

# Blended Learning in Harvard College: A Pilot Study of Four Courses

Executive Summary, Results,  
Recommendations and Surveys

## **Acknowledgements**

We want to express our gratitude for faculty who opened up their classrooms to help the university community gain insights that can be used to develop and strengthen blended learning practices on campus. We would like to thank Michelle Bellino and Lisa Shen, students from Harvard's Graduate School of Education for their qualitative expertise and evaluation summaries used to inform this report. Thank you also to the senior members of the Bok Center staff for the written feedback summaries and pedagogical expertise used to guide the recommendations contained in this companion report.

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## EXECUTIVE SUMMARY

In the fall of 2013, faculty members from Harvard College pilot tested the implementation of four new courses taught in the blended format, integrating HarvardX materials with face-to-face classroom methods. These four courses (The Einstein Revolution, China, Concepts of the Hero in Classical Greek Civilization, and Science and Cooking) were previously existing General Education (Gen Ed) courses that were redesigned to be hybrid courses. This experiment was driven by the University's commitment to exploring new teaching and learning approaches and by the desire to gain insights into how to most effectively engage Harvard's new generation of learners.

The Derek Bok Center for Teaching and Learning created a set of four, individual feedback reports to provide course instructors and teaching staff with information to inform future iterations of these courses. This approach was purely exploratory and with a focus on how different course designs affect student behavior and attitudes towards the course. This is a necessary first step in evaluating the blended learning approach before we can seek to assess its impact on learning. In this companion report we present individual course summaries followed by a discussion of what we learned about this first iteration of blended learning courses in aggregate. Full access to the data can be requested through individual permissions from faculty members teaching the courses.

### Key Findings:

There was significant variability in terms of how each course was implemented in the face-to-face environment. Courses differed by **content**, **class size**, **physical space** (i.e., case study room vs. large lecture hall, versus room with tables), **pedagogical practice** (i.e., cold calling, table discussions, Learning Catalytics, semi-circle), **spacing of delivery** (massed {once a week 2 hour block} vs spaced {interval twice a week 1<sup>1/2</sup> hours}), **assignment type** and **grading structure**. Similarly, the online activities across classes were vastly different. In three of the four courses, faculty chose to eliminate weekly course section meetings. Each of these variables greatly affected the nature of student engagement.

It is often the case that student evaluation results for a course go down when new pedagogical approaches are first implemented. We found that, three out of the four courses taught in the blended format received lower overall mean course evaluation ratings than previous versions of the courses taught in the traditional format, while in one course the distribution of ratings was very similar. Reports of in-class student engagement were variable across courses as would be expected due to the different pedagogical approaches employed by teaching staff to get students to actively participate. Students appeared to appreciate learning activities more when they were more explicitly structured, such as when they were given discussion questions in advance, problem sets or worksheets to scaffold learning. Course evaluation feedback ratings for these classes also dropped several percentage points. This could be an artifact of the loss of sections to compensate for additional class time spent online. Students felt that sections provide opportunities for TAs to answer questions and offer feedback. A good number of students expressed interest in reinstating weekly sections despite additional class time.

We speculated that students would spend more time on coursework outside of class in the blended format as compared to the traditional format, as instructors redesigned their courses to move substantial content online. However we found that with the exception of one course, most students reported spending on average between 3-6 hours outside of class per week on course work, which is roughly the same amount of time spent in a typical Harvard undergraduate course. This might largely be due to how students are engaging with the online components or timesaving behaviors (fast-forwarding/skipping). The structure of online embedded assessments and how they were graded greatly affected how students engaged with the online material.

A significant number of students remarked on the high quality of the HarvardX online content and expressed appreciation for the quality of materials and the thoughtfulness that went into designing the online pedagogical experience.

A major challenge for implementation of these pilot courses appeared to be with the integration of the face-to-face meetings and online learning lessons. The blended format opened up more time in the classroom, which presented challenges for faculty who tried a variety of different ways to engage learners.

Students' overall assessments of the courses' blended formats were also variable. Students who favored the blended format most often cited flexibility of learning at one's own pace as a major benefit. Students who disliked the blended format most often based their feedback on a particular course's implementation. In some cases, the perceived shortcomings of the blended courses may stem from a particular teaching approach that the faculty member chose than the blended structure itself.

These pilots highlight the importance of iterative course re-design and the need for additional faculty development, as a significant reconceptualization of the course is needed when creating a blended format. The following recommendations were created based on the information that was gathered from this evaluation.

## Recommendations:

- a) **Begin the planning process early.** Just as much time and attention as is devoted to the development of digital resources needs to be allocated to developing in-class activities that engage students and integrate the two environments. Mastery in the traditional lecture format does not necessarily translate directly into fluency in student-centered approaches. Flipped learning requires instructors to assume more facilitative rather than directive roles in the classroom as they transition their students to become more active in class and more self-directed online. This takes time and careful planning.
- b) **Use intentional design (backwards design).** When designing these courses it is easy to assume that because these approaches are interesting and engaging, that students are actually learning. Selection of instructional approaches requires knowledge of their application, their relative strengths and weaknesses, and most importantly their alignment with the course's instructional objectives. There should be justification as to why and how materials are being used. Technology may not always be the answer.
- c) **Reexamine the function of section time and its relevance to providing time for student feedback and Q&A.** This should include at minimum thinking about what students gain in section, both interpersonally and intellectually, and how these gains could be re-acquired during in-class time.
- d) **Make participation and grading transparent:** Clarifying exactly how participation grades are calculated serves to refocus student anxieties from self (how I am doing? what's my grade?) to more collective responsibility for engagement. What matters is the transparency and clear signaling to students about what kinds of thinking, learning, and communicating are valued in this new mode of teaching.

- e) **Give regular and timely feedback:** Timely feedback is particularly important so that students understand and feel comfortable with course expectations. Feedback helps clarify mistakes and directs students learning. This is especially true in guiding students in how to participate in new ways.
- f) **Manage student expectations (be attentive to changes in expectations that new ways of thinking assume):** Many students regarded the digital course components as attempts to *supplant*, rather than *to integrate with* in-class experiences. To correct this misconception it is essential that the purpose and relevance of the online format, its components, and its interconnections with the in-class meetings be made explicit to students.
- g) **Experiment with new ways of engaging the physical space in the classroom:** There should be more activating physical movement on the part of the professors as well as the students themselves. The active structure of the blended format should be supported by the physical space in the classroom. We would recommend investigating the locations for newly proposed courses, potentially more modular or less amphitheater-style classrooms that enable flexibility and movement for group and active learning.
- h) **Add and subtract:** Failure to redesign an existing course that has been previously taught in either a MOOC or traditional format is a major contributor to the excessive workload challenge. Avoid adding on additional learning activities without subtracting from the previous design. Students may become overwhelmed by the workload and adapt superficial learning strategies to manage their time. Remember: less is more.
- Make increased **time commitments clear**, while highlighting potential learning gains.
  - If possible, **shorten** pre-class video modules or **reduce** the number of video segments. Honestly reflect on the central learning goals of each lesson and adjust the assignments.
  - **Publish the length of video clips** on the syllabus so that students can manage workload.
- i) **Seek advice from peers and staff at teaching and learning or faculty development centers:** Consult with other instructors who have taught in the blended format. Get feedback from your students. When planning a course reach out to teaching and learning centers at your college or university. These centers typically assist with course planning, teaching strategies, assessment, and media support.

## COURSE DESCRIPTIONS

Four general education courses<sup>1</sup> previously taught in the traditional format were redesigned to be hybrid courses. In the traditional courses, students attended lectures and participated in discussion sections led by teaching fellows each week. In three of the four hybrid courses, sections were eliminated to reduce the number of face-to-face meetings because substantial course content and student learning activities were moved online. (The fourth course, **Science of the Physical Universe 27: Science and Cooking** retained a weekly lab section in the blended setting). All four hybrid courses were developed to combine online with face-to-face instruction; students engaged with online material prior to class, freeing up class time to engage in more interactive learning activities. Even so, there was great variability in terms of how each course was implemented. Courses differed by **content**, **class size**, **physical space** (i.e., case study room vs. large lecture hall, versus room with tables), **pedagogical practice** (i.e., cold calling, table discussions Learning Catalytics, semi-circle), **spacing of delivery** (massed {once a week 2 hour block} vs spaced {interval twice a week 1 1/2 hours}), **assignment type** and **grading structure**. Each of these variables greatly affected the nature of student engagement. Similarly, the online activities across classes were vastly different. Course descriptions for each class are presented in Table 1 below.

**Table 1. Course Comparisons**

Class	Course Description	In-class Time	Assignments + Participation	Section	Size
<b>History of Science 121: The Einstein Revolution</b>	Students followed Einstein’s scientific, cultural, philosophical and political trajectory while tracking the changing role of physics in the 20 <sup>th</sup> and 21 <sup>st</sup> centuries. Course addressed Einstein’s engagement with relativity, quantum mechanics, Nazism, and nuclear weapons. Also what it means to understand physics in its broader history.	<b>Frequency: 1x week; 2 hrs.</b> Class time mainly reserved for <b>table discussions</b> . Students were given questions and asked to use Wikipedia to answer them. <b>Class discussions taped.</b>  <b>Meeting space:</b> <a href="#">Science Center 469</a> . Classroom with modular tables and chairs. Seats 18-40. Room size made fitting camera crew, students and teaching staff challenging.	<b>Embedded assessments</b> online: 125-word essays and multiple-choice questions. Required and graded (50%)  <b>In-class participation</b> included discussion and group work (50%)	None	30
<b>Societies of the World 12: China</b>	Course explored the institutional and cultural patterns in China from ancient times to the present, engaging intellectual and religious trends, material and political culture, art and literature, and China’s economic and political transformation—past, present and future.  <b>Class was team-taught</b> by two professors. Halfway through the semester the students switched professors.	<b>Frequency: 2x week; 1 hr.</b> Class time was mainly reserved for <b>cold calling</b> based on required discussion readings and questions. There were three Friday sections held during the course of the semester  <b>Meeting space:</b> <a href="#">Belfer Case Study Room</a> . Seats 55. Tiered seats with swivel chairs. Difficult for group work. Class discussions were taped.	<b>Embedded online assessments.</b> Required (25%)  <b>In-class participation</b> via cold-calling and discussion based on required readings (30%)  Mid-term exam (15%) 2 short papers (30%)	None	33

<sup>1</sup> Students at Harvard take courses to fulfill Gen Ed credit in seven categories including: Culture and Belief, Empirical and Mathematical Reasoning, Ethical Reasoning, Science of Living Systems, Science of the Physical Universe, Societies of the World, and the United States in the World. The curriculum is composed of courses specifically created for Gen Ed and students can take courses in departments that have been specially approved to count as Gen Ed credit. The curriculum is meant to introduce greater flexibility in fulfilling course requirements and to provide greater accessibility of courses to non-concentrators on themes of broad significance. A defining characteristic of the new curriculum is the emphasis placed on “ways of connecting.” i.e., connecting ideas across disciplines, connecting established material to new ways of teaching it, and connecting knowledge to its implications for the broader world.

**Table 1. Continued**

Class	Course Description	In-class Time	Assignments + Participation	Section	Size
<p><b>Culture and Belief 22:</b> Concepts of the Hero in Classical Greek Civilization</p>	<p>Students read (in English translation) and discussed the Homeric <i>Iliad and Odyssey</i>, seven tragedies (Aeschylus' <i>Oresteia</i> Trilogy, Sophocles' two Oedipus dramas, and Euripides' <i>Hippolytus and The Bacchic Women</i>), and two dialogues of Plato (the <i>Apology</i> and the <i>Phaedo</i>), as well as Greg Nagy's e-book, <i>The Ancient Greek Hero in Twenty-four Hours</i>. The e-book was designed to provide students with close readings and analysis of primary sources found in the Sourcebook.</p>	<p><b>Frequency: 2x week; 1 hr.</b>            Professor organized a 30-person <i>semi-circle unstructured group discussion</i>. Each class thirty students formed a semi-circle in front of the class. The professor asked students their thoughts about the readings for participation points. He showed videos clips in which he drew connections between the world of today and the world of the past. Class discussions were taped.</p> <p><b>Meeting space: Lowell Lecture Hall.</b> Large lecture hall with stadium seating.</p>	<p><b>Embedded online assessments</b> for each "Hour" module of the 24-module online e-book. Assessments not required.</p> <p><b>Micro-essay annotations</b> in response to final question posed for each "Hour" module. 22 questions (2-3 sentence answers). Graded pass/fail. (22%)</p> <p><b>Position papers:</b> Thirteen 500-word responses to questions assigned each week. Letter grades. (39%)</p> <p><b>In-class participation</b> was determined via semi-circle discussions and office hours. Weighed heavily in final grade. (39%)</p>	<p>None</p>	<p>237</p>
<p><b>Science of the Physical Universe 27:</b> Science and Cooking</p>	<p>This course was a collaboration between world-class chefs and Harvard professors. Each week, a chef lectured about some aspect of gastronomy that tied into the science of soft materials given by a Harvard professor. The course included lab work that relied on concepts of cooking to understand and motivate experimental measurements of soft materials.</p> <p><b>Class was team-taught</b> by Harvard professors and chef lecturers.</p>	<p><b>Frequency: 2x week; 1.5 hrs.</b></p> <p><b>Tuesday lectures</b> typically started with a 15-minute summary of scientific points covered on the online videos followed by presentations made by a visiting chef to discuss culinary applications.</p> <p><b>Thursday lectures</b> were led by course instructors. These began with a review of the scientific concepts in the videos and then a dissection of the scientific basis of a recipe and discussion of homework problems.</p> <p><b>Learning Catalytics</b> were used throughout lectures to encourage discussion with chefs and to reinforce science concepts. Students used their own electronic devices. Meetings were taped.</p>	<p><b>Weekly problem sets:</b> Required (15%)</p> <p><b>Lab worksheets:</b> pre and post worksheets to be submitted in class to account for participation (10%)</p> <p><b>In-class participation:</b> real-time questions via <i>Learning Catalytics</i>. Students required to respond to 75% of questions. (5%)</p> <p><b>Embedded online assessments:</b> short answer questions following videos. Students could click forward to find answers. (10%)</p> <p>2 mid-term exams (40%)</p> <p>Final research project (20%)</p>	<p>Yes <sup>2</sup></p>	<p>310</p>

<sup>2</sup> **Lab Section** held each week (2 hrs.) Enrollment this year was limited as they experimented with sections that were suited for students who considered themselves scientists and wanted to move at a faster pace and delve more deeply into the science of cooking.

## METHODOLOGY

In the assessment of these pilots we employed a range of evaluation methodologies including surveys, focus groups, and in-class observations. We supplemented this information with end-of-semester course evaluations (The “Q”) provided by Harvard College Institutional Research (HCIR). Individual survey instruments were created for each class separately with a common core of items for each. We included rating scales related to in-class meetings, course assignments, online instruction, online behavior and participants’ attitudes towards blended learning. There were two open -ended items in which students were asked to explain their likes/dislikes of the blended format in general and to create a list of bulleted point suggestions about how to improve the course. Please see Appendices A-D for copies of the surveys. A different format was used to evaluate the Culture and Belief course (“Heroes,” Greg Nagy). For this course, a set of three surveys was created, the class was divided into thirds for survey administration, and each group of students was sent a distinct set of 2-6 open-ended questions.

For all surveys, response rates were greater than fifty percent (>50%) with the exception of the Science and Cooking Class where only 25% of the class responded. For this course a respondent analysis was conducted to determine whether student responses were independent of grades. A Chi-square analysis demonstrated that there was no association, so we felt confident to proceed. Students in all surveys were fairly represented across gender and concentration. Response rates for Q evaluations were high as would be expected (>90%) as student participation is tied to early grade access.

Individual focus groups were conducted for the China, The Einstein Revolution, and Science and Cooking courses. Given the small sample sizes, we recognized that the focus group data could not sufficiently account for the range of students’ experiences in the courses. Rather, student voices in these classes allowed for an in-depth understanding of how these individuals experienced various aspects of the courses. This data highlighted salient themes that emerged during the focus group conversations. We connected these findings to the survey and Q data, a more representative sample of students, to give a clearer and more valid portrayal of student experiences<sup>3</sup>.

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<sup>3</sup> Focus group analyses were prepared by **Michelle Bellino, EdD** and **Lisa Shen, EdD candidate in Harvard’s Graduate School of Education**

## SUMMARY RESULTS

The range of different approaches to the blended format adopted by the courses led to high variability in terms of the student experience. Courses taught in the blended format received lower mean ratings than previous versions of the courses taught in the traditional format with the exception of the China class where the distribution of ratings was very similar. However this is not surprising given that the literature suggests that as many as three to four iterations may be needed to complete the transition from a traditional to a blended course (Danchak and Huguet, 2004; Ellem and McLaughlin, 2005; Trevitt, 2005).

Reports of in class student engagement were variable across courses as would be expected due to the different pedagogical approaches employed by teaching staff to get students to actively participate. Most often faculty remained faithful to a particular teaching approach throughout the semester. Getting students actively engaged was most often driven by assigning participation points to students who were being cold-called, participating in groups discussions, answering quiz questions, using Learning Catalytics, or participating in unstructured discussion circles. While the incentive to earn participation points as part of the overall course grade motivated many students to come to class prepared and encouraged participation, it led some students to cut corners, to become focused on earning points instead of learning, and to integrate the course material in less meaningful ways. Variability in participation opportunities and a sometimes perceived ambiguity in how participation points were being assigned also caused some students to become anxious and frustrated with the course and caused others to become disengaged.. Students appeared to appreciate learning activities more when they were well structured such as when they were given discussion questions in advance, problem sets or worksheets to scaffold learning.

A good number of students expressed their interest in reinstating weekly sections in the China, Heroes, and Einstein courses (there were lab sections in the Science and Cooking Class). They explained that weekly sections would allow for more effective feedback, time for Q&A and meaningful collaborations with peers in these classes. In the Heroes course, nearly one third of student responses articulated an interest in reinstating weekly section meetings, noting that this would deepen their sense of an intellectual community. Q Evaluation feedback ratings for these classes also dropped several percentage points. This could be an artifact of the loss of sections, as sections provide opportunities for TFs to answer questions and offer feedback. Interestingly, the lab sections in the Science and Cooking course received higher ratings than the chef lectures and faculty led discussions. Students found lab sections to be well organized and actively engaging. Lab sections added to students' understanding of the scientific concepts presented in the videos. Q evaluation feedback ratings for the Science and Cooking course remained somewhat stable.

A number of students in the Heroes course remarked on the high quality of the HarvardX platform, noting that the guidance on reading strategies helped focus and prioritize their learning. They expressed appreciation for the quality of materials and the thoughtfulness that went into designing the online pedagogical space. Most students in the China, Einstein and Science and Cooking courses found the online lessons interesting and engaging. While the majority of these students reported that the lessons were divided into manageable segments, some students found them to be time consuming perhaps because there were too many segments assigned each week. In part because of the perceived time investment, some students reported that they engaged in a number of time saving strategies such as scrolling through transcripts, rewinding, and fast-forwarding to complete the online embedded assignments. Students varied by class in terms of how often they fast/forwarded and skipped parts of the videos. More than half of student respondents (>52%) reported that they rewound and replayed parts of the videos fairly often/very often. Although there was between-course variability in terms of reported multitasking behavior (between China, Einstein and the Science and Cooking courses), only a small percentage ( $\leq 31\%$ ) of students

reported engaging in checking email, doing other work, watching TV, etc. fairly to very often while completing the online lessons. At least forty percent ( $\geq 40\%$ ) of respondents reported taking notes fairly often/very often while engaging with the online lessons.

There was the potential that students would spend more time outside of class in the blended format as compared to the traditional format as instructors redesigned their courses to move substantial content online: however it was found, with the exception of the China course, that most students reported spending on average between 3-6 hours outside of class per week on course work. We looked to the 2013 Student Senior Exit survey to provide context for these numbers. In the Senior Exit survey students report spending an average of 18 hours on academic activity outside of class. Assuming students are taking four classes, this breaks down to roughly 4-5 hours on each class. Students thus spent roughly the same amount of time outside of class in the blended formats as they would in a typical Harvard undergraduate course. This might largely be due to how students are engaging with the online components. However, for the China course, students reported spending roughly 7-10 hours outside of class. This is more time outside of class than was reported in the Q evaluations for the China course taught in the traditional format in 2011 and more time spent than for the average Harvard course. Students mentioned this extra workload in the open-ended comments in the Q evaluations as well as the survey.

A major challenge for implementation of these pilot courses appeared to be with the integration of the face-to-face meetings and online learning lessons. Students were almost equally divided on whether in-class meetings were well integrated with the online modules. Our survey results indicate that when material presented in class did not directly relate to their assignments some students saw class meetings as superfluous explorations, but not necessarily aiding in their comprehension and interpretation of the content.

Finally when we asked students whether they would be likely to enroll in another course with a blended format (online modules with in-class meetings) responses were again variable. Students in the 'yes' categories most often cited liking the flexibility of the blended format in permitting them to learn at their own pace. The ability to rewind and replay online lessons was most often attributed to this flexibility. For students in the 'no' categories, their impressions of the blended format were inevitably conflated by their experience in a particular course's implementation, as demonstrated by frequent attributions that many shortcomings in the course experiences stem from the particular teaching approach that the faculty chose rather than one particular interpretation of a blended structure. A few students cited individual learning styles as being a reason for their either liking or disliking the blended format.

These pilots highlight the importance of iterative course re-design which makes use of assessment data to inform reflective practice and collaborative dialogue between teaching staff and curricular specialists, a critical factor in ensuring successful technology-enabled change. This first round of courses was an exercise in learning by doing. This was both adventurous and practical in our case. It was adventurous as we were trail blazing into the unknown and practical since it allowed us to "learn on the job" as it would have been unrealistic to attempt to prepare a fully reworked curriculum ahead of its implementation. During this first iteration we were able to identify a number of different directions where further course development could be focused including 1) the implementation of in-class pedagogies and how to engage students actively; 2) student feedback and sections; 3) course integration/coherence; 4) embedded assessments; and 5) students incentives and online behavior. As can be seen from the report summaries, the challenges that most students faced with these courses were not due to the online environment but rather to what was occurring in the classroom and the integration of the two. The success of the flipped classroom largely depended upon how direct instruction was delivered as the blended format opened up more time in the classroom, which presented challenges for faculty who tried to find ways to engage learners, and perhaps for students who had to become more self-directed/more responsible for their learning.

As the demand for blended classes continues to grow so will the need for development of instructors to teach and design blended courses. Instructional development is necessary and requires careful planning since significant course overhaul is needed when creating a blended course, including reconsidering course design, developing new learning activities, integrating online and face-to-face components, and learning new teaching skills. The Derek Bok Center for Teaching and Learning is working to develop this scaffolding. Most importantly as faculty take interest in building blended environments it will become increasingly important that we have evidence on which to draw as we make decisions. From these reports there are already recommendations that will inform future iterations of these courses.

## REFERENCES

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**APPENDIX A**  
Societies of the World 12  
China Survey

**In Class Behaviors**

How many in-class meetings did you attend?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about your IN-CLASS MEETINGS.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were well-organized (1)	<input type="radio"/>				
were well integrated with the online modules (2)	<input type="radio"/>				
were redundant with the online modules (3)	<input type="radio"/>				
expanded upon what I learned online (4)	<input type="radio"/>				

I felt like being called upon in class challenged me to integrate the course material in meaningful ways.

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

I felt like being called upon in class motivated me to come to class prepared.

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

How did you feel about the class being taped?

- Did not like it (1)
- Did not care (2)
- Felt okay about it (3)

I was actively engaged in the in-class activities and discussion.

- Strongly disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

### **Course Readings and Assignments**

How many of the background readings did you complete?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

How many of the readings for in-class discussion did you complete?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Overall how helpful were the readings for in-class discussion in preparing you for participating in class?

- Very Useless (1)
- Useless (2)
- Neutral (3)
- Useful (4)
- Very Useful (5)

Please indicate the extent to which the following assignments helped you think critically about the material.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
The online multiple choice assessment questions (1)	<input type="radio"/>				
Short papers (2)	<input type="radio"/>				

Would you have watched the online modules as frequently if the embedded assessments were not required for your participation grade?

- Definitely not (1)
- Probably not (2)
- Maybe (4)
- Probably yes (5)
- Definitely yes (6)

### Online Behavior

How many of the online lessons did you complete?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about online lessons.  
**THE ONLINE LESSONS:**

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were interesting and engaging (1)	<input type="radio"/>				
were divided into manageable segments (2)	<input type="radio"/>				
contained the right amount of visualizations, animations and/or charts (3)	<input type="radio"/>				
contained the right amount of text (4)	<input type="radio"/>				

How often did you do the following while watching the online lesson?

	Never (1)	Almost never (2)	Sometimes (3)	Fairly often (4)	Very often (5)
skip parts of the video (1)	<input type="radio"/>				
rewind/repeat parts of the video (2)	<input type="radio"/>				
take notes (3)	<input type="radio"/>				
multitask (i.e., watch video while checking email, doing other work, watching TV, etc.) (4)	<input type="radio"/>				
Watch the online lesson with others in the class (5)	<input type="radio"/>				

## Overall

On average how many hours per week did you spend on

	1 hour or less (1)	2 hours (2)	3 hours (3)	4 hours (4)	5 hours (5)	6+ hours (6)
Online Modules (1)	<input type="radio"/>					
Background readings (2)	<input type="radio"/>					
In-Class discussion readings (3)	<input type="radio"/>					

Given a choice, would you enroll in another course with this format (i.e., online modules with in-class meetings)?

- Definitely not (1)
- Probably not (2)
- Maybe (4)
- Probably yes (5)
- Definitely yes (6)

Why or why not?

Please let us know how we can improve. Please create a list of 5-10 bulleted point suggestions.

**APPENDIX B**  
 History of Science 121  
 The Einstein Revolution Survey

**In Class Behaviors**

How many in-class meetings did you attend?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about your I  
 N-CLASS MEETINGS.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were well-organized (1)	<input type="radio"/>				
were well integrated with the online modules (2)	<input type="radio"/>				
were redundant with the online modules (3)	<input type="radio"/>				
expanded upon what I learned on-line (4)	<input type="radio"/>				

I felt like the table discussions challenged me to integrate the course material in meaningful ways.

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

How did you feel about the class being taped?

- Did not like it (1)
- Did not care (2)
- Felt okay about it (3)

I was actively engaged in the in-class activities and discussion.

- Strongly disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

### Course Readings and Assignments

How many of the class readings did you complete?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

How useful were the readings in helping you to construct the 125 word essays?

- Very Useless (I could complete the essays without doing the readings) (1)
- Useless (2)
- Neutral (3)
- Useful (4)
- Very Useful (5)

Please indicate the extent to which the following assignments helped you think critically about the material.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
The online multiple choice assessment questions (1)	<input type="radio"/>				
125 word essays (2)	<input type="radio"/>				

Would you have watched the online modules as frequently if the embedded assessments were not required

for your participation grade?

- Definitely not (1)
- Probably not (2)
- Maybe (4)
- Probably yes (5)
- Definitely yes (6)

**Online Behavior**

How many of the online lessons did you complete?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about on-line lessons. THE ON-LINE LESSONS:

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were interesting and engaging (1)	<input type="radio"/>				
were divided into manageable segments (2)	<input type="radio"/>				
contained the right amount of visualizations, animations and/or charts (3)	<input type="radio"/>				
contained the right amount of text (4)	<input type="radio"/>				

How often did you do the following while watching the online lesson?

	Never (1)	Almost never (2)	Sometimes (3)	Fairly often (4)	Very often (5)
skip parts of the video (1)	<input type="radio"/>				
rewind/repeat parts of the video (2)	<input type="radio"/>				
take notes (3)	<input type="radio"/>				
multitask (ie, watch video while checking email, doing other work, watching TV, etc.) (4)	<input type="radio"/>				
Watch the on-line lesson with others in the class (5)	<input type="radio"/>				

**Course Overall**

Compared with a traditional lecture format in a class of this size, I feel like the blended format of this course (on-line lecture and in-class meetings)

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Allows for more quality interactions with the professor (1)	<input type="radio"/>				
Allows for more interaction with students in the class (2)	<input type="radio"/>				
Engages me more deeply with the course material (3)	<input type="radio"/>				
Gives me more opportunity for clarification of concepts that I may not understand (4)	<input type="radio"/>				
Allows me to self-regulate my understanding of the material more effectively (5)	<input type="radio"/>				
Motivates me to come to class prepared (6)	<input type="radio"/>				
Gives me more opportunity to engage with the course material at a deeper level (7)	<input type="radio"/>				
Compensates adequately for the loss of section meetings (8)	<input type="radio"/>				

Given a choice, would you enroll in another course with this format (ie, online modules with in-class meetings)?

- Definitely not (1)
- Probably not (2)
- Maybe (4)
- Probably yes (5)
- Definitely yes (6)

Why or why not?

Please let us know how we can improve. Please create a list of 5-10 bulleted point suggestions

## APPENDIX C

### Science of the Physical Universe 27 Science and Cooking

#### Background

What field of study best represents what you are concentrating in?

- Science/Math/Engineering (1)
- Humanities (2)
- Social Sciences (3)

#### In-class Behaviors

How many Tuesday in-class meetings did you attend (i.e., Chef lectures)?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about your IN-CLASS MEETINGS.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were well-organized (1)	<input type="radio"/>				
were well integrated with the online modules (2)	<input type="radio"/>				
were redundant with the online modules (3)	<input type="radio"/>				
added to my understanding of the scientific concepts presented in the videos (4)	<input type="radio"/>				
were actively engaging (5)	<input type="radio"/>				

How many Thursday in-class meetings did you attend (i.e., Course instructor lectures)?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about your IN-CLASS MEETINGS (i.e., Course instructor lectures)

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were well-organized (1)	<input type="radio"/>				
were well integrated with the online modules (2)	<input type="radio"/>				
were redundant with the online modules (3)	<input type="radio"/>				
added to my understanding of the scientific concepts presented in the videos (4)	<input type="radio"/>				
prepared me for the week's homework (5)	<input type="radio"/>				
were actively engaging (6)	<input type="radio"/>				

Learning Catalytics helped me reinforce my understanding of the science concepts of the class.

- Strongly disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

Now we are going to ask you some questions about your **Lab Section**.

Please indicate the extent to which you agree with the following statements about your lab meeting.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were well-organized (1)	<input type="radio"/>				
were well integrated with the online modules (2)	<input type="radio"/>				
were redundant with the online modules (3)	<input type="radio"/>				
added to my understanding of the scientific concepts presented in the videos (4)	<input type="radio"/>				
prepared me for the week's homework (5)	<input type="radio"/>				
were actively engaging (6)	<input type="radio"/>				

### Course Readings and Assignments

How many of the recommended readings did you complete?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

The recommended readings were helpful in enhancing my understanding of the course material IF THEY COMPLETED THEM

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

Please indicate the extent to which the following assignments helped expand your understanding of the scientific concepts required in class

	Not at all (1)	Very little (2)	Somewhat (3)	Fairly well (4)	Very well (5)
weekly problem sets (1)	<input type="radio"/>				
lab worksheets (2)	<input type="radio"/>				
final research project (3)	<input type="radio"/>				
In-lab cooking assignments (4)	<input type="radio"/>				

### Online Behavior

How many of the cooking videos did you complete (videos made by the visiting chefs)?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about on-line lessons.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were interesting and engaging (1)	<input type="radio"/>				
were divided into manageable segments (2)	<input type="radio"/>				
contained the right amount of visualizations, animations and/or charts (3)	<input type="radio"/>				
contained the right amount of text (4)	<input type="radio"/>				

How many of the science videos did you complete (videos made by faculty teaching this class)?

- None of them (1)
- Fewer than half (2)
- Half (3)
- More than half (4)
- All of them (5)

Please indicate the extent to which you agree with the following statements about on-line lessons

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
were interesting and engaging (1)	<input type="radio"/>				
were divided into manageable segments (2)	<input type="radio"/>				
contained the right amount of visualizations, animations and/or charts (3)	<input type="radio"/>				
contained the right amount of text (4)	<input type="radio"/>				

How often did you do the following while watching the online lesson(s)?

	Never (1)	Almost never (2)	Sometimes (3)	Fairly often (4)	Very often (5)
fast forward/skip parts of the video (1)	<input type="radio"/>				
rewind/repeat parts of the video (2)	<input type="radio"/>				
take notes (3)	<input type="radio"/>				
multitask (ie, watch video while checking email, doing other work, watching TV, etc.) (4)	<input type="radio"/>				
Watch the on-line lesson with others in the class (5)	<input type="radio"/>				

### Overall

Rate the difficulty of the scientific concepts presented in class

- Too easy/overly simplistic (not the appropriate level for my background and experience) (1)
- Just right (2)
- Too hard (The concepts were presented at a level that was difficult for me to understand) (3)

Did you...

	Yes (1)	No (2)
take advantage of the advanced materials (1)	<input type="radio"/>	<input type="radio"/>
attend the advanced lab sections (2)	<input type="radio"/>	<input type="radio"/>

Why didn't you take advantage of the advanced materials and/or lab sections?

Given a choice, would you enroll in another course with this format (i.e., online modules with in-class meetings)?

- Definitely not (1)
- Probably not (2)
- Maybe (4)
- Probably yes (5)
- Definitely yes (6)

Why or why not?

Please let us know how we can improve. Please create a list of 5-10 bulleted point suggestions.

## **APPENDIX D**

### Culture and Belief 22

#### Concepts of the Hero in Classical Greek Civilization Survey

##### *Overview of open-ended questions asked*

- How is your notion of the ancient hero different than it was before you took this course? At what point did the biggest change in your understanding take place? Please explain in more than a few words.
- Have you experienced any types of barriers in interpreting these texts, and what are they?
- How has this course changed the way that you read? Has a particular component of the course been especially instrumental in these changes?
- Given your experiences of reading H24H and/or watching the online course videos, of doing the fast readings, of completing the online self-assessments, and of writing the micro-essays—how have the Monday and Wednesday class meetings helped you activate these prior experiences, with the ultimate goal of writing the position papers?
- How could the format of these class meetings be adjusted to aid you as you synthesize the various components of the course in preparation for writing?
- What has worked well and less well about the following course components? Would you do anything differently? [Self-assessments; Micro-essays; Office hours with TFs; Position papers; Participation]
- Which aspect of the course, if any, is it most important to do the same in future iterations?
- Which aspect of the course, if any, is it most important to do differently in future iterations?
- Do you feel that you are part of an intellectual community in your interactions with your fellow students, Prof. Nagy, your TF, and all the other HeroesX participants?
- How have the class meetings, the Discussion Board threads, and your TF's office hours contributed to the sense of being part of an intellectual community?
- How could the sense of intellectual community be strengthened?