Empowering MOOCs Through Course Certifying Agency Framework

Yeong-tae Song, Yuanqiong Wang and Yongik Yoon

Abstract The arrival of Massive Open Online Course (MOOC) was hailed by many learners around the globe. More universities are willing to offer their top notch professor's courses as MOOC. However, when utilizing the knowledge from MOOCs, learners need to go through a number of hurdles—getting course completion certification (MS Global Learning Consortum: An example of LIP accessibility information, IMS Global Learning Consortium Inc., 2001, [10]) from various providers, get recognition of the knowledge level of a MOOC in the related domain, and make it searchable for various purposes. In this paper, we propose a MOOC course certifying agency framework, which merges learners' profiles from various MOOC providers so consolidated profiles are available in one place. Standards such as IMS LIP and Dublin Core (Feigenbaum and Prud'Hommeaux in SPARQL by example: a tutorial, Cambridge Semantics, 2011, [5]) are adopted and expanded to describe relate MOOC course profiles, learner profiles, learning goals, and related skill sets. It enables matching of qualified learner profiles for a job position and/or to identify a set of related MOOC course profiles for some learning goal. The potential employers look for a matching skill set from converged learner profiles through the agency. Each skill for the position goes through a mapping procedure with a corresponding MOOC course profile. After mapping skills to corresponding MOOCs, the framework searches for the converged profiles. The result is the list of learners who match or almost match a given job description.

Keywords e-Learning · Massive open online course · Learner profile · Course profile · Ontology · Certifying MOOC · Semantic search

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1 Introduction

The introduction of Massive Open Online Course (MOOC) enables vast amount of openly-accessible knowledge sets from many traditional universities. Since its introduction, more than 4200 openly-accessible and college-level courses (from 500 + Universities) have emerged from course providers such as Coursera, Udacity, and edX [18].

MOOCs are beginning to become highly visible and endorsed by many major top-tier universities. The American Council on Education (ACE), an organization that advises college presidents on policy, has gone so far as to endorse five MOOCs from Coursera for credit and is currently reviewing more from Udacity [1, 32]. No longer are MOOCs plagued by the stigma that they no longer offer the quality of education provided by typical university classroom settings.

However, despite the increase in course quality now being seen in MOOCs, these courses offer knowledge in a vast variety of formats and learning pedagogies [3]. Learning material pertinent to a learner's professional development often resides in a variety of locations and is highly disorganized. With learners no longer engaging in traditional learning pedagogies and the weight of accomplishments in the e-learning community no longer easily discerned, several problems have emerged that our approach aims to solve:

- Learners desire to retrieve available courses relevant to their own learning goals potentially in a proper sequence to best achieve their learning goals from a distributed set of MOOC providers and their courses
- There is no way currently to track learners' accumulation of knowledge from different MOOC providers under a single authoritative agency who will facilitate management of this information
- There is lack of agreement among MOOC providers on the approaches or standards to facilitate managing this information

Udacity, Coursera, and edX now claim over 24 million students by EdSurgeNews (https://www.edsurge.com/news/2015-09-08-udacity-coursera-and-edx-now-claim-over-24-million-students). Without solving the above problems, the knowledge to be gained from completion of these courses represents viable skill sets that may go completely unrecognized once these learners enter the job market. Therefore, having access to a knowledge base of their skill sets could benefit both employers and the students themselves.

Ideally, a MOOC learner should be able to retrieve courses from a variety of MOOC providers where they present a certifiable proof upon successful completion of the course so that the knowledge gained from the MOOC course can be mapped to some kind of skill set that can be recognized by a potential employer or any other entity of interest.

Our approach aims to build a framework that will allow for learners to easily retrieve courses relevant to their specific learning goals in a proper sequence that best suits their learning preferences. The information about successfully completed courses from all MOOC providers will be tracked by an over-arching authority and be searchable by employers looking for employees to fill available job descriptions that require the skill sets may be satisfied by the completed courses.

The rest of the paper will discuss the components of this framework listed as follows:

Section 2 discusses related work and applicable standards for learner profile and course profile, Sect. 3. illustrates learner profile model, Sect. 4 illustrates course profile model, Sect. 5 describes all the constituent components in the proposed model, Sect. 6 briefly describes typical scenarios, and finally Sect. 7 provides conclusions.

2 Relevant Works

MOOC is an educational delivery method that is gaining acceptance in academic circles as an alternative to the traditional instructor led, classroom delivery method. These online courses typically involve videos of lectures combined with interactive assessments [30] while encouraging student collaboration and use of social networking applications. MOOCs combine the connectivity of social networking with the facilitation of an expert in an online, resource rich, environment [15]. The focus on the connectivity of these courses necessitates their scalability and in this case massive truly means massive with enrollments reaching the thousands in a single offering [19]. One important benefit of these courses is that, while they are many times taught by world renowned professors and at highly esteemed institutions, they are typically free of charge. This can be especially beneficial for learners who are lack of funding resources while trying to improve their skill sets to advance their careers. For example, Garrido [8] reported that MOOC has been used for professional development in Colombia, the Philippines, and South Africa. Like any recent innovation, MOOCs are evolving rapidly to suit the needs of both providers and students. As such, MOOC's final form and value has yet to be determined, but the opportunity presented by the MOOC format is attracting a great deal of attention [7].

There are many reasons that the popularity of MOOCs is increasing. With the cost of education rising faster than that of healthcare, MOOC has advantages for students in that they are available anywhere and at no charge [7, 14]. The only prerequisite for the courses is an Internet connection and interest in learning the material. Many students look upon these classes as a way to see if they are interested in a subject without having to pay [22]. If the course is too difficult or not interested in the material anymore, they simply stop attending. The student does not have to worry about a failing grade or an incomplete and is not bound by a financial investment in the course that will be lost by not completing it. It is also important to note that many MOOCs do not list a set of outcomes for qualification of success; students who drop out of the course may have achieved the educational goal they were pursuing by acquiring the desired knowledge [13]. In this case, success or failure of the course is determined by the student's goal and not a syllabus. Thus, a reason for the increasing popularity of the MOOC format is that they present low risk to the student and therefore learning can take place at even a modest interest level [4]. MOOCs are also taught in small chunked lessons that include information and assessments. This chunking of information creates a fast turnaround time between learning a concept and performing the assessment activity [19]. Classroom based courses often feature an hour long lecture and the students are sent home to practice the skills they learned. With the MOOC format the professor typically lectures for a short time then the students perform an assessment, followed by another short lecture and assessment. Assessment activities are designed to encourage learners to be socially active and to pose questions, work through problems, and discuss class topics using social media. This social learning lets the students support and learn from one another.

For the providing institution, they have the ability to attract large numbers of students and crossing national borders. This widespread exposure helps to increase the institution's global awareness and notoriety. Some professors and institutions have recognized that MOOC is an opportunity to take their class worldwide and attract students that would be otherwise unavailable due to geographic or financial factors. Institutions are also using MOOCs as a means of attracting students in the fields of engineering and computer science to their programs [25].

While this growth in popularity is demonstrative of the opportunity that MOOCs may represent, many academics still doubt the effectiveness of the MOOC format [15, 22]. They point out several weaknesses, one of which is the logistics and preparation involved in teaching a class of thousands. Some professors have stated that preparing for a MOOC becomes a fulltime job by itself. Personalized attention is not feasible when classes get that large and even though they spent many hours preparing many professors feel that the students are being short changed by the class [16, 26]. Moreover, students learn in very different ways and not all learning styles can be accommodated in a MOOC [23]. Complex concepts are another problem in that they are difficult to convey even when working in small groups. Some professors who have taught MOOCS have stated that they felt the need to decrease the rigor of the material [28]. The largest recognized evidence that the MOOCs are not as effective as traditional classes is the high percentage of students who do not complete the course [12]. Many professors see this large drop in participation as evidence that MOOCs are not as effective as a traditional classroom based courses [18]. The level of attrition is higher than that of traditional classes and had been shown to be as much as 80%. In one class, 150 thousand students registered and only 20 thousand finished. While 20 thousand students completing an offering of a single class is impressive it is still a decline of roughly 87%. In 2015, a two-year study by Harvard and MIT [9] reported about 57% of the participants stated intention to obtain a certificate from MOOC class, and among the 43% who was unsure or did not intend to earn a certificate, 8% of them eventually did. In addition, they claimed "*increase and formalize the flow of pedagogical innovations to and from residential courses*" as one of the future directions for improving the retention rate for MOOC.

Most professors recognize MOOCs as another tool that can be used to convey information, while MOOC delivery format still needs refinement [2]. Some identified areas where improvement would be beneficial are assessment and certification. Providers and instructors have moved quickly to try to address these weaknesses. Assessments have been improved and even automated; classes taught as MOOCs have had their curriculum aligned with the classroom version in the hope of making the classes comparable. Recent studies have shown students who successfully complete these MOOC courses have no significant difference in later performance than students who complete traditional courses [24]. In one study, students who completed their introductory computer science course through a MOOC were shown to pass more and fail fewer classes than those who completed the face-to-face class. Certification and accreditation of MOOCs could be considered the next step in their evolution. Although, early MOOCs were non-credit or certification courses, many providers including Udacity and Coursera have recognized the need for a verification of completion of the course and are even offering levels of competency such as “Highest Distinction”. Thus, providers are able to certify student achievement. Many professors who either have just finished or are in the process of teaching their first MOOCs have stated in a survey that some MOOCS should be counted as regular classes for credits [27, 28]. In February 2013, the American Council on Education (ACE) recommended that its members provide transfer credit from a few MOOC courses [15]. However, majority of the universities are still not accepting it.

3 Learner Profile Model

Currently there is no standardized learner profile format for MOOC providers so it is difficult to combine the content of the learner information and their completed course information from various MOOC providers. There are two competing standards in industry—IMS Learner Information Profile (LIP) and IEEE Personal And Private Information (PAPI). In our approach, we mainly followed IMS LIP and its XML schema format to represent the converged learner profile and course completion information. In IMS LIP, there are 11 core structures to describe a learner such as identifications, security keys, transcripts, goals, qualifications, certifications and licenses (QCL), activities, interest, competency, relationship, affiliation and accessibility [11, 12]. We have added course related attributes to represent course completion information that should come from various MOOC providers' sites:

- Learner: < Identification (Full Name, Email Address)>, <Learning Goal>, <QCL>, Activity (MOOC Completion Status)
- Courses *: <Course title> <Course Category>, <Completion Status>, <Date of completion>, <Completion Status (Type of Certificate such as *highest distinction*)>, <Course content provider>, and <MOOC Provider>.

```xml
<coursetitle>
  <typename>
    <tysource sourcetype="certificate"/>
    <tyvalue>Computer Science 101:Introduction to Computer Science</tyvalue>
  </typename>
</coursetitle>
<coursecategory>
  <typename>
    <tysource sourcetype="certificate"/>
    <tyvalue>Computer Science</tyvalue>
  </typename>
</coursecategory>
<completionstatus>
  <typename>
    <tysource sourcetype="MOOC Site"/>
    <tyvalue>Completed</tyvalue>
  </typename>
</completionstatus>
<dateofcompletion>
  <typename>
    <tysource sourcetype="certificate"/>
    <tyvalue>Date of Completion</tyvalue>
    <certlevel>Certificate of Accomplishment with Highest Distinction</certlevel>
  </typename>
  <date>April 6, 2012</date>
</dateofcompletion>
```

Fig. 1 A part of converged learner profile in XML format

The main purpose of conforming to industry standard such as IMS LIP for the learner profile is to make the system interoperable with other systems e.g. converging learner information from various MOOC providers' sites. IMS LIP specification also defines a set of packages in XML that can be used to import data into and extract data from IMS compliant learning management systems. A partial screenshot of the XML learner profile is shown in the Fig. 1.

4 Course Profile Model

In our proposed approach, we have followed an industry metadata standard - Dublin Core (DC) to represent the course content elements for the course profile. The main purpose of using Dublin Core is to create simple descriptive records for all the MOOC courses. DC elements describe the resources in the networked environment in an effective and interoperable way. It has fifteen "core" elements as shown in Fig. 2 [5]. We have used the following elements to express the course profile contents: title, description, creator, creator organization, type, audience, publisher, identifier, format, typical learning time, workload, category, difficulty level, language and cost. The only added element is 'cost' that we used to describe the price value of the courses. Figure 3 shows our Course Profile in XML format.

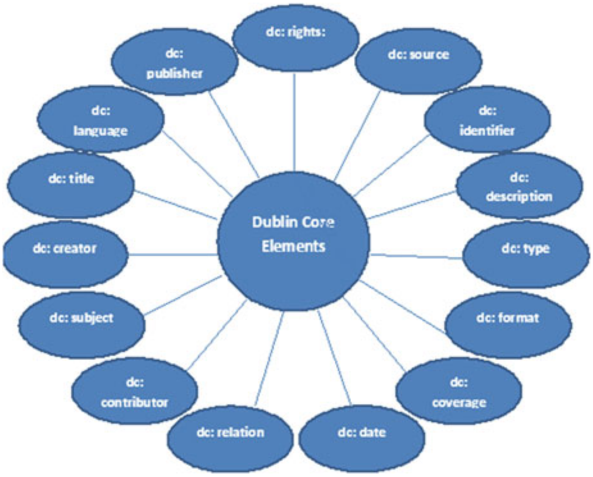

Fig. 2 The Dublin Core

```xml
<?xml version="1.0"?>
<metadata
  xmlns:csmd="http://www.imsglobal.org/profile/cc/ccv1p2/ccv1p2_imscsmd_v1p0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:dc="http://dublincore.org/documents/dcs/">
  <dc:title>Introduction to Astronomy</dc:title>
  <dc:description>An introduction to astronomy through a broad survey</dc:description>
  <dc:creator>Ronen Plesser</dc:creator>
  <dc:CreatorOrganization>Duke University</dc:CreatorOrganization>
  <dc:type>Lecture Videos </dc:type >
  <dc:audience>Unspecified</dc:audience>
  <dc:publisher>Coursera</dc:publisher>
  <dc:identifier>
    https://www.coursera.org/#course/introastro</dc:identifier>
    <dc:format>text/html</dc:format>
    <ims:typicallearningtime>
      <ims:workload>9 weeks</ims:workload>
    </ims:typicallearningtime>
    <dc:category>Physical & Earth Sciences</dc:category>
    <dc:DifficultyLevel>None</dc:DifficultyLevel>
    <dc:language>English</dc:language>
    <dc:CostCurrency="USD">None</dc:CostCurrency>
</metadata>
```

Fig. 3 Course profile in Dublin Core format

5 Proposed Framework Components

The Course Certifying Agency (CCA) framework consists of various software module components and persistent data storage. Our persistent data storage options utilizes XML technology. The course profiling module continuously monitors newly available MOOCs and populates course profile attributes in an XML data file. *Merging Learner profile* module will update a learner profile when new course completion information for the learner is available from a MOOC provider.

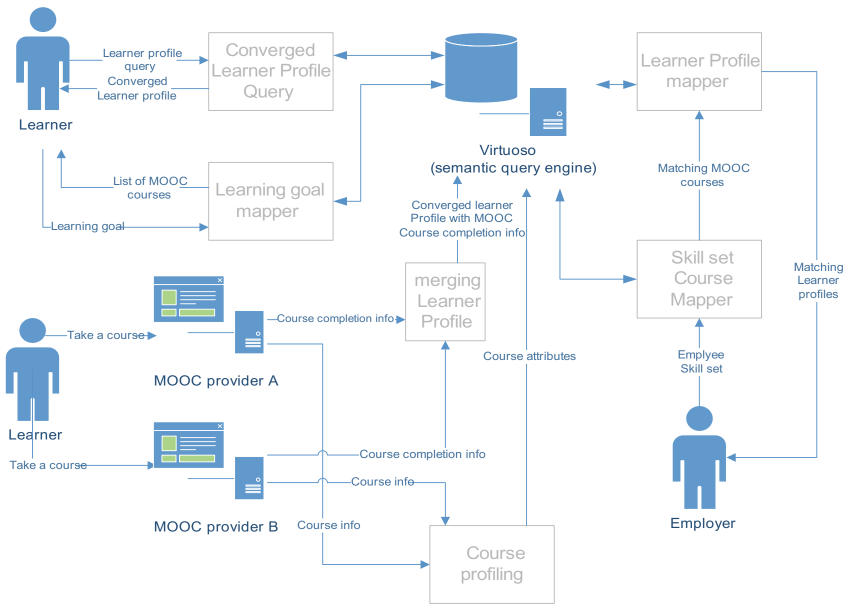

Fig. 4 Course certifying agency architecture

The CCA will gathered data from distributed MOOC providers into both *Merging Learner Profile* module and the *Course Profiling* module. The converged learner profile may be queried by the learners to check their converged profile for their converged MOOC completion information. Learners provide their learning goals to the Learning Goal Mapper to get a list of MOOCs that can help satisfy their learning goals. The course completion information from the learners may be useful for potential employers who are looking for employees with some desired skill set. The desired skill set may be interpreted into a set of relevant MOOC courses by the *Skill set—Course mapper*. The resulting MOOC courses will be utilized in searching a learner's profile that has corresponding MOOC course completion information, which can be done by the *Learner Profile Mapper* as in the Fig. 4.

5.1 *Virtuoso RDF Triple Store*

The central component used for the distributed learner profile will be an RDF store running an instance of *OpenLink Virtuoso Universal Server* [31]. The Virtuoso RDF Triple Store will house RDF graphs for two ontologies that are direct OWL representations of our Course Profile and Learning Profile models described in Sect. 2 [12]. Using the SPARQL query [6, 26] engine that is built into the OpenLink Virtuoso RDF Triple Store server, we will be able to query the graph for relationships from various MOOC providers to find the courses most relevant to the learner's learning goals or to query learners' profiles for finding best matches with desired skill sets. Additionally, using the built-in OWL inference properties that are possible with Virtuoso, we can expand our queries to result in more related resources in certain ways other than key words. In this case, RDFS and OWL object properties may be included for consideration in the expanded query [16, 17]. For the following examples, URIs will be prefixed per W3C guidelines for the purpose of readability. The two graphs representing our ontologies that model the Learner Profile and Course Profile will be prefixed as "CP:" and "LP:", respectively. "CP:" is a shortened reference name for a URI with a Universal Resource Identifier (URI) such as <http://cp.towson.edu/CourseProfile/CourseProfile.owl>. For the given ontology, properties can be created to describe the relationships between the courses such as CP:isPrerequisteOf and CP:isCorequisiteOf or their inverse properties CP:hasPrerequisite and CP:hasCorequisite, respectively, for a graph prefixed per W3C guidelines as CP [20]. Among many other APIs for RDF data sets, dotnetRDF (http://www.dotnetrdf.org/) was chosen for the manipulation of the proposed data sets. It is an open source.Net API that allows for manipulation of our RDF data sets in a programmatic way. Additionally, the API allows for the parameterized construction of SPARQL queries against the Virtuoso RDF Triple Store [17, 29].

5.2 Course Profiler

A Course Profiler component will perform all duties pertaining to the maintenance of the course information made available from MOOC providers online and converged within the Course Certifying Agency.

5.2.1 Access of MOOC Provider Course Listings via RESTful API

As MOOC providers continue to engage in trending web technologies, it is possible to access course listing for easy integration of our CCA platform via a RESTful API. As an example, the Twitter API documentation provides a RESTful web method "GET statuses/retweets/:id". This method allows users with authentication tokens to substitute an appropriate ID for a given tweet and have up to the first 100 retweets of said tweet returned via JSON format. If such an API were available from MOOC providers, the returned data in JSON format could be packaged via a data manipulation factory class and converted with dotnetRDF into triples nodes representing the subject, predicate, and object of a triples statement and submit it to Virtuoso for insertion into the RDF triple store.

5.2.2 Parsing HTML of MOOC Course Search

With RESTful APIs such as "MOOC LIST (https://www.mooc-list.com/tags/rest-apis)", one can mine course data of MOOC provider sites using *HttpWebRequests* to perform actions against a web site as if it were being performed from a browser. Once this request has been returned to the agent that has spawned the request, the results are handled and parsed.

5.3 Course Profile Mapper

5.3.1 Mapping to Triples Format

The Course Mapper component will interpret the raw data gathered either via JSON or HTML parsing and package the data into RDF triples representing the abbreviated list of Course Profile properties defined in Table 1 below.

The Course Profile structure example in the Table 1 is the example of triple subject-predicate-object statement that we use to define a course listing. In this example a course listing is characterized with a unique identifying integer value that is independent of the MOOC that is originated from our converged profile system. As can be seen, the predicates of these course profile triple statements refer directly to the Dublin Core RDF specification indicated by the prefix "dc:" which is represented in whole by the URI <http://purl.org/dc/elements/1.1/>. This is done to remain in accordance with our standards declared in Sect. 2.

Table 1 Course profile properties and course profile structure (partial example) in RDF triples format

IEEE LOM/DC standards element	MOOC courses elements	***Subject***	***Predicate***	***Object***
Title	Course name with IDs	***<CP:1>***	***<dc:title>***	***<Agile methodology>***
Description	Course overview	***<CP:1>***	***<dc:description>***	***<Introduction to Agile methodology>***
Creator	Instructor	***<CP:1>***	***<dc:creator>***	***<James Bond>***
Creator Organization	Academic Institution	***<CP:1>***	***<dc: creatorOrganization>***	***<Towson university>***
Publisher	MOOC provider name	***<CP:1>***	***<dc:publisher>***	***<Coursera>***

5.3.2 Insert Mapped RDF Triples in Triple Store

dotnetRDF has the ability to designate a set of triples as part of a specific graph. In this instance, as mentioned earlier, the triples mapped using the course mapper will be placed in the CP graph. Figure 5 displays some example code displaying the direct manipulation of triples in a specific graph using the dotnetRDF API and a sample query result is shown in the Fig. 6.

The ontology for Course Profile is defined by owl using Protégé as shown in the Fig. 7 [20, 21].

```
//First connect to a store in this example we use Virtuoso
VirtuosoManager manager = new VirtuosoManager("localhost",
                                              port,
                                              instance,
                                              "user",
                                              "password");

//Construct the Triple we wish to add
Graph g = new Graph();
INode s = g.CreateUriNode(new Uri("http://cp.towson.edu/courseprofile/1"));
INode p = g.CreateUriNode(new Uri("http://purl.org/dc/elements/1.1./#title"));
INode o = g.CreateLiteralNode("Agile Methodology");
Triple t = new Triple(s, p, o);

//Now delete the triple from a graph in the store
if (manager.UpdateSupported)
{
    //UpdateGraph takes enumerables of Triples to add/remove or null to indicate none
    //hence why we create a Triple array to pass in the Triple to be deleted
    manager.UpdateGraph("http://cp.towson.edu/courseprofile/cp.owl", null, new Triple[] { t });
}
else
{
    throw new Exception("Store does not support triple level updates");
}
```

Fig. 5 Code example utilizing dotnetRDF API

```
PREFIX                                    CP:
<http://cp.towson.edu/cp/courseprofile.owl>

PREFIX                                    LP:
<http://lp.towson.edu/lp/learnerprofile.owl
>

SELECT ?learner_email ?course_id

WHERE    {    ?course_id    CP:hasPreRequisite
CP:Software_Engineering;

             LP:hasLearner

            ?learner_email;


LP:ha sTakenCoure CP:272 . }
```

Endpoint

Course_id	Learner_email
720	K1@fakeemail.com
892	K2@fakeemail.com
700	syt@fakeemail.com

Fig. 6 Example SPARQL query for proposed SPARQL endpoint

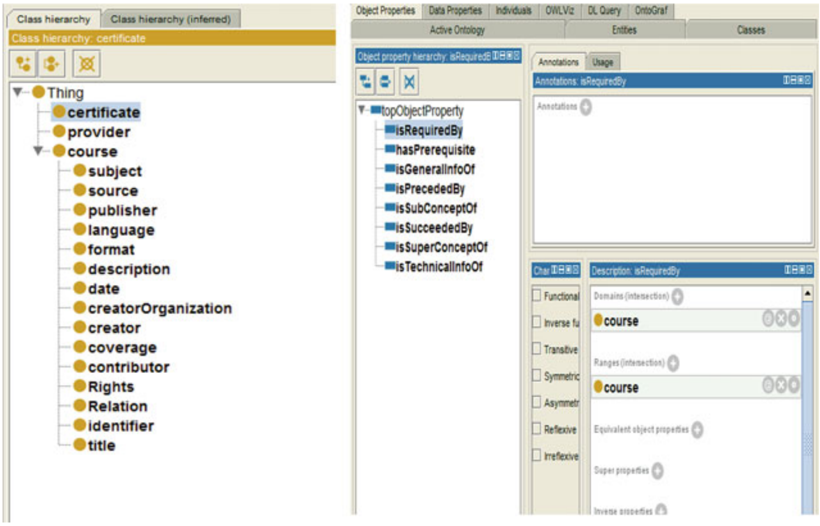

Fig. 7 Course profile owl file in Protégé [21]

5.4 *Learner Profiler*

Learner Profiler component will perform maintenance regarding the learner's demographics as well as their completed course information for persistent storage from a various MOOC providers. Whenever a learner receives a MOOC completion certificate from a MOOC provider, the profiler updates the Learner Profile so all MOOC completion information may be searched in one place regardless of their providers.

5.5 *Learner Profile Mapper*

Learner Profile Mapper is a software module that is used when an employer's request comes into find a learner profile that matches with a certain desired skill set for the position. Each skill in the set will go through a mapping process to find a matching MOOC completion record or other related QCL (qualifications, certifications, and licenses) history. The mapping process will have two steps—one for finding match MOOC and the other for searching learner profiles for the identified MOOC or QCL. Any matching over 80% considered relevant for the position. The selected learner profiles need to go through filtering process where location, desired matching level, and any other factors that are imposed by the employer will be utilized. The final result can be exported into serialized XML in the format shown in the Fig. 1 for direct delivery to potential employers for the final selection.

5.6 CCA Component Summary

Utilizing the components of the framework described above, the CCA can perform the following operations:

1. Provide semantic search for all available MOOC provider courses based on learner's learning goal. All MOOCs must be registered in the CCA before use. All object properties need to be set during the registration process for intelligent semantic searches—take advantage of all defined relations among MOOCs.
2. Provide semantic search for employers seeking employees with desired skillsets based on their record of completed MOOC and other QCL. Selected profiles can be delivered to the employers in a serialized XML format.
3. Provide learners the ability to store learner profile information and completed courses from a variety of distributed MOOC providers under one validating, certifying umbrella.
4. Continually update the course profile listings by monitoring a variety of MOOC provider's search sites either via RESTful API techniques or via other crawling techniques.

6 Using CCA

6.1 Setting up Learning Goal

Each learner is encouraged to set up their own learning goals. Each learning goal is interpreted by the CCA and produces a set of MOOCs that help achieve the learning goal. For that, when a course is registered, it is required to set up relationship with other MOOCs such as "superseded by", "isSubconcepOf", "isGeneralinfoOf", or "prerequisite of". Newly identified relationship between MOOCs may be easily added because of the properties—URI—in RDF triple. So when a learning goal is submitted, the course mapper as shown in the Fig. 4 is executed to extract the related keywords for the goal. With resulting keywords, it will execute a SPARQL query with the intention to find all related MOOCs. Once the learner has received a list of MOOCs, s/he will go through filtering for removing unnecessary MOOCs and ordering for the remaining MOOCs for proper sequence.

6.2 Searching for Matching Learner Profile

When needed, employers may request the CCA for the matching learner profile for their advertised vacant position. They may submit a desired skill set(s) for the position(s). The CCA returns the list of learner profiles that match at least 80% of the desired skill set. The requestor may go through the filtering process for additional criteria and finalize their selections.

7 Conclusion

MOOC is becoming a more prevalent trend in postsecondary education and could be future generations' solution for gaining a quality professional education at a low or no cost. MOOCs could function as the bridge between academia and industry allowing learners to customize their skill sets and aptitudes to what prospective employers are searching for. While MOOCs have proved themselves in some scenarios as a valid, credit-worthy endeavor in the eyes of potential employers or even educational councils, there is a need to establish verifiable quality assurance process and also the certification process for MOOC completion so it may become valuable asset for all MOOC learners.

The Certifying Course Agency is an approach that imposes add-on values to MOOC courses so they may be recognized by potential employers as well as by entire learning community. It also facilitates and encourages the standardization of profiles of both courses and learners across distributed MOOC providers. The Certifying Course Agency has proposed current and future methodologies for the aggregation of both Course Listing data and Learner Profile data. With this aggregated data, learners have the potential to search using powerful semantic tools and orient themselves on a path toward their learning goals across various MOOC providers. Going further, the CCA also provides learners and employers a middle-ground to best serve one another both in building better workforces and attaining more fulfilling careers.

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