

ARTICLE

Reading the Brain: An Interdisciplinary First-Year Seminar on the Intersection of Neuroscience, Literature, and Popular Culture

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Topics related to the brain are becoming increasingly common in cultural products such as literature and film. Media representations of the brain and mind therefore provide an interesting method for introducing first-year college students to the field of neuroscience. In this article, we describe an interdisciplinary first-year seminar that we implemented at Gettysburg College, co-taught by a cognitive neuroscientist (KDW) and a literary scholar (TFB). The course explores a number of themes, such as memory, autism, and neuroaesthetics, as well as the relationship

between brain and mind, using novels, short stories, film, and theater. The success of the course highlights the benefits of using non-technical sources to introduce students to scientific concepts as well as the value of teaching collaboratively across disciplinary boundaries.

Key words: cognitive neuroscience; humanities; science, technology, engineering, and mathematics (STEM); neuroculture; pedagogy; co-teaching; neuroscience education

Introducing students to the science curriculum in their first year of college is critical for developing informational literacy (Takao and Kelly, 2003; Stout, 2011; Libarkin and Ording, 2012; Birol et al., 2013), as well as familiarity and comfort with STEM disciplines (Birkett and Shelton, 2011). Many students first encounter these topics in traditional introductory science courses that use standard pedagogical techniques (e.g., lecture-based classrooms) and conventional scientific texts (e.g., textbooks). These courses prepare students well for further coursework in science, but are sometimes less successful than other pedagogical approaches (e.g., increasing student anxiety in some cases; Cooper et al., 2018) and are often less appealing to non-science majors (Esslinger, 1985; Bell, 2014; Dube, 2018). In addition, these courses sometimes fail to bridge the gap between science and other intellectual traditions within the humanities and social sciences. Therefore, it is important to constantly re-evaluate the methods of introducing first-year college students to science in light of ongoing trends in higher education.

Recent research demonstrates that interdisciplinary teaching is a valuable method of engaging students in cross-disciplinary thinking and is particularly beneficial in helping neuroscience students grasp difficult concepts (Mead, 2009; Ulness and Mach, 2011; Kennedy and Hassebrock, 2012; Wolfe and Moran, 2017; Wolfe and Lindeborg, 2018). One other important trend in higher education worth noting is the increasing prevalence of co-teaching across traditional academic disciplines (e.g., Brown and Pollack, 2004). Numerous examples of such collaborations in recent years have highlighted the potential for this approach to achieve better learning outcomes for students (Forgey and Colarossi, 2003; Gillespie and Israetel, 2008; Colburn et al.,

2012; Garran et al., 2015; Campbell et al., 2018; Schmulian and Coetzee, 2019; Cordie et al., 2020).

Neuroscience instructors for many years have incorporated non-traditional scientific sources into their classes, with great success, ranging from case studies (Meil, 2007; Mickley and Hoyt, 2010), biographies and autobiographies (Banyard, 2000; Gunther, 2011; Pollack, 2015), novels (Harrington, 2006; Todman, 2007; Marsh et al., 2012; Ginn, 2013), and visual media such as art, films, and television (Wiertelak, 2002; Lafer-Sousa and Conway, 2009; Kronemer and Yates, 2012; Wijdicks, 2015). Despite this growing body of literature, these non-traditional sources are, unfortunately, often only injected in isolated bits.

In light of these emerging trends in undergraduate education, we present an interdisciplinary first-year seminar that we taught at Gettysburg College on the intersection of neuroscience, literature, and other mediums such as film and advertising. The course was co-taught by a cognitive neuroscientist (KDW) and a literary scholar (TFB) and focused on the ways in which neuroscience is portrayed in novels, films, plays, and advertisement, and on the ways that brain science can help us understand why and how we read. Although previous published course descriptions have used some non-traditional sources, our course (a) employed multiple source materials throughout the semester, (b) actively involved co-teaching from scholars in both humanities and natural science, and (c) focused on introducing both neuroscience and literature to first-year students in a seminar environment. Despite the fact that there has been much theoretical discussion of the links between cultural products (e.g., literature and film) and neuroscience (e.g., Aldama, 2015), not many courses explore this intersection. Therefore, we hope that our article

outlining the history and ultimate success of our course might encourage others to explore this intriguing interdisciplinary pairing.

FYS Program at Gettysburg College

The course was part of the first-year seminar (FYS) program at Gettysburg College, which is a group of specially designed courses intended to hone critical thinking, speaking, and writing skills. First-year seminars offer the benefits of an experience often reserved for college seniors to students beginning their college career. These courses, offered at Gettysburg since 1996, provide an opportunity to work closely with faculty members and a small cohort of peers to explore a topic that they all find interesting. The program has been very successful; for instance, students enrolled in a FYS at Gettysburg College have a significantly higher retention rate than those who do not. First-year seminars were optional, but encouraged, when we taught this course. They are now required of all first-year students at Gettysburg College.

First-year seminars at Gettysburg College employ and develop a variety of skills including writing, speaking, critical thinking, quantitative reasoning, and the use of technology or instrumentation. The courses encourage participation and discussion and are linked closely with other first-year student co-curricular programming at the college. For instance, each seminar's students are typically housed in the same dormitory. This arrangement helps extend class discussions into the less-formal arena of their living environment and promotes the open exchange of ideas.

First-year seminars at Gettysburg College are limited to sixteen (16) students to encourage extensive discussion. The program has both academic and social benefits; it eases the transition to college, introduces students to the kind of thoughtful conversation that is characteristic of a good liberal arts education, enriches learning, and serves as an "academic ice-breaker," helping them to build lasting relationships. In addition, faculty advisors are assigned based on seminar placement, so that incoming students have an academic advisor whom they see regularly throughout the semester in their seminar. Most first-year seminars at Gettysburg College include field trips, films, guest speakers, workshops, as well as community service projects.

COURSE DESCRIPTION

Given that our course was a first-year seminar, we focused on basic concepts related to neuroscience and literary analysis. Students had few preconceptions about the course and were open to the cross-fertilization. We taught the course in two subsequent academic years, with minor modifications during the second year. In the first year, we invited two juniors who were both English and Psychology double majors to join us as Peer Learning Associates (PLAs) so they could serve as models for interdisciplinary learning and thinking. In the second year, we did not include any PLAs. During the first year, the course fulfilled two Gettysburg College general curriculum requirements: 1) Science, Technology, and Society (STS); and 2) Integrative Thinking. The STS requirement at Gettysburg College

focuses on helping students understand the implications of scientific discoveries and technological advances, and the processes by which science and technology and society influence each other. Such courses focus on methodological analysis; historical or cultural contexts; particular discoveries, theories, or technologies; and/or issues of policy. The Integrative Thinking requirement at Gettysburg College emphasizes interdisciplinary or multidisciplinary approaches to a common theme and through these courses, students gain an understanding of the connections and tensions among approaches to common issues, texts, and phenomena. In the second year, the course continued to fulfill the Integrative Thinking requirement and also fulfilled the first-year writing requirement as a second curricular goal (which focuses on introducing students to the essentials of college-level writing).

According to the Director of the FYS Program at Gettysburg College, the course was one of the more popular seminars and filled to capacity within minutes when enrollment opened. While many of our students spoke of wanting to major in Psychology, others expressed long-term interests in other academic disciplines such as Biology, Mathematics, Theater Arts, and Music. This suggests that the course not only attracted potential Psychology majors but also other majors as well, which enhanced its interdisciplinary reach.

Course Format

The class met weekly for two 75-minute periods. We used a discussion format primarily, but classes differed throughout the semester. For instance, some classes consisted of lectures that involved PowerPoint presentations, which were distributed to members of the class in advance so they could more easily follow. Other classes involved group work to give students time to answer questions in small groups before sharing them with the larger group. Sometimes we began with a quiz to confirm that students had done the reading or to stimulate thinking about particular issues. Other times we spent time in class on writing skills.

Breakdown of Topics

During the first year, the course was divided into eight segments: 1) Literary Analysis Primer, 2) Cognitive Neuroscience Primer, 3) Mind/Body, 4) Neuropsychology, 5) Autism, 6) Human/Animal Cognition, 7) Neuroculture, and 8) Neuroenhancement and Neuroethics. The first three segments were more disciplinary than interdisciplinary. It was not until the fourth segment that we interwove literary and scientific materials. The specific topics varied slightly during the second year of the course but followed the same general flow – see Table 1.

The first week was a General Introduction. We focused on two poems and two short stories. We used short, complex pieces in order to help students become more conscious of their reading habits. We also wanted to encourage interactive participation. Students enjoyed the introductory pieces and seemed comfortable as they offered different interpretations. We encouraged them to challenge

Course Topic (<i>Time Allocation</i>)	Assigned Materials
Literary Analysis Primer (<i>two classes</i>)	Reed (1969); Raine (1979); Morrison (1983); Cortázar (1985)
Cognitive Neuroscience Primer (<i>two classes</i>)	Ellison (2012); Jääskeläine (2012)
Mind/Body Relationship (<i>four classes</i>)	Feist (1953); Doctorow (2014)
Neuropsychology (<i>six classes</i>)	Schacter (1983); Sacks (1995); Nolan (2000); Powers (2006)
Autism (<i>seven classes</i>)	Moon (2004); Jackson (2010); Walsh et al. (2011); Grandin and Panek (2013)
Neuroculture (<i>three classes</i>)	Hasson et al. (2008); Frazzetto and Anker (2009); Chatterjee and Vartanian (2014)
Neuroenhancement and Neuroethics (<i>three classes</i>)	Barry (2011); Garland (2014)

Table 1. Topic breakdown and assigned reading and viewing for the course.

and develop one another's ideas.

During the second week of class, students read two introductory texts on the brain. We reassured them that we did not expect them to remember all the new terms and that our goal was to give them an overview of the brain and some idea of the long and evolving history of neuroscience. We stressed that over the years, scientists and philosophers have identified different sources for our minds/souls (e.g., ventricles, the heart, and the brain) and with each succeeding image our representation and understanding of the mind changed.

The third week was spent on E. L. Doctorow's *Andrew's Brain* (2014). The main character is a cognitive neuroscientist so Andrew's story was also inevitably the story of our fractured understanding of consciousness, the mysteries of intentionality, and how the brain drives the mind (and vice versa). The students found the novel difficult but came up with insights nevertheless. We paired this novel with the 1950s film, *Donovan's Brain* (Feist, 1953). The pairing was illuminating and enabled students to see that Doctorow might have been drawing on the earlier film to explain Andrew's unusual psychodynamics and to attack any simplistic notions of the mind/body connection. As Andrew asks at one point, "How can I think about my brain when it's my brain doing the thinking?" (p. 34). We considered the notion of "theory of mind" and the need to take into account that others have minds and that it is in our best interest to consider what others might be thinking, something that Andrew seems unwilling to do. As one student observed, "Andrew seems to lack feelings."

Although we were both present in every class, and would comment from our own disciplinary perspectives on each other's chosen texts, it was not until the fourth week that we interspersed literary and scholarly texts. We combined Richard Powers' *The Echo Maker* (2006) with Oliver Sacks' "The Last Hippie" (1995) and Schacter's "Amnesia

Observed" (1983). The novel, the case study, and the neuroscience article neatly mirrored one another. Not only was a character in the novel (Weber) clearly modeled on Oliver Sacks, but one of the main characters was suffering from Capgras syndrome as the result of an automobile accident so brain function and dysfunction were at the center of the novel. We also encouraged students to compare Schacter's more formal, scientific article with Sacks' more novelistic and empathic narrative of "Greg"; in doing this, we were replicating an important theme in the novel, for Weber contemplates turning Mark and his Capgras into an article and is concerned that his once revolutionary narrative case histories for the general public are now passé and perhaps unethically exploitative. Filled with self-doubt he wonders about the value of his research. In addition, reading plays an important role in Mark's cure and the book as a whole suggests that brains become (and regain) mind through the power of reading. We used the film *Awakenings* (Marshall, 1990) in this segment of the course, for in it there is another Oliver Sacks like figure struggling to convince non-scientists that neuroscience offers hope to warehoused patients.

Our section on Autism was the longest and fullest section of the course. We included a novel (Elizabeth Moon's, *The Speed of Dark*; 2004), one essay ("Lighting up the Autistic Brain" by Grandin and Panek, 2013), and a chapter from Dawn Prince-Hughes' memoir *Songs of the Gorilla Nation* (2004). We also took the class to see a live theatrical production of *The Curious Incident of the Dog in the Night-Time* (Elliott, 2014) with special funding from the Provost's Office. To fill out this part of the course, we brought in the *Temple Grandin* biopic (Jackson, 2010).

The Speed of Dark (Moon, 2004) allowed us to engage once again in the question of ethics and whether neuroscience can or should help us. In the book, the author sets up an ironic contrast between "normals" and "autistics"

and encourages us to question our assumptions about the differences of people on the autistic spectrum. The main character in the novel is given the opportunity of participating in a neuroscientific experiment which would alter his brain so that he would no longer be autistic. This was a new procedure and might not work, and, in fact, might harm rather than help him. We divided the class into teams to debate whether Lou, the main character, should undergo the procedure. The students were deeply engaged in the debate and in such complementary issues as how we decide something is normal and something is not, how free are we to become who we are, and how much power should science exercise in determining what is acceptable human behavior and what is not.

The chapter from *Songs of the Gorilla Nation* (Prince-Hughes, 2004) served as a perfect transition from autism to human/animal cognition. Like *The Speed of Dark* (Moon, 2004), Prince-Hughes' memoir emphasizes that individuals with autism are not that different from other people. Stressing the blurred border between human and animal cognition, her ethnography of gorillas explores how animals can help us remember what we have lost. Our next text, Karen Joy Fowler's *We Are All Completely Beside Ourselves* (2013) chronicles the consequences of an experiment to raise a chimp and child together as twins. The novel raises many questions about ethics, about brains and minds and mimicry, and about how we learn and how memories can trick us. Although we did not pair any scientific readings with the novel, one of us (KDW) lectured on the history of animal/human experiments. Fowler's novel also used passages from Kafka's "A Report to an Academy" (Kafka, 1917) as epigraphs to emphasize our human failure to understand animals from their point of view. In the novel, the human twin is, as she matures, deeply disturbed by the anthropomorphic bias of the experiment. That is, we want to know if chimpanzees can do what children can do, but we never consider what the chimp can do and the child cannot. The unacknowledged assumption is that humans are smarter than animals. What Kafka, Prince-Hughes, and Fowler argue is that, in many ways, animals are much smarter than we are and we need to take the animal perspective more seriously.

Our next section, Neuroculture, consisted of four neuroscience articles and a visit to the Schmucker Art Gallery at Gettysburg College. In class discussion, the students were able not only to understand but to challenge and extend the articles' arguments. The film *Memento* (Nolan, 2000), which accompanied these readings, perhaps proved to be more mystifying than any of the neuroscientific texts. In this section, we explored the many ways in which neuroscience intersects with aesthetics. We were fortunate that the exhibit in the Art Gallery – "(Un)Governed Spaces: A Panorama of Afghanistan" by Gregory Thielker and Noah Coburn (2015) – so vividly represented aesthetic innovation and gave us much opportunity to explore many different aesthetic dimensions, both visual and spatial (the artwork was an installation that included not only a large curving wall of a panoramic painting of Shomali Plain north of Kabul, but also photographs, video, and smaller paintings, and the persistent sound of wind).

Our final section, Neuroenhancement and Neuroethics, brought together Max Barry's *Machine Man* (2011) and the film *Ex Machina* (Garland, 2014), both of which are rich with representations of neural and physical enhancements, and provoke much thought about the ethics of the neuroenhancement (and every other enhancement) industry. Moreover, both pose important questions about what makes us human. Our brains or our mind? Is there any difference between the two after all? It was also intriguing that both film and novel neatly circled back to *Andrew's Brain* (Doctorow, 2014) and *Donovan's Brain* (Feist, 1953) and to the questions surrounding the relationship of brain to body and how brains might survive their bodies. The brain-in-the-vat scenario is enduring and seductive. It also speaks to the phenomenon of reading, which is probably as close as most of us will ever get to being brains in vats.

Assignments

Students were required: (a) to participate in a group panel presentation of one of the films on the syllabus, (b) to write one journal entry per week, (c) to complete two analytical papers over the course of the semester, (d) to participate in classroom discussions, and (e) to complete a take-home final exam consisting of two essay questions.

Panel Presentations

Film panel presentations were spread throughout the semester. Panels were composed of three to four students who were expected to present relevant information about the film and its context and facilitate discussion for the entire period. The goals of the film panels were to: (a) examine key ideas, images, and issues in the film; (b) present research into the film's context, historical, political, cultural, etc.; and (c) make connections between the film and other texts discussed in class, focusing on how the film reinforced and/or challenged the ideas and themes found in other course materials. Panelists connected films to questions of cognition and neuroscience. For example, as part of the film panel on *Donovan's Brain* (Feist, 1953), students brought in B.F. Skinner's classic work on behaviorism (Skinner, 1953) and tied it into the representation of the brain in the film; students presenting on the *Temple Grandin* biopic (Jackson, 2010) brought in a history of treatments for autism and tied it into the film's presentation of the mother/daughter relationship. Expectations for the content of the presentations, as well as their assessment, were articulated in the syllabus (which is included in the Supplementary Materials).

Journals

Students were expected to write an entry once a week for most of the semester. Sometimes we gave them prompts to help them focus their writing. At other times, students were free to choose a topic and format for their entry. Even with prompts, we assured them that these were merely suggestions. The goal of the journals was to help students prepare for class discussion and for the two analytical papers. Students were encouraged to use a journal entry as a basis for an analytical paper so they might be able to use our marginal comments to develop and extend their

arguments. They were also encouraged to meet with PLAs (during the first year) and to take advantage of the Writing Center at Gettysburg College (during both years). In order to ensure that they would do well on their first analytical paper, we met with them individually in conference.

Analytical Papers

The analytical papers (and the journal) served as spaces where students could make interdisciplinary connections. Again, we gave them prompts to help them make these interconnections. If they wrote about a scholarly neuroscience article, they were encouraged to analyze the structure of the article, to look for confusing or contradictory moments, to draw conclusions about the effectiveness of the argument; if they wrote about a literary text, they could consider how the author represented cognitive neuroscience, the brain and its relationship to mind, and our mental processes, especially reading and interpretation. They were also encouraged, whether discussing a scientific or literary text, to consider how a text contributed to their understanding of the questions that drove our course: how literature, media, and science intersect; how scientific experimentation, technology, and human cognition intersect; how portrayals of the relationship between brain and cognition evolve over time in cultural products; how brain science helps us better understand our experience of art, literature, and culture; how writers shape a reader's experience of a text, i.e., play with our minds.

Class Participation

As explained above, to encourage participation first-year seminars are limited to 16 students. In the syllabus, we advised them to take notes as they read and to annotate, and to identify key passages that deserved close reading and extended analysis or that moved, confused, and/or disturbed them. We encouraged them to make connections to other texts, to other authors, to life experiences.

Final Exam

The final assignment was a take-home, open-book exam in which students forged connections between disciplines and between assignments. This was given online and students could take as much time as they needed to complete the task. Each of us prepared one question. One question (prepared by KDW) asked students to discuss the ways in which three of four works: a novel, *The Speed of Dark* (Moon, 2004); a piece of non-fiction, "Lighting Up the Autistic Brain" (Grandin and Panek, 2013); a film, *Temple Grandin* (Jackson, 2010); and a play, *The Curious Incident of the Dog in the Night-Time* (Elliott, 2014) used the specific techniques of their mediums/genres to portray the experience of being autistic. For example, how does the *Temple Grandin* movie employ cinematic techniques to enhance the viewer's experience of autism? The second question (prepared by TFB) asked students to speculate about the relationship between mind and brain in three of four texts: two novels, *Andrew's Brain* (Doctorow, 2014) and *The Echo Maker* (Powers, 2006); a case study, "The Last Hippie" (Sacks, 1995); and a scholarly article (Frazzetto and Anker, 2009). They were directed to look at the dynamic between brain

and mind as represented in these texts and to consider both theoretical speculations about as well as specific images and incidents that represented this interaction. By asking students to make interconnections between specific texts, we believe we made it difficult for them to simply use online sources. We did not discourage them from seeking online help, but directed them to cite any information gleaned in that manner.

RESULTS

The course had three important objectives related to our primary goals: (1) exploring the representations of brain function and dysfunction in art, film, and literature; (2) discussing how portrayals of the mind/brain relationship has evolved over time in cultural products; and (3) discovering how neuroscience is used to better understand our experience of art, literature, and culture. Several assignments throughout the semester allowed us to assess our successes related to these goals and objectives, as well as overall writing ability of students, including their weekly journals, film panels, and analytical papers.

Improved Writing

Given that one of the goals of the seminar was to introduce students to college-level writing, we assessed the degree to which their writing improved over the course of the semester. Using standard readability statistics embedded in Microsoft Word, we compared performance on the students' first analytical paper (due in early October) to performance on the students' second analytical paper (due in late November; Table 2). We found statistically significant improvement across a range of writing metrics, using two-tailed, paired *t*-tests, including average word length, $t(13) = 3.419, p = .005$, Flesch Reading Ease (which represents the complexity of the text, with lower numbers reflecting greater complexity), $t(13) = 2.669, p = .019$, and Flesch-Kincaide Grade Level (which represents the average grade level needed to understand the text, with higher numbers reflecting greater complexity), $t(13) = 2.396, p = .032$.

Impact on Brain Literacy and Interdisciplinarity

We also assessed the analytical papers to determine if there was significant improvement over the course of the semester in three metrics that we developed to look at the

Statistic	Average Score (Paper 1)	Average Score (Paper 2)
Average Word Length*	4.66 (0.20)	4.84 (0.24)
Flesch Reading Ease*	55.71 (7.84)	49.41 (7.78)
Flesch-Kincaide Grade Level*	9.96 (1.44)	11.05 (1.27)

Table 2. Readability statistics (and standard deviations) showing improved writing over the course of the semester. * denotes statistically significant improvement.

specific content of the course. The first metric that we developed was “Literary Analysis,” which we defined as the frequency with which student made comments or observations that demonstrate a basic ability to focus on how plot/structure, character, setting, and other features are used by an author to create meaning. The second metric was “Brain Literacy,” which we defined as the frequency with which students made comments or observations that demonstrate a basic understanding of brain structure and/or function, neuroscientific techniques or fields, and related concepts. Finally, our third metric was “Interdisciplinarity,” which we defined as the frequency with which students made comments or observations that bridged multiple disciplinary perspectives.

We trained two independent readers to code both the first and second analytical papers for the frequency of each of these three types of statements. The two readers were blind to the author of each paper, as well as to whether each paper was a student’s first or second submission. Given our inability to validate these somewhat coarse measures of our themes, we did not conduct traditional statistical tests on the outcomes of these analyses. Nevertheless, there appeared to be a numerical trend for higher rates of Brain Literacy and Interdisciplinarity in the second analytical papers, but no difference in Literary Analysis across the two assignments (Table 3). We do not draw any strong conclusions from these particular data, but the qualitative patterns observed here are at least partially consistent with the hypothesis that students improved in their brain literacy and interdisciplinarity over the course of the semester.

Sustained Interest in STEM Disciplines

The course enrolled 32 students across the two years. Of the 28 students who completed their degrees at Gettysburg College, 19 (68%) declared majors or minors in STEM disciplines (e.g., Biology, Biochemistry and Molecular Biology, Chemistry, Environmental Studies, Health Science, Mathematics, Neuroscience, and Psychology). Three students (11%) declared majors or minors in non-STEM disciplines related to the course content (e.g., English, Cinema & Media Studies, Philosophy, and Theater Arts).

Overall Positive Student Evaluations

Partway through the semester, we administered a mid-semester evaluation to assess the degree to which we were successfully implementing the course. Student feedback was very helpful in shaping the second half of the course and it also affirmed that students enjoyed the interdisciplinary nature of the course. Example comments ranged from, “I find the conversations and discussions stimulating,” to, “I feel it is a very relaxed atmosphere where questions and new perspectives are encouraged,” and, “I think it is a great way to blend two very different studies that I enjoy thoroughly.”

During the last two weeks of the semester, students at Gettysburg College complete an end-of-semester evaluation in each of their courses. The standardized evaluation form consists of ten questions that provide information about the student (e.g., “how would you evaluate

Writing Metric	Average Frequency (Paper 1)	Average Frequency (Paper 2)
<u>Literary Analysis</u> <i>Comments or observations that demonstrate a basic ability to focus on how plot/structure, character, setting, etc. are used by the author to create meaning</i>	6.23 (2.84)	6.00 (3.37)
<u>Brain Literacy</u> <i>Comments or observations that demonstrate a basic understanding of brain structure and/or function, neuroscientific techniques or fields, etc.</i>	2.07 (2.69)	3.27 (2.64)
<u>Interdisciplinarity</u> <i>Comments or observations that combine multiple academic disciplines</i>	4.27 (2.39)	5.07 (2.48)

Table 3. Mean occurrence of three different writing metrics (and standard deviations) across two writing assignments over the course of the semester. Higher numbers indicate greater frequency.

your own commitment to and engagement with this course?”), the course (e.g., “how would you rate the assignments and tests the instructor required as measures of learning in the course?”), and the instructor (“how effective was the instructor in conducting the class sessions?”). Students respond to each question with a text-based, multiple-choice selection (options range from “poor” to “excellent” or “very little” to “a great deal”) as well as open-ended comments. For questions related to the instructor, students could provide a single answer for both instructors, or could provide separate evaluations for each instructor. These evaluations are used for faculty evaluation and for ongoing course development.

Students chose the two positive choices (e.g., “very good” and “excellent”) significantly more often than the two negative choices (e.g., “poor” and “fair”) for the majority of questions on the evaluation form. Using two-tailed exact binomial tests, we found a significantly greater probability of positive responses for commitment to the course ($p < .001$), amount learned ($p < .001$), helpfulness of course materials ($p < .001$), instructor effectiveness in conducting class ($p = .003$), instructor effectiveness in providing feedback ($p = .003$), and overall instructor rating ($p < .001$).

Written comments constitute the most useful portion of the evaluations and students made a number of observations that supported the overall success of the course. Concerning the use of non-traditional science sources, students commented, “the movies presented were extremely helpful to me in fully understanding some of the neurological disorders discussed in class,” “I have learned a lot of new information about the brain and have been exposed to many new literary works/styles,” and, “very modern and interesting course material.” Related to the co-teaching approach, students commented, “the two teachers

balanced each other out well. They brought different ideas and methods of learning,” and, “I have taken both psychology and English courses but having this interdisciplinary course greatly increased my knowledge of both.”

In addition to the college-wide standardized evaluation form, we developed a supplemental course evaluation with questions that were more specific to this course (e.g., “Are you more interested in neuroscience as a result of this course?” and “Did you think that the film panels were an effective learning tool?”). Students responded to each of these questions with open-ended comments. For example, students re-affirmed the value of the film panels: “I definitely think that the film panels were valuable, being able to compare and contrast film and literature helps see how we interpret things differently through visual or reading,” “the film panels worked well and got everyone in the class involved in some way,” and “having a film panel after was nice because it brought up ideas that I may never have thought of.” Similarly, the course increased, or reinforced, many students’ interest in neuroscience and literature: “it was fascinating to read literature looking at the neuroscience aspects,” “the readings and films were well chosen,” “I found the relationship between the two to be very interesting – did not know they were so well connected and I would like to learn more about both topics and their relation in the future,” and “having two professors from different disciplines allowed for valuable differences in perception of material and instruction. A happy medium between hard science and literature.”

DISCUSSION

As already noted, the course was successful. Students were enthusiastic about both course content (the many ways that science, technology, and society intersect) and course interdisciplinarity (with its heavy emphasis on neuroscience and literary questions). Their writing improved over the course of the semester as did their ability to make interdisciplinary connections both in class and in their written assignments. Finally, most students went on to declare majors or minors in STEM disciplines.

Value of Co-Teaching

As always happens when two people from different disciplines teach together, we learned along with our students, not only about each other’s discipline but also about our different teaching styles. In addition, one of our goals was to work together on articles about the intersections of literature and neuroscience and study more fully and academically the course’s issues: the exciting new developments in cognitive neuroscience, how the brain reads, how reading affects the brain, how brains turn into minds, why reading is both a dangerous and enlightening experience (e.g., Zunshine, 2006; Wolf, 2007; Dehaene, 2009). We look forward to examining more fully the ways that brain research can help us understand the processes of reading, interpreting, writing, and becoming human.

Financial Considerations

Implementing this interdisciplinary seminar was relatively

inexpensive. Gettysburg College has a dedicated pool of money to support the first-year seminar program, and so we were able to take our students to a live theatrical performance each time that we taught the course. While this was certainly rewarding and fit well with the overarching themes of the course, it was by no means necessary and could easily be omitted if funding for field trips is not readily available at your institution. We also employed two Peer Learning Associates in the first year of the course, for a modest cost, to assist with a variety of tasks and to model interdisciplinarity for students enrolled in the course. We decided, however, that this was not necessary in the second year, further reducing the costs of implementing the course. The final consideration relates to the cost of team-teaching. For schools that have a strong support system for co-teaching, this will not pose a significant challenge. For schools that do not have a tradition of collaborative teaching, however, creative solutions may need to be discussed between faculty and administrators in order to ensure that each instructor receives teaching credit for such a worthwhile, collaborative, and interdisciplinary experience.

Areas for Improvement and Other Concerns

After the first year, we did feel that it was simply too much content for one semester. This often happens whenever a new syllabus is constructed. It is difficult to know in advance how much material can be covered in how much time; this difficulty seems to increase when team-teaching is involved. In the second year, we eliminated some of the readings, specifically, those related to human/animal cognition (Prince-Hughes, 2004; Fowler, 2013). This resulted in a much more manageable reading load for the students over the course of the semester.

We also decided that we needed to change which two requirements of the Gettysburg Curriculum our course would meet (even though many courses may meet more than two curriculum requirements, Gettysburg College only allows a single course to fulfill two). Since our course so clearly fulfilled the Science, Technology, and Society and Integrative Thinking curricular goals, it seemed appropriate to designate them as our curricular goals in the first iteration. We did not anticipate, however, that some students choose seminars based on whether they met Gettysburg College’s First-Year Writing requirement and so there were some concerns raised by students about the amount of writing in our class, which did not advertise itself as fulfilling the writing requirement. Because we believe the writing components of our course were key to understanding the questions that drive the course (how we read, why we read, how brains become minds, how literary people approach these questions, how neuroscientists approach these questions), we decided to replace the STS requirement with the First-Year Writing requirement in the second year.

Although we both enjoyed and valued the intense interdisciplinarity of team-teaching, we do think it is possible to teach this course with only a single instructor of record. Clearly, some of the benefit from daily interaction between scholars in different disciplines would be lost with a single

instructor of record; however, bringing in one or several other faculty members as occasional or regular guests could provide a workable solution if institutional barriers prevent both instructors from receiving full teaching credit.

Finally, there are certainly potential downsides to team-teaching that must be acknowledged. For instance, co-teaching does require giving up a certain bit of control over course structure and day-to-day operations, and potential disagreements between co-teachers need to be navigated carefully. Also, it is possible that student evaluations of teachers may not be entirely independent for each instructor, even if students provide separate feedback. That is, it might be difficult for students to disentangle the contributions of each instructor separately, which could have an impact on faculty performance evaluations without careful contextualization. Finally, the increased workload of co-teaching might not be fully reflected in the teaching credit assigned by the institution. In our case, we were both fortunate to receive full teaching credit for this endeavor. However, if instructors were required to share a single teaching credit, then this type of course would most certainly result in some degree of additional, uncompensated effort. In the end, careful planning and open dialogue between the two instructors, and with the relevant departmental chairs and divisional deans should go a long way towards addressing these potential concerns.

CONCLUSIONS

Team-teaching is an important academic tool; we need to find ways to harness its innovative power. In these days of economic vulnerability, what better and less expensive way to develop and deepen faculty and student understanding of new trends in academic fields than to fund more team-teaching? And, for faculty, there is the added bonus of energizing both research and teaching. Moreover, we need to find ways to facilitate team-teaching between humanists and scientists. We need to create more such opportunities so that faculty of such different stripes can appreciate and learn from their similarities and differences rather than feel in competition for scarce resources.

The links between neuroscience and literature have been explored in many literary texts (not only in the books we selected for our course, but in many not included, e.g., Goldstein, 1983; Lodge, 2001; Shakar, 2011). Likewise, there is increasing interest within cognitive neuroscience in understanding the neural basis of consuming cultural products such as literature, art, and films. One of the most impressive examples of this is the publication of Dehaene's *Reading in the Brain* (2009) and his response to his critics (2014). If an important goal of education is to engage our students in cutting-edge research, then we need to find ways to encourage faculty to construct new interdisciplinary seminars around new and exciting questions that engage us.

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APPENDIX: FYS139-3 SYLLABUS

Reading on the Brain

FYS 139-3

Meeting Times: Tues & Thurs, 1:10pm to 2:25pm

Meeting Location: Breidenbaugh 311

Instructors:

Dr. Kevin D. Wilson
Office: McCreary 315
Phone: x6186
Email: kwilson@gettysburg.edu

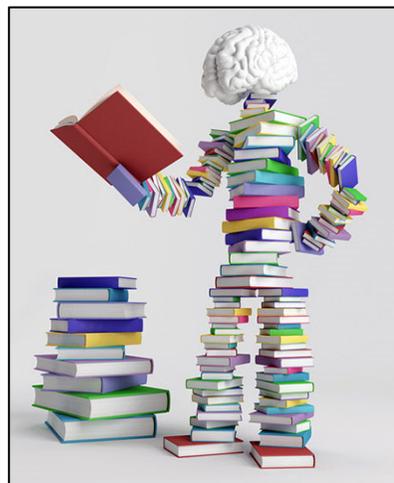
Office Hours:
Tues: 4-5pm; Thurs 9:30-10:30am
or by appointment

Dr. Temma F. Berg
Office: Breidenbaugh 301A
Phone: x6753
Email: tberg@gettysburg.edu

Office Hours:
Tues & Thurs: 2:30-4pm
or by appointment

"A first illustration of such a constitution [of consciousness] can be the experience of getting oriented in a new city, whose 'picture' gradually takes shape in our mind. Having arrived at night and having lost all our bearings in retiring to our quarters, with only a very confused idea as to how we got there, we may find ourselves awaking in a strange bed with the task of building up a new space pattern, thus far quite unrelated to our previous life spaces. . . . Perhaps the most important process here is how the 'empty lots' of our new spatial pattern are more and more 'built up' by corridors, stairs, streets, and houses that establish themselves more or less firmly until the pattern gets sedimented, usually after a good many upsets, which break up the first outlines as a result of disorientations, 'getting lost,' and similar adventures." Herbert Spiegelberg, *The Phenomenological Movement*, 1965

"I am slow, very slow to believe the protestations of another; I know my own sentiments, because I can read my own mind, but the minds of the rest of man and woman-kind are to me as sealed volumes, hieroglyphical scrolls, which I can not easily unseal or decipher." Charlotte Bronte; *Letter to Ellen Nussey*, 1834



Course Description:

If you've seen the movie *Memento* or *Ex Machina*, you know that interest in the brain and its mysteries is increasing exponentially. Pick up any newspaper or magazine and you might find an article about implanting false memories directly in the brain or using brain imaging to determine if someone is racist. Advances in brain science such as these capture public attention and emerge in a variety of cultural products such as literature, film, and advertising for commercial products. In this course, we study the ways in which cognitive neuroscientists, writers, artists, and filmmakers represent the brain, its functions, and dysfunctions. We also seek to understand the relationship between brain and mind and the role that reading plays in their interaction. We look at how recent advances in neuroscience help us to better understand why we consume, and how we respond to, cultural products. Finally, and more broadly, we examine how cognitive neuroscience, art and literature, and society intersect.

Course Goals:

Students will develop:

1. A basic understanding of brain structure and function
2. A basic understanding of how to read literature and of reading as a fundamental process
3. An interdisciplinary approach to understanding brain function and dysfunction

4. A basic understanding of the ways that literature, media, and science intersect with one another and how these intersections affect public awareness
5. A basic appreciation of the interconnections between scientific experimentation, uses of technology, and human cognition

Course Objectives:

To accomplish these goals, you will:

1. Survey topics in cognitive neuroscience related to neuroanatomy and the neural systems involved in cognition. *(Implementation of Goals #1 & 3)*
2. Be introduced to methods used to study the brain (brain imaging, lesion studies, etc.). *(Implementation of Goal #1)*
3. Explore representations of brain function and dysfunction in art, film, and literature. *(Implementation of Goals #2 & 3)*
4. Discuss how portrayals of the relationship between brain and cognition have evolved over time in cultural products. *(Implementation of Goals #3, 4, & 5)*
5. Discover how brain science is used to better understand our experience of art, literature, and culture. *(Implementation of Goals #2, 4, & 5)*
6. Reflect on the reading process as you read course materials and on representations of reading in the texts we discuss. *(Implementation of Goal #2)*

“Reading the Brain” fulfills two requirements of the Gettysburg Curriculum:

The First-Year Writing Requirement of the Effective Communication Goal

The Effective Communication Goal strives to develop “*proficiency in writing, reading, and the use of electronic media. Central to these skills is the ability to articulate questions clearly, identify and gain access to appropriate kinds of information, construct cogent arguments, and engage in intellectual and artistic expression. Emphasis on this goal begins in the first year of study and continues in the major.*” The First-Year Writing Requirement may be a composition course or a first-year seminar. Our seminar, “Reading on the Brain,” has been designated a first-year seminar that meets the first-year writing requirement.

Gettysburg College Writing Policy:

Since the ability to express oneself clearly, correctly, and responsibly is essential for an educated person, the College cannot graduate a student whose writing abilities are deficient. Instructors may reduce grades on poorly written papers, regardless of the course, and, in extreme cases, may assign a failing grade for this reason.

Interdisciplinary Course Requirement of the Integrative Thinking Goal

The Integrative Thinking Goal strives to “*develop critical and open minds that seek to adopt well-argued points of view through the active consideration and integration of alternative methodologies, perspectives, and foundational presuppositions.*” Throughout the course, we will routinely examine the methods, conventions, and assumptions that have been used to portray brain function and dysfunction in cultural products (e.g., literature, art, films) through the lens of cognitive neuroscience. We will examine how historical developments in brain science have changed the way in which brain function (and brain research) has been portrayed over time. We will also look at modern research in cognitive neuroscience that attempts to understand the aesthetic experience of art, film, and literature at the neurological level. In this way, therefore, we will also be using the methods of cognitive neuroscience to examine the experience of responding to art and literature. Last but not least, we will encourage students to reflect on their own reading processes, develop their critical thinking skills, and hone their writing skills; and, hopefully, students will see how deeply interconnected reading, thinking and writing are.

Your final grade will be determined as follows:

Reading Journal (20%)

You will be required to keep a reading journal, in which you will write ten times during the semester. **Prepare entries before class; this will enable you to voice your own ideas before hearing what others have to say and it will also help you keep your journal up-to-date. Sometimes we will give you prompts; sometimes you will have to come up with your own ideas.** Your entries (two- to three-pages, New Times Roman 12, double-spaced, one inch margins) must focus on a particular theme, idea, or problem in, or particular portion of, a text either literary or scholarly. You can write about your reading experience, what you are paying attention to and why, what questions arise for you, your emotional responses, your intellectual responses. Your journal entries will provide you with an opportunity to reflect on course readings before class discussion and enable you to come to class with ideas to share. When reflecting on texts, it is necessary to bring in pertinent citations and explain them in your own words. It is also a good idea to bring in passages

that confuse you and try to tease out their significances. Bring your journals to class each time we meet. We will collect them at least four times a semester, sometimes without warning. **Keep your reading journal in a folder so that accumulated entries can be turned in when necessary and so that we (and you) can see your progress as the course evolves.** (*Assessment of Objectives #1-6*)

Since this class fulfills the First Year Writing Requirement, grammar, structure, and style will count in assessment of all your written work (journal entries, presentations, quizzes, and exams); however, since this is a reading journal we will be even more interested in your reading responses. Be honest; be thoughtful; it is okay to be confused or mistaken. If you seek help to understand a difficult concept, cite the source you consulted. Your first entry should be done before class time on Tuesday or Thursday of the second week; the last one by class time on Tuesday or Thursday of the penultimate week. You are allowed two passes; you can use them at your own discretion, but they do not count toward your ten entries. To indicate that you are passing during a particular week, write "Pass" and the dates of the week on a piece of paper and add this to your folder in its proper place. **You must turn in ten dated entries, and you must keep up with your journal entries even though we may not have yet returned your assessed and earlier entries back to you.**

Analytical Papers (20%)

You will write two in-depth analytical papers. For each paper you may use one of your journal entries as a starting point. Re-writing is the best way to learn to write, so when we respond to your journal entries we will give you ideas as to how you might build on your entry and turn it into an effective analytical paper. In your analytical papers your goal is to understand the theoretical concepts and questions that guide our seminar. When writing these responses it is vital to have an argumentative edge and to use it to organize and develop your ideas. To write a coherent paper, you must focus. It is also important to include pertinent citations carefully selected and logically incorporated into your ongoing argument. You must find citations that support your idea and explain them in such a way that it is clear to your reader how they support your argument. **Your formal, carefully-argued, and carefully-written analyses should be 4 to 5 pages (or 1500 words). Analytical Paper #1 is due at the end of Week #6; Analytical Paper #2 is at the end of Week #12. LATE PAPERS WILL NOT BE ACCEPTED.** (*Assessment of Objectives #2-6*)

Film Panel (20%)

As a member of a film panel, you will work with the other members of your group to present the main ideas of one of the assigned films. Each panel should come to class prepared to facilitate class for the entire class period. Sometimes to do this effectively, you must over prepare, that is, come with more material than you may actually have time to cover. (This is what facilitative teaching is all about, learning how to respond to what is going on in the classroom, expanding here, omitting there, as necessary.) You should meet at least three times for your film panel. The first time, you should view the film together and decide how you are going to research your project. The second time you should meet with one of us to discuss how your research is going and we will help you think about what else you might do and help you develop a successful film presentation. The third time, you should run through your presentation so that you will have an opportunity to refine your presentation and to get a sense of how much time you will need for what. It is vital that the parts of your presentation form a coherent whole; to do this effectively, you need to know what the other members of your group are doing. As you finalize your presentation be creative, try different approaches. Try not to model yourself too closely on preceding panels. Feel free to meet with us more than once at any time during the process of crafting your presentation.

The goals of the film panels are to 1) examine key ideas, images, and issues in the film; 2) present your research into the film's context, historical, political, cultural, etc.; and 3) make connections between the film and other texts discussed in class, focusing on how the film reinforces and/or challenges the ideas and themes found in other texts we have discussed. Remember, film is a visual as well as dynamic medium. It is important to pay attention to the way film uses color, camera angles and movement, composition, sound, scenery, atmosphere, narrative structure, etc. **Screening and close reading of key scenes from the film should be a part of your presentation. Just as we re-read sections of a written text to understand it more fully, just so we need to re-view different scenes in a film in order to see them more fully and understand how they work.**

Film panels will be judged according to the following criteria: 1) a clear beginning, logical organization, and a conclusive ending; 2) screening and interpretation of key scenes; 3) ample discussion of main ideas and key scenes; 4) significant research; 5) inclusion of connections to other course materials; 6) making sure that each member of the panel speaks; 7) interspersing thoughtful questions throughout the presentation in order to stimulate good class discussion; 8) making sure you know how to use technology; and 9) providing members of class with a comprehensive bibliography, which must include at least five sources. Three of these sources must come from books and/or journals originally in print although now they may be accessible on a database. Only two of these may be websites, and you must choose them carefully. Make sure they are reliable and academically sound.

You are responsible for viewing the film before class discussion. All films are on reserve in Musselman Library. They are also on Moodle, but it is always best to view films on a larger screen than a computer can provide so do please watch films on a TV or in one of the College's smart classrooms. Try to view films in groups. Also, return the film immediately to the library when you are finished viewing it so that others may take it out. **Do not wait until the last minute to view a film. After viewing the film, record your reactions. Note cognitive, emotional, and interpretive responses. What did you pay attention to? Why? What themes did you find? What did you feel? Why? Where did the film succeed? Where did it fail? Remember, film is a visual as well as dynamic medium, so pay attention to the way film exploits color, camera angles and movement, lighting, composition, sound, scenery, atmosphere, etc. Bring these reaction notes to class on the day of the film panel. We will collect them at the end of the film panel. (Assessment of Objectives #3-6)**

Attendance, Participation, Quizzes (10%)

You are expected to attend class, to read and think about the assigned material, and to come to class prepared to discuss readings and films. The class participation part of your grade depends not only on your attendance, but also on your *active* participation in class.

In order to participate actively, you need to read actively. **ANNOTATE!** Take notes as you read. Underscore, highlight, and identify key passages that deserve close reading and extended analysis or that moved and/or disturbed you. Write in the margins of your texts. Mark what you don't understand or want to explore more fully. Look for continuities and discontinuities, make comparisons, form ideas of your own. Make connections (to other texts, to other authors, to life experiences). We learn much more if we hear from different points of view and enter texts from multiple angles.

In addition to your intellectual presence in all the above ways, your physical presence also matters; **you are allowed only two absences.** Your final grade will go down one grade for each additional absence. (For example, if you are absent three times and are due a "B" you will receive a "B-"; if you are absent four times and are due a "B" you will receive a "C+.") You should save your absences for emergencies; that is their purpose. Two latenesses will add up to one unexcused absence. Athletic absences will count as unexcused absences; however, you can arrange to make up these absences.

We will sometimes begin class with a quiz. This helps us focus on key ideas and stimulates the brain! (Assessment of Objectives #1-6)

Final Exam (30%)

You will take a cumulative final exam during the final examination period, which will include short answer and essay questions covering the assigned reading and discussion material from the whole semester. (Assessment of Objectives #1-6)

All grades will be converted to percentages in order to compute your final grade. Final grades will be assigned on the following scale:

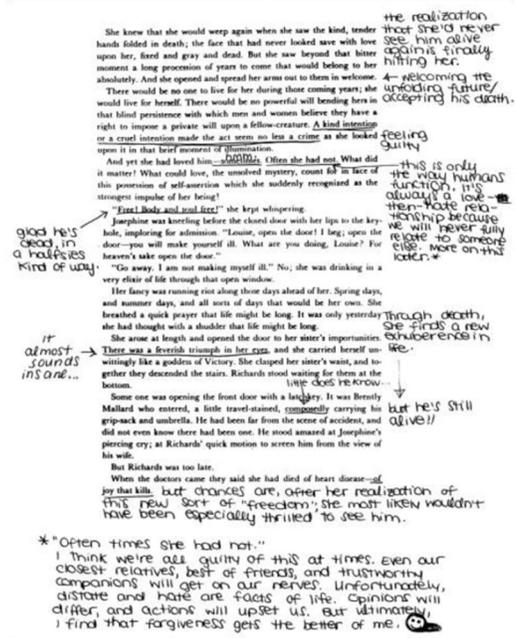
93-100%	=	A	83-86%	=	B	73-76%	=	C	63-66%	=	D
90-92%	=	A-	80-82%	=	B-	70-72%	=	C-	60-62%	=	D-
87-89%	=	B+	77-79%	=	C+	67-69%	=	D+	59% or less	=	F

Depending on the distribution of final grades, we reserve the right to curve upwards. We will never curve grades downward.

Student Participation Outside of Class:

Students at Gettysburg College are expected to devote 12-15 hours per week to each of their classes (including both inside- and outside-of-class time). You will only be in class 2.5 hours of that time, so therefore **you are expected to**

FIGURE 2. Annotation of "The Story of an Hour" by Kate Chopin



spend at least 10 hours per week devoted to this class outside of class time. Much of that time should be spent reading, reviewing your notes, working on your response and analytical papers, watching films, and testing yourself on the material. Research indicates that grades in any course are heavily related to the amount of time students spend on the course outside of the classroom, so if you hope to achieve a high grade, then you should plan to put in the expected amount of time and effort.

Class Format:

We will typically read and discuss texts over the course of each week. The whole class will discuss them jointly. In the beginning of the semester, we will lead discussions, but later in the semester you will lead the discussion in pairs.

Class Etiquette:

- All cell phones, pagers, MP3 players, etc. must be turned OFF during class. “Silent” or “Vibrate” mode is not acceptable. If there is an emergency in your family and you need to keep in touch, let us know before class.
- Please show up on time and do not leave until the end of the class. Late arrivals and early departures are disruptive and disrespectful to your fellow classmates and to us. Similarly, please do not leave during class to use the restroom. Since we meet after lunch it would be a good idea to go to the restroom before class begins.
- Discussions will be interactive, so we encourage you to ask questions and offer comments. However, out of courtesy to your fellow classmates and to the instructors, please raise your hand if you want to contribute.

Special Accommodations:

If you have a disability that necessitates an Individual Educational Accommodation Plan (IEAP), please make arrangements to meet with one of us outside of class in the first week of the semester to discuss your situation.

Honor Code:

The Honor Code is a serious and solemn pledge that you took the day that you matriculated at Gettysburg College and that you renew each and every time you write it down, and sign your name, on a test, quiz, paper, or assignment. It is not something that you can take lightly, or follow “half-way”, but rather it must be a core value that you deeply embrace and apply in every single aspect of your Gettysburg experience. In order for an Honor Code to work, you must actively reflect on its meaning every single time that you swear to abide by it and you must take every reasonable measure to ensure that you, and your fellow classmates, are upholding that promise. One manifestation of that promise is that you properly credit the source of any intellectual property (ideas, writing, creative works) that is not your own, and that every single assignment that you turn in for this course is the product of your own individual effort. You are more than welcome to study with other students, and to discuss ideas for your assignments with other students, but the content of those assignments must be yours and yours alone. You may consult sources for help in understanding difficult concepts but be sure to cite them appropriately. To use another person’s ideas or words and not cite them is plagiarism.

In order to help you uphold the Honor Code, we have several other policies that will apply to examinations during this course. For instance, you will always sit as far away as possible from other students with the equivalent of at least one empty space between you and the next closest person. Similarly, all of your belongings must be kept in your bags, which will be stored at the side or front of the room during the exam. Finally, you may not use or keep any electronic devices on your person during the exam – all cell phones, MP3 players, etc. must be stored in your bags for the duration of the exam.

If any aspect of the Honor Code is unclear, please come see one of us at any point during the semester.

Required Readings - Books:

Andrew's Brain by E.L. Doctorow
The Echo Maker by Richard Powers
The Speed of Dark by Elizabeth Moon
Machine Man by Max Barry

Required Readings – Articles: (These articles are listed in order and are available on Moodle as PDFs)

Ellison, A. (2012). *Getting your head around the brain*. New York, NY: Palgrave Macmillan. (Ch 1: “Engage your Brain”)
 Jääskeläinen, I.P (2012). *Introduction to cognitive neuroscience*. Bookboon.com. (Ch 3: “Anatomy of the Brain”)

- Schacter D.L. (1983): Amnesia observed: remembering and forgetting in a natural environment. *Journal of Abnormal Psychology*, 92, 236–242.
- Sacks, O. W. (1995). *An anthropologist on Mars: Seven paradoxical tales*. New York: Knopf. (Ch 7: “The Last Hippie”)
- Grandin, T., & Panek, R. (2013). *The Autistic Brain: Thinking Across the Spectrum*. Boston: Houghton Mifflin Harcourt. (Ch 2: “Lighting Up the Autistic Brain”)
- Walsh, P., Elsabbagh, M., Bolton, P., & Singh, I. (2011). “In search of biomarkers for autism: Scientific, social and ethical challenges.” *Nature Reviews Neuroscience*, 12, 603-612.
- Frazzetto, G., & Anker, S. (2014). “Neuroculture.” *Nature Reviews Neuroscience*, 10, 815-821.
- Chatterjee, A., & Vartanian, O. (2014). “Neuroaesthetics.” *Trends in Cognitive Sciences*, 18, 370-375.
- Hasson, U., Landesman, O., Knappmeyer, B., Vallines, I., Rubin, N., & Heeger, D. (2008). “Neurocinematics: The neuroscience of film.” *Projections*, 2, 1-26.

Required Films – Available on Moodle and on reserve in Musselman Library:

- Donovan’s Brain* (1953)
Memento (2000)
Temple Grandin (2010)
Ex Machina (2015)

Week	Session	Topic/Readings	Notes
#1	Tuesday	General Introductions	
	Thursday	Poetry	
#2	Tuesday	Ellison, "Engage your Brain"	Sign Up for Film Panel
	Thursday	Jääskeläinen, "Anatomy of the Brain"	
#3	Tuesday	<i>Andrew's Brain (Chapters 1 & 2)</i>	
	Thursday	<i>Andrew's Brain (Chapters 3 & 4)</i>	
#4	Tuesday	<i>Andrew's Brain (Chapters 5 through end)</i>	
	Thursday	Film Panel #1: Donovan's Brain	
#5	Tuesday	Schachter, "Amnesia observed..."	
	Thursday	Sacks, "The Last Hippie"	
#6	Tuesday	<i>The Echo Maker (Parts 1 & 2)</i>	
	Thursday	<i>The Echo Maker (Part 3)</i>	Analytic Paper #1 Due
#7	Tuesday	Reading Days	
	Thursday	<i>The Echo Maker (Parts 4 & 5)</i>	
#8	Tuesday	Film Panel #2: Memento	
	Thursday	Grandin, "Lighting Up the Autistic Brain"	
#9	Tuesday	Walsh et al, "In Search of Biomarkers for Autism"	Theater Field Trip
	Thursday	Autism articles, continued	
#10	Tuesday	<i>The Speed of Dark (Chapters 1-7)</i>	
	Thursday	<i>The Speed of Dark (Chapters 8-14)</i>	
#11	Tuesday	<i>The Speed of Dark (Chapters 15-21)</i>	
	Thursday	Film Panel #3: Temple Grandin	
#12	Tuesday	Frazzetto & Anker, "Neuroculture"	
	Thursday	Chatterjee & Vartanian, "Neuroaesthetics"	Analytic Paper #2 Due
#13	Tuesday	Hasson et al, "Neurocinematics"	
	Thursday	Thanksgiving	
#14	Tuesday	<i>Machine Man (Chapters 1-7)</i>	
	Thursday	<i>Machine Man (Chapters 8 through end)</i>	
#15	Tuesday	Film Panel #4: Ex Machina	
	Thursday	Wrapping Up	
Finals		Final Exam	