Innovation in GI teaching and learning: a case-based approach

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Abstract

There is a need to align the geospatial education and training offered by European universities with the requirement of the private and public sector to have access to a well-trained Geographic Information workforce. Over the past decades the collaboration between academia and the private and public sector gained importance in research as well as education. However, a more intense collaboration and more innovative methods are necessary to cope with the challenges of the fast evolving technological developments in the geospatial and ICT fields. In the context of the giCASES Erasmus+ project, a case-based and collaborative learning method has been designed based on the concept of co-creation of knowledge. Six case studies have been identified and described to test the approach. The case studies have been analysed and modelled with focus on three collaborative learning patterns. This poster describes the approach, the identified case studies, as well as the collaborative learning patterns. In ongoing and future work, the different patterns will serve as use cases for the deployment of a collaborative learning platform and for testing the co-creation of knowledge.

Keywords: case-based learning, co-creation of knowledge, education, Geographic Information, learning process.

1   Case-based learning

The work described in this poster is based on the first findings of the project "giCASES – Creating a University-Enterprise Alliance for a Spatially Enabled Society", a Knowledge Alliance project co-funded by the Erasmus+ Programme of the European Union. The project aims at enhancing the collaborative creation, management and sharing of knowledge in the field of Geographical Information (GI), as well as to facilitate and strengthen innovation in GI training and education at large. These objectives are pursued through the development of new and multidisciplinary approaches for teaching and learning in the GI field with the aim to facilitating the exchange, flow and co-creation of knowledge. The approach is based on the shared and collaborative development, between companies and universities, of new learning material and the design of collaborative learning processes based on real-world cases (case-based learning). During the learning processes the involved stakeholders use one or more collaborative learning platforms.

A survey was conducted among industry, public administration and academia on the current practices of collaboration in GIS&T education and the needs and demands of these stakeholder groups with regard to the joint creation, management and sharing of knowledge. The survey revealed that the collaboration between Higher Education Institutions (HEI) and other stakeholders in designing and delivering GIS&T education still is organised in a rather traditional manner without case-based approaches (Vancauwenberghe and Vandenbroucke, 2016). The survey also revealed that skills and competences in spatial data modelling, spatial data analysis, programming and application development, and non-technological disciplines have to be improved according to the market needs and that the work on real-life case studies defined by private companies or public organisations would be one of the most preferred and effective types of collaboration to improve the compliance of acquired competences with labour market needs and, ultimately, students' employability in the GI field (Vancauwenberghe and Vandenbroucke, 2016).

The proposed case-based approach is answering these needs, but it is at the same time quite new and – although successfully applied in other types of education (economy, etc.) – has not yet been tested within the GI education sector. Case studies start from the description of real-world problems, which tackle specific topics and issues in the GI domain and have well-defined scopes, learning outcomes, results, time frames (beginning and end dates), actors and corresponding roles, and are addressed in a practical learning environment. Case-based learning also requires new ways of developing accompanying learning material (usually starting from existing learning material).

The approach and the revision of the learning material will be subject of an accurate testing and validation phase to

guarantee their re-usability by other stakeholders. The testing and validation will be applied on 6 case studies (CS) identified: CS1 - Use of indoor GIS in healthcare; CS2 - Environmental analysis using cloud service systems; CS3 - Embedding INSPIRE into e-Government; CS4 - Integrated management of the underground; CS5 - Harmonizing data flows in Energy saving EU policies; CS6 - GIS Applications in Forestry.

2 Modelling the learning process

All the case studies are different from each other, but the processes they use to co-create knowledge may have many characteristics in common. Co-creation of knowledge is the process through which two or more organizations and/or actors interact with each other in a collaborative fashion to generate learning content and gain common insights (Mauser et al., 2013; Minghini and Brovelli, 2017). All the actors participating in the process contribute in the acquisition and the generation of competence, where competence can be seen as *"a combination of knowledge, skills and attitude appropriate to the context"* (European Commission, 2007). By nature, co-creation of knowledge is a cooperative and multi-directional process. The approach adopted within the giCASES project aims at co-creating knowledge but also skills and attitudes through collaborative learning. This approach is founded on dialogue, iterations, exchanges of (intermediate) results and shared generation of outputs/outcomes among all the actors involved.

The common characteristics of the collaborative processes used in the various case studies to co-create knowledge have been modelled through a high-level description (abstraction) of those processes and the related actors and their mutual interactions. This is what we have defined as patterns of co-creation or "use cases", i.e. the abstraction of a context-specific process of collaboration which can be then realized within one or multiple case studies. The process patterns of

case based learning and co-creation of knowledge have been classified according to their degree of collaboration and their type of output.
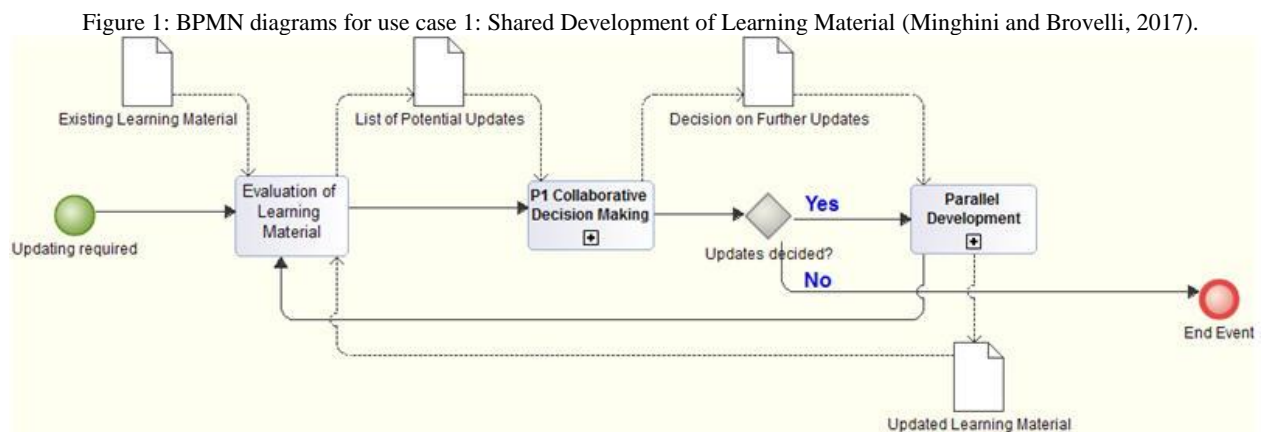
According to the degree of collaboration, a process may be classified as: 1) "autonomous process" (there is no collaboration at all between the partners); 2) "shared process" (each partner performs its own tasks independently under a common agreement); or 3) "collaborative process" (all partners cooperate and contribute to the result). The processes of co-creation of knowledge may be also classified according to the main result(s) achieved, i.e. "learning material" and/or "training/education".

By combining these classification schemes (the three degrees of collaboration and the two types of outputs), there are in total six possible process patterns that can be modelled. Among them, four collaboration patterns have been identified and described using BPMN (Business Process Model and Notation) diagrams: 1) Shared Development of Learning Material (see Figure 1), 2) Collaborative Development of Learning Material, 3) Shared Provision of Training, and 4) Internship. For each pattern, guidelines, templates and draft agreements to be used when developing and providing case-based learning have been defined. The design patterns defined by Barchetti et al. (2011) were used as building blocks for the BPMN description of the four collaboration patterns.
The proposed poster will specifically illustrate the case-based approach and the process patterns modelled, with examples of related BPMN diagrams.

Acknowledgements

Figure 1: BPMN diagrams for use case 1: Shared Development of Learning Material (Minghini and Brovelli, 2017).

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