Supplemental Material

CBE—Life Sciences Education

Hewitt *et al.*

Supplemental Material.

The Socio-Scientific Issues based curriculum used in the article was a combination of previously published lab modules and newly developed modules situated in Socio-scientific issues (see Supplemental Material Table 1 for examples and references). For an example of a newly developed lab and how the socio-scientific issues are implemented see Hewitt, et al. 2014. Authors are happy to share all curricular materials with interested persons. For access, please contact corresponding author (L.Kayes).

Table 1. Outline of 10 Weeks of Socio-Scientific Issues-Based Labs Implemented

Week No.	Lecture/Lab Topic	Example Lab Activities	Socio-Scientific Issue
1	Mitosis & Meiosis	Karyotype analyses of patients with case studies	Genetic testing – What would you want to test for?
2	Genetics	Investigate heritability of traits- compare artificial selection to genetic modification	Should we allow GMO agriculture in our area?
3	DNA Replication, Transcription & Translation	Students extract their cheek DNA and perform PCR to find their genotype for bitter taste gene (see Merritt et al., 2012)	Do you want your human genome sequenced? Who should have access to it?
4	Molecular Biology	Students analyze PCR results with gel electrophoresis to determine their genotype for bitter taste gene (see Merritt et al., 2012)	Cont'd previous
5	Evolution & Natural Selection	Students analyze mtDNA sequences from humans of different origins and design a drug trial. (see Kalinowski et al., 2012) They use Hardy Weinberg to analyze course PTC allele frequency data.	Should doctors treat patients with certain medications based on "race"? How should human evolutionary genomic research be reported to the public?
6	Climate & the Biosphere (conservation & animal migration)	Students predict amphibian migration events based on temp. and precipitation. (see Amphibians on the Move, Urban lab)	What should be done about wildlife mortality on roadways?
7	Animal Behavior	Students perform crayfish	How would you deal

	(Invasive Crayfish Behavior)	agonistic behavior contests with invasive crayfish. (see Hewitt et al., 2014)	with existing populations of invasive crayfish in our state?
8	Terrestrial Ecology I	Students identify plants from local creek watershed and prep for being part of course-wide experiment in false brome removal.	What should be done about noxious weeds in our area?
9	Terrestrial Ecology II	Students pull and measure false brome in plots in the field while learning ecological sampling methods.	Cont'd previous
10	Human Impacts on the Ecosystem	Students were assigned an outdoor environment and developed and presented an ecotour based on what they learned over the term. (see Boes, 2013)	How should we deal with tourism's impacts on the environment?

Boes, K.E. (2013). Campus Eco Tours: An Integrative & Interactive Field Project for Undergraduate Biology Students. *The American Biology Teacher, 75,* 330-334.

Hewitt K., Kayes, L.J., Hubert, D.,&Chouinard, A. (2014). An Issues-based laboratory module for integrating animal behavior and invasive species concepts: Investigating the effects of the invasive red swamp crayfish. *American Biology Teacher, 76,* 609-614.DOI: 10.1525/abt.2014.76.9.7

Kalinowski, S.T., Andrews, T.M., Leonard, M.J., &Snodgrass, M. (2012). Are Africans, Europeans, and Asians different "races"? A guided-inquiry lab for introducing undergraduate students to genetic diversity and preparing them to study natural selection. *CBE-Life Sci Educ, 11,* 142-151.

Merritt, R.B., Bierwert, L., Slatko, B., Weiner, M.P., Ingram, J., Sciarra, K., &Weiner, E. (2008). Tasting phenylthiocarbamide (PTC): A new integrative genetics lab with an old flavor. *The American Biology Teacher, 70,* 23-28.

Taylor,C., Freidenfelds,N., &Urban M. (2012). Amphibians on the move: Predicting why and when. Retrieved from: http://hydrodictyon.eeb.uconn.edu/people/urban/teachers.html)

Table 2.

Student responses to questionnaires by code categories, descriptions and frequencies from open response questions given in the end of term (week 10 survey).

Survey Question	Coded Category	Number of References		Code Description
		SSI (n=435)	Control (n=415)	
GTA Relationships	Excited to teach	178	137	GTA was perceived to be excited about teaching and/or passionate about the subject
	Somewhat excited to teach	8	6	GTA was perceived to be somewhat excited about teaching or excited to teach a particular topic but not others
	Didn't seem excited to teach	9	17	GTA was not perceived to be excited about teaching and/or passionate about the subject
	Positive about GTA quality and/or relationship	249	155	GTA was perceived to be "awesome", "wonderful", "excellent", etc.
	Average quality/relationship	13	19	GTA was perceived to be "average", "ok", "fine", etc.
	Negative/no relationship	14	31	GTA was perceived to be "rude", "mean", "cold", etc. Some stated a general dislike for the GTA
	Cares about student learning	264	240	GTA spent time with students giving them extra help and/or were reported to display a caring attitude about student learning
	Knowledgeable	57	39	GTA was perceived to be knowledgeable about biology
	Made things fun	27	24	GTA made things "fun", "enjoyable", "exciting", etc.
	Confused or ill-prepared	28	19	GTA was perceived to be "confused", "misinformed", "unorganized", etc.
	Good communication	11	9	GTA was perceived to be very accessible through emails, office hours, after class, etc.

	Unfair grader	6	10	The GTA was a “harsh” grader or unclear about expectations
	Low interaction	9	10	There was an insufficient amount of interaction with GTA in class
Peer Relationships	Positive/friendly interactions	394	355	Students “got along” with their peers or enjoyed working together, made friends, etc.
	Negative/problematic interactions	32	46	Students did not get along with one or more group members and/or cited examples of problematic group interactions
	Neutral interactions	35	25	Students got along “fine” or “ok” with peers
	Equal contribution	244	218	Peers contributed equally in the lab activities
	Unequal contribution	37	50	Peers did not contribute equally in the lab activities
	Somewhat equal contribution	9	13	Peers contributed equally “sometimes”, or during some labs
Curriculum Relevance	Skills development for career or coursework	194	203	Some activities were relevant to what they would do in their future careers or in other coursework
	No relation	131	165	Students saw no relevance of the lab activities to their daily lives or future career goals
	Real world relevance/informed decision-making	79	13	Lab activities helped inform students about issues important for their lives and/or gave them a sense of social responsibility
	Interesting or enjoyable	54	28	Lab activities were “interesting”, “fun”, “enjoyable”, etc.
	Major requirement	29	27	Relevant to completion of a major requirement
	Teamwork/social skills	14	15	Developed social skills working in a collaborative setting
	Changed or verified goals, interests, or career paths	12	2	Affirmed interests in certain careers in science or helped them explore new options
	Biology relates to everything	7	9	It’s relevant because life is all around us