Ontology Construction of Online Education (HE7069)

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Introduction

Data science and technology breakthroughs have been promoted the development of education models, such as online education, flipped classroom and blended learning. In those models, participants and education resources are increasing and diversifying quickly, which require systematic and ontological descriptions to extend their utilities.

Current education ontologies are focused on courses, schools, procedures and behaviours. Domain knowledge and ontology technology have been applied to design curriculum and experiments. But, there is incompleteness of current ontologies when describing objects and activities of online education. The incompleteness could hinder development of computational education, since specified schema is an antecedent to analyse and share educational resources.

Purpose

This study has two primary purposes:

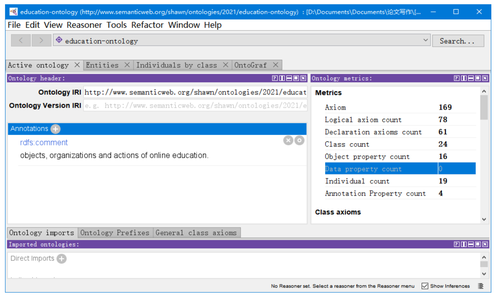
•describe novel patterns of online education. education ontology was induced and codified to describe online courses, activities, platforms and discussion forum.

•uncover the underlying patterns of online education and commonality among online education platforms.

The education ontology can describe various aspects of online education more precisely. Once education resources are described, they could support the integration of online education resources and promote innovation of online education strategy

Method

First, collect online education resources and activities through engagement of online courses. Second, induce and specify novel schemas from those resources. Third, codify education ontology by protégé software, and assign instances to classes from an online course PennX+BDE1x_ Big Data and Education at edx.org.



Results

Rationale of Online Education

- The driving forces of online education are virtualization approaches of education activities with support of cloud platforms, computation and statistical models.
- Information technologies promoted creation and diversification of educational resources.
- In online education platforms, activities are correlated to cognitive, psychological and social aspects.

Table 1 Novel Patterns of online education

Aspect	***Traditional***	***Online***
Organization	Centric	Distributional
Teaching	Linear	Multiple, specification
Material	Uniform	Various, user provided
Assessment	Batch	Instant, peer assessment
Review	Lecturer	Peer, automation
Discussion	Class, group	Discussion forum

New Ontology

The education ontology includes 78 logical axioms and 61 declaration axioms. Objects have 24 classes, and object property has 16 properties. The individuals are selected from the first two weeks of course PennX+BDE1x on EDX platform and annotated with descriptions and labels.

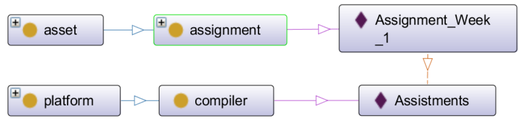
Objects in the ontology are elements that could be browsed by participants. They have the following classes.

L1	**L2**
asset	assignment, lecture, stream, syllabus
course	forum, lesson
institution	company, university
participant	instructor, mentor, student
platform	compiler, coordinator, resources
UGC	answer, comment, question, submission

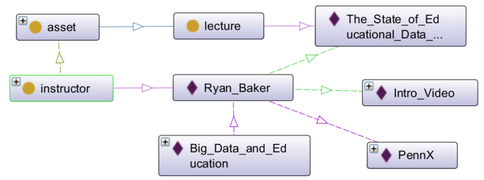
Properties of objects are associations between classes of those objects, as follows.

L1	**L2**	**L3**
Action	assessment	Assign, review, submit
	Enroll	
	Lesson	Learn, publish
	Post	Quest, answer, subscribe,
Relation	Belong_to	Institution, Instruction
	Hosted_by	

In the following figures, there are three edge types: 1) edge between classes is sub_class or property, 2) edge between class and individual is has_individual, 3) individuals related to each other with confirmation to their classes.



In the following, instructor Ryan_Baker has published materials of intro_Video and The_State_of_Edu…. The ‘publish’ is a property between classes of instructor and asset.



Education materials in the platform could be mapped to external linked data and knowledge bases. In addition, appraisal and assessment are usually accomplished through corroboration and a trusting network.

Conclusion

This study constructed an education ontology to describe online education with multiple aspects of objects, activities and platforms. Based on the commonality of platforms, online courses could be described by the ontology to extract underlying mechanisms and objects. It could also describe patterns of modern education models, such as online education, blended education, micro classroom and flipped classrooms. In addition, it could be applied to computational education science and support innovations of online education strategy.

Acknowledgements

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