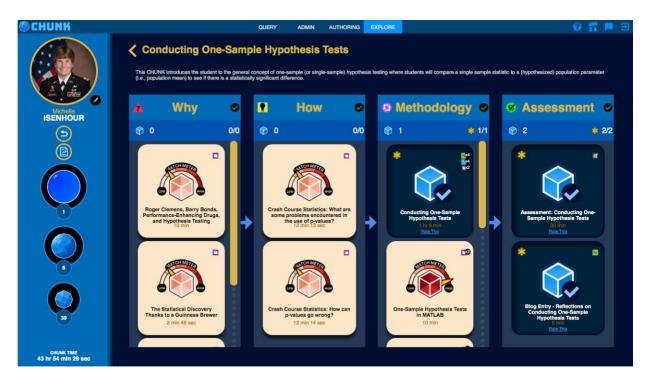
Student Self-Assessments in a Computational Data Analysis Course

I teach basic (undergraduate) statistics and data analysis to students at the graduate level. The purpose of my course is to prepare students for computational data analysis they will see in their downstream courses, as well as in their future careers as military officers and US Department of Defense civilians.

As I describe my methods to allow the students to self-assess their computational thinking skills, I'm going to also describe a current research project at the Naval Postgraduate School called CHUNK Learning. I've been given an opportunity to integrate my teaching methods and materials with the software proof-of-concept we developed and I currently have 27 students learning computational statistics and data analysis using the CHUNK Learning platform in an enriched classroom environment (the quarter ends at the end of September, so feel free to ask me in October how it went).



Because the majority of my students come from a variety of backgrounds and academic programs, I try to give them a broadening experience (prior to the assessment) using a three-pronged approach. First, I try to find motivational videos, papers, or blog articles. In CHUNK Learning, these activities motivate the learner by attempting to answer the "Why should I learn this?" or "How will I use this in real life?" questions before the student engages with the learning material. The following table lists some examples that I typically use when covering hypothesis testing. The intent is that the student will watch or read those activities that best align with his/her interests (in fact, the CHUNK Learning environment presents the materials to the student so that the ones with the highest "match" to the student profile is on top).

Topic	Type	Title	URL
Hypothesis Tests	Why?	Which Hypothesis Test to	https://towardsdatascience.com/which-hypothesis-test-to-perform-
		Perform	<u>89d7044d34a1</u>
One-sample	Why?	Roger Clemens, Barry	https://sigmazone.com/clemens_bonds_hypothesis_test/
Hypothesis Tests		Bonds, Performance-	
		Enhancing Drugs, and	
		Hypothesis Testing	
One-sample	Why?	The Statistical Discovery	https://youtu.be/U9Wr7VEPGXA
Hypothesis Tests		thanks to a Guinness Brewer	
One-sample	How?	Crash Course Statistics: How	https://youtu.be/WWagtGT1zH4
Hypothesis Tests		can p-values go wrong?	
Two-sample	How?	Does the Nike Vaporfly	http://www.nytimes.com/interactive/2018/07/18/upshot/nike-
Hypothesis Tests		Running Shoe Make a	vaporfly-shoe-strava.html
		Difference?	
Two-Sample	How?	Which Movie is the Best?	https://towardsdatascience.com/hypothesis-testing-in-real-life-
Hypothesis Tests			<u>47f42420b1f7</u>
Two-Sample	How?	Cryptocurrencies are Less	https://blockonomi.com/cryptocurrencies-are-less-correlated-with-
Hypothesis Tests		Correlated with Bitcoin in	bitcoin-in-2019/
		2019	
Two-Sample	How?	Preferred Leadership Styles	https://thesportjournal.org/article/preferred-leadership-styles-of-
Hypothesis Tests		of Student Athletes in a	student-athletes-in-a-midwest-naia-conference/
		Midwest NAIA Conference	

Then, when creating the lesson plan (referred to as the Methodology in CHUNK Learning), I program a pre-class assignment that is intended to serve as a self-assessment for the student. The student first reads/reviews the text and tries the assignment. The student is then presented with the solution, along with my MATLAB script file (or Live Notebook). This allows the student to determine where he/she is deficient prior to attending the class lecture. Additionally, in the Methodology portion, I tend to provide a variety of resources (tools for their toolbox) from the internet (MATLAB documentation, how-to videos, etc.). The in-class lecture includes additional practical exercises or hands-on experience before the student returns to CHUNK Learning to attempt the assessment.

The assessment consists of a computer-based assessment that provides immediate feedback to the student. All assessments are open book, open notes and the use of a calculator or any statistical software package is authorized. Additionally, students may retake the computational assessment an unlimited number of times. Originally, the students were only allowed one attempt at the assessment, but I found that by allowing the student multiple attempts, they are able to learn from their mistakes and reinforce their computational skills.

The second part of the assessment consists of an individual blog entry which requires the student to conduct a final self-assessment by answering specific questions. The questions typically require the students to map the content to real-world examples and explain how they would utilize the techniques. Their blog responses allow me to gauge their comfort with the material as well as their comfort with computation using the statistical software package.

The focus at the individual topic level is centered around the student; all assessments allow the student to assess how well he/she understands the material. The course capstone project and final exam allow me, as the instructor, to assess overall learning.