Expanding Web Science Integration in an ITWS Curriculum

John S. Erickson
Web Science Research Center
Rensselaer Polytechnic Institute
110 8th St
Troy, NY 12180
erickj4@rpi.edu

Marie Joan Kristine T. Gloria
Web Science Research Center
Rensselaer Polytechnic Institute
110 8th St
Troy, NY 12180
glorim@rpi.edu

Greg N. Hughes
Information Technology & Web
Science Program
Rensselaer Polytechnic Institute
Troy, NY 12180
hugheg@rpi.edu

ABSTRACT

Building on Rensselaer Polytechnic Institute's continued effort to support a Web Science education, the following presents steps taken to integrate and enhance RPI's Information Technology and Web Science (ITWS) program. The paper provides examples that showcase the integration of Web Science focused guest lectures and WSRC managed team projects into the ITWS curriculum. It concludes with a review of the outcomes and a discussion of next steps.

Categories and Subject Descriptors

K.3 Computers and Education

General Terms

Computing education, Information technology education, World Wide Web, Semantic web description languages, Data extraction and integration

Keywords

Web Science Education, Web Science

1.INTRODUCTION

Beginning with the Spring 2013 term, members of the Web Science Research Center at Rensselaer Polytechnic Institute (WSRC) began a dialog with the RPI Information Technology and Web Science (ITWS) program faculty to explore opportunities to increase the level of web science integration in the ITWS curriculum and to enhance the visibility and awareness of WSRC amongst students. At that time, a single advanced-level "Web Science" (WS) course, an advanced level Semantic eScience course, and a bi-annual two-hour guest lecture on Semantic Web and linked data technologies were the only offerings. A shared desire between the ITWS faculty and WSRC motivated a more robust integration of critical topics throughout the ITWS curriculum, to taught by WS experts. To accomplish this, integration planning began with a thorough analysis of course syllabi to identify courses offering the best opportunities for integration. The remainder of the paper proceeds as follows. We begin with a high-level review of both the RPI ITWS program and WSRC. Then, we offer two specific Web Science class examples

that were integrated within the standing ITWS curriculum. We also offer a table summarizing all additional courses added to the curriculum. We conclude with both a reflection of positive outcomes as well as thoughts on next steps.

1.1 Overview of RPI ITWS

Since 1998, RPI's Information Technology and Web Science (ITWS) program has offered a unique opportunity for students to combine a mastery of Information Age technologies with an academic discipline of their choice. Rensselaer's unique multi-disciplinary ITWS degrees allow students to explore the World Wide Web and other IT technologies from the algorithmic, engineering, and social perspective [1]. Students take a core set of courses on Web and IT development and management, and then develop an expertise in a concentration that involves multiple courses from arts, engineering, management, communications, artificial intelligence, Web systems, and medicine among others [2]. Rensselaer currently offers two degree programs in ITWS: a Bachelor of Science in Information Technology and Web Science and a Master of Science in Information Technology. Both are highly interdisciplinary, drawing courses from four of the five academic schools at Rensselaer.

1.2 Overview of Web Science Research Center

The Web Science Research Center at Rensselaer Polytechnic Institute (WSRC RPI) is one of nine founding members of the Web Science Network of Laboratories (WSTNet) established by the Web Science Trust. The center is part of a global alliance. WSRC RPI is affiliated with the Tetherless World Constellation at Rensselaer Polytechnic Institute (TWC RPI), a leader in Semantic Web and Web Science research and technologies. TWC RPI focuses on the World Wide Web and its future use, exploring the research and engineering principles that underlie the Web, enhance its reach, and expand its capabilities.

2.WEB SCIENCE INTEGRATION EXAMPLES

As introduced above, while the ITWS curriculum aligned closely with the initiatives of the WSRC, few course offerings were available to students and WSRC projects lacked visibility within the department. After the initial engagement discussions, an evaluation of the syllabi was conducted. For each course considered, integration opportunities included one or more guest lectures at strategic points within the syllabus; topical assigned reading and related problem sets; and project opportunities. Three courses emerged from this process as candidates for new

engagement, and one course was targeted for an increased level of engagement. Table 1 summarizes the additional elements.

Table 1. Summary of Integrated Elements

Course Name	Description
Intro to ITWS (ITWS1100)	• Type of engagement: two-hour guest lecture & assignment • Introduced topics: "Intro to Web Architecture," "Intro to Semantic Web & Linked Data," "Intro to Web Science" (incl. examples of Tim Berners-Lee's "Process of Web Science" applied to use cases)
Managing IT Resources (MITR) (ITWS4310)	• Type of engagement: Two guest lectures & assignments • Lecture: "Building & Consuming the Web of Data" (two-lecture sequence) [3]
Web Science (ITWS4200)	• Type of engagement: Two-hour guest lecture • Lecture: "RDF/SPARQL and Web Analytics"
ITWS Capstone (TWS4100) [one/ term]	• Type of engagement: Two-hour guest lecture • Traditional lecture: "Intro to the Semantic Web (and Linked Data)" (Fall 2013 and previous) • Revised lecture: "Engineering a Semantic Web" (Spring 2014) [4]. Revised content based on development of resources for other ITWS guest lectures.
ITWS Capstone (degree) Project (ITWS4100)	• Type of engagement: "App for Social Change" project • Technical contribution: apply linked data and Semantic Web principles • Experience: First proposed to students Fall 2013; engaged one team Spring 2014 • Result: Successful project completion (expected) May 2014. Four-member undergraduate team using government open data published by the State of New York as a basis for an interactive app to visually compare urban sprawl indicators on a per-county basis across New York State.

3. OVERALL POSITIVE OUTCOMES

A year after the initial engagement, the integration Web Science concepts and teachings within the ITWS curriculum found much success. Feedback included:

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[1] Web Science Research Center, Tetherless World Constellation, Rensselaer Polytechnic Institute - dlm@cs.rpi.edu

[2] Center for Cognition, Communication, and Culture, Rensselaer Polytechnic Institute - jluciano@gmail.com

[3] Information Technology & Web Science Program, Rensselaer Polytechnic Institute - plotkr2@rpi.edu

• *Faculty Acceptance:* The RPI ITWS Program faculty was instrumental in helping plan the WSRC integration effort and inviting participation in selected classes.

• *Classroom Engagement:* Guest lectures, discussions and other speaking opportunities including presentation of project challenges were met with a high level of engagement and participation by the students.

• *Technical Enrichment:* RPI ITWS faculty report anecdotal evidence of positive impact in other coursework, ranging from greater awareness of Web Science and related topics, to an enhanced level of understanding and active use of knowledge in classroom settings and in coursework. Intensive coverage of web architecture, semantic web and linked data fundamentals in certain courses has enabled increased technical coverage by instructors, in those courses and others.

• *Sustained Engagement:* Due to the raised awareness of WSRC RPI by students, there is increasing interest among students in pursuing activities such as undergraduate research, graduate study and/or internships.

4. NEXT STEPS

RPI WSRC and the RPI ITWS program are reviewing the progress made over the 2013-2014 academic year and are making plans for 2014-2015. Under review are the timing of guest lectures to maximize the impact of the material, and adding guest lectures based on the evolving scope of technology; this is in addition to the usual updates to lecture material based on year-over-year evolution of the web. The WSRC/ITWS partners are also reviewing in detail the ITWS Capstone project, giving special consideration to the technical scope of the project, the level of expertise that is demanded versus what can realistically be expected, the level of mentoring required, and the pedagogical contribution.

5. ADDITIONAL AUTHORS

Deborah L. McGuinness[1], Joanne S. Luciano[2], & Richard M. Plotka[3]

6. REFERENCES

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