**GE RATIONALE**

***Course background****.* In Spring semester & Maymester 2017, Drs. Anelli (.7) and Klooster (.2) co-instructed a version of “Evolution in Darwin’s World and Ours” as two linked courses, both required: ENTMLGY 3790H (2 cr, pre-departure) and ENTMLGY 3797H (1 cr study abroad, UK component). EEOB, History, and Comparative Studies provided concurrences. This submission is a request to revise the two linked courses into a General Education course in Historical Study, ENTMLGY 3797.01E & 3797.02E, the latter as the UK study abroad component.

***Note on student sources****.* A challenge for the instructor teaching about Darwin and evolution is deciding which sources to select for student use, due to the enormity of scholarship given impetus by the “Darwin Industry.”[[1]](#footnote-1) A blessing is that most primary source material is freely available online. We selected key primary sources, and secondary sources that are both authoritative yet intelligible to undergraduates in any major. Additional sources (films, lectures by historians, etc.) enrich the spectrum of evidence for students’ consideration.

***Note on instructor sources****.*  We drew on Darwin-related primary and secondary sources, and scholarly works on the history of biological and evolutionary thought, for course content.[[2]](#footnote-2) We consulted the literature on teaching historical thinking and benefited from the pedagogical ideas of Sam Wineburg (2001, 2018) and others; and referred to Wiggins and McTighe (2005, 2011) and other scholarly sources to inform and develop our assessment methods.[[3]](#footnote-3)

**COURSE OVERVIEW VIS-À-VIS EXPECTED LEARNING OUTCOMES (ELOs)**

**ELO #1. Students construct an integrated perspective on history and factors that shape human activity**

Two of the four required course books, which students read in their entirety, focus on the development of evolutionary theory and its relationship to wider social, political, economic, religious, and intellectual contexts. The first text, Charles Darwin and the Question of Evolution (2011), was written for undergraduates by Darwin historian Sandra Herbert. It includes a selection of excerpts from twenty-nine primary source documents and discusses discoveries and explorers of natural history (e.g., Linnaeus, von Humboldt, Darwin) and sources of evolutionary ideas (e.g., Erasmus Darwin, Thomas Jefferson, George Cuvier, Thomas Malthus, Jean-Baptiste Lamarck, Alfred Russel Wallace), beginning with the late 18th century through publication and reception of the Origin of Species (1859). Herbert also includes a series of questions for students (which we use as writing prompts), a chronology (1739-1882) of the history of evolutionary ideas, and a bibliography arranged thematically.

The second required book, Darwin’s *Origins of Species*: A Biography (2006), is by Janet Browne, reputedly our foremost Darwin biographer. This broadly integrative book is one in the series called “Books That Changed the World.” Browne discusses Darwin’s renowned family tree, influences, close scientific colleagues, personal life, and the publication and reception of the Origin. Like Herbert, Browne discusses William Paley’s Natural Theology (1802), which in essence embodied the Victorians’ view of intelligent design. Darwin embraced natural theology as a college student at the University of Cambridge; his views changed radically after his momentous, 5-year voyage around the world on the HMS *Beagle*. Browne’s final chapter (also quite relevant for ELO #2) summarizes Darwin’s broad, sweeping legacy, with allusions to literature, eugenics, Social Darwinism, the modern synthesis; the disciplines of paleoanthropology, experimental biology, genetics, ethology, primatology, sociobiology; the controversy between biometricians and Mendelians; and 20th century challenges to evolution.

To engage students more holistically and enrich their experience abroad,[[4]](#footnote-4) we show PowerPoint images of art representative of the period under discussion (running a gamut from antiquity to 20th century). In London, we take students to the National Gallery; before our visit they know of “must see” paintings (e.g., we inform them that there is a single Leonardo DaVinci painting in the U.S., so they should view those in the National Gallery). We also inform them of the large number of Impressionist paintings they can view abroad.[[5]](#footnote-5) In London we attend a performance of *Phantom of the Opera*, prior to which we discuss the opera in a scheduled class discussion.

**ELO #2. Students describe and analyze origins and nature of contemporary issues**

As our students comprise a range of majors, to provide context and background on the history of biological thought we begin the course with John Moore’s textbook, Science as a Way of Knowing (1993). Moore’s opening chapter reminds students that our most remote ancestors sought to understand the natural world and that our understanding has progressed as culture, technologies, and other entities of human endeavor evolved.[[6]](#footnote-6) Moore highlights paleolithic art, prehistoric spiritual practices and beliefs (animism, totemism, shamanism), and nature-inspired artifacts from ancient Sumerian, Akkadian, and Egyptian civilizations. These topics are discussed with illustrations. Once abroad in London, interested students can view relevant artifacts at the British Museum, which we visit as a class (gallery 51 and related galleries: <https://www.britishmuseum.org/visiting/galleries/europe/room_51_europe_10,000-800_bc.aspx> ; gallery 56 and many related galleries: <https://www.britishmuseum.org/visiting/galleries/middle_east/room_56_mesopotamia.aspx> ; gallery 64 and many related galleries: <https://www.britishmuseum.org/visiting/galleries/ancient_egypt/room_64_early_egypt.aspx> ).

In subsequent Moore readings, students learn about Aristotle and the classical Greeks, who eschewed the supernatural when explaining nature. Students discover that thousands of years would elapse before hypothesis testing and experimentation became cornerstones of the scientific method (we augment this reading with a lecture on the Scientific Revolution, highlighting Bacon, Vesalius, Harvey, Hooke, Leeuwenhoek)*.*

Moore also highlights the importance of geology and fossil evidence for Darwin’s theory. Darwin maintained a lifetime friendship with Charles Lyell, the great 19th century geologist. In his essential work, Principles of Geology, Lyell cited (and discussed by Moore) the discoveries of 17th century naturalists, Steno and Hooke; Cuvier’s work in vertebrate paleontology; theories on extinction and catastrophism; and Smith’s geological map. Students also view a lecture by eminent evolutionary biologist Sean B. Carroll, who highlights fossil evidence vis-à-vis Darwin’s evolutionary thinking.

Moore examines the paradigm shift from natural theology to evolutionary theory[[7]](#footnote-7) and contrasts the meaning of the terms *theory, hypothesis, proven, fact,* and *truth* in scientific *vs* everyday parlance. Upon completion of these topics (end of week 3), we begin our deep dive into Darwin and evolution. We depart from Moore’s textbook and foundational “content” knowledge to focus student efforts on source-based activities and historical interpretation.

Darwin scholars Herbert and Browne contextualize Linnaeus’ hierarchical taxonomic system and the discoveries of early 18th century naturalists as factors contributing to the emergence of evolution as a concept in the latter part of the 18th century. (Herbert’s book excerpts key primary sources.) Lamarck is generally identified as the first evolutionist owing to his book, Philosophie zoologique(1809), in which he set forth bold views of species mutability and abjured essentialist notions rooted deeply in Plato and Aristotle. Fifty years later, Darwin and Wallace independently envisioned a revolutionary new paradigm that continues to bear fruit.

To underscore the relevance and significance of contemporary evolutionary theory, students read, discuss, and are quizzed on Neil Shubin’s Your Inner Fish (2008). This highly accessible book walks students through the evolutionary history of the human body and illustrates the explanatory power of evolutionary theory. Two online films by Shubin augment his book (<https://www.hhmi.org/biointeractive/your-inner-fish-series> ). A short *Scientific American* article by David P. Mindell (2008) elucidates remarkable advances and unanticipated technologies that derive from evolutionary theory (e.g. forensic genetics, vaccine development, evolutionary medicine, linguistics, and evolutionary computation in computer science).

**ELO #3. Students speak and write critically about primary and secondary historical sources by examining diverse interpretations of past events and ideas in historical contexts**

Students will read and evaluate sources for reliability and biases, identify consistencies and inconsistencies among sources, interpret sources within their historical context, and reconcile divergent interpretations to formulate and justify their own plausible interpretations (these elements comprise the Historical Thinking Skills Scoring Rubric).[[8]](#footnote-8) Some of the primary and secondary sources that students read have generated differing interpretations among Darwin scholars. We surface some of these discrepancies in open-ended questions assigned as Written Reponses (WRs), which provide fodder for discussion (sample questions below).

1. Did Darwin act dishonorably when he allowed Lyell and Hooker to co-publish Wallace’s 1858 manuscript on natural selection with his own evidence for the same mechanism?[[9]](#footnote-9)
2. What were Darwin’s religious views? Did he turn to atheism later in life? Provide evidence in support of your views.
3. How should we interpret the two (1st ed., 1859) or three (6th ed., 1872) religion-infused quotes that open the Origin of Species? Why do you think Darwin included them?
4. What was Darwin’s scientific methodology? Did he proceed (as he claimed) “on true Baconian [inductive] principles,” collecting facts without any theory in mind, or was he testing hypotheses and drawing conclusions [deducing]? What’s your evidence?
5. Why did it take Darwin 20 years to publish his theory of species origin? Evidence?
6. What similarities and differences are there in Darwin’s vs Wallace’s lives and experiences? How important do you think these elements are in terms of each man’s scientific thinking and achievements?
7. How is it that Darwin and Wallace both hit upon the mechanism of natural selection *independently*?

**COURSE ACTIVITIES FOR ASSESSMENT AND EVALUATION (GRADING)**

*Highlight of course activities relevant to ELO #1:* *Students explain cause, effect, and relevance of specific historical events/periods within the broader historical context; students understand and apply basic historical concepts, methodologies, and approaches*

Certain questions in Herbert’s book, and some we wrote for Browne’s book, help students develop of an integrated historical perspective. Students’ answers to our reading-related questions, “Written Responses” (WRs), and Herbert’s questions, are uploaded to Carmen before class time. Their uploaded responses fuel class discussion and help students (particularly the more reticent ones) verbally articulate their ideas. Sample questions follow.

1. From Herbert: In what ways were politics and science intertwined in regard to the theory of evolution between the 1780s and the 1860s?
2. From Herbert: What sort of transatlantic ties were apparent within the natural history community in the eighteenth century?
3. From Herbert: What role did the abolitionist movement play in Darwin and Wedgwood family history? Were Darwin’s ideas on abolition and his ideas on the evolution of species at all related, and if so, how?
4. From Anelli & Klooster: Both Herbert and Browne discuss Chambers’ book, *Vestiges of the Natural History of Creation*, published in 1844. Describe and contrast its reception among the Victorian reading public, theologians, and scientists, and the impact it is thought to have had on Darwin, and Wallace separately (see Wallace’s mention of *Vestiges* in his *Recollections*, excerpted in Herbert; and Darwin’s references to the book in his correspondence). What can account for this diverse array of responses?

Students read, analyze, and evaluate various sources (listed at the end of this document), and discuss their source work in class, beginning in week 4; source-based work continues through the end of the course (when students are completing their Eugenics Essay, next page).[[10]](#footnote-10) In week 5, we introduce an experiential learning activity that we developed to enable students to practice historical thinking and research methodologies. Students work in pairs to conduct a bit of initial research on Benjamin D. Walsh,[[11]](#footnote-11) correspondent of Charles Darwin. They begin working outside of class and continue their work in class, under guided discussion that we lead. The activity starts off with a Wikipedia biographical entry on Walsh[[12]](#footnote-12) and moves successively to an 1870 obituary penned by Walsh’s colleague, to a scholarly article on Walsh,[[13]](#footnote-13) to the online Darwin correspondence ([Darwin Correspondence Project](https://www.darwinproject.ac.uk/)). (Documents in Appendix explain this activity: Historical Thinking Guide, Elements of Historical Thinking, Historical Thinking Skills Scoring Rubric, Historical Thinking Activity: Benjamin D. Walsh and Charles Darwin).

*Highlight of course activities relevant to ELO #2: Students understand history as the study of change over time; contingency (students learn that these changes were never inevitable)*

The two examples below of course work illustrate the origins and nature of contemporary issues; we also provide rationale for their inclusion in this course.

**1. Eugenics Essay.** Browne (2006) broadly contextualizes the eugenic movements in the U.S. and Europe. In our experience, many (if not most) students have little to no knowledge of these movements and their ramifications. Students will write an end-of-semester essay (see Appendix) based on their analyses and evaluation of exhibits (sources) at the virtual [Eugenics Archive](http://eugenicsarchive.org/eugenics/list3.pl). We do not lecture on this topic; the intent is for students to transfer and apply skills they have practiced throughout the course, guided by strategies and procedures articulated in the Historical Thinking Skills Scoring Rubric. We will welcome relevant questions in class during weeks 13 & 14 provided students come prepared to ask them.

**2. Evolution Controversy.** In our experience, most students lack substantive knowledge of Darwin and Wallace and the origins of evolutionary thought, and have little awareness of the significance of modern evolutionary theory and its broad applications. Indeed, despite the everyday impact of evolutionary theory, one in three American adults firmly rejects evolution, and only ~14% acknowledge it as “definitely true.”[[14]](#footnote-14) Introductory biology courses typically cannot devote time to delve into historical nor contemporary issues surrounding evolutionary theory, leaving students uninformed or mired in misconceptions that hamper their ability to examine and resolve conflicting views, particularly regarding human origins. We have found it helpful for students to compare 19th vs 20th/21st century responses to evolutionary theory, as the anti-evolution arguments from both timeframes share many elements (weeks 11 & 12 in the syllabus). Browne and Herbert address the evolution controversy in historical context; Browne and Eugenie Scott (online lecture, “Science and Religion”) discuss the contemporary controversy.

Contingency Examples

As Andrews and Burke (2007; cited in footnote #3) state, “The core insight of contingency is that the world is a magnificently interconnected place. Change a single prior condition, and any historical outcome could have turned out differently.” The central foci of this course are Darwin and evolution. From weeks 4 through 11, students are immersed in Darwin’s life, experiences, thoughts, friends, and correspondents who fulfilled his requests for information about the natural world, influenced him, and were pivotal to paths he pursued. What if he hadn’t gone to Edinburgh and met Peter Grant, or to Cambridge and met Henslow? Both professors were significant for Darwin in his formative years. What if his uncle had been unsuccessful in convincing Darwin’s father that Darwin should be permitted to sail around the world on the *Beagle*? It’s hard to imagine Darwin’s musings about species mutability had he not explored the Galápagos, Cape Verde Islands, or the pampas, particularly when one considers that Darwin hardly ever left the tiny village of Downe once he started a family. What if Hooker and Lyell hadn’t prevailed upon Darwin to co-publish his proprietary evidence for species origin by natural selection together with Wallace’s 1858 manuscript? Darwin’s life, and Wallace’s, are rife with such contingencies, which we surface in discussion and assignments. To help humanize Darwin and Wallace and bring both men to life, students also view two (non-Hollywood) films and one brief animated short.

*Highlight of course activities relevant to ELO #3: Students apply critical thinking through analyzing primary and secondary sources; understand and articulate diverse historical interpretations; articulate historical arguments in a variety of forms of communication*

Students work with an array of sources (listed below), write about them (formal essay, written responses to readings, exams, quizzes), and discuss them in small groups and during class time. As noted for ELO #2, at the start of week 4 we dispense with Moore’s textbook and introduce students to historical thinking and research. We will be reminding students to consult the “Historical Thinking Guide”[[15]](#footnote-15) and the “Historical Thinking Skills Scoring Rubric”[[16]](#footnote-16) as they prepare their Written Responses (WRs) and complete other activities. Depending upon the activity at hand, we will use all or part of the scoring rubric (i.e., specific columns of the rubric, as appropriate) to assess and/or grade students’ competencies.

**Primary sources students will use:**

* Darwin’s Autobiography (unexpurgated version, N. Barlow, Editor); online version available: <http://darwin-online.org.uk/content/frameset?viewtype=text&itemID=F1497&pageseq=1>
* Darwin’s “secret” Transmutation Notebooks (selected excerpts of Darwin’s musings on natural laws, humans, Malthus, and natural selection-- searchable images: <http://darwin-online.org.uk/EditorialIntroductions/vanWyhe_notebooks.html> with commentary on certain key excerpts by Darwin historian, David Kohn (of the “Darwin Industry”), who helped transcribe, annotate, and contextualize the Notebooks and Darwin’s correspondence <https://soundcloud.com/onbeing/david-kohn-darwins>
* Letters of the Darwin Correspondence (authoritative, annotated transcriptions, with summaries and extensive supportive materials <https://www.darwinproject.ac.uk/letters/darwins-life-letters>
* Excerpts from the Origin of Species (also online: <http://darwin-online.org.uk/>)
* Interview with Darwin biographer James Moore, conducted by Krista Tippet <https://onbeing.org/programs/james-moore-evolution-and-wonder-understanding-charles-darwin>
* Excerpts of 29 documents in Herbert (2011)
* Various documents in the Eugenics Archive <http://eugenicsarchive.org/eugenics/>

**Secondary sources students will use:**

* Course text books
  + Browne, Janet. Darwin’s *Origin of Species*. New York: Grove Press, 2006.
  + Herbert, Sandra. Charles Darwin and the Question of Evolution: A Brief History with Documents. Boston: Bedford/St. Martin’s, 2011.
  + Moore, John A. Science As a Way of Knowing. Cambridge: Harvard University Press, 1993. Excerpted readings posted at Carmen.
  + Shubin, Neil. Your Inner Fish: A Journey into the 3.5- Billion Year History of the Human Body. New York: Pantheon Books, 2008
* Excerpts/quotes for class discussion and/or as prompts for Written Responses (WRs)
  + Bowler, Peter (1989). Evolution, The History of an Idea, revised edition. Chicago: University of Chicago Press.
  + Kohn, David (1985), editor. The Darwinian Heritage. Princeton: Princeton University Press.
  + Mindell, David P. (2008). “Evolution in the Everyday World.” *Scientific American* (January issue), pp. 82-88.
  + National Academies of Science (2008). Science, Evolution, and Creationism.
  + Ruse, Michael (1979). The Darwinian Revolution. Chicago: University of Chicago Press.
  + Scott, Eugenie (2004). Evolution vs. Creationism: An Introduction. Berkeley: University of California Press.

**Online lectures, videos, and other sources students will use:**

* Lectures (ordered chronologically by week in syllabus)
  + Dr. Sean Carroll, “Endless Forms Most Beautiful” <https://youtu.be/g6tROZ2hLE8>
  + Dr. Janet Browne, “Darwin’s Legacy” <https://youtu.be/NO_QHEvyCYk>
  + Dr. Eugenie Scott, “Ways of Knowing” <https://youtu.be/mEnFJTgr9x4>
* Videos and films (ordered chronologically by week in syllabus)
  + Origin of Species—The Making of a Theory: <http://media.hhmi.org/biointeractive/films/OriginSpecies-Theory.html>
  + Forgotten Voyage—Life of Alfred Russel Wallace: <https://youtu.be/Z1eQ6DadodA>
  + Life of Alfred Russel Wallace, animated 7 min. film: <https://youtu.be/H8q3my7ujws>
  + Neil Shubin—Your Inner Fish: https://www.hhmi.org/biointeractive/episode-1-your-inner-fish
  + Neil Shubin—Your Inner Reptile: <https://www.hhmi.org/biointeractive/episode-2-your-inner-reptile>
  + Neil Shubin—Great Transitions—The Origin of Tetrapods: <https://www.hhmi.org/biointeractive/great-transitions-origin-tetrapods>
* Two excerpts from David Quaamen’s The Song of the Dodo and The Reluctant Mr. Darwin (see footnote 9)

**GE Assessment Plan** (revised 9.24 2019)

**ELO 1: Students construct an integrated perspective on history and the factors that shape human activity.**

Methods of Assessment:

1. Direct Measure

A specific question will be embedded on a midterm (course has 2 total) or final exam.

*Sample*: Research has shown that Linnaeus’ accomplishments and Humboldt’s travels influenced the future activities of Thomas Jefferson, Darwin, and Wallace. Identify each of these people and explain how their activities provide concrete evidence in support of the opening statement.

Assessment Rubric:

|  |  |  |  |
| --- | --- | --- | --- |
| Excellent | Good | Fair | Poor |
| Demonstrates a robust, critical, integrated and self-aware understanding of history and the factors that  shape human activity. | Demonstrates adequate and integrated understanding of history and the factors that shape human activity. | Demonstrates modest understanding of history and the factors that shape human activity. | Demonstrates little or no understanding of history and the factors that shape human activity. |

1. Indirect Measure

Students will complete an informal feedback survey rating their achievement of the learning objectives for the course. These will be submitted anonymously before the final exam.

*Sample*: To assess the effectiveness of this General Education course, we seek your input on the course learning objectives. Please place an “x” in the grid below to indicate your opinion. Please consider sharing explanatory comments in the space below. All responses are anonymous.

*This course provided opportunities for me to meet this objective.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Agree Strongly | Agree | Neutral | Disagree | Disagree strongly |
|  |  |  |  |  |

*Comments:*

Level of student achievement expected for the ELO. Expected score= 75% of students achieve good/better and agree/agree strongly that course meets objective.

Assessment Evaluation Goals:

A summary report will be given to the program director for General Education Assessment. Assessments will be summarized and used to inform course revisions before the next teaching.

**ELO 2: Students describe and analyze the origins and nature of contemporary issues.**

Methods of Assessment:

1. Direct Measure

A specific question will be embedded on a midterm (2 total for the course) or final exam.

*Sample*: Describe and analyze the 19th century origins of the contemporary controversy surrounding evolutionary theory. Draw parallels between the two timeframes by discussing the relevant opposing ideas, the people who espoused them, and how they disseminated their ideas (e.g. books they authored).

Assessment Rubric:

|  |  |  |  |
| --- | --- | --- | --- |
| Excellent | Good | Fair | Poor |
| Demonstrates a robust, critical, and self-aware analysis of the origins and nature of contemporary issues. | Demonstrates adequate and critical understanding of the origins and nature of contemporary issues. | Demonstrates modest understanding of the origins and nature of contemporary issues. | Demonstrates little or no understanding of the origins and nature of contemporary issues. |

1. Indirect Measure

Students will complete an informal feedback survey rating their achievement of the learning objectives for the course. These will be submitted anonymously before the final exam.

*Sample*: To assess the effectiveness of this General Education course, we seek your input on the course learning objectives. Please place an “x” in the grid below to indicate your opinion. Please consider sharing explanatory comments in the space below. All responses are anonymous.

*This course provided opportunities for me to meet this objective.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Agree Strongly | Agree | Neutral | Disagree | Disagree strongly |
|  |  |  |  |  |

*Comments:*

Level of student achievement expected for the ELO. Expected score= 75% of students achieve good/better and agree/agree strongly that course meets objective.

Assessment Evaluation Goals:

A summary report will be given to the program director for General Education Assessment. Assessments will be summarized and used to inform course revisions before the next teaching.

**ELO 3: Students speak and write critically about primary and secondary historical sources by examining diverse interpretations of past events and ideas in their historical contexts.**

Methods of Assessment:

1. Direct Measure:

A specific question will be embedded on a midterm (2 total for the course) or final exam.

*Sample:* In his Autobiography, Darwin claimed his years at Cambridge were “sadly wasted.” In contrast, letters we read in the Darwin Correspondence Project indicate that Darwin was strongly influenced by his undergraduate experience and that he influenced others. In your answer, reconcile these diverse accounts of the past. Provide a critical analysis of the sources (e.g., who wrote them, why they were written, who was the intended audience) and explain how they aid you in arriving at your best historical interpretation.

Assessment Rubric:

|  |  |  |  |
| --- | --- | --- | --- |
| Excellent | Good | Fair | Poor |
| Demonstrates a robust and critical ability to speak and write about primary and secondary sources. | Demonstrates adequate and critical ability to speak and write about primary and secondary sources. | Demonstrates modest ability to speak and write about primary and secondary sources. | Demonstrates little or no ability to speak and write about primary and secondary sources |

1. Indirect Measure

Students will complete an informal feedback survey rating their achievement of the learning objectives for the course. These will be submitted anonymously before the final exam.

Sample: To assess the effectiveness of this General Education course, we seek your input on the course learning objectives. Please place an “x” in the grid below to indicate your opinion. Please consider sharing explanatory comments in the space below. All responses are anonymous.

*This course provided opportunities for me to meet this objective.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Agree Strongly | Agree | Neutral | Disagree | Disagree strongly |
|  |  |  |  |  |

*Comments:*

Level of student achievement expected for the ELO. Expected score= 75% of students achieve good/better and agree/agree strongly that course meets objective.

Assessment Evaluation Goals:

A brief summary report will be made available to the Chair of the department. Assessments will be summarized and used to inform course revisions before the next teaching.

1. The term refers to the sheer volume of primary sources— Darwin’s notebooks (containing his earliest, innermost musings while constructing his theory), correspondence (> 15,000 surviving letters), autobiography, manuscripts, and publications— and the historians of science who, in a concerted effort initiated in 1982, pored over these sources, annotated many, and published scholarly works based on them. [↑](#footnote-ref-1)
2. The most relevant such sources are cited at the end of this document. [↑](#footnote-ref-2)
3. Pedagogical and assessment sources include:

   Andrews, Thomas, and Burke, Flannery. “What Does It Mean To Think Historically?” In *Perspectives on Teaching* (January 1) (2007). Online newsmagazine: <https://www.historians.org/perspectives>

   Blain, Robert B. “Into the Breach: Using Research and Theory to Shape History Instruction.” In *Knowing, Teaching & Learning History*. Edited by Stearns, Peter N., Seixas, Peter, and Wineburg, Sam, Eds. New York: New York University Press, 2000.

   Lévesque, Stéphane. *Thinking Historically: Educating Students for the Twenty-first Century.* Toronto: University of Toronto Press, 2008. (Generally helpful, but especially chapter titled, “The Nature of Thinking and Historical Thinking.”)

   Stanford History Education Group. <https://sheg.stanford.edu/about>

   The Historical Thinking Project, Centre for the Study of Historical Consciousness, UBC. <http://historicalthinking.ca/>

   UMBC Center for History Education: ARCH. <https://www.umbc.edu/che/arch/index.php>

   VanSledright, Bruce A. “What Does It Mean To Think Historically… *and How Do You Teach It?*” In *Social Education* 68(3) (2004), 230-233.

   Wiggins, Grant and McTighe, Jay. *Understanding by Design.* 2nd ed. Alexandria, VA: Association for Supervision & Curriculum Development, 2005.

   Wiggins, Grant and McTighe, Jay. *The Understanding by Design Guide to Creating High-Quality Units.* Alexandria, VA: Association for Supervision & Curriculum Development, 2011.

   Wineburg, Sam. *Historical Thinking and Other Unnatural Acts: Charting the Future of Teaching the Past*. Philadelphia: Temple University Press, 2001.

   Winberg, Sam. *Why Learn History (When It’s Already On Your Phone).* Chicago: University of Chicago Press, 2018 [↑](#footnote-ref-3)
4. See course syllabus for 12-day education abroad itinerary. [↑](#footnote-ref-4)
5. The majority of students in our 2017 study abroad course had never visited an art museum; when we visited the National Gallery in London, one pair of students asked Dr. Anelli if the paintings were original! [↑](#footnote-ref-5)
6. Moore wryly points up both human progress and “decline” with change over time, noting that the average Sumerian likely knew more about the natural world than today’s average city dweller. [↑](#footnote-ref-6)
7. Regarding the learning outcome “history as the study of change over time,” this paradigm shift represents a significant occurrence in the history of evolutionary thought and one to which we return repeatedly in the course. [↑](#footnote-ref-7)
8. See Appendix for UMBC’s Historical Thinking Skills Scoring Rubric—Secondary. [↑](#footnote-ref-8)
9. One example of opposing interpretations of this particular event comes from a single author, David Quaamen, who states on his website: “I addressed the subject of Darwin's interactions with Alfred Russel Wallace, and their co-discovery of the idea of natural selection, at some length in *The Song of the Dodo*.  It's the same story I tell, with different nuances, in chapter five of *The Reluctant Mr. Darwin*.  A few readers have told me they found it perplexing that, having recounted the Darwin-Wallace controversy in a way sympathetic to Wallace in *Dodo*, I seemed to have switched camps and recounted it with sympathy for Darwin in the later book.  Perplexed or not, they were right; that's precisely what I did.” (Quaamen, a highly successful writer, is not a professional historian.) [↑](#footnote-ref-9)
10. Once abroad, students meet with professional historians and archivists at the Darwin Correspondence Project (University of Cambridge) and the Linnaean Society (London). Details in Syllabus, Study Abroad Itinerary. [↑](#footnote-ref-10)
11. We selected Walsh because Anelli has conducted research on him for many years, and has given papers and published articles on his life and scientific contributions to Darwinian theory. Anelli assisted the Darwin Correspondence Project with the Walsh-Darwin correspondence. [↑](#footnote-ref-11)
12. The Wikipedia entry on Walsh is not authored by Anelli; the author’s name does not appear. [↑](#footnote-ref-12)
13. Anelli (then Sheppard) authored this publication. [↑](#footnote-ref-13)
14. A 2006 research article in the journal *Science* reported that significantly more adults in 32 European countries and Japan accepted the concept of evolution than did American adults. We did, however, nose out Turkey. [↑](#footnote-ref-14)
15. Based on Stanford History Education Group (SHEG); VanSledright (2004) [↑](#footnote-ref-15)
16. Historical Thinking Skills Scoring Rubric, UMBC Center for History Education [↑](#footnote-ref-16)