

FROM SPHERES OF ACTIVITIES TO LEARNING AND WORK TASKS FOR VET STUDENTS

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Abstract

This paper presents a practical approach for designing work-based learning tasks that connect with actual workplace practices. The research focuses on applied informatics, but the methodology can be adapted to any vocational field. The central question is: how can VET programs bridge the gap between industry needs and educational curricula? Through collaboration with partners in Germany, Spain, Italy, and Serbia, a three-step process emerged: national regulations and job descriptions were analysed to identify spheres of activity; findings were cross-referenced with existing curricula to identify alignments and gaps; and industry experts validated and refined the results through interviews. Building on the Learning and Work Tasks framework by Howe and Knutzen, the identified spheres of activity serve as the foundation for deriving competence-based learning tasks. The paper demonstrates how work tasks, work objects and competences are systematically mapped within each sphere to create authentic learning scenarios that develop both professional and transversal competences.

Keywords: *Vocational education, spheres of activity, work-process learning, competency development, curriculum design.*

1. Introduction

VET systems across Europe are under growing pressure to ensure that what students learn in school reflects what the world of work actually requires. In fast-moving sectors such as applied informatics, this gap can be particularly challenging: curricula validated at one point in time risk becoming misaligned with industry practice before students even complete their training. At the same time, the relevance of transversal competences—skills that go beyond professional competences and enable people to handle professional and private challenges—is increasing across all sectors (Scharnhorst, 2021). The OECD identifies such competences as essential key competencies required in various areas of life (OECD, 2005).

Digital media offer particular potential in this context. In VET, they enable flexibility and contribute to the promotion of individualised and workplace-related skills (Howe & Knutzen, 2013). At EU level, the Digital Competence Framework calls for increased cooperation in digital education across national borders (Vuorikari et al., 2022). The MULE project (Multimedia Learning Environment for Work-Based Learning Tasks for VET Students in the Sector of Applied Informatics; Erasmus+ KA220-VET) was established to address this challenge directly. Coordinated by the Institute for Technology and Education (ITB) at the University of Bremen, the consortium comprises institutions from Germany, Italy, Serbia, and Spain. Its aim is to connect industry and VET schools through work-process-oriented learning tasks embedded in a digital multimedia environment, made available as open educational resources (OER) throughout Europe.

The central concept underpinning the project is the Learning and Work Tasks (LWT) framework developed by Howe and Knutzen. LWT enable project-oriented, work-based learning on challenging tasks from professional practice. They emphasise the close interlinking of learning and work, whereby operational work processes are used for educational and qualification potential (Howe & Knutzen, 2022). A work process represents a complete work action to fulfil a work order: the order is accepted, planned, carried out and completed, with the result being a concrete product or service (Howe & Knutzen, 2022). The combination of theoretical and practical content in LWT aims to promote both professional competences and transversal competences including methodological, social and personal skills (Howe & Knutzen, 2022). This paper shows how the identification of Spheres of Activities helps to create Learning and Work Tasks for students in informatics which are directly linked to practice.

2. Identifying spheres of activity: A three-step process

Spheres of activity (SoA) are typical areas of activity of a profession or sector. They generalise comparable occupational work processes and describe what is characteristic of an occupation. By defining them, a common understanding of the typical areas of activity in a sector is established across all partner countries. Once SoAs are described by typical tasks, a prototypical work-process and tools, the competences needed within each sphere can be analysed and integrated into each phase of a work process within the SoA, and LWT can be developed to integrate those work processes into the school curriculum (MULE Comparative Report, 2024). The identification of SoAs followed a three-step process:

Step 1 — Identification of SoAs from national sources. Each national team collected and analysed sources of information on tasks and work processes in applied informatics. In Germany for example, sources included occupational profiles from the Bundesagentur für Arbeit and training framework curricula (Ausbildungsrahmenlehrplan and Rahmenlehrplan) from the BIBB, as well as competence structure models and module handbooks. From these sources, typical work actions (verbs) were extracted and mapped against typical work objects (nouns) in a derivation matrix. Meaningful relationships between actions and objects were then clustered into preliminary SoAs. In Spain, the team analysed IT programmes from the Basque VET authority IVAAC; in Italy, occupational profiles in the Bergamo area were analyzed; in Serbia, where official public job descriptions for IT specialists were unavailable through the national employment service, the team drew on a national labour force codex, the job platform Infostud, and national accreditation standards.

Step 2 — Countercheck with curricula. The preliminary SoAs were cross-referenced with existing VET and higher education curricula in each country to determine which spheres were already covered and where gaps existed. Germany matched against training framework curricula; Spain against IVAAC level-5 IT programmes; Italy against ENGIM curricula; and Serbia against nine study programmes across four higher education institutions. This step ensured that the SoAs reflected both occupational practice and educational content.

Step 3 — Validation by IT experts. The refined SoAs were reviewed through structured interviews and workshops with IT professionals from industry. Experts were asked to confirm the relevance of the identified spheres to their daily work, to provide examples of typical tasks within each sphere, needed competences to operate tasks professionally within the SoA and to identify any task areas not yet covered. In Spain, three companies from different sectors participated; in Italy, six experts from three IT firms provided feedback; in Serbia, four experts including software architects and data scientists were interviewed, in Germany experts from 3 IT companies. Expert input confirmed the validity of the identified SoAs and highlighted the growing importance of transversal competences, particularly interpersonal communication, as AI increasingly supports routine technical tasks.

All partners agreed on developing LWT for three shared transnational SoAs (MULE Comparative Report, 2024):

SoA 1: Developing, programming and testing software applications and solutions.

SoA 2: Developing, installing, testing and administering cybersecurity and data protection.

SoA 3: Creating, testing, deploying and administering networks and network architectures.

The three shared SoAs reflect the common ground found across all four countries through regulatory analysis, curricula comparison, and expert validation (MULE Comparative Report, 2024).

3. From spheres of activity to learning and work tasks

Each SoA serves as the foundation for developing LWT that target the specific competences required within that sphere. A competence model developed as part of MULE distinguishes between professional competences (job-specific) and transversal competences (methodological, personal, and social), recognising that LWT must develop both in an integrated way (MULE Competence Model, 2024).

The Task Manager — a browser-based online tool within the Kompetenzwerkstatt framework — supports the design and management of digital LWT (Howe & Knutzen, 2022). It enables teachers and trainers to structure tasks across the four work-process phases (order acceptance, planning, execution, and completion) and to enrich each subtask with multimedia materials: documents, illustrations, photos, videos, and links. This makes it possible to cater for different learning types and preferences, and supports both individual and team-based work.

For SoA 1, two LWT have been developed and are available on the MULE platform: Development of a user-friendly web tool for task management and the Development of a database-supported learning material management system. In both tasks, students work through the complete work-process cycle. In the acceptance phase, they analyse a client brief and identify requirements. In the planning phase, they design the system architecture, select tools and frameworks, and plan implementation steps. In the execution phase, they develop, test, and refine the application. In the completion phase, they document their solution and present it against the original requirements. Professional competences — applying programming knowledge, working with development tools, adhering to quality and documentation standards — are developed alongside transversal competences including systematic planning, structured problem-solving, and client communication.

SoA 2 and SoA 3 follow the same logic and are also open resource material. SoA 2 includes tasks such as developing security architectures for multi-cloud environments, requiring students to apply data protection standards and assess risk. SoA 3 includes tasks focused on the development and management of networked communication systems, applying defined security guidelines to ensure required functionality. Across all three SoAs, expert interviews confirmed that transversal competences — particularly the ability to communicate technically complex matters to non-specialist stakeholders — will become increasingly central as AI supports more routine implementation tasks (Siemer & Harberts, 2025).

4. Conclusion

The three-step SoA identification process demonstrated strong convergence across four national VET systems: despite different regulatory starting points, the same core spheres of professional responsibility emerged in Germany, Spain, Italy, and Serbia. This validates the SoA concept as a robust framework for cross-national curriculum development in VET.

By grounding LWT in empirically identified spheres of activity, the MULE project provides a structured pathway from occupational analysis to implementable curriculum — one that addresses both pedagogical requirements and the real demands of the IT labour market. The Task Manager makes this pathway practical: teachers can develop digital, multimedia-enriched LWT without high technical barriers, and students engage with authentic professional challenges rather than decontextualized exercises. All LWT developed are available as OER on the MULE multimedia platform; evaluation materials are available on request. Further research will examine the extent to which the design features of the multimedia environment support learning transfer and competence development in applied informatics.

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