

# Guest Editorial: Special Section on Semantic Technologies for Learning and Teaching Support in Higher Education

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SEMANTIC technologies are promising to significantly enhance learning and teaching in Higher Education (HE). This promise is based on the potential of semantic technologies to express meaning for learning resources, teaching resources, individuals, and learning objectives with the help of ontologies and annotation. Given semantic annotations, more efficient discovery and matching among learners, teachers, and learning resources can be achieved. Considering the volume of learning resources online and the growing number of learners with access to collaboration tools and online repositories, the affordances of semantic technologies are increasingly significant and potentially transformative for the HE sector.

Semantic technology adoption was initially hindered by issues such as ontology consensus, scarcity of resources for the annotation of large volumes of learning content, and ambiguities regarding the underpinning pedagogy of early deployments. However, the emergence of Web 2.0 strategies for enabling learning content annotation on a large scale on the one hand, and the adoption of semantic web and linked data approaches to data integration on the other hand, seem to have introduced a fresh and promising perspective, which has been explored in the context of HE. For example, the JISC-funded SemTech project performed a survey of semantic technologies in use by HE institutions [2] and outlined a roadmap for semantic technology adoption in HE [3], while the Linked Data Horizon Scan report provides recommendations for the effective use of linked data in the HE sector [1].

The linked data movement and emergent semantic technologies appear to bring significant value in terms of interoperability, well-formedness of metadata, data integration, reasoning across resources, and novel ways of collaboration and personalization, which can provide better support for learning and teaching and benefit teachers, students, and staff in HE institutions. This special issue reports on the latest developments on the use of semantic technologies to support learning, especially in HE and lifelong learning contexts.

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The first paper, "Case-Based Learning, Pedagogical Innovation, and Semantic Web Technologies," by Agustina Martínez-García, Simon Morris, Michael Tscholl, Frances Tracy, and Patrick Carmichael, discusses the potential of semantic technologies in the pedagogical context of case-based learning. It reports on the findings of a three-year research project that examined the potential of semantic technologies in case-based learning in a number of educational settings involving courses in various disciplines in different universities in the United Kingdom. The value of semantic technologies was identified on the level of data conversion and sharing, on the level of resource annotation, searching and visualization, and on the level of supporting rapid development environments. The project showed how this value can help transform real world cases into pedagogical ones that can be readily used in HE institutions.

Making choices for HE and professional development programs can also benefit from real world data on the choices of other individuals or lifelong learners throughout their careers. However, establishing the similarities between the backgrounds of lifelong learners and their career paths can be a challenging task. In "Flexible Querying of Lifelong Learner Metadata," Alexandra Poulouvasilis, Petra Selmer, and Peter T. Wood show how semantic technologies can help address this challenge by enabling flexible querying of lifelong learner data by combining query approximation and query relaxation techniques.

Apart from making career choices, learning processes can benefit from efficient access to relevant online resources. Learning resources that involve video can present particular challenges for annotation and searching, especially when large repositories are involved. In "Using Linked Data to Annotate and Search Educational Video Resources for Supporting Distance Learning," Hong Qing Yu, Carlos Pedrinaci, Stefan Dietze, and John Domingue show how video resources available in different repositories can be annotated and interlinked on a large scale with the use of semantic technologies and collaboration features. The authors show how linked data technologies in particular can help implement these approaches, which are validated on existing learning repositories.

The potential of semantic technologies in learning environments can go beyond searching and matching cases, career paths and online resources. In "Semantic Annotation of Ubiquitous Learning Environments," Mark J. Weal, Danus T. Michaelides, Kevin Page, David C. De Roure, Eloise Monger, and Mary Gobbi establish the value of

semantic technologies in logging and interpreting student activities with the purpose of providing them with more accurate feedback and improving their learning. This last paper of this special issues reports on how manual textual annotation, audio annotation, and location-based annotation with semantic technologies can support skills-based learning environments focusing on training that can take place in hospital wards.

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## REFERENCES

- [1] P. Miller, "Linked Data Horizon Scan," *Information Systems J.*, <http://linkeddata.jiscpress.org>, 2010.
- [2] T. Tiropanis, H.C. Davis, D. Millard, and M. Weal, "Semantic Technologies for Learning and Teaching in the Web 2.0 Era," *IEEE Intelligent Systems*, vol. 24, no. 6, pp. 49-53, 2009.
- [3] T. Tiropanis, H. Davis, D. Millard, M. Weal, S. White, and G. Wills, "JISC-SemTech Project Report," JISC, <http://www.jisc.ac.uk/media/documents/projects/semtech-report.pdf>, 2009.



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