Journal of Educational Technology Development and Exchange (JETDE)

Volume 6 | Issue 2 Article 6

6-2013

Deep Learning through Reusable Learning Objects

Rosalyn Rufer

Ruifang Hope Adams

Rufe. R. & Admas. R. H. (2013). Deep learning through reusable learning objects in an MBA program.
Journal of Educational Technology Development and Exchange, *6* (2), 69-82

Deep Learning through Reusable Learning Objects in an MBA Program

Rosalyn Rufer
Empire State College – State University of New York\

Ruifang Hope Adams
Empire State College – State University of New York

Abstract: *Being able to leverage an organization's processes and core competencies to sustain its competitive advantage is important (Ray, Barney, & Muhanna, 2004). One learning objective of an on-line MBA is to teach students how to apply the VRIO (value, rarity, imitate, and operationalize) model, developed by Barney and Hesterly (2006), in order to identify an optimum strategy. However students in the program have had difficulty in understanding this model, partially because of the traditional pedagogy used in online teaching. This case study demonstrates how reusable learning objects (RLO) can facilitate knowledge in an online learning environment. The RLO developed and applied in this study was able to enhance student learning through interaction and subsequent deep learning.*

Keywords: deep learning, on-line learning, reusable learning objects, distance learning, MBA education.

1. Introduction

"Deep learning applies substantive insights from the learning disciplines to exploit the affordances of the technology, in order to develop contexts that empower learners to achieve educational goals" (Boyle & Ravenscroft, 2012, p. 1225). According to Boyle and Ravenscroft (2012):

> the design [of interactive technologies] requires not just a construction of the overall learning context, but detailed concern with the tasks, the activities of learners, and the means of knowledge representation used. We need to weave these into a learning context in such a way as to enable learners to succeed where they might otherwise fail. (p. 1230)

A layering of tasks can help the learning gain a deeper understanding of the concepts (Kurubacak, 2007). Knowledge management systems organize resources so that information can be built upon (Arshad & Bhalalusesa, 2012). This was found to be the case in the MBA Marketing Management course, where it was determined that readings (textbook and online mini-lectures) were not sufficient to teach students how to determine the buying

behaviors of potential customers; a new concept taught in this course (Rufer & Adams, 2012). The next layer of learning implemented was to include narrated PowerPoint lectures and Webinars to align with learners that were auditory as well as visual. In addition, online discussions were incorporated to move from contextual learning to reflective learning, through collaboration:

> In a traditional classroom, the faculty member facilitates synchronous learning and collaboration. This becomes more difficult in a Web-based learning platform. Furthermore, differences in student learning styles are exasperated by the linear design of many web-based systems. As a result, the differences in learning outcomes may be related to the student's ability to adapt to the mode of the information presented, not just their ability to learn. (Rufer & Adams, 2012, p. 327)

However, the lesson learned about improving learning outcomes through deep learning, has application for traditional students, as well as those taking online courses (Zitter, de Bruijn, Simons, & Ten Cate, 2012). Knowledge management systems are important for developing processes that do more than just transfer information.

2. Deep Learning and the Learner

The pedagogy under evaluation in this paper is part of an MBA program developed for adult learners through a Web instructional management system. This program was chosen because the learners are self-directed, come from diverse backgrounds, and in many ways benefit from a flexible pedagogy because of time and space constraints. However, the lesson learned about improving learning outcomes through deep learning has application for traditional students, as well as those taking online courses.

3. A Case Study

One of learning goals of this MBA program is to teach students how to make strategic decisions that will enable the organization to sustain its competitive advantage. As part of the process, students apply common strategic management tools such as a SWOT (Strengths, Weaknesses, Opportunities, and Threats) and competitive analysis. In addition, being able to leverage an organization's processes and core competencies to sustain its competitive advantage is important (Ray, Barney, & Muhanna, 2004). Barney (1991) first looked at the firm's resources and their value, rarity, ability to be imitated, and the ability of the firm to operationalize these resources to sustain a competitive advantage known as VRIO model. Students are taught this model in their first course of the program. Later in the MBA Marketing Management course, students are asked to use this model to identify a viable strategic direction for their marketing plans.

Table 1. Percent demonstrating understandingof VRIO model without the use of an interactive RLO

	% demonstrating
Class Name	VRIO
SAEC	77%
MMS	72.4%
SEL	77%
average	75%

The model assesses the ability of the students to critically evaluate the sustainability of a firm's resources. This contains a series of "yes and no" narrative instruction and questions, and students judge a rational of the competitive strength of the firm in a

report format (see Figure 1 later in the paper). However, it was shown that only 72% of the students were able to apply this model to effectively identify the sustainable resources of the organization as indicated in Table 1.

Furthermore, as students moved from the advance Marketing Management (MMS) course to their capstone project (SAEC and SEL course sequence), only 77% were able to apply this critical management model in spite of several layers of learning as indicated in Table 1. The capstone course for the MBA is divided into two parts. The first part assesses the macro and micro environmental factors that affect the organization's performance (called SAEC in Table 1). The second part is the development of a full strategic plan including the optimum strategy for leveraging the competitive advantages of the organization (called SEL in Table 1). Because students in SAEC and SEL had previously completed the Marketing Management course, it was expected that 80 to 90% of the students would have been able to demonstrate competency in this area. In all three courses, there are readings and mini-lectures on the model, as well as online discussions of the role of the model in assessing the resources to determine an organization's strategy. Capstone students also present their applications of the model as part of blended learning and reflection in a face-to-face residency with the professor and their classmates, where the professor highlights the proper way to apply the model (Barney & Hesterly, 2006). However students fell short of meeting the expected learning outcome goal. It was believed that these activities would create a learning environment able to reach diverse learning styles.

The layered activities should have been able to reach diverse learners through visual (the readings), auditory, and kinesthetic activities at the residency. Collaboration and reflection through the online discussion was added to enhance the earlier layers to provide deep learning at the student level. These Web-based learning activities appeared to be "dynamic in order to accommodate learners' different backgrounds, competencies, and interests" (Lee & Su 2006, p. 6-7). Yet only 77% of the students grasped the concept by the end of their degree programs. One reason may be attributed to the fact that this content knowledge was not used anywhere else in the program and may have been easily forgotten (Dernt & Motschnig-Pitrik, 2005). Another reason may be reflective of the learner's style of learning and how engaging the on-line learning was for the student as Yaghmaie & Bahreininejad (2011) states:

> The whole idea of adaptive learning is that there exists no learning style that fits all types of learners' needs. Two approaches have been introduced in this area and the challenge of adaptive systems is to balance between these two different forms of adaptation: (1) adaptivity, which relates to the extent the system output is flexible based on some knowledge about the learner and (2) adaptability, which is system reliability in response to user modifiability. (p. 3280)

Much has been written about learning styles and student learning outcomes. Adams & Rufer (2010) mention that "Learning styles [have been] described by the cognitive, affective, and psychological behaviors of how students learn; approaches to learning looked at three ways to engage in learning: a surface approach (rote memorization), a deep approach (exploring and questioning), or a strategic approach (with tactics to earn the desired final grade); and intellectual development (with the highest level defined as that which follows the scientific method)" (p. 2). Based on this previous work by Rufer and Adams (2010), the authors understand

that changes in pedagogy using technology that provides both deep learning and at the same time interactivity can engage students regardless of learning styles. In Boyle & Ravenscroft's (2012) work, "Boyle delineated three possible layers of explanation for learning: the physiological, cognitive and interactional layers. He argues that the interactional layer is the appropriate one for the learning designer and that 'context' is the key concept at this layer" (p. 1226). Context here can be viewed as an activity system that "weaves together" the learning.

The authors expected that using a reusable learning object to create a knowledge management system would result in improved student learning outcomes. It became the objective to incorporate a learning activity that would "weave together" the learning throughout the student's degree program. To accomplish this objective the authors developed a reusable learning object (RLO) for VIRO that could be incorporated into the first course of the program, the marketing management course, and the capstone courses. This RLO was also designed to be interactive by engaging students who learned through visual and kinesthetic learning activities. As indicated by Lee and Su (2006):

> Internet users have much more diverse backgrounds than students. Therefore, web-based learning has to be dynamic in order to accommodate learners' different backgrounds, competencies, and interests. To meet this requirement, learning object service must have the following dynamic properties: active, flexible, adaptive and customizable. (p. 6-7)

4. Reusable Learning Objects

Idrosa, Mohameda, Esaa, Samsudina, and Dauda (2010) recognized that "a single learning object may be used in multiple contexts for multiple purposes" (p. 703). According to Valderrama, Ocana & Sheremetov (2005), "Learning objects are self-contained learning components that are stored and accessed independently. RLO is any digital resource that can be reused to support Web-based learning" (p. 274). Mavrommatis (2008) believes that reusable learning objects are small learning components that can be combined and reused in different contexts and that these objects are "best" designed to facilitate knowledge rather than communicate knowledge. Readings and mini-lectures in an online learning environment communicate knowledge. In the case presented here, an interactive model was used to support online student learning in the MBA program. This model facilitated the student's ability to critically assess a firm's resources and identify those resources that could be leveraged to create a sustainable competitive advantage (Barney, 1991).

5. Methodology: Research Design

The sample to be used was two different sections of the same course. A cluster sampling method was used because it was assumed that both sections were made up of students with similar experiences. All students in both sections were asked to evaluate the resources of an organization in a case study using the VRIO model described previously. Both sections were given a variety of learning objects including reading, PowerPoint presentations, and online discussion. However, the second group was also presented with a reusable learning object.

RLO Tool Design

To improve student learning in this MBA marketing management course, a team was formed to address the problem. Collaboration was an important step in developing a solution

for this learning object. One member from the team was an expert in the field of marketing and strategic management and the other an expert in instructional design. As such the authors began the process of developing the RLO by forming a "community of practice." According to Berkani & Chikh (2010), "one person can share the best way to design a special kind of learning situation based on his own experience, which may enable the other members to be inspired from it in order to design other learning situations" (p. 4437). The marketing and strategic management expert identified the concept that student were not properly applying. In this case, it was the application of Barney and Hesterly's VIRO model of how to assess an organization's resources for sustainability (Barney & Hesterly, 2006). Students wanted to identify which resources were rare, which were valuable, and which were not easily imitated, rather than assessing each resource for providing the firm with a sustainable competitive advantage. The authors felt that it was important to develop the RLO to help students envision this complicated topic: the relationship between resources and sustainable competitive advantage. The individual proficient in instructional design felt the RLO needed to be designed as a "highly interactive learning objects [to] allow for continuous, bi-directional interaction with all essential parameters" (Hanisch & Straβer, 2003, p. 647). According to Hanisch and Straβer (2003), to create a "highly interactive learning objects, requires expertise in subject, programming, pedagogics, didactics, and design" (p. 649). The objective was to "design them (the RLO) within the framework of a well-planned curriculum, one that incorporates standards compliant classification schemes allowing for consistent labeling of RLOs and efficient retrieval of the RLOs from databases "(Leon, 2002, p. 2). Katz, Worsham, Coleman, Murawski, & Robbins (2004) states that:

> The concept of the reusable learning object frequently has been linked to LEGOs. All the instructional parts are considered interchangeable, fit neatly together, and make impressive and creative structures. This analogy does not implicitly consider the application of sound instructional design and learning theories to the creation of reusable learning objects. While chunks of information can go together in such a way, good instruction does not. Instructional objects are not dynamically interchangeable, rarely fit together well as is, and when attempted, the results are rarely impressive inherent instruction. However, it does require an individual who is adequately equipped with the proper knowledge of learning sciences and ISD to ensure the effective reuse, repurpose, and reference (R3) of instructional objects. (p. 7)

When creating the RLO, the instructional designer considered how to turn "good" instruction that might be found in a traditional classroom into an online learning object. The first step in the design of this RLO was to map out a decision tree that students should follow to assess the sustainable competitive advantage of an organization's resources (see Figure 1). The course instructor identified ten common organizational resources that could provide an organization with a sustainable competitive advantage. If the resource was not valuable, the decision tree led the student to a node that stated the resource was a disadvantage, if it was valuable but not rare, it was identified as providing the firm competitive parity. If it was both valuable and rare, but could be imitated, it was identified as providing a temporary advantage. If the resource was valuable, rare, not easily imitated, and the organization could leverage the resource through its operations, then

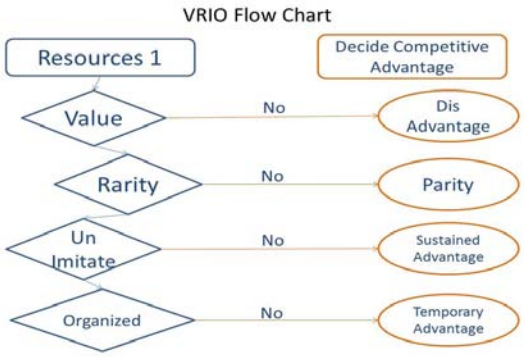

Figure 1. RLO decision tree

the resource was identified as a sustainable competitive advantage.

The instructional designer identified several technology resources that could support this type of decision making process. Valderrama, Ocana, & Sheremetov (2005) mention, "Intelligent Reusable Learning Components Object Oriented (IRLCOO) are described, a special type of Reusable Learning Objects (RLO) producing learning content rich in multimedia, interactivity and feedback" (p. 274). One type of technology resource that can provide for interactivity and feedback is that of an interactive PowerPoint presentation. According to Littlejohn, Falconer, and McGill (2008):

> a set of PowerPoint slides [can] provide the information content at the heart of learning activities representing all five forms [in which learning resources may be use]:
>
> 1.Narrative – if downloaded by the learner from a website or database;2. Communicative – if used as the basis for a discussion;
>
> 3.Interactive – if searched or scanned for bibliographic entries;
>
> 4.Adaptive – if edited with PowerPoint software; and
>
> 5.Productive – if the ideas from the slides are used as the basis for reconceptualization using concept mapping software. (p. 760)

A prototype RLO developed using PowerPoint in this case study was embedded in the Web-based course management system, where learners could download it and use any time. Guided by Littlejohn's principle, the RLO design processes designed here contained all five forms. During the design phase, the narrative activity instruction direction was governed by an overall navigation flow. Each of the resources probed an evaluation of the concept and solicitude a decision, to reach either a conclusion or evaluate a further decision steps for the concept. In addition, as part of the narrative for the students, the authors asked students to print out the last page of the PowerPoint to fill in as they moved through the decision making process. It was also suggested that students replace any resources that were not identified by the designers with those that were not a core competency of the organization (strength from the SWOT analysis).

5.1. Communicative

The RLO was designed with a unified communication message. Most of the interfaces were designed with global instruction and all the navigation buttons were named consistently such as "Home," "Go to the Next Question," or "Go back to Previous Question," etc. According to Boyle and Ravenscroft (2012), "design requires not just a construction of the overall learning context, but detailed concern with the tasks, the activities of learners, and the means of knowledge representation used" (p. 1230). The instructional designer paid close attention to this as she created the interactive PowerPoint presentation.

5.2. Interactive

The RLO was developed with an interactive mechanism and students could jump to any resource section, use as many times as needed, test different scenarios, or adapt the tool to their relevant organization whenever they wanted (see the "adaptive" form in this design process). The instructional designer created these interface in order to create interactive experiential knowledge for the learner as "Experiential Knowledge is the knowledge that is often modified and easily expressed, captured, stored and reused" (Berkani & Chikh, 2010, p. 4440). The authors expect that an increase in student learning comes from providing learning approaches that are congruent with a variety of cognitive learning styles and an increase interaction and reflection. We suppose that design patterns do not only increase the efficiency and flexibility of the design effort for novices, but also increase their understanding of the design process and the domain in which they design. Furthermore, we considered the cognitive effect of offering knowledge in the shape of design patters, and its implications for learning efficiency (Kolfschoten, Lukosch,Verbraeck, Valentin, & de Vreede, 2010). According to Kolfschoten, et al., (2010) "a learning task is less complex when part of it is already understood" (p. 654). In this case study the learner demonstrated greater ability in evaluating the value, rarity, inimitability, and the ability of the organization to leverage each resource in a systematic, interactive, and repetitive decision making process.

5.3. Adaptive

In this RLO the authors used a design pattern to allow learners to evaluate each resource separately. The RLO is designed as non-linear process to facilitate adaptively as a learner chooses any resource to evaluate. As indicated earlier, students prior to beginning this process created a SWOT and competitive analysis for their organization under evaluation. This provided students with a list of core competencies of their organizations under evaluation. It was our expectation that by doing this, the learner would then develop a sense about the importance of each resource for the organization's sustainable competitive advantage. Thus, this RLO was not only interactive it was also adaptive based on the SWOT and VIRO competitive assessment.

5.4. Productive

As a result, students can obtain very informative visual expressions to help him/her to make final decisions as relate to the marketing strategies (see Figure 2). If students reach this level of learning they will have transcended from a surface approach to learning to that of intellectual development and deep learning.

6. Findings

As noted earlier, the concept of developing strategy around the resources of the firm is a learning objective in the marketing

Resources Does the Organization have	Value	Rarity	Unable to Imitate	Organized Properly	Competitive Advantage
1. A Strong Financial foundation	YES	YES	YES	YES	Sustained Advantage

Figure 2. Example of a final decision strategy

Table 2. Percentage demonstrating mastery of concept before and after RLO

Class	Control (no RLO tool)		% after using tool	
SAEC	17/22	77%	40/43	93.0%
MMS	21/29	72.4	62/70	88.6%
SEL	7/9	77%	23/24	95.8%
average		75%		92.50%

Table 3. Chi-squared testing for relationship

course		Value	df	Asymp. Sig. (2-sided)
SAEC				
	Pearson Chi-Square	3.345[b]	1	.067
	Pearson Chi-Square	65		
MMS				
	Pearson Chi-Square	3.951[c]	1	.047
	N of Valid Cases	99		
SEL				
	Pearson Chi-Square	2.582[d]	1	.108
	N of Valid Cases	33		
Total				
	Pearson Chi-Square	9.306[a]	1	.002
	N of Valid Cases	197		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.22.
b. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.71.
c. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.69.
d. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .82.

management course, the capstone project, and the first course in the MBA program. The RLO developed here was first applied in the marketing management course and also applied in the capstone two-course sequence. Just as in the case study in the marketing management course, students in the capstone sequence showed mastery of this learning objective once they used the RLO (see Table 2).

The percent of students correctly evaluating their organization's resources to develop a strategy increase from 75% to 93% overall during the Fall 2012 term. The control (or those that did not use the RLO) were below the targeted 80 to 90% demonstrating competencies in this area. However, with the RLO, all three courses met or exceeded targeted learning outcomes. The chi-squared test supported the expectation that there was a relationship between student learning outcomes and whether or not they used the interactive RLO (see Table 3).

7. Conclusions and Discussion

Established in the management literature is the strong relationship between resources, strategy, and performance. The VRIO model is one way to assess the firm's resources or core competencies in order to identify an optimum strategy, "Business performance is a function of the effective deployment of resources associated with the strategy, not simply the content of the strategy" (Parnell & Carraher, 2001, p. 15). This RLO helps students identify the resources that can be leveraged to provide a competitive advantage. The next step in the learning process is for students to identify the strategy that will lead to a sustainable advantage. As evident by this case study, the RLO provided students with a way to think about their resources, and thus, the strategic direction of the organization in creating the desired learning outcomes.

The design of the RLO attributed to the successful engagement of the students. The RLO used probing as an evaluation method of each resource and solicitude a decision to reach either a conclusion or evaluate further decision steps for identification of the value, rarity, inimitability, and the ability of the organization to exploit the resource. This repetitive nature helped facilitate knowledge rather than just communicated it. The process provided deeper learning for the student by adding one more layer to the reflective learning process. The RLO also produced learning content rich in multimedia, interactivity, and feedback. For learners with diverse learning styles, the narrative nature of the RLO was congruent with their style; however, the interactivity helped to reach students who favor kinesthetic learning. The discussion at the residency and online helped provide increased reflection, and thus, a deeper learning experience. In addition to improving student learning outcomes, the RLO designed here proved to be reusable in several studies, with similar improvements in student learning outcomes.

8. Future Research and Limitations

This same tool was then introduced to students in the first course in the program at their opening residency experience in spring of 2013, to see if these students had similar learning outcomes to those applying the tool later in their degree program. Kurubacak (2007) mentions "To save labor, time, energy and money in programs, online workers (communication designers, online educators, technology staff, online learners, stakeholders, etc.) should share their knowledge and experiences with each other to easily modify and powerfully reuse resources" (p. 2669). Just as during the design phase, a community of practice was created to ensure that the RLO could be used by first term students. Idrosa,

Mohameda, Esaa, Samsudina, & Dauda (2010) state:

> These computer-mediated learning objects were developed around the principles of reusability, meaning that lessons can be generated and customized for specific topics. Therefore a single learning object may be used in multiple contexts for multiple purposes and these were developed as an outcome of the 'curriculum analysis.' (p. 703)

One limitation of this study is the small sample size for the second of the capstone courses. This affected the chi-squared statistical analysis with two cells less than expected (see Table 2). Another limitation is that the authors based conclusions on the use of a single RLO technology.

While "it is clear that developers are enthusiastically creating reusable learning objects (RLOs) in ever-increasing numbers, and are sharing them by placing them into learning object repositories (LORs)" (Bond, Ingram, & Ryan, 2008, p. 603), a PowerPoint may not be the only useful tool for this RLO. One technology tool considered by the instructional designer is the use of Generative Learning Object (GLO Maker), "GLO Maker is of interest for two reasons: it employs an explicitly generative approach to the design and realization of virtual contexts for learning and the design is placed within an explicitly layered approach" (Boyle & Ravenscroft, 2012, p. 1231). It was decided that the RLO should be designed in two phases with the first being PowerPoint technology as a prototype, because students were already familiar with this technology. The second phase would be to replicate the RLO using GL-Maker.

It is suggested that the Generative Learning Object (GLO Maker) authoring tool can be used to design some learning objects specifically tailored for a subject learning (Greaves, Roller, & Bradley, 2010), and can easily adapted for creating rich, interactive learning resources for different subject areas or content needs (Khademi , Haghshenas , & Kabir, 2011). The GLO-Maker populates publication in HTML CD-ROM package and SCORM package for import to any LMS, that requires no specialized programming skills to create media rich RLOs. Figure 3 shows the GLO-Maker authoring tool in Design.

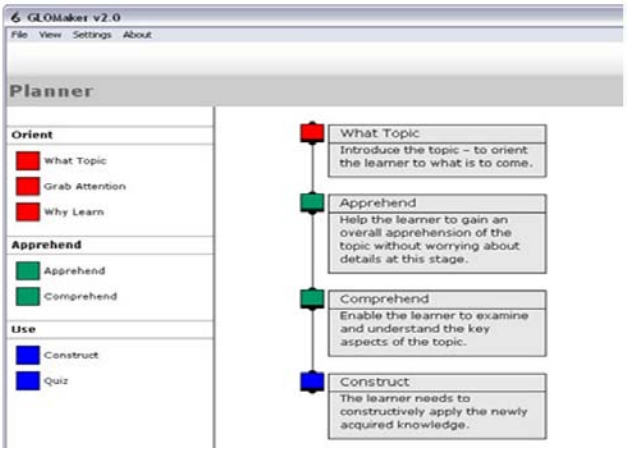

Figure 3. GLO maker tool planning interface

GLO-Maker was recommended to be the primary authoring tool for developing RLO, because many specific learning objects can be generated from well-designed core pedagogical formats or patterns. The GLO Maker tool is free to download [http://www.glomaker.org], and can be used for educational purposes. It is an open-source and easy to be adapted. GLO-Maker is popularly used by CETL, the Centre for Excellence for the Design, Development and Use of learning objects, partnered with London Metropolitan University, the University of Cambridge and the University of Nottingham [http://www.rlo-cetl.ac.uk/]. GLO-Maker's most unique feature is reusable pedagogical design, and neither content nor concrete learning objects. One of the benefits is to develop many specific learning objects based on similar pedagogical pattern (see Figure 4).

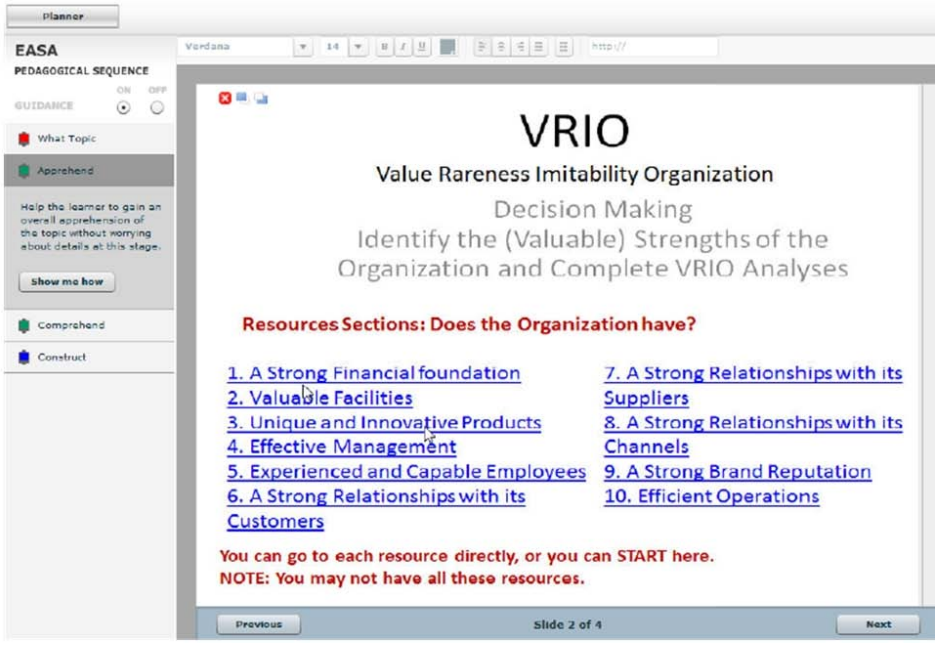

Figure 4. GLO maker tool design interface

9. Implications

A RLO appears to be a successful tool for an online learning environment. It is an effective way to create collaborative learning communities, bringing together teams with disciplinary and design expertise. The reuse of an RLO provides for both an efficient and effective way of engaging students. As each application of the RLO improves student learning outcomes, the RLO itself can be modified based on successive results. For example, in this case study the RLO was adapted by each student to include the core competencies found in their organizations being evaluated. In addition, the technology design itself will be modified to evaluate different technologies. The first technology applied was that of a PowerPoint presentation. This was selected because of the familiarity of students with PowerPoint. Students were able to quickly work within this technology

with little effort. Other technologies that will be evaluated in the future are GLO maker and Flash. Both can provide an interactive learning experience for the student. The RLO needs to be both interactive and layered, so that the students are able to reflect on the outcomes. The RLO studied here provided students with the repetitive application of the theory for a "deep learning" experience. It is the authors expectations that GLO maker will have similar results as the PowerPoint presentation.

The use of an interactive RLO is important in online learning environments, especially for complex theoretical constructs. In the example here, neither textbook readings, discussion questions, nor mini-lectures were able to reach twenty-five percent of the students. However, ninety-five percent of the students were able to better understand how to assess an organization's sustainable resource through the RLO. This case study demonstrates an effective way to apply technology to improve student learning outcomes.

References

Arshad, M. R. M,. & Bhalalusesa, R. (2012). Opportunities and Challenges of Using Knowledge Management Systems to Automatically Compile Reusable Learning Objects into Learning Materials. *International Proceedings of Computer Science & Information Technology*, (45), 201-205.

Adams, R.H,. & Rufer, R. (2010). Adapting Three-Dimensional-Virtual World to Reach Diverse Learners in an MBA program In Yang, H. & Yuen, S., *Handbook of Research on Practices and Outcomes in Virtual Worlds and Environment.* Hersey, PA: IGI Global.

Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management, 17*(1), 99-121.

Barney J, B., & Hesterly, W. S. (2006). *Strategic Management and Competitive Advantage*. Person Education, aHHSaddle River, New Jersey: Prentice Hall.

Berkani, L., & Chikh, A. (2010). A process for knowledge reuse in communities of practice of e-learning. *Procedia - Social and Behavioral Sciences, 2*(2), 4436-4443.

Bond, S. T., Ingram C., & Ryan S. (2008). Reuse, repurposing and learning design – Lessons from the DART project. *Computers & Education, 50*(2), 601-612.

Dernt, M., & Motschnig-Pitrik, R. (2005). The role of structure, patterns, and people in blended learning. *The Internet and Higher Education, 8*(2), 111-130.

Greaves, L., Roller, S., & Bradley, C. (2010). Repurposing with a purpose: A story with a happy ending. *Journal Of Interactive Media In Education, 2010*(01). Retrieved October 16, 2013, from http://jime.open.ac.uk/jime/article/view/2010-5

Hanisch, F., & Straβer, W. (2003). Adaptability and interoperability in the field of highly interactive web-based courseware. *Computers & Graphics, 27*(4), 647-655.

Idrosa, S. N. S., Mohameda, A. R., Esaa, N., Samsudina, M. A., & Dauda, K. A. M. (2010). Enhancing self- directed learning skills through e-SOLMS for Malaysian learners, *Procedia Social and Behavioral Sciences, 2*(2), 2010, 698-706.

Katz, H., Worsham, S., Coleman, S., Murawski, M., & Robbins, C. (2004). *Reusable Learning Object Model Design and Implementation: Lessons Learned*. In J. Nall & R. Robson (Eds.), Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2004 (pp. 2483-2490). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/p/11257

Kolfschoten, G., Lukosch, S.,Verbraeck A., Valentin E., & DeVreede, G. (2010). Cognitive learning efficiency through

the use of design patterns in teaching. *Computers & Education, 54*(3), 652-660.

Kurubacak, G. (2007). Building knowledge networks through project-based online learning: A study of developing critical thinking skills via reusable learning objects. *Computers in Human Behavior, 23*(6), 2668-2695.

Lee, G., & Su, S. Y. W.(2006). Learning object models and an E-learning service infrastructure. International Journal of *Distance Education Technologies, 4*(1),1-16.

Littlejohn, A., Falconer I., & Mcgill L. (2008). Characterizing effective elearning resources.*Computers & Education, 50*(3), 757-771.

Leon, J. (2002). *Reusable Learning Objects: Hazards, Hi-Performance, and a New Convergence*. In M. Driscoll & T. Reeves (Eds.), Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2002 (pp. 1788-1791). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/p/9349

Mavrommatis, G. (2008). Learning objects and objectives towards automatic learning construction. *European Journal of Operational Research, 187*(3), 1449-1458.

Parnell, J. A., & Carraher, S (2001). The role of effective resource utilization on strategy's impact on performance. *International Journal of Commerce & Management, 11*(3/4), 1-34.

Ray, G., Barney, J. B., & Muhanna, W. A. (2004). Capabilities, business processes, and competitive advantage: Choosing the dependent variable in empirical tests of the resource based view. *Strategic Management Journal, 25*, 23-37.

Rufer, R., & Adams, R. H. (2012, February). *Student centered marketing education through open learning resources and Web2.0 technology.* American Marketing Association Winter Educators Conference, Conference Proceedings.

Valderrama, R. P., Ocana P. B., & Sheremetov L. B. (2005). Development of intelligent reusable learning objects for web-based education systems. *Expert Systems with Applications, 28*(2), 273-283.

Yaghmaie, M., & Bahreininejad, A. (2011). A context-aware adaptive learning system using agents. *Expert Systems with Applications, 38*(4), 3280-3286.

Zitter, I de Bruijn, E., Simons, R., & Ten Cate, O. (2012). The role of professional objects in technology-enhanced learning environments in higher education. *Interactive Learning Environments, 20*(2), 119-140.

Contact the Authors

Rosalyn Rufer
Empire State College – State University of New York
Email: Rosalyn.Rufer@esc.edu

Ruifang Hope Adams
Empire State College – State University of New York
Email: Hope.Adams@esc.edu