From chaos to structure: A game-based approach to stimulate and analyse critical thinking

Kelvin Autenrieth (Independent Researcher, Germany) and Ulrich Wechselberger (Institute for Web Science, WEST, Koblenz, Germany)

In this article we introduce an approach that not only helps to develop instructional teaching environments for critical thinking, but also holds potential for designing research scenarios in this field of study. First we describe the Hasty Generalization Fallacy, where the drawn conclusion does not really hold and is not drawn with the necessary attention. We then argue that this hasty generalizations happen easily during video game play and can (but not must) be overcome by a popular method called Theorycrafting. After this we introduce a sociological model describing different modes of information processing and how these modes are activated. We then conclude how this model allows us to systematically provoke a switch from hasty generalizations when playing games to an elaborated mode of information processing. Finally we discuss that this approach can be used both for instruction and designing research studies on critical thinking.

Keywords: Critical thinking, hasty generalizations, games, theorycrafting, game-based learning

Author contact: autenrieth@edu-gaming.de

The scope of de-biasing in the classroom

Guillaume Beaulac (Yale University, USA) and Tim Kenyon (University of Waterloo, Canada)

Critical thinking is taught with a partial emphasis on individual strategies to mitigate cognitive biases. The thought is that, knowing about biases, students can reduce them. The empirical evidence, however, doesn’t provide much support for this thought: this doesn’t really mitigate biases; in fact, it can worsen them. We have previously argued that the emphasis on de-biasing in critical thinking education is worth preserving, but in light of a more explicit and broader conception of de-biasing. We now present teaching strategies we have used and plan on testing to step beyond these individual strategies to expand the scope of de-biasing in the classroom. These approaches have not yet been characterized as critical thinking strategies, but rather as pragmatic considerations in, e.g., design, engineering, marketing. This broadens the prospects for finding a range of effective critical thinking techniques for de-biasing.

Keywords: critical thinking, biases, debiasing, education, nudges

Author contact: guillaume.beaulac@yale.edu
Cognitive and moral reflection across social networks

Jean-François Bonnefon (CNRS, Toulouse, France)

Social learning is a highly adaptive strategy, which has gained unprecedented leverage with the advent of global social networks. Here we investigate the ability of social networks to propagate fast (intuitive) vs. slow (reflective) thinking. A first series of experiments introduces what is now called the "unreflective copying bias": Social networks can propagate the output of reflective thought, but not the process of reflective thinking. A second set of experiments introduces the "tragedy of the forum": Reputation concerns distort the moral opinions that people express in networks, with the effect that a network of reflective individuals can converge instead on an intuitive moral decision.

Keywords: Social learning, social networks, intuition, reflection, morality
Author contact: jfbonnefon@gmail.com

The impact of engaging in philosophy with children on the development of critical thinking

Patty Cooke (University of Rochester, USA)

This presentation will focus on a 2013 study, conducted by the presenter in an upstate NY public middle school, that explored whether a seminar in philosophy, designed to engage middle school children in philosophical argumentation, would impact the development of their critical thinking skills. The seminar focused primarily on argument analysis and was devoted to the explicit teaching of analytic skills regarding reason and evidence. It provided students the opportunity to interact with peers in philosophical dialogue. A pre and post assessment was used to measure the development of critical thinking skills of students randomly placed in either a treatment or control group. The assessment consisted of six open-ended questions which were presented to students before and after the intervention. These questions were designed to measure aspects of critical thinking, such as: understanding the credibility of a source; the cogency of an argument; and open-mindedness. The qualitative and quantitative findings from this empirical investigation provided credibility to the claim that engaging in a seminar in philosophy, focused on argument analysis, promotes the development of critical thinking in middle school children.

Keywords: critical thinking, argumentation, philosophy, children, cognitive development
Author contact: patty_cooke@websterschools.org
Critical thinking across the curriculum

Robert H. Ennis (University of Illinois, USA)

Often it is disputed whether critical thinking should be taught as a separate subject, or as part of existing subjects, neglecting the possibility that both be done, a resolution that Robert Sternberg called the “mixed approach”. I shall today offer a detailed set of suggestions for implementing a mixed approach. Suggestions include an introductory one-year general course that promotes a set of general critical thinking principles and criteria – with extensive practice with examples in a variety of areas of discourse and subject matter with which students are familiar; together with the infusion of these general aspects of critical thinking courses in the various disciplines throughout the institution at all levels, as well as the promotion of a variety of subject-specific critical thinking principles and criteria in the disciplines at appropriate levels of sophistication. Coordination, assessment, teaching focused on “transfer of training” and student involvement (sometimes with small group activity), a critical thinking glossary, faculty seminars, availability of expert consultation, an open-minded student body, and widespread faculty support for the program are some key features of an institution implementing this program in Critical Thinking Across the Curriculum.

Keywords: mixed approach, assessment, implementation, transfer, faculty support
Author contact: rhennis@illinois.edu

Learning to reason with other people

Jean Goodwin (Iowa State University, USA)

Humans are capable of critical thinking—although, as is well-documented, we may be reluctant to invest scarce cognitive resources in that laborious activity. How then to tilt students' cognitive economies a little more towards system 2? In this paper, I follow the lead of a number of research projects, including those of Billig and associates, Sperber & Mercier, and many "dialectical" theories of argumentation, which have proposed that we learn to reason, and continue the practice of reasoning, primarily in interactions with other people. Instead of trying to directly intervene in students' cognitive economies, these approaches would suggest that what we need to do is to insert students into appropriate social contexts. But as is also well-documented, not all social contexts are appropriate; collaborative reasoning can lead to increased polarization and groupthink. In this paper, I extend previous work by defending one sort of appropriate context for learning, the debate, and defining the debate's central characteristic, the burden of proof. Inducing students to take responsibility for supporting their position with good reasons creates the factors which promote elaborated thinking. In particular, a debater who has undertaken an obligation to make arguments now faces criticism for failing to perform well. Debate pedagogy thus provides opportunities for the social management of individual cognitive biases.
Communication and comprehension of science arguments

Ulrike Hahn (Birkbeck College, London, United Kingdom)

The communication of scientific results to non-scientists occupies a central role both within education and public discourse. The talk outlines the methodological possibilities for empirical research brought about through adoption of a Bayesian perspective on argument strength.

Keywords: argumentation, Bayesian reasoning, probability, science communication
Author contact: u.hahn@bbk.ac.uk

Virtue, emotion regulation, and debiasing in critical thinking instruction

Moira Howes (Trent University, Canada)

Virtues such as intellectual courage, fairmindedness, and openmindedness have a longstanding role in the cultivation of objective reasoning in part because they help people regulate emotions in dialectical exchange. Conversely, the ability to regulate emotion assists with the cultivation of objective reasoning in part because it helps people to engage virtuously in dialectical exchange. Given this, I argue that if we want to help students develop better debiasing strategies, we should take the virtuous and emotional dimensions of critical thinking instruction more seriously. Such an approach, however, will require a deeper integration of instruction in philosophy and psychology. To show why this deeper integration is needed, I first examine psychological research concerning the role of emotion regulation in reasoning. I argue that this work suggests that practical instruction in emotion regulation and emotional flexibility may significantly improve students’ ability to debias. I argue further that psychological research suggests that focusing principally on weaknesses and errors—as is commonplace in philosophy, argumentation studies, and legal reasoning—itself leads to bias unless countered by sound strategies of emotion regulation. I then examine work in philosophy that suggests virtue-based critical thinking instruction is important for debiasing, in part because of its effect on emotion regulation and social relationships between arguers. Given this, I argue that we should make use of research in philosophy and psychology to help students cultivate the virtues and emotion regulation skills relevant to debiasing.

Keywords: virtue, emotion regulation, debiasing, critical thinking, psychology, philosophy, argumentation, reasoning, objectivity
Author contact: mhowes@trentu.ca
Natural born arguers: an evolutionary perspective on critical thinking education

Fabio Paglieri (ISTC-CNR Rome, Italy), Hugo Mercier (Centre de Science Cognitives, Université de Neuchâtel, Switzerland) and Marteen Boudry (Dept. of Philosophy & Moral Sciences, Ghent University, Belgium)

A key aim of teaching critical thinking is to enable people to make better de-cisions and arrive at sounder beliefs, by examining the reasons that support their decisions and their beliefs. While experimental research shows that such improvements would be direly needed, it also suggests that they are unlikely to take place: biases like the myside bias have proven very resilient. The argumentative theory of reasoning explains these biases as normal features of a mechanism designed for argumentation, rather than flaws in a ratiocination skill: humans are born arguers, not solitary reasoners. This suggests that some aspects of current critical thinking education, such as focusing on logical fallacies, are unlikely to yield good results. Instead, students should be taught to practice argumentation within relevant social contexts, and learn its value and how to make the best of it, while instructors should pay greater attention to the reasons behind (alleged) fallacies.

Keywords: argumentative theory of reasoning, critical thinking education, argumentation, social epistemology, heuristics and biases

Author contact: fabio.paglieri@istc.cnr.it

The normative and empirical challenge of investigating critical thinking in diverse cultural contexts

Rebecca Schendel (UCL Institute of Education, London, United Kingdom)

In the context of an increasingly global higher education landscape, there is growing convergence around the language used to describe university education in different cultural contexts. Within this homogenising discourse, critical thinking is frequently mentioned as a crucial learning outcome. Although long an important aspect of higher education in the United States and Europe, the concept of critical thinking has not always featured in the same way elsewhere in the world. However, there is now a growing sense that graduates everywhere need to know how to think critically about problems and use evidence when making decisions. Much of this is driven by neoliberal narratives around skills for productivity in the global knowledge economy, but support for critical thinking as a university outcome is also linked to ideas around political participation, technological literacy and the promotion of lifelong learning, as well as more holistic ideas of student personal development. Despite growing international consensus around its importance, there is limited research into critical thinking in many cultural contexts. This is partially a normative challenge, as there is debate around the cultural specificity of critical thinking skills and dispositions. It is also an empirical question, as
the manner in which critical thinking might be assessed or understood is likely to differ depending on cultural context. These questions challenge both educational researchers, who are interested in the ways in which institutions might encourage the development of critical thinking skills, and those researching critical thinking from philosophical or psychological perspectives.

**Keywords:** Critical thinking, cross-cultural research, educational research, higher education, methodology

**Author contact:** r.schendel@ioe.ac.uk

**Triumphs and travails: my experiences as the inaugural Eugene H. Fram Chair in Applied Critical Thinking at Rochester Institute of Technology (2012-2015)**

Chip Sheffield (Rochester Institute of Technology, USA)

In 2012, I became the first recipient of the Eugene H. Fram Endowed Chair in Applied Critical Thinking at RIT, in Rochester, NY. To the best of my knowledge, this is the only such endowed position devoted solely to CT in higher education in North America. It was made possible by a generous 3 million dollar gift from an anonymous alumnus who wished to honor a retired faculty member who had taught for 51 years in the Saunders College of Business. Professor Fram was revered for his commitment to Bloom’s taxonomy, innovative case studies, academic rigor and Socratic method. It reports directly to the Provost, and it includes full release from teaching duties, as well as a significant stipend for programming, scholarship and travel. Key responsibilities have been to provide collaborative leadership, advocacy and oversight for CT across the entire campus through invited lectures, research, scholarship, workshops for faculty, students and staff, networking with national and international authorities, community outreach, as well as reflection on innovative teaching pedagogy, planning, assessment and curricular development related to CT. In this special invited presentation for RACT2015, I will discuss the successes and failures, triumphs and travails of this unique position, along with critical insights, regrets, unforeseen obstacles, and the special challenges that remain for anyone charged with integrating CT across a large institutional setting.

**Keywords:** Critical Thinking, pedagogy, assessment, programming, curricular development, future challenges.

**Author contact:** cbsfaa@rit.edu
Cicero's speech on Pompey's command: How to learn (and teach) the art of strategic reasoning?

Gabor Tahin (Downside School, Radstock Bath, United Kingdom)

The paper addresses two fundamental questions of teaching (and learning) rhetorical reasoning through the example of a paradigmatic deliberative speech of Roman political oratory. It shows that a speech from classical oratory can provide an effective means to teach a variety of argumentation skills (i.e. the recognition of fallacies or the manipulation of biases in the target audience). It also considers an elusive problem of rhetorical or critical reasoning instruction, how students may learn to adapt their knowledge to real-life situations, where a large number of uncertain variables demands a constant awareness of the conditions affecting the audience’s decision. The paper will argue that the application of a new model of strategic reasoning called heuristic rhetoric could illustrate a workable solution to both problems. Cicero’s speech was written in favour of the law proposed by C. Manilius in 66 B.C., which was to give Cn. Pompeius Magnus extensive imperium in a war against Mithridates VI of Pontus and Tigranes, king of Armenia. The speech in favour of Cn. Pompeius’ command demonstrates Cicero’s strategy to develop a complex rhetorical argument in response to a crisis situation. The heuristic analysis of the speech concludes that the seemingly reasonable yet manipulative argument provides a constructive proposal in a complicated historical moment. The new analytical framework also offers a functional model of strategic argumentation, which can be adapted to real-life arguments, where critical decisions have to be made fast.

Keywords: oratory, rhetoric, argumentation, strategy, heuristic, Cicero, Pompey
Author contact: tahingm@gmail.com

Erotetic problem-solving and learning: from real data to formal models

Mariusz Urbanski, Katarzyna Paluszkiwicz and Joanna Urbanska (Adam Mickiewicz University, Poland)

We report research on correlations between level of fluid intelligence and fluencies in simple and difficult deductions (syllogistic vs. erotetic reasoning), and on the impact of learning logic on these fluencies. We observed that although participants of higher ability performed better than participants of lower ability in both kinds of deductive tasks, those who undergone extensive training in formal logic obtained significantly higher results in tasks involving difficult deductions. We conclude that fluency in difficult deductions, while related to fluid intelligence, is related to subjects’ educational experience as well and that this does not hold in case of simple deductions. We interpret these results in terms of the distinction between algorithmic and reflective subsystems of Type 2 processing. Drawing on subjects comments on erotetic reasoning tasks, we formally model these solutions in terms of different versions of erotetic implication.
The folk epistemological basis of argument

Michael Weinstock (Ben-Gurion University of the Negev, Israel)

People who have not studied how to argue, let alone the philosophy or academic study of argument, nevertheless do argue. When in an argument context, what do they bring with them, and why are there differences in argument skills and approaches to argument? The study of epistemic thinking—that is, of folk understandings of the nature of knowledge and knowing—includes, first, whether people in everyday contexts believe there is a need to justify claims, and if yes, how they understand the purpose of justification, what constitutes reasons for claims, and what are standards of sound justification. This area of research would then seem to take the epistemological approach to argumentation. In some sense this is true. However, the epistemology is a folk epistemology, rather than a philosophical system, and people’s everyday epistemologies invoke social, pragmatic, contextual norms of argument and knowledge justification, as well as epistemic norms. Research on argument construction and evaluation in everyday reasoning situations, classrooms, and different cultures has found that epistemological development, social experience, and culture are factors in underlying different norms regarding justification in argument. In the study of epistemic thinking, people’s understandings of the role of evidence and explanation, use of narrative or relational arguments, evaluations of argument fallacies, and consideration of alternative arguments appear to depend on people’s courses of epistemological development. While for most people argument and epistemic thinking has been untutored, recent research suggests that an educational focus on argument and justification can influence the course of development.

Debiasing in legal decision-making

Frank Zenker, Christian Dahlmann and Farhan Sarvar (Lund University, Sweden)

Judges tend to assume of themselves, firstly, that non-jurist decision makers regularly err when assessing the relevance of legal evidence; and secondly, that judges reason in ways that reliably avoid such error. Empirical research in the ‘Heuristics and Biases Tradition’, however, supports the first assumption also for judges. Relevance assessments may therefore differ widely between intuitive and deliberative modes of reasoning and decision-making between and within groups of agents. Our research focuses on the second assumption, addressing four related research-questions through controlled experimentation and interpretative analysis: 1. What is the accuracy difference between judges’ and laypersons’ assessments of the relevance
of legal evidence? 2. Do relevance assessments improve across groups subsequent to being explicitly instructed to deploy a debiasing technique? 3. What is an optimal allocation between debiasing techniques and the biase(s) mitigated? 4. How can debiasing techniques be improved? Our talk reports preliminary results pertaining to the first two questions, based on empirical pilot-studies with samples of Swedish professional judges, undergraduate law-students, and non-law students, pertaining to: ad misericordiam, ad hominem, ad populum, anchoring, hindsight, and base rate neglect, phenomena previously validated as reliable experimental effects. For each bias, experimental participants are presented with a mock legal-case manipulated to contain bias-triggering information and explicit de-biasing instructions, or not. The purpose is to experimentally assess the (positive, negative, or neutral) effect-size of instructions to deploy a debiasing technique in a hypothetical legal decision-making scenario vis-à-vis established cognitive biases, and a number of debiasing techniques that count as far less established.

**Keywords:** heuristics and biases, debiasing technique, relevance assessment, experimental research, optimal intervention

**Author contact:** frank.zenker@fil.lu.se