Bringing Imagination Back to the Classroom: A Model for Creative Arts in Economics

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Abstract

This paper draws from the cognitive and neuroscience literature to develop theoretical support for the growing interest in the use of creative arts in college economics classrooms. The research suggests that creative arts activate important neurological pathways that aid the transfer of information from short- to long-term memory, where it can be retrieved for future problem-solving. To encourage meaningful learning and economic literacy, students must be able to mentally organize and retain information from their classroom experiences. The fresh metaphors and imagery present in creative arts such as poetry can deepen and clarify conceptual meaning, and allow students to learn and express their understanding of economics in a more personal and memorable way.

Keywords: Economic education, pedagogy, cognitive load theory, literature, poetry

JEL classification codes: A20, A12, Y80
Why I am an Economist

Because e-quil-i-bri-um is the perfect end to Haiku
Because time slows to a discount rate
at the asymptote of an hour glass
Because I am color blind to shades of gray
Because I like to tell bedtime stories to a captive audience
Because marginal costs are like shooting stars
when it counts
Because there are exactly seven colors in a rainbow
Because self interest is like a cockroach
Because there is always a right question to the wrong answer
Because my worry lines give me away
Because I approach the limit of creativity but never reach it
Because a rational mind needs a pillow
Because the market for astronauts is too small
Because numbers are like words and functions are like stanzas
Because efficiency is the pay dirt of a lazy mind
Because a fortune cookie told me to ‘be practical’
and so did my advisor.
BACKGROUND

Recent advances in cognitive psychology and neuroscience have greatly improved our understanding of how the human mind processes and retains information, leading to both theoretical and practical applications in the fields of education and pedagogy. At the same time, economists have become increasingly aware of the need for alternatives to the standard 'chalk and talk' approach to teaching economics, especially as it relates to principles courses (Becker et al. 2006). And yet, economists have largely failed to draw upon these scientific advances in learning to better adapt economics instruction to fit the needs of the modern day student. Tinari and Khandake (2000) describe this failed connection as it relates to music, noting that ‘despite overwhelming evidence that music has significant effects on cognitive processes, economists have generally not tapped into the use of music as a potential source for examples and applications in economics courses’ (253). Although the lack of applied translational efforts to link cognitive psychology and neuroscience to pedagogical innovation is not unique to economics (Roediger 2013), it remains an important issue that deserves greater attention in our classrooms.

A relatively small number of economists have advocated to varying degrees for pedagogical integration of the creative arts into economics classrooms, from the use of literary passages as case studies to the creation of student poetry and visual art to enhance depth of experience with the material. Although largely anecdotal, the available evidence is uniformly positive in student- and instructor-related outcomes. However, the existing literature lacks a defined theoretical basis to understand the mechanism behind these anecdotal successes. This paper seeks to fill this gap by drawing from the cognitive and neuroscience literature to understand potential pathways for the creative arts to impact memory and learning in economics.
Before reviewing of science of learning and describing a theoretical model, it is useful to first consider the goals of economics instruction at the university level. What type of learning is expected of our students? This paper will assume that the underlying goal is to improve economic literacy, and to promote independent economic-based logic and problem-solving. The majority of college students will only be exposed to economics through the principles courses, and for this reason these goals are particularly relevant to the introductory sequences. In essence, we seek to train students (sometimes in as brief a period as a semester) to think like an economist. However, thinking like an economist in the real-world means that students must be able to adapt their knowledge to novel settings, which undoubtedly require a certain level of analytical imagination and conceptual creativity. To be sure, all of this assumes that the students’ experience in the classroom was memorable enough to support retention of the basic problem-solving skills and concepts in the first place.

If we assume then that economic literacy in the real-world requires both creative thinking and a memory of the original concepts, it would make sense that these skills should be encouraged and valued at the point of origin – the classroom. ‘In addition to highly specialized mathematical, statistical, and econometric techniques, the economist’s toolbox needs to include interdisciplinary approaches to provide better, sharper, and more powerful tools to dissect, and repair society’s most pressing economic problems’ (Kish-Goodling 1993, 339). With that goal in mind, this paper will explore the fundamental science linking creative arts to economic literacy and learning.

**HOW THE MIND WORKS**

To understand the theoretical basis for how creative arts might improve learning outcomes in economics, it is important to first review the basic terminology of learning and memory (see also
Table 1). **Working memory** represents the conscious cognitive center of the human mind, but it is limited in the number of *new* elements (possibly no more than two or three) that it can process at any given time (Paas et al. 2003). The concept is related to that of **short-term memory**, which refers to the temporary storage of information just received (generally for a period up to about 20 seconds) (Hardiman 2012). This limitation for processing new information is counter balanced by the ability of working memory to pull from **long-term memory** storage, essentially to use old information to help process new information.

[Insert Table 1 about here]

Unlike short-term memory, information stored in long-term memory is thought to contain a potentially unlimited number of **schema**, or constructs of information organized as a single element with a specific function (Artino 2008). Schema allow the mind to make interpretive short-cuts, collapsing necessary information about a multi-step task or mental process into a single component, bypassing the limited capacity of working memory to support complex human thought (Paas et al. 2003). Schema are synonymous with the concept of heuristics or ‘rules of thumb’ as they are generally understood in the experimental economics literature, and therefore are subject to the same limitations of stereotypes and bias (Tversky and Kahneman 1974).

Short-term memory storage and working memory capacity can support complex human thought only to the extent that the necessary schema can be retrieved and processed from long-term memory. In other words, new information is more easily processed in working memory in the presence of a well-developed knowledge structure. For this reason, the critical objective of teaching and learning is to transfer the information into long-term memory, a process also known as **consolidation** (Hardiman 2012). Consolidation to long-term memory allows this information
to be incorporated into new or existing schema, making it available for later retrieval and application to new problems and thought processes. Figure 1 provides a simplified flowchart of how the mind processes information.

[Insert Figure 1 about here]

The capacity of working memory and short term storage is extremely limited (Paas et al. 2003), and learning is unlikely to occur in scenarios that exceed the capacity of working memory. The critical component to complex learning therefore relies on the ability of working memory to harness information from long-term storage through available schema. Although working memory provides the processing center for consciousness, without the schema present in long-term memory we would not be capable of intellectual activity, much less complicated economic reasoning.

So how does all this relate to learning, and specifically to creative arts in economics pedagogy? The goal of economic literacy is only feasible if students are able to transfer instructional material from short- to long-term memory through this process of consolidation. Economic literacy requires that students develop the appropriate schema, so that this logic might be retrieved for later problem-solving. The creative arts enhance learning by supporting the consolidation of learned information into an organized framework to promote memory acquisition, retrieval, and literacy.

**Cognitive Load Theory**

Cognitive load theory (CLT) represents a theoretical construct to understand how working memory supports or impedes learning (Artino 2008; van Merrienboer and Sweller 2005; Paas et al. 2003; Schnotz and Kurschner 2007). CLT focuses on instructional design strategies to
minimize or maximize various positive and negative aspects of cognitive load (or mental effort) in working memory that will ultimately increase consolidation and schema formation. Although cognitive load theory is not without its criticisms (de Jong 2010; Schnotz and Kurschner 2007), it provides a useful starting point to describe the theoretical basis for integrating the creative arts into economics classrooms. The three components of working memory described in CLT are intrinsic, extraneous, and germane cognitive load (see Figure 2).

[Insert Figure 2 about here]

Intrinsic cognitive load represents the difficulty of the material to be learned as well as the exogenous expertise of the learner. For example, a concept that requires many pieces to understand the whole would be more complex (especially for someone lacking in background knowledge) than something that could be understood as a stand-alone component. Although in some respects intrinsic load is thought to be fixed (the inherent level of difficulty cannot be manipulated per se by innovative pedagogy), some have suggested that intrinsic load can and should be adjusted to fit the underlying skill set of the learner. For example, Schnotz and Kurschner (2007) identify a ‘zone of proximal development’ that aligns intrinsic load (higher for more advanced learners and lower for more novice learners) to optimize working memory.

Not surprisingly, attention to the demands on working memory is most beneficial when the information to be learned is naturally high in intrinsic load (Artino 2008; van Merrienboer and Sweller 2005). This makes intuitive sense – material that requires complex analytical skills to make appropriate connections is more responsive to small changes in design, as opposed to information that is relatively easy and straightforward, because it is not overly taxing on working memory in the first place. In the context of the economics classroom, the subject matter is naturally high in intrinsic load, i.e. requires multiple steps to understand relatively complex and
sometimes unintuitive concepts; therefore, the gains from improved instructional design strategies that target the limitations of working memory are potentially large.

Extraneous cognitive load is defined as instructional techniques that require the attention of working memory but do not ultimately facilitate learning. Extraneous cognitive load represents an unnecessary barrier to learning, and strategies specifically designed to reduce extraneous load have been noted to be effective (van Merrienboer and Sweller 2005). To draw the connection to economics, recent arguments suggesting the standard tools of economic pedagogy – lecture and textbook – are less effective than active learning techniques (Becker et al. 2006; Hansen et al. 2002) suggest that present economic pedagogy is unnecessarily high in extraneous cognitive load. In other words, standard chalk and talk techniques place an unnecessarily high extraneous cognitive load on the economics learner.

The final type is germane cognitive load, which represent instructional techniques that enhance a learner’s understanding of the linkages between and among concepts, which facilitates schema construction and memory consolidation. Germane cognitive load promotes the development of schema, which necessarily increases mental effort of the learner. For this reason, the pedagogical strategy with respect to germane cognitive load can be conceived of as an optimization problem subject to the constraints of limited working memory capacity. To be effective, strategies that increase germane load must not exceed the capacity of working memory, and are typically met with a balanced reduction in extraneous cognitive load.

To summarize, CLT proposes economics instruction be designed to optimize the limited capacity of working memory, which will increase the natural ability of the learner to consolidate memory to long-term storage, i.e. promote economic literacy. This is done by considering the constraints of high intrinsic load and limited working memory capacity, while designing
pedagogical strategies to reduce extraneous load and simultaneously enhance germane load. Put more simply, we cannot change the difficulty of the material or the starting point of the student, but we can teach it more efficiently to improve learning outcomes.

So how exactly do the creative arts stimulate learning within the context of cognitive load theory? The creative arts provide an approach to more efficiently balance the constraints of working memory by encouraging schema development and consolidation to long-term memory storage. For example, recent work by Leahy and Sweller (2008) apply CLT to understand the role of imagination in memory transfer. Their work suggests that when intrinsic load is high, imaginative learning, which they define as mentally rehearsed performance as opposed to directly reading instructional materials such as textbooks and notes, assist students in the construction of schemas and long-term memory transfer. In other words, students are more able to understand how the individual parts fit together to create the complex whole under scenarios of imaginative thought. Although this research is not directly applied to creative arts pedagogy, it suggests that learning that requires imagination may be favored for materials, such as economics, that are naturally high in intrinsic load. Similar work by Leutner et al. (2009) and Roediger (2013) suggest that exercises in mental imagery increase learning in the natural sciences, concluding that imagery fosters deeper processing through efforts to mentally transform verbal information into pictorial information.

Recent work in brain imagining provides additional insight into how the creative arts might impact and improve learning (Ferstl et al. 2008; Schon et al. 2010; Zeman et al. 2013). While it is commonly understood that the left hemisphere of the brain is responsible for the lion’s share of language processing (Binder et al. 1997), a growing body of research indicates an important role for the right hemisphere in processing more emotional forms of language,
including music, poetry, and figurative language. Zeman et al. (2013) compare poetry versus prose (such as textbook passages) using fMRI to identify differential patterns of brain activity in response to the varied language format. Their results suggest that right hemisphere processing, and particularly those areas previously associated with introspection and deeper meaning, is differentially activated in response to poetry over prose. This work follows a growing body of neuroimaging research exploring how our brains process complex language such as metaphors (Ferstl et al. 2008) and song (Schon et al. 2010). Based on this preliminary work, poetry and music appear to have very particular brain responses, and activate areas outside the standard reading network that would be derived from traditional textbook learning to stimulate areas involved in complex reasoning.

Additional work by Hardiman (2012) and Rinne et al. (2011) place specific emphasis on the application of cognitive psychology and neuroscience to what they call the Brain-Targeted Teaching Model. They argue for arts integration in teaching as a way to improve long-term memory consolidation, in part through increased motivation of students as well as promoting sustained attention to task. The argument in favor of the creative arts further emphasizes that it can be used to promote deeper conceptual meaning, especially for information high in intrinsic load. The research identifies eight characteristics of creative arts pedagogy believed to improve learning and long-term memory consolidation (Hardiman 2012, and Rinne et al. 2011); these include repeated rehearsal, elaboration, generation, enactment, production, effort after meaning, pictorial representation, and emotion and memory. Table 2 provides a full list of descriptions, along with examples of creative arts strategies that might be applied to the economics classroom. [Insert Table 2 about here]
I will draw specific focus to two of these characteristics – generation and repeated rehearsal. Generation of material is one of the critical components of creative arts in the economics classroom, because it is the one that most relies on student creativity and imagination. Ideally, the discussions and assignments will provide some level of autonomy to the student to pursue a topic area and form of artistic expression that best suits their interests. When given the opportunity to be creative, students will often provide quite insightful interpretations of concepts they would have otherwise never fully grasped through reading and lecture alone.

For example, in response to an extra credit opportunity offered in one of my classes to produce creative work related to an economics concept of their choice, students produced a range of unique poetry and art that increased the depth of experience for the entire class. Love was a common theme, as a few wrote poetry related to value and opportunity costs, and another produced a valentine card that visually represented the elasticity of demand for love (in this case inelastic). Others wrote parodies of existing poets and writers, such as a synopsis of the course in the language and illustration of a Dr. Seuss book, as well as a parody on a well-known poem by William Carlos Williams, The Red Wheelbarrow:

so much depends upon
a red wheel barrow
whose price is elastic
next to so many cheap green ones
This type of classroom activity also fosters a number of the other characteristics noted in Table 2 that increase memory consolidation, including elaboration, enactment, production, effort after meaning, pictorial representation, and emotion and memory.

A final characteristic worthy of drawing specific attention to here is the opportunity for repeated rehearsal fostered by creative arts integration in the classroom. Repetition is quite possibly the oldest and most accepted strategy for memory consolidation; even if all other desired outcomes of a creative project fail, it has at a minimum required the student to review and rehearse the material from a prospective that by design is unique from the textbook or lecture. Repeated rehearsal need not come only from student creative work, but the instructor might also provide alternative modes of expression to represent a given topic.

However, it is important to note that it is not necessary for an instructor to create original art to successfully use these techniques in the classroom. Simply being familiar enough with existing forms of artistic expression to lead a discussion, or allowing students to create their own art, would be sufficient to take advantage of the approaches outlined here. The extent to which standard textbooks could begin to supply examples and exercises that relate economic concepts to varied forms of creative expression would go a long way toward facilitating their use in the classroom.

**ADDITIONAL EVIDENCE FROM THE ECONOMICS CLASSROOM**

The argument for more active styles of teaching and engagement in the college economics classroom is not new to the discipline (Becker 2000). These appeals run complementary to efforts to promote economic literacy, especially as it relates to university principles courses (Hansen et al. 2002). Many suggest that the style of economics instruction with its focus on teaching through lecture and memorization fails to engender literacy and to promote general
interest in the field (Hansen et al. 2002). Although few economists have carefully studied the relationship between the creative arts and economics, many have opined that their common features merit more attention in pedagogy (Watts and Smith 1989). Becker et al. (2006) go so far as to describe the use of the creative arts in teaching, such as examples drawn from literature and film, as ‘an all-too-rare instance of a feasible Pareto improvement’ (15). The argument in support of creative arts integration is that they neither sacrifice rigor nor replace important economic theories in the classroom, but instead support a deeper understanding of the concepts (Becker et al. 2006).

Table 3 summarizes the published economics literature on the application of various creative arts tools in the college economics classroom. These publications provide course information, reading lists, and in some cases syllabi to aid others interested in replicating their efforts. Together they illustrate a number of possible strategies for integrating the creative arts, particularly in economics principles courses. Some describe the use of creative arts to generate discussion, and to explore concepts in greater depth and through various lenses, including introducing particular authors, such as Dr. Seuss (Miller and Watts 2011) and Shakespeare (Kish-Goodling 1993), as well as particular genres or artistic mediums, such as film (Leet and Houser 2003), music (Tinari and Khandke 2000), and poetry (Ziliak 2009). Their application in the classroom range from extra credit options to intensive writing assignments and exams. For the more comprehensively integrated classroom, creative arts span the entire class syllabi, such as incorporating the Great Books (Hartley 2001) or short stories (Ruder 2006) to draw unique focus on economic concepts and logic. Although the majority require interpretation of existing creative works, a smaller number advocate for encouraging students to generate original creative works such as poetry based on the concepts (Becker et al. 2006; Ziliak 2009),
The theoretical concept of cognitive load predicts that these varied teaching approaches using creative arts would facilitate consolidation to long-term memory. While concrete evidence on the benefit to students in terms of learning outcomes and long-term memory consolidation in economics is lacking, the reported evidence suggests that the use of the creative arts provides a number of perceived benefits: 1) it is a more memorable experience for students (and instructors), 2) it engages students, especially otherwise disinterested ones, and 3) it facilitates economic literacy.

Firstly, the anecdotal evidence from classroom experiences support the concept that economics material is made ‘more memorable’ by the use of literary and artistic tools (Tinari and Khandke 2000). For example, in describing their application of Dr. Seuss children’s books in the economics classroom, Miller and Watts (2011) argue that ‘a central point in favor of using literary passages is simply the more memorable, accessible, and eloquent use of language than what most readers associate with economists’ writing and in particular with writing in economics textbooks and journal articles’ (164). Hartley (2001) provides additional support for this in his use of the Great Books of Western Civilization to teach economic principles, noting that when paired with literature, ‘students develop a habit of thinking about material rather than simply memorizing it’ (156).

Another common theme of support among instructors who have engaged in creative arts teaching is that it engages an otherwise disenfranchised group of students. Becker (2006) states, ‘Although literature, drama, music, and poetry might seem out of place in economics classrooms, these are perhaps more effective than any other sources at capturing the attention of those students who claim to enjoy economics the least’ (86). Watts and Christopher (2012) promote
the use of visual arts in the economics classroom, noting that while formal evidence of the benefits are lacking, at a minimum the creative arts represent ‘another way to water what many current and former students view as a very dry field’ (420). Ruder (2006) argues similar effect for the use of short stories in economic principles courses, noting that they help convey economic concepts in a more engaging manner. Ruder suggests that the key to the use of short stories is that they apply real-world examples and teach ‘by parable.’ Leet and Houser (2003) make similar observations for the use of film, which they argue reach a target audience outside the norm.

A third central theme from the literature describing the use of creative arts in economics pedagogies notes that these approaches promote and favor logic and literacy over the rote memorization practiced in more mainstream classrooms. Kish-Goodling (1993) brings attention to the goals of creative arts integration in his advocacy for Shakespeare in the classroom, ‘Often literary works reflect our economic life more accurately than today’s economic statistical techniques and mathematical models’ (330). This point is further emphasized by Miller and Watts (2011), who similarly argue that the Dr. Seuss children’s books widen the range of possible teaching tools, ultimately improving literacy.

While the learning curve for implementing various creative arts in the economics classroom may be steep for some instructors, it need not serve as a barrier. Based on the naturally high intrinsic cognitive load of economics material, learning strategies such as the creative arts that optimize working memory are likely to improve student outcomes, even with relatively small changes to the curriculum. The combined evidence of the cognitive, neuroscience, and economic pedagogy literature suggest that the benefits likely outweigh the start up course preparation costs. The classroom examples presented in Table 3 provide a range
of potential formats to choose from, and can be adapted to the interests and knowledge of the instructor. Economics principles textbooks and supplements could be designed to facilitate the use of creative arts by providing a range of examples drawn from music, literature, poetry, and art, along with discussion questions and potential assignments.

CONCLUSION

This paper draws from the cognitive and neuroscience literature to develop theoretical support for the use of creative arts in economics classrooms. The research suggests that creative arts activate important neurological pathways that aid the transfer of information from short- to long-term memory, where it can be retrieved for future problem-solving. Based on the principle that the capacity of working memory is limited, the creative arts represent an approach to optimize mental effort, improve learning outcomes, and ultimately increase economic literacy. More research on learning outcomes in economics classrooms is needed to understand the full range of potential benefits and target strategies related to creative arts.

There is no shortage of metaphors in economics that relate value and utility to physics and mechanics-based models, yet the challenges students face in the real-world require creative thinking and human interaction. The fresh metaphors and imagery present in artistic expressions such as poetry can serve to deepen and clarify conceptual meanings that are presently steeped in dry language that students fail to fully understand, much less remember past the exam. To encourage meaningful learning, students must be able to mentally organize and retain the information, and be able to adapt their knowledge to new information. The creative arts represent a natural way for students to learn and express their understanding of economics in a more personal and memorable way, and the evidence suggests this approach will improve learning outcomes and economic literacy.
REFERENCES


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