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Is Truthiness Enough? Classroom Activities for Encouraging Evidence-Based Critical Thinking

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Abstract

Teaching students how to think critically and develop lifelong habits of evidence-based inquiry outside of the classroom is a primary goal for educators today. This paper describes nine activities designed to promote evidence-based critical thinking in college or high school classrooms in any discipline. We have developed a seven step process for critical thinking, with teaching modules designed to build skills in these steps in an engaging, active way. The modules involve a variety of teaching methods, including use of video, discussion, debate, and homework assignments. We begin with fun, engaging, less emotionally-laden topics such as toys that claim to read brain waves or pictures of ghosts and then progress to more serious topics such as use of medical marijuana and racial profiling in airports. The modules were designed to stimulate interest in our students and could easily be modified to encourage students to think more deeply about current issues in the news or local community. There is evidence that these modules can increase motivation to think critically outside the classroom (Burke, Sears & Kraus, 2012) and help students evaluate their own belief systems (Burke, Sears, Kraus, & Roberts-Cady, in press). Further, we report on data suggesting that, when combined with deductive reasoning activities, these modules can boost students' critical thinking skills.

Keywords: Critical thinking, teaching, classroom activities, paranormal beliefs.

Today's students are drowning in 'facts.' They have information readily available at every moment on their internet-connected devices. Google and Wikipedia alone can answer most questions at the touch of a screen or click of a mouse. Easy access to information makes the memorization of basic facts—once the hallmark of education—largely irrelevant in the modern world. The vast amount of information available calls instead for honing of different skills. While students are repeatedly reminded not to believe everything they read or see on TV or other media devices, many still consider on-line open source sites to be acceptably reliable sources of information. Thus, choosing which information merits attention and knowing how to weigh the evidence for supposed 'facts' are critically necessary skills for the information age. Consumers of information must be able to delineate between well supported claims and those that rely on 'truthiness,' or using a gut-sense feeling instead of empirical evidence or thinking to determine truth (Colbert, 2005). Truthiness is also defined as "the quality of preferring concepts or facts one wishes to be true, rather than concepts or facts known to be true" (Merriam-Webster,

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2006). A major challenge for educating young and emerging adults is helping them to develop critical thinking skills that translate beyond the classroom walls and will allow them to make informed choices based more on truth than truthiness (Paul, 2005; Wyer, 2009).

Critical thinking is a complex concept that has been defined in a number of ways, including as metacognition (Paul, 2005), as logical argument analysis (Watson & Glaser, 2006), and as careful weighing of the evidence to support a claim (Bensley, 1998). While most educators agree that it is vital to teach critical thinking (Flores, Matkin, Burbach, Quinn & Harding, 2012; Wyer, 2009), we do not always agree on the definition or specific skills we are hoping to instill in students (Chenault & Duclos-Orsello, 2008). With this challenge in mind, we set out to create classroom modules that promote critical, empirically-based thinking skills. We based the modules on Bernstein's (2007) five steps for critical thinking. He proposed that students needed to think about the claim ('what am I being asked to believe?'), evaluate the evidence, consider alternative interpretations of the evidence, and, finally, draw conclusions. These steps are similar to the subtests in the Watson-Glaser critical thinking test (inference, recognition of assumptions, deduction, interpretation and evaluation of arguments; Watson & Glaser, 2006). In addition to these constructs, we sought to address potential barriers to critical thinking, such as biases, emotional reasoning, overuse of personal experience or small case studies, and reliance on authority (Myers, 2009) directly in our modules. We therefore created the following seven steps to critical thinking as the foundation around which we then designed our classroom teaching modules.

Critical Thinking: Seven Steps

1) What am I being asked to <u>believe or accept</u>?
2) What <u>evidence</u> is available to support the claim?
3) What <u>alternative</u> ways are there to interpret the evidence?
4) Rate the evidence/alternatives on 0-10 scale based on <u>validity/strength</u>
5) What <u>assumptions or biases</u> came up when doing the above steps? (e.g., using intuition/emotion, authority, or personal experience rather than science)
6) What <u>additional evidence</u> would help us evaluate the alternatives?
7) What <u>conclusions</u> are most reasonable or likely?

We were aware that students might be initially resistant to focusing on critical thinking, as this type of thinking requires more cognitive effort than simply relying on authority or intuition (Browne & Freeman, 2000). We were thus careful in our design to choose engaging and timely topics as well as utilize considerable active learning to optimize student motivation. We designed nine brief critical thinking (CT) modules for use about once per week throughout the semester. We tested these modules in a wide variety of college psychology classrooms, ranging from introductory psychology to research methods and senior seminar, before ultimately implementing them in a newly designed course called "Critical Thinking in Psychology." The activities were structured such that, each week, we built upon the steps that had been the focus of the previous week's module. For

example, the first activity centered on identifying claims and evidence, and the next module added in brainstorming about alternative interpretations of evidence. Each module featured an informational presentation and associated class activity (e.g., discussion, debate, or writing assignments) about a different controversial topic or issue such as medical marijuana, whether vaccines can cause autism, ghost photos, racial profiling, dog breed bans, and psychic powers. The topic areas could easily be modified to follow current debates of interest to students, but we believe that active learning is important to student engagement in the material. For development of critical thinking, our impression is that scaffolding the seven steps across sessions would be optimal. However, instructors could use and adapt individual exercises depending on the context and goals of their course.

We will discuss several of these modules in depth to illustrate how we present critical thinking in an active way in the classroom, as well as other modules with less detail to provide ideas for you to build from in your own classrooms.

The Modules

Module 1: Star Wars Force Trainer - This module is a stimulating introduction to the steps of critical thinking. We bring a Star Wars Force Trainer to class ($45; Uncle Milton, 2009). This is an educational toy that claims that by "utilizing dry neural sensor technology, the headset reads and interprets your brainwaves" (NeuroSky, 2011). The learning guide that accompanies the toy discusses various types and functions of brain waves and compares the toy to EEG machines that develop relaxed concentration (presumably theta waves). The guide claims that the user's relaxed brain waves cause a small ball to move up a tube attached to the sensor. Students read the material that comes with the toy, along with an article on the future of brain-controlled devices that hypothesizes that the future holds help for Alzheimer's patients and kids with ADHD through these devices that use electrodes to monitor concentration (Hammock, 2009). The students then watch a short clip on YouTube to illustrate how the toy works: http://www.youtube.com/watch?v=6MFOduNUE8U.

We have students identify the claims the manufacturer is making about the Force Trainer. Encouraging brainstorming of claims before looking at evidence is an important first step to critical thinking, one that is often overlooked in the rush to judgment. Once we generate a list of claims (such as that the machine is accurately reading and interpreting brain waves, and objects can be moved by developing certain brain waves), we ask students to test the device. This is when the fun begins. Many students do think that when they concentrate carefully the ball is moved farther, and they begin to be convinced that the initial claims might be true. Testimonials from parents of autistic children who claim the force trainer helped their child learn to relate better with others and other YouTube evidence also exist to support these claims.

We then move to step 3, generating other ways to interpret the evidence, as well as ideas for testing alternative hypotheses for how the Force Trainer works (which is part of step 6). These range from trying the Force Trainer on non-animate objects (which does not

work, supporting the manufacturer's claims) to trying it on dogs (which is possible but difficult, so we push for other ideas) to trying it on things that conduct electricity but do not have brain waves, like root vegetables. Left to brainstorm long enough, most groups develop the idea to try the force trainer on other parts of their own bodies. Not surprisingly, most students' knees have the same ability (if not greater) to move the ball 'with the force of theta waves' as their heads. This is an obvious problem for the manufacturer's claim (we are not aware of any brain waves in our legs) and a memorable lesson in critical thinking. Students learn that there might be multiple explanations for the evidence they see with their own eyes, and may start to think that critical thinking can be fun and valuable.

Module 2: Photos of Ghosts - The second module also focuses mainly on identifying claims and thinking of alternative explanations for the existing evidence. We start with a few statistics from a 2011 Rasmussen poll that suggests that 31% of adults believe in ghosts (Rasmussen Reports, 2011). We then show a PowerPoint slide show of supposed ghost pictures and have students evaluate the claims and the evidence. It is important not to skip the first step of evaluating claims. Many students want to simplify the claim to state that ghosts exist, but if prodded, they will recognize that there are more embedded claims, such as that ghosts can be photographed with certain technology. We then move to the evidence of ghosts provided by the photographs. Being skeptical of photos found on the web is second nature to today's students, but we ask them to come up with other explanations beyond Photoshop. In one classic picture of a ghost hugging a child, for example, the ghost in question could be smoke from the photographer's cigarette. We also discuss optical illusions such as the Muller-Lyer illusion where you 'see' something that does not exist by filling in missing parts of a pattern you expect to find (Muller-Lyer, 1889).

We end this discussion by questioning whether the alternative explanations for the photographic evidence actually mean that ghosts do not exist. When we first ask what we have concluded, often students jump directly to 'ghosts do not exist' but, if questioned, they conclude that ghosts may or may not exist, but they cannot be photographed. Astute students will point out that we have not actually supported that claim either, and that we simply think that *these* photos are probably not of ghosts. This final discussion is most useful in evaluating claims, evidence, and alternatives, and is an important caution to not over-step one's data. It also introduces the fact that using critical thinking does not necessarily mean you cannot believe in paranormal phenomenon—rather, it simply requires you to examine the evidence for your beliefs. As an instructor and scientist, maintaining this openness to possibility is important, especially early in the modules so as not to alienate students.

Module 3: Astrology activity - Many students read their horoscope regularly, with some degree of belief in those predictions, so this module is highly relevant for them and may engender resistance if not handled carefully. As with each module, we ask students to brainstorm about the basic claim of astrology (step 1). One simple claim is that personality types are associated with particular Zodiac signs. We ask students to tell us what evidence there is to support this claim (step 2). They generally offer personal anecdotes or

stories in which their horoscope was correct or where the description given based on their birth Zodiac sign has been accurate. Because we have already focused on step 3, alternative ways to interpret evidence, in this module we spend more time discussing step 5, biases and assumptions. We discuss cognitive biases such as illusory correlation (Hamilton & Gifford, 1976) and confirmation bias (Nickerson, 1998; Watson, 1960). We then ask students to brainstorm how they could use the scientific method to test the claim (step 6). After brainstorming about methods, we give students a handout with 12 personality profiles that come from a book on astrology (March & McEvans, 1982). We ask them to circle the description that best describes their personality. Once they have made their choice, we show them the "correct" answers, that is, which descriptions go with what birthdates according to the astrology book. We then count how many students circled the personality description that is supposed to correspond to their birthdate. As the "correct" answers are revealed, those students who have chosen the right answers rejoice, and those who did not have a match are usually more subdued. We can see the attraction of confirmation bias clearly. This leads to a discussion of how many students should match before we are convinced that the correct answers represent more than chance. In a class of 25 students, for example, one would expect about two or three to guess correctly if the choices were random since the odds are 1-in-12. We can also discuss how small numbers that occur naturally by chance can be over-interpreted. Students who are really thinking critically will point out that astrology could still be correct, but that our descriptions may have come from a weak source (i.e., outdated book), for which they get bonus points. We end with a brief review of the scientific literature that shows no empirical support for predicting personality using birth dates (Saklofske, Kelley, & McKerracher, 1982; Tyson, 1980).

Module 4: Psychic abilities - In this module, we use a short video clip of Uri Geller to introduce the claims of his psychic abilities (we show the first 6 minutes of http://www.youtube.com/watch?v=M9w7jHYriFo). We then ask students to individually write down what they see as the claim (step 1), the evidence that supports the claim (step 2), alternative explanations for the evidence (step 3), and to create a study design that would fairly evaluate the claim (step 6). After they have each designed a study, we show the students the next 7-minutes from the same video (above) that shows Uri Geller failing to produce results on the Tonight Show. We discuss the ironic finding that after the show aired, belief in psychic ability actually increased. We then visit the James Randi Educational Foundation website (http://www.randi.org/site/), which is devoted to the scientific study of psychic claims. We discuss their one million dollar challenge, which states that "the JREF will pay US$1,000,000 (One Million US Dollars) ("The Prize") to any person who demonstrates any psychic, supernatural, or paranormal ability under satisfactory observation." (JREF, 2012). This challenge has existed since 1964, and well over a thousand applicants have tried to win the prize. To date, not one single person has been able to prove their psychic abilities in a scientific test. This website also provides interesting examples of tests designed by the Foundation.

Module 5: Pit bull Ban - In module 5, we start with a newspaper article about banning pit bull dog breeds in Denver, CO (Kass, 2005). As in the previous module, we have students write individual answers for step 1, the claim, and step 2, the evidence provided.

We then focus squarely on step 4, evaluating the existing evidence. We write all the evidence from the article on the board and have students rank order each statement from most convincing to least. This ranking process, done in discussion with peers, is an effective way to get students thinking about what constitutes compelling evidence and why. The goal for this module is not to come to a conclusion about the pit bull ban, but rather to recognize that we do not yet have enough information to make a decision. We end with a discussion of what additional evidence would be needed to make a fair decision about whether pit bulls should be banned. Note that this module can easily be modified to focus on virtually any currently newsworthy event (e.g., did the FBI or CIA miss something years earlier in the case of the Boston Bombers?).

Module 6: Deal or No Deal – In this module, we focus primarily on step 5, the biases that come onto play when making decisions. We emphasize metacognition here, which is thinking about your thinking. We begin with a clip of the TV game show *Deal or No Deal* at http://www.youtube.com/watch?v=hmZFHjQfx-o and ask students to think about biases that might come into play and lead the contestant to make decisions that they later regret. Screening in over 40 countries, *Deal or No Deal* became an international television sensation in the 21st century (Deal or No Deal Countries, 2012). Once students are introduced to the game, we show a clip of a contestant who was offered $603,000.00 and ended up with $1.00 (http://www.youtube.com/watch?v=MQ40bwT-0fU), directing students to pay particular attention to the biases in the advice given to the contestant. We then have students make a plan for how they would make decisions in this game, and ask a volunteer to play the game while other students give them (hopefully) solid advice (http://www.nbc.com/Deal_or_No_Deal/game/flash.shtml). This is an excellent exercise to show how difficult it is to stick to a rational plan in the face of high emotions and peer pressure.

A scientific study of the show (Post, van den Assem, Baltussen, & Thaler, 2008) found that several cognitive heuristics come into play that can explain contestants' decisions. Notably, the *break-even effect* causes losers to take greater risks due to incomplete adaptation to prior losses, and the *house-money effect* leads contestants who do well in early rounds to make riskier decisions later because the money they currently hold does not seem like it is theirs. Ironically, risky decisions in this instance lead to both the biggest losses AND the biggest winnings in *Deal or No Deal*, while rational strategies typically yield more moderate amounts of prize money. This interactive experience in decision-making may help students identify the pressures that could lead to poor choices in other life situations. Social pressure to stay at a party and drink, for example, often sways students who have rational plans to get a good night's sleep or study. Students can generate their own examples of situations in which critical decision-making would be valuable.

Module 7: Autism and Vaccines - This module is similar to module 4 on psychic phenomena in that we start with a video presentation and evaluate the evidence for the claims. However, in this instance, we are focusing on real-world problems and families who are making life and death decisions with high emotional load. We show a CBS news segment about a court case in which Michael and Theresa Cedillo tried (and failed) to prove that vaccines were responsible for their child's severe autism

(http://www.youtube.com/watch?v=r0GOkS0uXWE). The video provides a forum for both sides to present their evidence. Students are asked to pay close attention to the types of evidence presented by each side, and weigh strengths and weaknesses of these arguments (step 4). Students then draw conclusions and explain what evidence they used to reach those conclusions (step 7). The emotional component of the mother's grief over her child's condition is also discussed, and links can be made to the student's own experience with *Deal or No Deal*. With more class time, instructors could also show Jenny McCarthy and Jim Carrey, two popular celebrities, discussing their beliefs about the vaccine-autism link on *Larry King Live* at http://www.youtube.com/watch?v=HX-SCdjDOrA; despite the lack of scientific basis for their beliefs, these movie stars have convinced many parents to forego essential vaccinations for their children (step 5). Almost one quarter of parents currently believe that vaccines might be dangerous, and, accordingly, child vaccination rates are declining at a rate of 3-4% per year (Nixon, 2010). We invite students to think about what information they would need to make a sound decision about vaccination for their own families, and, finally, we present scientific evidence that children who are vaccinated tend to have *lower* rates of developmental disorders, including autism (Andrews et al., 2004).

Modules 8 & 9: Topics in the news: medical marijuana and profiling - These last two modules will be considered together, as they each involve debate methods and are designed to get students thinking about real-world controversies and social issues using our seven-step method. The medical marijuana issue is an examination of a recent decision by our college campus to ban the use of medical marijuana, which is legal in our state. We divide the students into two groups based on their initial leaning for or against the ban. Students are assigned to argue the alternate point of view from their own initial reaction. Those who do not have strong feelings pro or con are divided in such a way as to balance group size. The homework is for all students to bring in at least three pieces of evidence for their assigned side of the debate (step 2). We then have an in-class debate in which each side presents its case, uninterrupted, using their best evidence. After each group has presented their case, they may directly question each other. Following the debate, students are then asked to write an individual essay on their own beliefs, and support their view with evidence (steps 4 and 7). Many mention that arguing a point they did not originally believe caused them to look more closely at the evidence, and many either changed their view, or became more open to the other side's argument. The goal was clearly to formulate an informed decision for themselves while being mindful of the evidence used to form this opinion.

The module about racial profiling took the process a step farther. We examined evidence for and against racial profiling, beginning with a discussion of current use of racial profiling by airline security, and expert views on profiling by TSA (Press, 2009). We then discussed the case of racial profiling by Maryland State Police (ACLU, 2010) as well as local profiling by looking at ads in our city newspaper that list "no dogs, no smokers, no students." Many students have had experiences of similar discrimination, because many landlords believe that students might in fact be worse renters on average. This leads to a lively discussion of when/if scientific evidence trumps moral reasoning. Is it right to profile in the name of public safety? Should your 80 year-old grandmother be searched in the

airport as often as a strong young man? Do landlords have the right to only rent to people over 30 years old or people with full time jobs? It is important to note that critical thinking is one way to answer these questions, but social justice and morality might also be a necessary part of the equation.

Empirical Support for the Modules

We examined the effectiveness of these modules with 128 college students and found that they encourage students to use critical thinking more in their daily lives and to critically evaluate their own beliefs, particularly about paranormal phenomena (Burke, Sears, Kraus & Roberts-Cady, in press). Although our modules significantly reduced paranormal beliefs from pre- to post-semester testing, they did not, when used by themselves, change scores on the Watson–Glaser Critical Thinking Appraisal, Form S (WGCTA–FS; Watson & Glaser, 2006), which is primarily a test of deductive reasoning. For an in-depth discussion of these findings and a critique of the current literature examining testing of critical thinking, see Burke, Sears, Kraus & Roberts-Cady (in press).

Because our initial study did not show increases in deductive reasoning skills, in the Spring of 2013, the third author (BLB) modified his "Critical Thinking in Psychology" (CT) course to include 10 minutes per week of deductive reasoning practice along with several of the modules described above and some new ones along student interest (e.g., the value of a college degree, critical thinking of religion). The deductive reasoning practice used problems similar to the Watson-Glaser test although with psychology examples. These problems typically present a short statement with a variety of possible conclusions. Test takers are asked to evaluate the strength of each conclusion and identify assumptions that appear to have been made. Students completed problems individually, and then discussed their answers in small groups, explaining their reasoning to their peers. The entire class later discussed the correct answers.

In this current study, we compared the CT class (n=20) results to those of an introductory math class, which was used as a control group (n=19). Pre and post semester testing included The Revised Paranormal Belief Scale (RPBS; Tobacyk, 2004; Tobacyk & Milford, 1983) and the WGCTA-FS test of critical thinking skills (Watson & Glaser, 2006).

Mixed model 2(pre/post) X 2(CT/math) ANOVAs with alpha set at .05 were used to examine results. As expected from previous studies of our modules, we found a significant interaction between pre-post measures of paranormal belief and class, $F(1, 35)=9.60$, $p=.004$, $\eta^2=.215$. The math group had pre and post test scores of 84.76 ($SD=20.86$) and 84.97 ($SD=20.91$) respectively. The CT class had pretest scores similar to the math students with an average of 81.85 ($SD=21.89$), but a significantly lower posttest average of 65.85 ($SD=20.29$).

Critical thinking scores also showed significant interactions, $F(1, 32)=5.03$, $p=.03$, $\eta^2=.136$. The math scores on the WGCTA-FS were virtually identical throughout the semester, averaging 21.50 ($SD=2.96$) at pretest and 21.29 ($SD=4.53$) at posttest. The CT students started higher, perhaps because they are more advanced students. Their pretest

average was 28.10 (*SD*=5.87) but they also improved significantly over the semester, with a posttest average of 32.30 (*SD*=5.51).

Although these results are preliminary in nature, they show clear promise for our method of teaching critical thinking. It is interesting to note that the students who had the deductive reasoning with the modules increased their CT scores by an average of 17%, while in our previous study, philosophy students, who were trained in deductive reasoning without use of the modules, increased only 8% on average (Burke, Sears, Kraus & Roberts-Cady, in press). It is therefore possible that the active, engaged learning promoted by the modules is useful above and beyond standard deductive logic skill training and may be optimal when combined with them.

Conclusions

These modules are suggestions for how to get students to exercise their critical thinking muscles. They can be used individually or as a series of building modules in almost any class—psychology or beyond—that has critical thinking as one of its goals. Each could be adapted to fit the interests of your students and hot topics of the day or of your city/campus. It is our hope that the descriptions of these modules herein will spur teachers into creating their own interactive ways to foster more critical thinking in the classroom. Many researchers argue that critical thinking is a vital life skill and lament the lack of effective critical thinking training in higher education (Flores, Matkin, Burbach, Quinn & Harding, 2012; Paul, 2005; Wyer, 2009). Our modules contain the key features proposed by Browne and Freeman (2000) for critical thinking classrooms: active learning, developmental tension, and fascination with the contingency of conclusions.

Recent reports suggest that many people are using YouTube as a daily source of news, and that reliance on sources that have no established standards for accuracy is growing rapidly (Pew, 2012). Clearly, students (and society) would benefit from more practice at looking deeper than the surface 'truthiness' of information. Our hope is that this habit of mind will become engrained with repeated practice, and will be used in everyday life such as medical decisions, better informed consumer choices, and political decisions. If educators work together toward this goal, we can encourage a generation of students who know how to think for themselves and do not simply believe whatever they read or see on the internet.

References

ACLU (2010, Feb 2). "Driving while Black" in Maryland. *American Civil Liberties Union Website*. Retrieved from http://www.aclu.org/racial-justice/driving-while-black-maryland.

Andrews, N., Miller, E., Grant, A., Stowe, J., Osborne, V., & Taylor, B. (2004). Thimerosal Exposure in Infants and Developmental Disorders: A Retrospective Cohort Study in the United Kingdom Does Not Support a Causal Association. *Pediatrics*, *114*(3), 584-591. doi:10.1542/peds.2003-1177-L.

Bensley, D. A. (1998). *Critical thinking in psychology: A unified skills approach.* Pacific Grove, CA: Brooks/Cole.

Bernstein, D. A. (2007). *Promoting critical thinking and active learning in psychology courses.* Keynote presentation given at the Mountain States Conference on the Teaching of Psychology. Durango, CO (October 6-7).

Browne, M., & Freeman, K. (2000). Distinguishing Features of Critical Thinking Classrooms. *Teaching In Higher Education*, *5*(3), 301-309. doi:10.1080/13562510050084703.

Burke, B. L., Sears, S. R., & Kraus, S. (2012). *I Don't Think, Therefore I Cram: Critical Thinking in Psychology Classrooms.* Poster presentation given at the National Institute for the Teaching of Psychology (NITOP). St. Petersburg Beach, FL (January 3-6).

Burke, B. L., Sears, S. R., Kraus, S., & Roberts-Cady, S. (in press). In critical condition: A comparison of critical thinking changes in psychology and philosophy classes. *Teaching of Psychology*.

Chenault, T. G., & Duclos-Orsello, E. (2008). An act of Translation: The need to understand students' understanding of critical thinking in the undergraduate classroom. *The Journal of Effective Teaching, 8*, 5-20.

Colbert, S. (2005, October 17). *The Colbert Report*, Comedy Central.

"Deal or No Deal Countries" (2012, August 6). Retrieved from http://www.dealornodeal.com/news/countries.

Flores, K. L., Matkin, G. S., Burbach, M. E., Quinn, C. E., & Harding, H. (2012). Deficient critical thinking skills among college graduates: Implications for leadership. *Educational Philosophy and Theory, 44*, 212-230. doi: 10.1111/j.1469-5812.2012.00672.x.

Hamilton, D. L., & Gifford, R. K. (1976). Illusory correlation in interpersonal perception: A cognitive basis of stereotypic judgments. *Journal of Experimental Social Psychology, 12*, 392–407.

Hammock, A. (2009) The future of brain-controlled devices. Retrieved from http://www.cnn.com/2009/TECH/12/30/brain.controlled.computers/index.html.

JREF (2012). James Randi Educational Foundation one million dollar paranormal challenge. Retrieved from http://www.randi.org/site/index.php/1m-challenge.html

Kass, J. (2005, June 17). Denver's pit bull ban roils owners. *The Christian Science Monitor*. Retrieved from http://www.csmonitor.com/2005/0617/p01s05-usgn.html

March M. D., & McEvans, J. (1982). *The only way to learn astrology*. San Dieago: Astro Computer Services.

Merriam-Webster. (2006). *Word of the Year*. Retrieved from http://www.merriam-webster.com/info/06words.htm?&t=1342024525.

Muller-Lyer, F. C. (1889). Optische Urteilstauschungen. *Dubois-Reymond's Archiv fur Anatomie und Physiologie, Supplementband*, 261–267.

Myers, D. G. (2009). *Psychology*: *Ninth Edition*. New York, NY: Worth.

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology, 2*, 175–220.

Nixon, R. (2010, November 14). Myths Fuel Dangerous Decisions to Not Vaccinate Children. *Live Science*. Retrieved from http://www.livescience.com/8948-myths-fuel-dangerous-decisions-vaccinate-children.html.

Neurosky. (2011). Star Wars Force Trainer. Retrieved from http://company.neurosky.com/products/force-trainer/.

Paul, R. (2005). The state of critical thinking today. *New Directions of Community Colleges, 130*, 27-38.

Pew Research Center's Project for Excellence in Journalism (2012, July 16). *YouTube & News*. Retrieved from http://www.journalism.org/analysis_report/youtube_news

Post, T., van den Assem, M. J., Baltussen, G., & Thaler, R. H. (2008). Deal or no deal? Decision making under risk in a large-payoff game show. *American Economic Review, 98*, 38-71. doi: 10.1257/aer.98.1.38.

Press, W. H. (2009). Strong profiling is not mathematically optimal for discovering rare malfeasors. *Proceedings of The National Academy of Sciences of The United States Of America, 106*(6), 1716-1719. doi:10.1073/pnas.0813202106.

Rasmussen Reports. (2011, October, 26). *31% Believe in Ghosts*. Retrieved from http://www.rasmussenreports.com/public_content/lifestyle/holidays/october_2011/31_believe_in_ghosts.

Saklofske, D. H., Kelley, I. W., & McKerracher, D. W. (1982). An empirical study of personality and astrological factors. *Journal of Psychology, 110*(2), 275.

Tobacyk, J., & Milford, G. (1983). Belief in paranormal phenomena: Assessment instrument development and implications for personality functioning. *Journal of Personality and Social Psychology, 44*, 1029-1037. doi:10.1037//0022-3514.44.5.1029

Tobacyk, J. (2004). A revised paranormal belief scale. *The International Journal of Transpersonal Studies, 23*, 94-98.

Tyson, G. A. (1980). Occupation and astrology or season of birth: A myth?. *Journal of Social Psychology, 110*(1), 73.

Uncle Milton (2009) Star Wars Science. Retrieved from http://unclemilton.com/star_wars_science/#/the_force_trainer/

Watson, P. C. (1960). On the failure to eliminate hypotheses in a conceptual task. *Quarterly Journal of Experimental Psychology, 12*, 129–40.

Watson, G., & Glaser, E. M. (2006). *Watson-Glaser Critical Thinking Appraisal: Short form manual*. San Antonio, TX: Pearson.

Wyer, K. (2009). *U.S. faculty: Civic engagement, diversity important goals for undergraduate education*. Retrieved from http://www.heri.ucla.edu/PDFs/press/pr030509-08faculty.pdf.