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Teaching Tip: Visualizing IS Course Objectives and Marketable Skills

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ABSTRACT

Course and learning objectives are important tools for setting goals, navigating the course, and measuring performance. Unfortunately, when multiple interrelated objectives are presented as a list of statements, students perceive them as having little utility and tend to misunderstand or ignore them. To increase students' attention to course objectives, to help them understand the arc, structure, and valuable outcomes of the course, and to engage in active learning, we propose an approach to presenting course objectives in a visual form. The evidence suggests that visualized objectives increased students' interest in understanding them and provided aids to instructors to better explain how various components of the course fit together and translate into marketable skills. We recommend practical steps for visualizing objectives in any course and present examples of visualizations in two IS courses – "Enterprise Architecture" and "Systems Analysis and Design."

Keywords: Active learning, Bloom's taxonomy, Course development models, Job skills, Learning goals & outcomes, Teaching tip, Visualization

1. INTRODUCTION

A syllabus sets the goals, structure, and tone of a course. Statements called course objectives, learning objectives, learning outcomes, or learning goals are used to express what students are expected to understand, know, and achieve during and upon completion of the course (Bloom et al., 1956). Many researchers suggested that focused objectives are important for a learner-centered syllabus (Brooks et al., 2014; Ludy et al., 2016; Leone et al., 2019). Course objectives (the term we use for the overall objectives in a single course) should provide structure and guidance to the students on how to succeed in the course, as well as to guide the instructor's assessment of students' performance (Mitchell and Manzo, 2018). The positive effect of understanding and using objectives on learning performance has long been established. Learners who receive accurate information on what is expected of them prior to instruction show greater achievement than those who received vague information (Dalis, 1970; Duchastel and Merrill, 1973). Mitchell and Manzo (2018) argued that, unless students and faculty share an understanding of the purpose and value of learning objectives, the latter served no purpose.

Unfortunately, course objectives are usually presented as a long list of statements full of terms students do not yet understand (McKee, 2016); for example, "Upon completion of this course, students should be able to recommend controls that will protect information assets from threats." A well-developed and rich course usually involves multiple interdependent objectives, but the longer the list, the less likely students are to read it and use it as guidance. Leone et al. (2019) found that only 21% of students accurately identified an objective listed in the syllabus. Mitchell and Manzo (2018) found that only around 80% of surveyed faculty believed that the students actually read the learning objectives in their syllabi; 26% of surveyed students admitted that they did not read the objectives, and 30% of surveyed students responded that they did read the objectives simply because they were in the syllabus rather than because they served a useful purpose. Thus, even when the importance of objectives is communicated by professors, the students often do not take this information seriously (McKee, 2016; Leone et al., 2019). Leone et al. (2019) found that, within the framework of Instructional Communication Theory (Morreale, Backlund, and Sparks, 2014), explicitly listing course objectives in the syllabus was ineffective; however, students were able to interpret course objectives more accurately when the instructor used other ways to communicate their course objectives.

The purpose of this teaching tip is to recommend an approach to convey the objectives of an information systems course in an understandable, visually appealing, and practical way that attracts students' attention. The value of this teaching tip is in demonstrating how the arc, or theory, of the course can be visualized to increase students' awareness, interest, and internalization of this structure to help them navigate the course, engage in active learning, and achieve better performance (Lending and Vician, 2012; Srinivasan, 2019).

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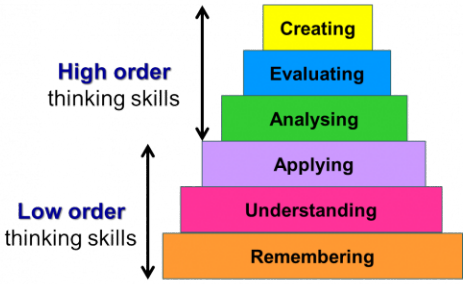

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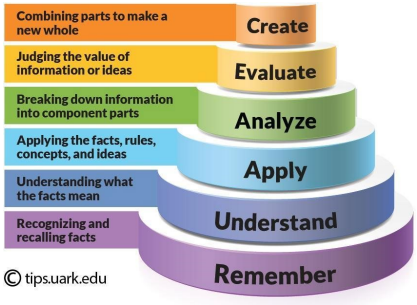
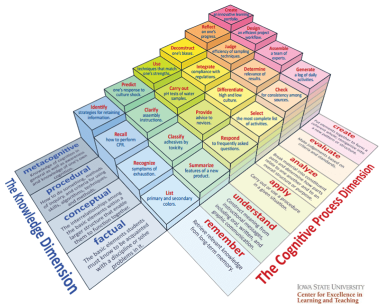


Adopted from Jessica Shabatura (https://tips.uark.edu/using-blooms-taxonomy)



Adopted from Rex Heer, Center for Excellence in Learning and Teaching, Iowa State University (https://www.teachthought.com/critical-thinking/3-dimensional-model-blooms-taxonomy).
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Figure 1. Examples of Visualizing Bloom's Taxonomy

2. PROBLEM

Faculty continuously look for ways to improve learning objectives (Mager, 1997; Kizlik, 2003; Gronlund, 2004). Approaches like the ABCD method (Audience, Behavior, Condition, Degree; Heinich, 2002) and SMART attributes (Specific, Measurable, Attainable, Relevant, Time-bound; Hall, 2016; Bates, 2019) have been widely popularized. The underlying premise of these improvements is that the better understanding of course objectives by students leads to better performance (Duchastel and Merrill, 1973); "well-written learning objectives… help students create a focused mindset as they enter into course content" (Mitchell and Manzo, 2018, p. 457). Students themselves might see objectives as guides to learning (Brooks et al., 2014). However, many students claim that objectives are poorly written or ambiguous (Brooks et al., 2014). As a result, students may lose interest and do not pay attention to them. As we discovered, students think that "course objectives are not 'jazzy.'"

So, how can we help students who lack interest understand and internalize course objectives and engage in active learning? One possible way is to use visualizations and infographics. For example, Ludy et al. (2016, p. 2) argued for turning the learner-centered syllabus into an engaging syllabus with "purposeful use of graphics… and color." They found that such a syllabus is engaging and motivating. Instructors experimenting with the visual syllabi cited greater appeal, students' engagement, and motivation, more favorable perceptions of the instructor and the course, and, most importantly, ease of navigating and understanding (Hangen, 2011; Ludy et al., 2016; Robb, 2016; Gooblar, 2017).

The usefulness of the proverbial "a picture is worth a thousand words" has been supported empirically (Naps et al., 2003). In multiple domains, visualizations help understand complex documents and relationships. For example, visualizations have been proposed to help understand complex software terms of service (Berger-Walliser, Bird, and Haapio, 2011; Rekola and Boucht, 2011; Passera, Smedlund, and Liinasuo, 2016). Visual models are encouraged, expected, and commonly used in academic research and practice. The evidence suggests that visualization may also act as a moderating variable strengthening the positive effect of understanding the objectives on learners' performance in the course.

In the scholarship of teaching and learning, visualizations have been proposed to help understand Bloom's taxonomy of learning objectives (which has immediate relevance to our topic). A few examples illustrating various levels of complexity and visual appeal of such models are presented in Figure 1. Moreover, Figure 2 presents an example of visualizing more complex relationships.

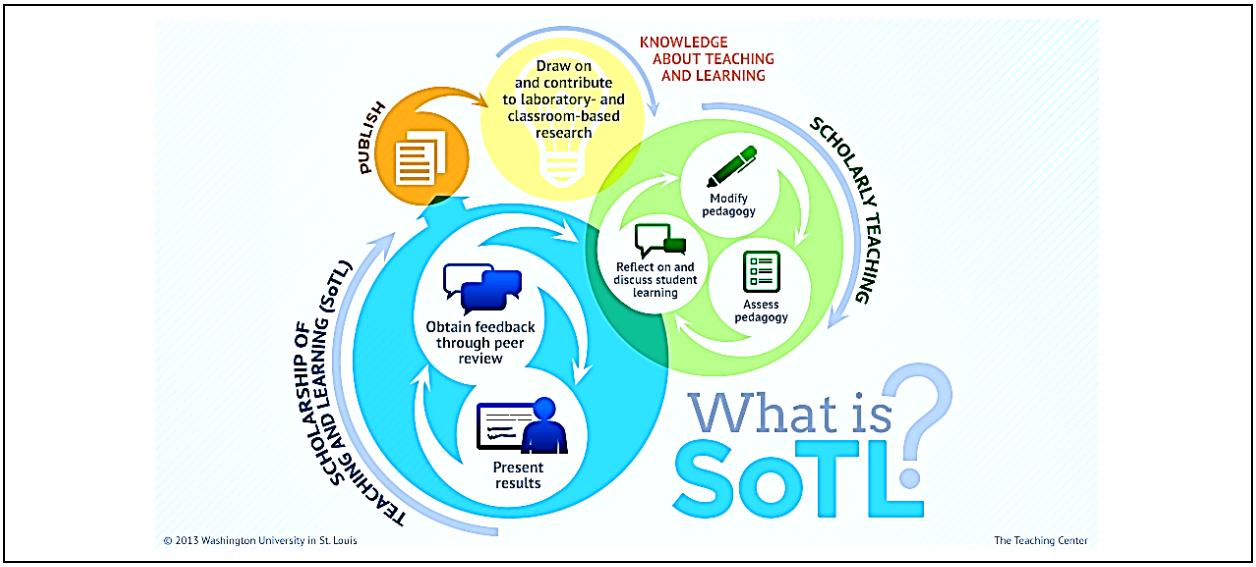

Figure 2. Visualizing the Scholarship of Teaching and Learning
Adopted from The Teaching Center, Washington University in St. Louis (https://teachingcenter.wustl.edu/scholarship), with permission

Another way to demonstrate the importance and relevance of the course objectives to students is by linking them to marketable skills that students gain by taking the course. As employers provide feedback on the skills required, universities recognize the need to emphasize to students the importance of demonstrating these skills in their job applications (Skoyles, Bullock, and Neville, 2019). By explaining the practical marketable skills that students can add to their professional resumes upon completion of the course, we "create a sense of knowing where they are going, along with a sense of anticipation and excitement around what they will learn" (Srinivasan, 2019). For example, an undergraduate student seeking a job in cybersecurity is much more excited about being able to do "ethical hacking and penetration testing with Metasploit" rather than "to conduct a risk assessment of the As-Is IT architecture," even though the latter is a related, much more general, and higher-level competency.

In summary, the belief that visualizing course objectives and relating them to marketable skills might improve students' understanding, internalization, and performance, led us to attempt developing visual presentations of objectives and marketable skills for CIS courses we teach.

3. IMPLEMENTATION

While we acknowledge the importance of the course objectives presentation methods mentioned above, our aim was to create a visualization that is structured (i.e., grounded in the theory of the course and Bloom's taxonomy), practical (i.e., serves as a guide towards marketable skills), parsimonious (i.e., not cognitively taxing; Miller, 1956), and attractive. We began with a 300-level "Enterprise Architecture" course that is a part of the core CIS curriculum in a mid-size, U.S., mid-Atlantic university. The objectives of this course as they were presented several years ago are shown in Figure 3.

The course consists of three topical modules, namely "Business Processes and Business Process Modeling," "Data Communication Network Architecture and the Cloud," and "IS Infrastructure Security, Risk Assessment, Risk Mitigation, and Disaster Recovery." These three topics are preceded by the topic of "IS Strategy, Architecture, and Infrastructure." Each topic involves a number of concepts and modeling techniques.

We wanted our visualization to convey the following ideas:

a) The course consists of three main interrelated topics, integrated under the idea of IS Strategy - Architecture - Infrastructure;
b) The progression from the basic understanding of the key concepts (low-level learning objectives on Bloom's taxonomy), through the ability to apply and analyze, to the competencies of evaluating and creating (high-level objectives on Bloom's taxonomy) within each of the topical modules;
c) Mastering each of the topics gains practical technical marketable skills (that can be shown in students' professional resumes); and
d) The sense of parallelism and systematism in analyzing problems and applying modeling techniques.

To accomplish this, we first looked for, brainstormed, and refined a visual form to present the objectives in a more appealing format than a list. Bloom's taxonomy suggested the idea of progression from basic to advanced skills through the six levels of competency. The modular structure of the course (three topical modules) provided an idea of splitting objectives into "streams." The requirement for parallelism and systematization pushed us to find a way to formalize patterns of analysis, modeling, and diagraming across all three topical modules (e.g., an idea of developing low- and high-level models of a system). The process involved several refinement re-iterations of sketching, wordsmithing, and incremental improvement based on feedback from colleagues and students. Figure 4 presents the current version of the objectives visualization for this course.

Upon completion of the course, students should be able to:

I. Plan, analyze, design, and model an enterprise architecture to solve an organizational problem. They will be able to:
   a. Create an activity diagram that is free from syntactic errors and which accurately reflects the "as-is" business process;
   b. Identify improvements to a process and create a "to-be" business process;
   c. Describe, distinguish, and recommend the appropriate cloud "as a service" architecture;
   d. Create high-level and LAN-level network diagrams that describe an "as-is" hardware for an organization and which are free from syntactic errors;
   e. Recommend a "to-be" network design and diagram it;
   f. Identify an organization's information assets and security threats to the assets;
   g. Be able to recommend controls that will protect assets from threats;
   h. Add security hardware to a network design;
   i. Be able to recommend disaster recovery plans for an organization;
   j. Analyze business cases and produce conceptual architectural solutions to the issues presented.

II. Conduct an effective requirements elicitation interview by being able to:
   a. Choose and apply visual models:
      i. distinguish which models to use;
      ii. apply visual models to requirements elicitation;
   b. Analyze the current state of the system:
      i. describe what an"as-is" system is;
      ii. differentiate an "as-is" from a "to-be" system;
      iii. illustrate "as-is" and "to-be" systems;
      iv. evaluate an "as-is" system.
   c. Design the "to-be" system:
      i. formulate a "to-be" design.
   d. Build relationships with the Client:
      i. identify the importance of the client relationship;
      ii. practice competent client relationship skills.

Figure 3. Sample Course Objectives for "Enterprise Architecture"

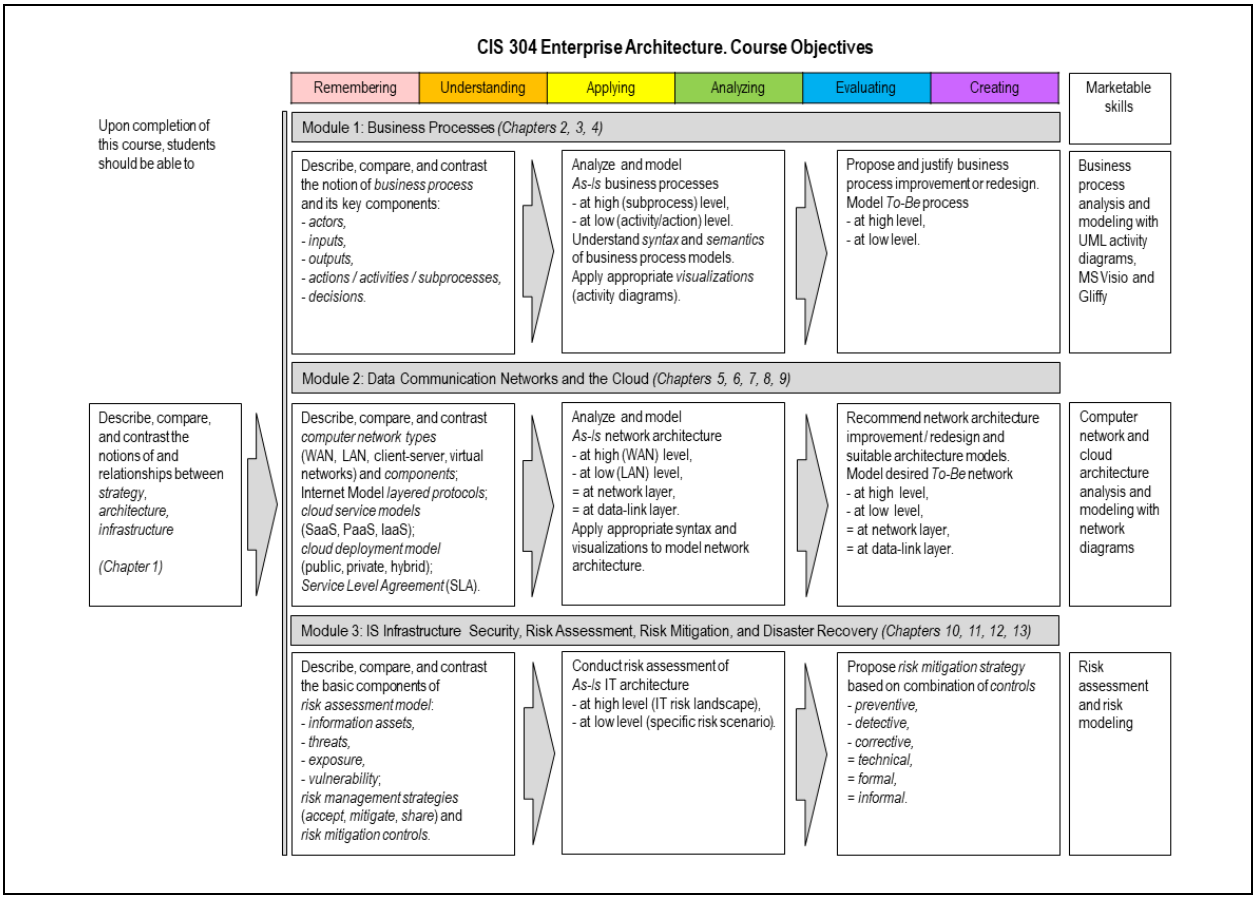

Figure 4. Sample Visualized Course Objectives for "Enterprise Architecture"

4. OBSERVATIONS AND EVIDENCE

4.1 Qualitative Evidence

The value of this technique was acknowledged by both instructors and students. After the initial introduction of the visualization by one of the authors in spring 2018, two other faculty members found using it appropriate and helpful when explaining the course objectives to students. Since then, the practice has been continued for five semesters. Students' and professors' feedback illustrate the usefulness of this visualization. Specifically, students' comments suggested that it gained their initial attention and interest: "Having the course laid out in a way that spells out what we're going to be getting from each portion of the class is extremely valuable because it's more than the jargon-y learning objectives that we see in other classes that don't mean anything yet."

Moreover, students who received course objectives as a visualization were referring to them throughout the semester and frequently checked with the instructor to better understand how current assignments map into the course objectives:

> Visual course objectives did help me navigate both [Enterprise Architecture and Systems Analysis and Design] courses; It was really helpful to have the courses broken down into "stages" where I could see what the course would be focusing on, what I would be learning, and the skills I should gain at each stage.

Students referred to the visualization when they updated their resume at the end of a unit or at the end of the course:

> I was able to have a much better understanding of the kinds of relevant marketable skills I would be able to put on my resume, and the course objectives visualizations did help my resume; I am able to replace relevant coursework on my resume with real hard skills that I have gained which I believe speaks louder than a course title.

After this visualization was initially proposed for the "Enterprise Architecture" course, instructors teaching other IS courses, such as "Systems Analysis and Design," expressed interest in this technique. One of the instructors commented:

> The visual objectives were great on the first day of class. Usually students have a glazed look when presented with a long list of course objectives. This visual immediately caught their attention and even stimulated discussion. One student commented that she thought most college classes were just a long list of topics that didn't often seem to fit together. But she could see that this class did and she wondered out loud if all professors saw their classes like this. I found the visual course objectives to be helpful when discussing results on exams and quizzes. Having Bloom's Taxonomy across the top, especially in color, allowed me to better explain a grade to students that were questioning the evaluation of a problem. For example, I could ask, "did you evaluate everything necessary to mitigate that threat and create the best controls? Or did you just remember and understand that there were a few controls that could be applied?" The graphic permitted me to actually point at a location on the visual objectives and discuss the differences between simple and complex problem solving, rather than requiring […] rote memorization. Having marketable skills on the course syllabus was new to me. It makes sense, especially for a class in computer information systems. Having the objectives of a course displayed from simple to complex, and then matched up with the course outcomes written as marketable skills, makes so much sense. It is a great idea.

4.2 Quantitative Evidence

To support our intervention with quantitative evidence, in the fall 2019 semester, we conducted an anonymous, voluntary survey of students' confidence in understanding the objectives of the course. Although our educational context did not permit a rigorous, controlled experiment, our objective was to obtain some quantifiable support of the premise of visualized course objectives. We surveyed 201 students taking 2 junior-level courses: "Enterprise Architecture" (101 students, 81% male, 4 sections taught by 2 professors) and "Intermediate Application Development" (100 students, 79% male, 3 sections taught by 1 professor); the participants' median age was 20-21 years. These two courses are required for CIS majors and minors. Objectives in these two courses are very comparable in terms of volume and complexity. In the sections of the "Enterprise Architecture" course, the objectives were presented using a visual format, and in the sections of the "Intermediate Application Development," the objectives were presented in the traditional format of listed statements. In both groups, the objectives were presented and explained at the beginning of the semester to set the trajectory and expectations for the course; then, the objectives were presented again in the middle of the course, with re-iteration on what objectives have already been covered and what remain to be covered.

The results of a short, voluntary survey of students in these two courses after the mid-semester review of the course objectives demonstrated that in both groups, on average, students had high self-reported confidence in claiming to know what they gained from the course; that is, that they understood the structure of the course well, could add marketable skills to their resumes, and could explain to their potential employer what they learned. However, when asked about specific skills, students in the sections where visualized course objectives were presented showed higher confidence in being able to perform tasks requiring those skills than students in the sections where course objectives were presented in the traditional textual format. Students who were exposed to visualized objectives also demonstrated greater variability in specific skills they would add to their resume upon completion of the course, suggesting that those students had more understanding of all the skills shown in the visualization. These students seemed to better grasp the complexity of the course objectives than students presented with "traditional" course objectives. While these results could be affected by a number of factors, and we cannot make claims of statistical significance, this evidence supports that presenting the visualized course objectives with highlighted marketable skills can positively affect students' understanding and their confidence in acquiring the skills, strengthening the case of visualized objectives presentation.

Upon completion of this course, students should be able to:

I. Demonstrate an understanding of the systems development life cycle:
   a. Explain the purpose of each of the four phases (planning, analysis, design, and implementation), the steps that are part of each phase, and the relationship between the phases;
   b. Be able to determine the appropriate approach for a given project, including selection of an overall methodology and the appropriate techniques and strategies within each phase;
   c. Demonstrate an understanding of the professional and ethical responsibilities of systems analysts in a global environment.

II. Demonstrate proficiency in the techniques needed for a systems development project:
   a. Demonstrate the ability to analyze a business problem, and identify and define the computing requirements appropriate to its solution;
   b. Model a system using object-oriented techniques including activity diagrams, use-case diagrams, use-case descriptions, and sequence diagrams;
   c. Assess the feasibility of a systems development project;
   d. Apply project-management tools to a systems development project;
   e. Conduct an effective requirements elicitation interview.

III. Be able to work effectively in a team to perform systems analysis and design.

IV. Communicate effectively (in writing and orally) with users about systems development projects and be able to serve as a liaison between the technical and business groups.

Figure 5. Pre-visualization Course Objectives of "Systems Analysis and Design"

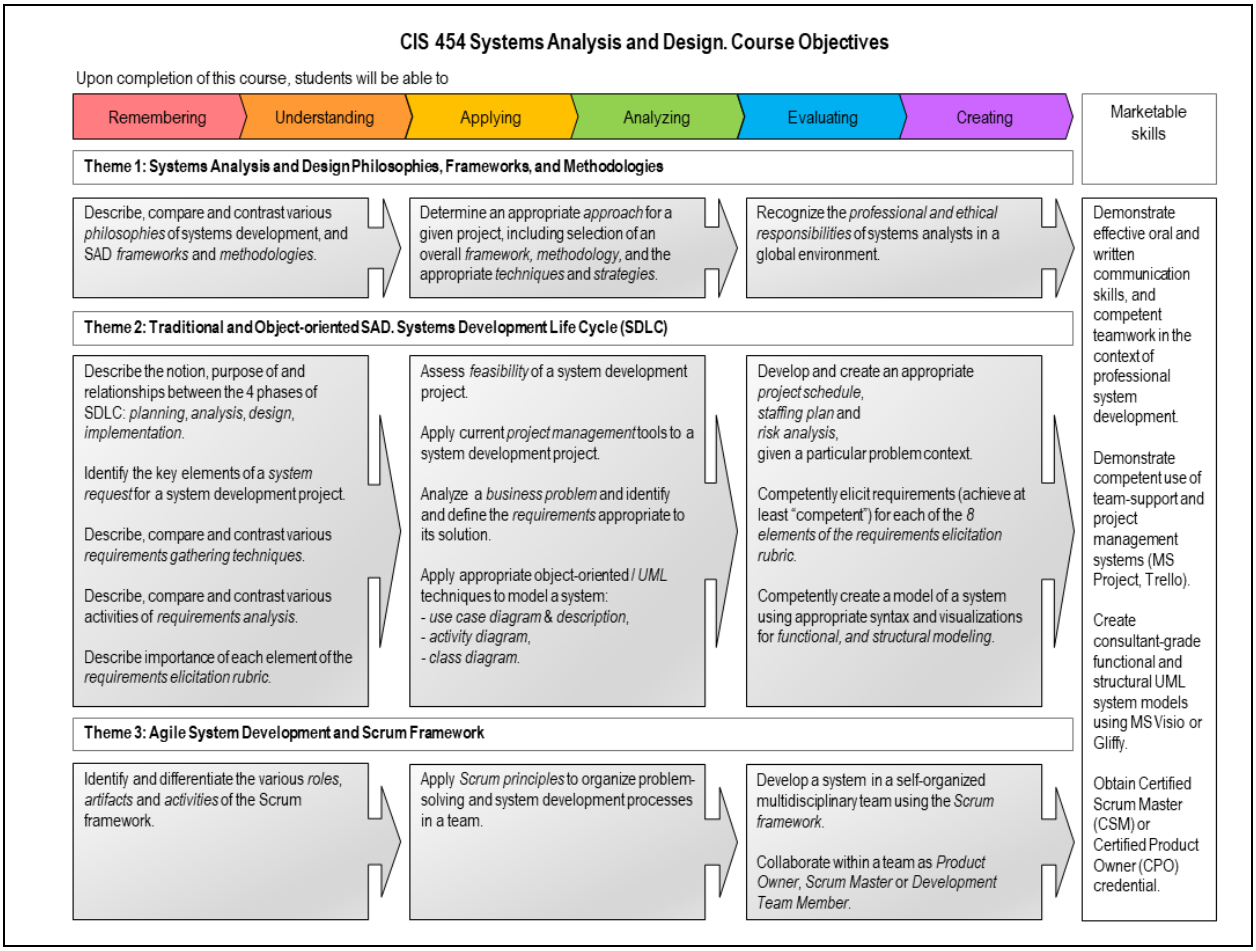

Figure 6. Visualized Course Objectives of "Systems Analysis and Design"

5. TEACHING SUGGESTIONS AND DISCUSSION

Based on our experience with developing course objectives visualizations, we make the following recommendations to those instructors who are interested in this approach. We illustrate this with the example of the "Systems Analysis and Design (SAD)" course taught at our institution using the textbook *Systems Analysis and Design: An Object-Oriented Approach with UML, 5/e* by Dennis, Wixom, and Tegarden. The objectives for this course before visualization are shown in Figure 5; the visualized objectives are shown in Figure 6.

Step 1: Align existing objectives with Bloom's taxonomy. Our SAD course objectives already used verbs that indicated the highest level of Bloom's taxonomy that we expected students to achieve (e.g., *determine* the appropriate approach, *model* a system, *conduct* an interview, etc.). We referred to Fink (2003) or similar works for identifying relevant verbs for the objectives.

Step 2: Break your course into two to four modules. These modules can be course blocks, major topics, themes, tracks, etc. For example, for several years, our SAD objectives were organized around the phases of the Systems Development Life Cycle (SDLC); therefore, we initially used the natural modules suggested by our SAD textbook – the planning, analysis, and design phases. Our course was focused on planning and analysis, while the design and implementation are covered in the follow-up capstone course. Now our SAD course also introduces students to Agile frameworks, including Scrum, as alternatives to the SDLC framework and the Waterfall methodology. This fact, which was obscured in the pre-visualization objectives shown in Figure 5, is now fully illustrated in the visualized objectives in Figure 6. In general, the modules of a course may not be very obvious, and identifying them might require incremental refinement. In our case, we considered at first that choosing an appropriate development framework was a part of the planning phase of a system development project. After a number of iterations, we ultimately decided to have an overview module that discussed the choice of frameworks and methodologies and the discussion of structured versus Agile system development; we also decided to move away from structuring the course around the four phases of the SDLC.

Step 3: Map objectives to modules. As stated in Step 1, our initial objectives indicated competencies at the highest level of Bloom's taxonomy, but neglected beginner competencies. To show the progression through the levels of Bloom's taxonomy, we needed to add appropriate lower-level objectives in our visualization. This exercise led to useful discussions among the faculty about why, how, and what we expected our students to learn by the end of the course. We recommend expressing objectives by highlighting the core concepts, ideas, and skills (e.g., system, model, activity diagram) and cognitive abilities ("describe," "compare and contrast," "apply," "model," "propose"). Within each theme, arrange objectives from basic to more advanced according to Bloom's taxonomy and incorporate Bloom's taxonomy into visualization.

Step 4: Find a visual form for the presentation. We ended up using a 3x3 matrix as the canvas for our visualization. This particular representation may not be necessarily the most appropriate form for every course, but in our case it organically integrated and interrelated the modules/themes and progression. Some inspirations and ideas for other visual forms may be drawn from the books on pedagogy (e.g., Fink, 2003), visualization examples such as www.bridging-the-gap.com/22-visual-models-used-by-business-analysts, or academic papers in your specific domain (e.g., Palvia, Midha, and Pinjani, 2006). We find it useful to retain the same visual form across different courses in our CIS major so that students become accustomed to "reading" these visualizations in a certain way. But if and when a different form becomes more effective in structuring and conveying the objectives, it should be developed, refined, and used instead. We place the "Upon completion of this course" part in the top left corner of the image to signify that it applies to all objectives.

Step 5: Incorporate marketable skills. Define and concisely describe marketable skills that students could add to their resumes after taking the course. Our faculty guide students in their resume preparation, so this was a natural addition to the visual presentation of the objectives. It helps students understand *why* they take a course, *what* they take from it to the professional world, and *how* they get there.

Step 6: "Repeat" (solicit feedback and continue refinement). As you explain your objectives to students, solicit their feedback and incorporate it in refining your visual model semester after semester. While the objectives themselves will tend to remain fixed for some time, the way they are conveyed may and, perhaps, should be continuously improved to reflect students' understanding and expectations.

6. CONCLUSION

This teaching tip demonstrates and discusses an approach to increasing students' awareness of and curiosity about the course objectives by presenting them in a visual form and linking them to marketable skills. Our evidence suggests that, thanks to visualized objectives, students have a better "big picture" of *what* they are doing in the course and what specific concepts and skills they need to learn, as well as *how* these concepts and skills translate into marketable skills in their professional resumes. This generally keeps students more engaged and helps them perform better in the course. Although visualizing objectives is not the sole or a major contributing factor to students success, we believe that presenting objectives in a visual form contributes to students' appreciation of what they learn in IS courses and offers them good examples of how their ideas can be conveyed in a more understandable and appealing form to their future clients, thus improving the overall culture of CIS communications.

A further and deeper investigation of the efficacy of visualized objectives for students' engagement and learning is undoubtedly needed beyond students' and instructors' comments or simple comparisons. For example, Mitchell and Manzo (2018) found that the phrasing of textually presented objectives did not have a statistically significant effect and consistent impact on students' perceptions and performance, while our empirical evidence suggests the contrary. This inconclusiveness offers the opportunity for interesting research questions and studies.

7. ACKNOWLEDGMENTS

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8. REFERENCES

Bates, B. (2019). *Learning Theories Simplified: ...and How to Apply them to Teaching*. SAGE Publications Limited.

Berger-Walliser, G., Bird, R. C., & Haapio, H. (2011). Promoting Business Success through Contract Visualization. *Journal of Law, Business & Ethics*, 17, 55–76.

Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *The Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. New York: David McKay Co., Inc.

Brooks, S., Dobbins, K., Scott, J. J. A., Rawlinson, M., & Norman, R. I. (2014). Learning about Learning Outcomes: The Student Perspective. *Teaching in Higher Education*, 19(6), 721–733.

Dalis, G. T. (1970). Effect of Precise Objectives upon Student Achievement in Health Education. *The Journal of Experimental Education*, 39(2), 20–23.

Duchastel, P. C. & Merrill, P. F. (1973). The Effects of Behavioral Objectives on Learning: A Review of Empirical Studies. *Review of Educational Research*, 43(1), 53–69.

Fink, L. D. (2003). *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. John Wiley & Sons.

Gooblar, D. (2017). Your Syllabus Doesn't Have to Look Like a Contract. Retrieved February 25, 2019, from https://chroniclevitae.com/news/1864-your-syllabus-doesn-t-have-to-look-like-a-contract.

Gronlund, N. E. (2004). *Writing Instructional Objectives for Teaching and Assessment*. Pearson/Merrill/Prentice Hall.

Hall, M. (2016). Writing Effective Learning Objectives [Blog]. Retrieved February 25, 2019, from https://ii.library.jhu.edu/2016/07/20/writing-effective-learning-objectives/.

Hangen, T. (2011). Extreme Makeover, Syllabus Edition [Blog]. Retrieved February 25, 2019, from http://www.tonahangen.com/2011/01/syllabus-makeover/.

Heinich, R. (2002). *The ASSURE Model. Instructional Media and Technologies for Learning, 7th Edition*. Upper Saddle River, NJ: Merrill/Prentice Hall.

Kizlik, B. (2003). How to Write Learning Objectives that Meet Demanding Behavioral Criteria. Retrieved February 25, 2019, from http://www.adprima.com/objectives.htm.

Lending, D. & Vician, C. (2012). Writing IS Teaching Tips: Guidelines for JISE Submission. *Journal of Information Systems Education*, 23(1), 11–18.

Leone, E. A., Salisbury, S. L., Nolen, Z. L., Idema, J. L., Parsley, K. M., Stefanik, K. L., & Daniel, K. L. (2019). Identifying the Breakdowns in How Students and Faculty Interpret Course Objectives. *Bioscene: Journal of College Biology Teaching*, 45(1), 16–23.

Ludy, M.-J., Brackenbury, T., Folkins, J., Peet, S., Langendorfer, S., & Beining, K. (2016). Student Impressions of Syllabus Design: Engaging Versus Contractual Syllabus. *International Journal for the Scholarship of Teaching and Learning*, 10(2), n2.

Mager, R. F. (1997). *Preparing Instructional Objectives: A Critical Tool in the Development of Effective Instruction* (3 ed.). Atlanta, GA: Center for Effective Performance.

McKee, K. (2016). Why Students Don't Care about Your Learning Targets. Retrieved April 5, 2019, from http://kennycmckee.com/why-students-dont-care-about-your-learning-targets/.

Miller, G. A. (1956). The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information. *Psychological Review*, 63(2), 81–97.

Mitchell, K. M. W. & Manzo, W. R. (2018). The Purpose and Perception of Learning Objectives. *Journal of Political Science Education*, 14(4), 456–472.

Morreale, S., Backlund, P., & Sparks, L. (2014). Communication Education and Instructional Communication: Genesis and Evolution as Fields of Inquiry. *Communication Education*, 63(4), 344–354.

Naps, T., Cooper, S., Koldehofe, B., Leska, C., Rößling, G., Dann, W., Korhonen, A., Malmi, L., Rantakokko, J., Rockford, J. R., Anderson., J., Fleischer, R., Kuittinen, M., & McNally, M. (2003). Evaluating the Educational Impact of Visualization. *ACM SIGCSE Bulletin*, 35(4), 124–136.

Palvia, P., Midha, V., & Pinjani, P. (2006). Research Models in Information Systems. *Communications of the Association for Information Systems*, *17*(1), 1042–1063.

Passera, S., Smedlund, A., & Liinasuo, M. (2016). Exploring Contract Visualization: Clarification and Framing Strategies to Shape Collaborative Business Relationships. *Journal of Strategic Contracting and Negotiation*, 2(1–2), 69–100.

Rekola, K. & Boucht, K. (2011). Visualizing Service Contracts – The Case of an Equipment Manufacturer. *15th International Conference on Information Visualisation*, 359–364.

Robb, C. (2016). How To Get Your Students To Read Your Syllabus: An Infographic [Blog]. Retrieved February 25, 2019, from https://colleenrobb.com/2016/02/21/how-to-get-your-students-to-read-your-syllabus-an-infographic/.

Skoyles, A., Bullock, N., & Neville, K. (2019). Developing Employability Skills Workshops for Students' Higher Education Achievement Reports. *New Review of Academic Librarianship*, in press.

Srinivasan, S. (2019). 5 Steps to Designing a Syllabus That Promotes Recall and Application. *Harvard Business Publishing – Education*. Retrieved September 30, 2019, from https://hbsp.harvard.edu/5-steps-to-designing-a-syllabus-that-promotes-recall-and-application.

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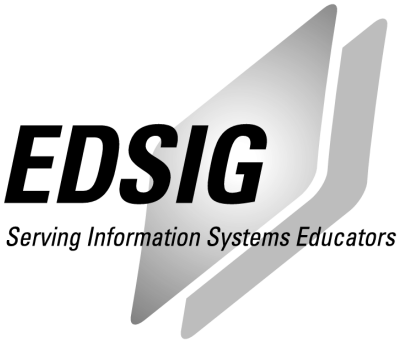

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