was mainly related to electrical engineering and my current job currently includes 80% process automation.
	– I didn't really have any preconceived expectations. I thought we'd go with what we got.
	– I have no other expectations, nice to network.
	– I had no previous training in automation, so at least the hope was that we would start with the basics. That's what happened, I kept up well and I learned a lot. Of course, several years of work experience in the field helped, at least in some topics.
How did the education meet your expectations?	– The education has so far met my expectations very well. On the other hand, I try not to expect anything, so it's easy to exceed expectations.
	– Only partially, actually surprisingly little. Of the four courses included in the training program, two were completely about the basics of automation, of course important things and good in terms of content and implementation, but one would assume that an applicant for such a degree would already know these things quite well.
	– The remote training model and the Xamk Learn study platform work well for me.
	– Having clearly gained basic knowledge in professional subjects and confirmation that the knowledge learned in practical working life has now been supplemented a little.
	– Compared to expectations, the training in the spring was exactly what I had hoped for, the basics before the more demanding sections.
	– Vocational studies have corresponded well to automation technology, and it has been developmental to do the studies.
	– In the education, there were a lot of assumptions about the students' knowledge regarding different things. About things they spoke in abbreviations without explaining them in any way. This brought challenges and coping skills that to study motivation.

Questions	Answers
How should the contents of the study courses be developed or do they currently serve education?	– It is difficult to say how study courses should be developed other than to look like trainers. With the principle “train what you know”. Currently, the study courses have served the education very well.
	– If the name of the degree will continue to be “Process automation project activity”, then the content of the courses should correspond more closely to the name of the degree.
	– In the name of education, there is project activity, I don’t think that much is included in the teaching, and on the other hand, I don’t miss it that much. Maybe it would even be eliminated, and the focus would be solely on process and automation. Teaching has been of high quality in the spring.
	– There were a variety of topics and I think they were well divided.
	– In my opinion, the contents of the learning materials are a solid information package. I liked it. I wouldn’t go to change anything.
How education could be developed in general?	– The education organization could try to increase understanding of the different starting points of the students and the fact that they may not have studied for a long time. Therefore, it would be good to create mechanisms that help the student to understand and act in school processes.
	– Personally, it doesn’t matter who does the teaching, but if this kind of training or any training is organized, you would think that teachers would be guaranteed for the duration of the degree.
	– There could be more general information about education, for example it was quite unclear to me where to look for optional courses, apply for them and when the application period is.
	– In general, I feel that there is a strong need for traditional electrical and automation courses in industry.
	– I think it’s pretty good this way. A lecture once a week is pretty much the maximum for a working family member since you have to have time to do the assignments. There are enough tasks and it’s good that you can do them a little at a time.

Discussion

The following listing in Table 2 presents the results of the survey in a nutshell.

Table 2. Survey results in a nutsell.

Classification	Pros	Cons
Community and Support: Students form a supportive community to aid learning peer support.	+	
Theory Review: Necessary theory is reviewed, considering students' diverse backgrounds.	+	
Process Automation Knowledge: Deepens understanding of process automation projects, phases, tools, and project management methods.	+	
Application Motivation: Applied to gain more information on process automation, with a background in electrical engineering and current job involving 80% process automation.	+	
Expectations: No preconceived expectations, open to networking.	+	
Learning Experience: Started with basics, which was helpful due to lack of prior training but supported by work experience.	+	
Meeting Expectations: Education met expectations well, with a focus on basics before advanced topics.	+	
Course Content: Some courses covered basics, which might be redundant for experienced applicants.		-
Remote Learning: Remote training model and Xamk Learn platform are effective.	+	
Knowledge Gain: Gained basic professional knowledge and supplemented practical work experience.	+	
Vocational Studies: Studies aligned well with automation technology and were developmental.	+	
Assumptions and Challenges: Assumptions about students' prior knowledge and use of unexplained abbreviations posed challenges.		-
Course Development: Current courses serve education well, but suggestions for aligning course content with degree name.		-
Teaching Quality: High-quality teaching, with a variety of well-divided topics.	+	
Learning Materials: Solid information package, no changes needed.	+	
Student Support: Need for mechanisms to help students understand and navigate school processes.		-
Teacher Consistency: Importance of having consistent teachers throughout the degree.	+	
General Information: Need for clearer information on optional courses and application periods.		-
Traditional Courses: Strong need for traditional electrical and automation courses.		-

We have addressed the following challenges.

Clear communication

Effective communication is fundamental to successful teaching and learning. Instructors should ensure that all abbreviations and technical terms are clearly explained when first introduced. This practice helps prevent confusion and ensures that all students can follow along regardless of their background. Providing a glossary of terms at the beginning of the course can also be beneficial.

Baseline assessments

Conducting baseline assessments at the beginning of the course is a valuable strategy for gauging students' prior knowledge. These assessments can take various forms, such as quizzes or surveys. The results can help instructors tailor the course content to better meet the students' needs. For example, if many students lack foundational knowledge in a particular area, the instructor can allocate more time to reviewing those basics before moving on to more advanced topics.

Supplementary materials

Providing supplementary materials is another effective way to bridge knowledge gaps. These materials can include additional readings, video tutorials, or interactive exercises reinforcing key concepts. Offering optional refresher courses or workshops at the start of the term can also help students who need extra support. By making these resources readily available, instructors can ensure that all students have the opportunity to succeed, regardless of their starting point.

Feedback mechanisms

Regular feedback from students is crucial for identifying and addressing areas where assumptions about prior knowledge might be causing issues. Instructors should create an environment where students feel comfortable sharing their difficulties and asking for clarification. This can be achieved through anonymous surveys, suggestion boxes, or regular check-ins during class. By actively seeking and responding to feedback, instructors can make necessary adjustments to their teaching methods and materials, ensuring that all students are on the same page.

Conclusion

In conclusion, the JATKOT project successfully developed a continuous learning education model tailored to the needs of both working life and students in the fields of technology. This model, which integrates the development needs of companies with the training and expertise services of universities of applied sciences, offers a flexible, place- and time-independent learning experience. The Master's degree program, structured into core skills, supplementary skills, and a thesis, ensures a comprehensive educational journey.

The survey conducted among the students highlighted the importance of clear communication, baseline assessments, supplementary materials, and effective feedback mechanisms. These elements are crucial for enhancing the learning experience and ensuring that the education model meets the diverse needs of students. Moving forward, it is essential to continue refining these aspects to maintain the relevance and effectiveness of the education model, ultimately contributing to the continuous professional development of individuals in the technology sector.

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REFERENCES

Rönkkönen, S. & Liminka, H. (2023). JATKOT-hankkeen ensimmäinen Mentorivalmennus käynnistyi lokakuussa. HAMK Beat, 4.12.2023.

Rönkkönen, S. & Eerola, T. (2023). Ammattikorkeakoulututkinto omalla työpaikalla opiskellen. HAMK Unlimited Professional, 23.10.2023. Available: https://urn.fi/URN:NBN:fi-fe20231010139469.