

Measuring Student Transformative Learning in a Biology Lab

Mark E. Walvoord



ABSTRACT:

Biology laboratory teaching techniques include active learning, collaboration, critical thinking, writing, reflection, and often discourse. Transformative learning theory states that students are given their best opportunities for transformation through willingness to grow, engagement in learning experiences, critical reflection, and substantive discourse. So, students in biology laboratories have a great setup through which to be transformed. To know if this really is happening, biology educators need assessment tools to measure levels of student transformation. Our university has recently implemented such a tool, campus-wide, through an initiative called the Student Transformative Learning Record (STLR). This poster describes the STLR rubric and gives suggestions for other instructors to implement a similar framework in their biology laboratory courses.

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INTRODUCTION:

Transformative Learning is an adult learning theory. It states that students who are willing to learn, then go through disorienting dilemmas, resolve these through reflection and discourse, leading to a lasting change in their belief, perspective, or understanding (Mezirow, 2010; Taylor & Cranton, 2012). On our campus, Transformative Learning (TL) is part of our mission, as a means to graduate students who are productive, creative, ethical, and engaged citizens and leaders of their communities. We define TL as developing beyond-disciplinary skills and expanding students’ perspectives of their relationships with self, others, community, and environment. We measure their transformation across our Central 6 Tenets (Fig. 1).

Figure 1. UCO’s Central 6 Tenets, core areas of student learning



Campus faculty and staff can create assignments and activities that are more conducive to student transformation by using high-impact practices (Kuh, 2008) like service learning, collaboration, undergraduate research, and writing-intensive projects. Since these are common practices in Biology laboratory courses, and promoted by ABLE, Biology education is an ideal setting to encourage and assess student transformative learning.

METHODS:

The University of Central Oklahoma has implemented a unique, campus-wide process to capture, assess, and track students’ Transformative Learning. It is called the Student Transformative Learning Record (STLR, <http://uco.edu/stlr>). A team of faculty, staff, and administrators drafted definitions of TL and of our Central 6 tenets (see icons above) and developed rubrics for assessing students’ growth in each of these. *Discipline Knowledge* was already assessed in coursework and recorded on the traditional academic transcript, but the other tenets needed criteria. We used existing American Association of Colleges and Universities’ VALUE rubrics (<https://www.aacu.org/value>) as the foundation for our STLR rubrics, and drafted criteria to assess at the levels of Exposure, Integration, or full Transformation. See rubrics at <http://uco.edu/tl> and one example from our *Health & Wellness* tenet below (Table 1).

Table 1. Our rubric for assessing student artifacts on the Health & Wellness tenet

TRANSFORMATION	INTEGRATION	EXPOSURE
<ul style="list-style-type: none">•The student personifies a holistic view of health and wellness (physical, spiritual, emotional, intellectual, environmental, financial, occupational, and social) and can articulate its meaning to others.•Student demonstrates commitment to care of self and/or others.•The student exhibits behaviors that demonstrate a change in perspective in fostering and sustaining a healthy community and natural environment.	<ul style="list-style-type: none">•The student exhibits an understanding of concepts for health and well-being and has begun to integrate at least one of the <u>eight dimensions of wellness</u> into their overall health and well-being.•Student participates in activities that demonstrate life balance, wellness, and maintenance of a healthy lifestyle.•The student can determine the need for change to improve their own health and wellness and/or the well-being of their community and natural environment.	<ul style="list-style-type: none">•The student has a basic awareness and understanding of at least one of the <u>eight dimensions of wellness</u> (physical, spiritual, emotional, intellectual, environmental, financial, occupational, and social).•Student is aware of the importance of activities that foster health and wellness, but may have minimally incorporated behaviors into personal lifestyle.•Student has had a basic introduction to issues around the community and their natural environment.

TRANSFORMATIVE LEARNING IN YOUR LAB:

Using Backwards Design principles

1. Identify the beyond-biology skills you’d like students to have when they leave your class. Maybe your institution already has a set of these.
2. Decide what it would look like for a student to display evidence of the best mastery of those skills, intermediate mastery, or just beginning understanding. Then, put this into a rubric (on paper or an MS Excel file or in your LMS).
3. Create or modify activities (perhaps using existing ABLE resources) to meet those goals--tagging which activities give students the best chance for growth in the specific skills you identified.
4. Explain to students:
 - a) the goals of each activity;
 - b) this new, non-grade-based assessment; and,
 - c) some incentive (e.g., highlighting these skills to future employers may help you land the job; the student with the most, mastered skills at the end of the semester will receive a free lunch)

Faculty and staff attend 6-hour training that covers TL theory, best practices, and STLR procedures, then they submit assignments, events, student groups, or independent projects to be STLR-tagged. They decide in which one or more tenets students have the best chance for growth then use the general STLR rubric(s) to create more assignment-specific criteria for each of those tenets at the three levels. Once students submit an artifact (e.g., reflection paper), the supervisor then assesses the submissions using their STLR rubric. Students can view this feedback and push their artifacts, ratings, and feedback to their ePortfolios.

We partnered with our Learning Management System provider, Desire2Learn (D2L)/Brightspace, to set up their existing competency structure tool to record student achievements campus-wide (i.e., across all students, all courses, and all semesters), then to display student progress on a dashboard (Fig. 2). So, as soon as a STLR supervisor publishes the students’ STLR ratings from a D2L dropbox/rubric, students’ dashboards update to show another “credit” in the assessed tenet(s). Students can click on tenets to drill down to levels achieved and click further to view each assignment or activity that was assessed (Fig. 2 inset). This setup is based on game theory and badging to help motivate students (Gibson *et al.*, 2015).

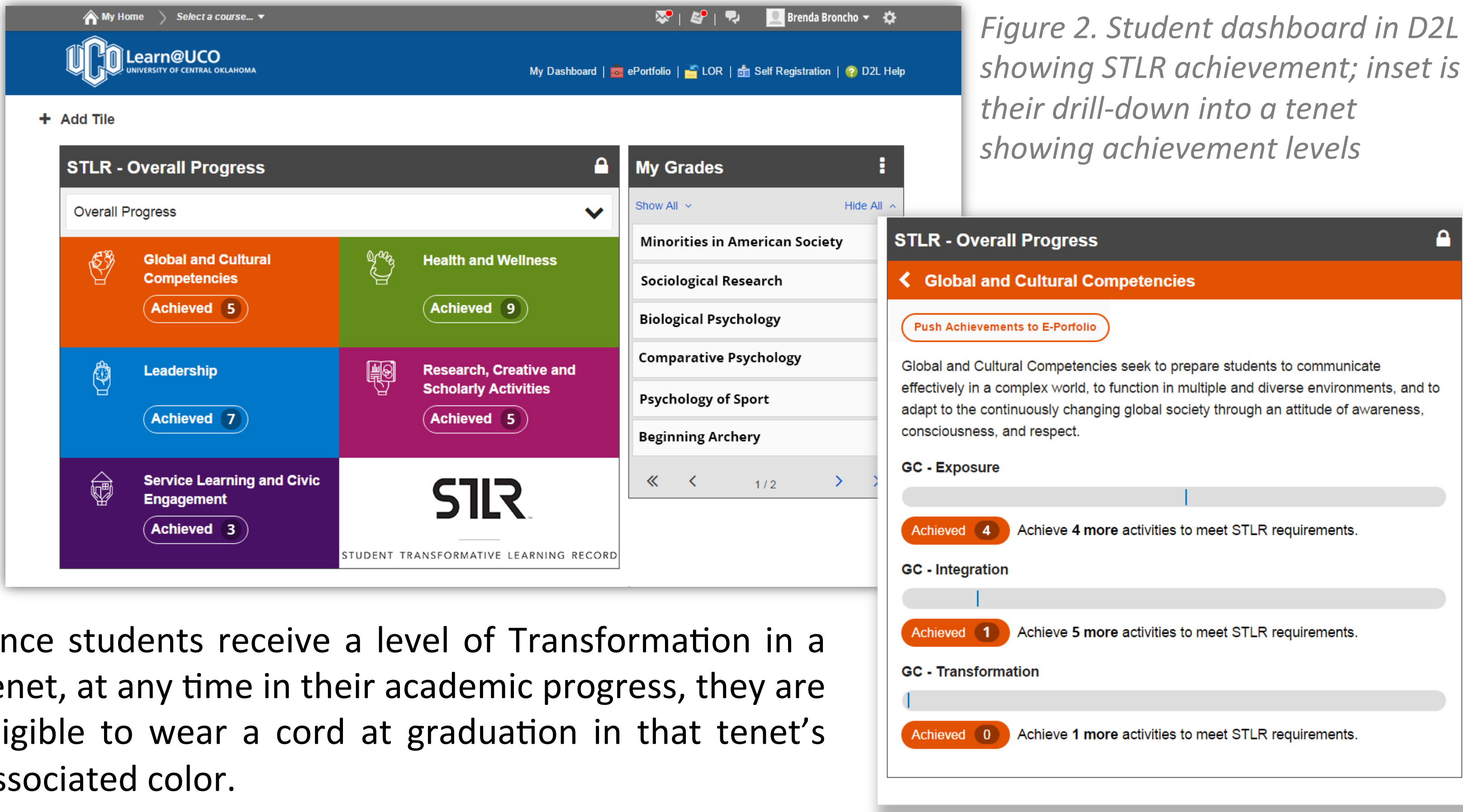


Figure 2. Student dashboard in D2L showing STLR achievement; inset is their drill-down into a tenet showing achievement levels

SCENARIO:

For instance, a biology student might have an assignment in his introductory biology class to watch a documentary and TED talk about declining bee populations, then answer some prompts. The professor grades this assignment, but also gives *Exposure*-level credits for the student’s *Health & Wellness* and *Global & Cultural Competencies* tenets. The student attends department seminars his sophomore and junior years that emphasize research. At each of these, he swipes his ID card to get automatic *Exposure*-level credits in the *Research, Creative, & Scholarly Activities* tenet. During his junior and senior years, he works in the lab of Dr. Wei Chen, researching laser immunotherapy for cancer treatment. He contributes to two research papers, presents his findings at a research day on campus (Fig. 3a), and writes up a reflection paper describing how his understanding of research, and his future career path in health research, have been changed through this research experience. Dr. Chen marks the student as having reached *Transformation* in the *Health & Wellness* and *Research, Creative & Scholarly Activities* tenets. The student attends a cording ceremony during graduation weekend, where the Provost presents him with green and fuchsia cords (Fig. 3b). The student highlights skills gained through these experiences on his graduate school applications.



Figure 3. A student presents his research findings (left); the student receiving his tenet cords (below).

DISCUSSION:

Results of our first full-year implementation are forthcoming, but pilot data show increased student retention and GPA for students that participated in STLR versus those that didn’t. Even without the technology infrastructure to implement a STLR-like setup for a biology laboratory course, individual instructors can use the same concept to motivate student learning in biology and beyond-biology content (e.g., communication, collaboration, and problem solving). See the blue box above-center for suggestions, encourage your chair to track and record growth across a degree program, or talk to your dean about tracking transformations inter-departmentally.

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