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The Power of Movement: Body-engaging Activities for Teaching Economics

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Abstract

Existing research points to the critical connection between student engagement and deep learning. This paper explores body engagement as one type of student-centered learning. While other disciplines are making progress in developing body-engaging pedagogical methods as a complement to traditional lectures, the use of such innovations in undergraduate level economics courses have been limited. We contribute to the literature by explaining both why we should and how we can incorporate body movement as a part of the tool kit for teaching economics. We offer specific examples of body-engaging activities and review students' evaluation of this pedagogical approach. We acknowledge challenges and limitations of incorporating these activities into a classroom and offer strategies to overcome these challenges.

Keywords: Student-centered learning, engagement activities, undergraduate economics.

In the fall of 2014, I was driving in the car, when a radio interview with Dr. Ann Marie Thomas from the University of St. Thomas caught my attention (Flatow, 2014). In Dr. Thomas's engineering course, students become human pendula by swinging on a trapeze and then analyze the data collected through these active experiments. Following her interview, a man called in to share his training experience for the special forces in the military. During training courses, if students were having trouble focusing, they were encouraged to get up, go to the back of the room and do a few push-ups in order to refocus their attention on the learning task (Flatow, 2014). When I went into my microeconomics class the next Monday, I told my students, "I am not going to make you do push-ups or swing on a trapeze, but you will get up and move."

According to Watts and Schaur's 2010 survey of U.S academic economists, only a limited number of instructors have moved away from the traditional pedagogical approach of 'chalk and talk' since the first survey was conducted in 1995 (Watts & Schaur 2011). Goffe and Kauper (2014) claim that economics instructors, who are still reluctant to give

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up traditional lecture style, either argue that alternative teaching methods are less cost effective or they believe that traditional lectures are the best way to teach economics (Goffe & Kauper 2014, p. 6). We believe that Brownell and Tanner's (2012) explanation of the slow adoption of new pedagogical practices amongst faculty in the natural sciences is likewise applicable to economics faculty. They argue that in addition to training, time, and incentives, professional identity and norms within the academy that place a higher value on research also inhibit the adoption of new pedagogical practices (Brownell and Tanner 2012). In this paper, we advocate for an approach that overcomes these barriers to adopting new teaching methods. Specifically, this paper advocates for incorporating body movement as part of the tool kit for teaching economics and explains how such activities can be implemented. We hope that the examples presented here help generate new ideas for not only teaching economics but other disciplines as well, particularly in math and graphing based courses.

Below, my co-author, a former student from my microeconomics class, and I explore how physical activity and engagement of the body can facilitate learning. We situate our research on body engagement within the established literature on active and student-centered pedagogical approaches. Existing research points to the positive connection between active student engagement and the process of learning (Bransford, Brown, & Cocking. 2000; Zull, 2002; Tranquillo, 2008; Willis, 2010; Pelligrino & Hilton, 2012). Documented exceptions to the 'chalk and talk' norm within economics include the use of computer simulations, class discussions, creative incorporation of television, English literature and cartoons, integrative graph assignments, use of role play, and in the case of a Tennessee high school classroom a supply and demand dance (Luccasen & Thomas, 2010; Buchs & Blanchard, 2011; Watts & Schaur, 2011; Vachris & Bohanon, 2012; Morgan, 2012; Zhang, 2012; Green, Kelly, Peterson, & Bean, 2015). Our choice to focus particularly on body engagement as a tool for active learning is driven by our own particular experiences and interests. Namely, we have both been students of dance at the college level. While we explore how interactive activities that demonstrate or apply a concept are useful, we are also interested in how body engagement, independent of course content, may improve students' capacity to learn. For example, is a student better able to solve a utility maximization problem after doing two jumping jacks?

Following our review of the theory and existing evidence from other disciplines, we provide examples of body-engaging and interactive activities for an economics classroom. Given our inability to empirically test the effectiveness of these pedagogical innovations due to institutional constraints, we examine perception of effectiveness with a review of student evaluations of this pedagogical approach. We conclude by exploring the need for further research on body-engaging pedagogy, particularly within fields that have thus far been resistant to such innovations.

Body Engagement as a Pedagogical Tool

Examples of body-engaging pedagogical practices exist across different disciplines. These activities can be as simple as getting students to dance in class. Dr. Virginia Zimmerman, a professor of English from Bucknell University, uses dance as a learning tool

to grasp the rhythm of a poem. The activity highlights how writing styles of different authors vary their use of meter and structure (Zimmerman, 2002). Paul Moerman, from Södertörn University in Sweden, also uses dance as a teaching tool for subjects such as language, mathematics, and philosophy. He claims dance routines build upon these subjects' content and enhance his students' learning, creativity, tactile perception, concentration, and cooperation skills (Moerman, 2013, p. 1).

Hall and Nemirovsky (2012) claim mathematics is at the crossroads of identifying the connections between the mind, body, social, and cultural practices through "embodied mathematical cognition" (Hall & Nemirovsky, 2012, p. 209, 213).[2] Instructors use the tile floor of a classroom to represent a complex plane to demonstrate the mathematical understanding of the movement of the body in space (Hall & Nemirovsky, 2012, p. 212-213; Nemirovsky, Rasmussen, Sweeney, & Wawro, 2012). In the related field of computer science, there is a small group of faculty that shares, via a QwikiWiki website, kinesthetic learning activities on different topics such as binary counting, graphics, and ray tracing ("Kinesthetic Learning Activities," 2015).

The example mentioned in the introduction is the course, "Dynamics with Circus Laboratory," designed by Dr. Ann Marie Thomas, an engineering professor from University of St. Thomas. Circus equipment such as the flying trapeze, bungee trapeze, and the German wheel are used to replace common dynamics laboratory tools such as the pendulum, mass and spring, and slipping and non-slipping disk. Students are given the choice to participate in these activities with specific measuring tools strapped on them for data analysis. The course is mostly rated with positive feedback, despite the high workload (Thomas, Berrier, & Guggenbuehl, 2011). Thomas, furthermore, describes how students become engaged on a deeper level with the material and demonstrate strong commitment to the course (Flatow, 2014).

The use of body engaging activities is consistent with our existing knowledge of the way in which humans learns. Zull (2002) in his book *The Art of Changing the Brain*; *Enriching Teaching by Exploring the Biology of Learning*, writes,

> "Action makes the learning cycle a cycle. Physical movement is needed to link our abstract mental notions with *new* concrete experience. Biology backs up this dual role for action in learning." (Zull, 2002, p. 221)

Contributing to the volume, *Mind, Brain & Education*, Willis (2010) analyzes how knowledge in neuroscience yields critical insights into effective pedagogy.[3] Research on the reticular activating system (RAS) of the brain indicates that fear and stress create barriers to learning. Thus, Willis argues that the creation of positive and relaxed classroom environment is important. Furthermore, she explains that novelty can play an important

[2] Summarized by Hall and Nemirovsky, Wilson explains embodied cognition as a process of "sensorimotor cognition" conducted when doing a specific thing, which can be "repurposed off-line" later in time (Wilson 2002, p. 632-633; Hall & Nemirovsky, 2012, p. 210). For example, a new dance choreography learned can be recalled before bedtime without physically doing the dance moves.

[3] Dr. Judy Willis is a medical doctor and has a Masters in education.

role in stimulating the RAS. Willis also examines how increased dopamine levels in the brain promote "focus, memory, and motivation" among students (Willis, 2010, p. 54). She provides several examples of "dopamine-releasing interventions," which include students moving around periodically, supporting positive peer interactions, creating activities that involve collaborative work and the use of humor in the classroom (Willis, 2010, p. 57).[4] In the sections that follow we describe engaging activities that can work through the channels described by Willis to enhance learning in an economics classroom.

Dancing to Economics?

Morgan (2012) describes how two microeconomics high school teachers, Marty Robinson and Jennifer McKerley, have been using dance moves to help their students remember basic economic models and concepts. They guide students to draw out demand and supply curves with their arms, then add new economic concepts accompanied with other arm movements, until they form a dance. Robinson claims, "Kids really respond to the dance. It's silly, but it helps on tests. I see students moving their arms to answer questions." McKerley has also witnessed students doing the dance to teach their friends and family economic concepts (Morgan, 2012).

Not all concepts can be easily associated in dance routines. Drama and role-plays also can aid in understanding a concept (Jensen, 2005). For example, Buchs and Blanchard (2011) discuss their use of role-play to teach the concept of sustainable development. Tranquillo (2008) argues that students who engage in kinesthetic activities are given the opportunity for a personal interpretation of the learned concept. Furthermore, body-engaging activities often dismantle concepts to their basic components to be easily understood, without complex equations and jargon. These kinesthetic activities can act as foundations toward understanding more complicated concepts. Most importantly, such activities keep the energy levels high in the class, as they involve great levels of interaction among students and instructors (Tranquillo, 2008, p. 7).

Unfortunately, the use of body movement in the classroom seems to decline as students advance through the education system (Tranquillo, 2008). It seems classroom settings change from movement while learning to 'sit still and listen', where uninstructed body movement could be deemed disrespectful or disruptive.[5] We often expect that, through the process of maturity, individuals develop a longer attention span and are able to sit still for longer periods of time. We argue that just because college students *can* sit still and listen, does not mean that they *should* or that it is the most effective way to learn.

Getting Students Moving in an Undergraduate Economics Classroom

Over the past year and a half, I have investigated ways in which the body can be engaged for learning, primarily in my microeconomics class at Franklin and Marshall College in

[4] For a more in depth analysis of the differential impact that fun delivery versus fun activities have on student engagement see Tews, Jackson, Ramsay, and Michel (2015).

[5] Blatt-Gross (2015) explains some opposition to 'movement while learning' methods comes from educators who are struggling to meet the high expectations of content coverage.

Lancaster, PA, USA. I also provide examples for activities that can be done in other economics courses.

There are a few activities/interventions, which require no preparation and minimal class time. When I teach supply and demand graphs, I have my students stand up in the middle of the lesson and trace in the air the upward sloping supply curve. This can of course also be done with a demand curve. This is not only to reinforce the slopes of supply and demand but also to engage students' bodies and increase alertness. This is consistent with Tranquillo (2008) claim that active learning re-energizes the classroom atmosphere. I have students do a similar activity when covering Engel curves and the theory of the backward bending supply of labor curve.

When I teach elasticity, I have students get up, stand tall and rigid with their arms to their sides to demonstrate a perfectly inelastic demand curve. For perfectly elastic demand curve, I have them put their hands out to make a horizontal line. I then have students wave their arms around, demonstrating flexibility. This reinforces the rigid characteristic of an inelastic demand curve, and the flexible characteristic of an elastic curve. Often this activity leads to a bit of laughter, one the "dopamine-increasing activities" discussed by Wilson (2010). My hope is that following this activity students are alert and in a positive state of mind, thus better prepared to learn the formulas for calculating elasticity.

As we move into more advanced material through the course, such as different types of market structure, I have students draw graphs on the board instead of in the air. Students often work in pairs and each person is responsible for one portion of the graph. I allow students to walk around and see other group's work, particularly if they are struggling. In addition to the benefit of getting students moving, this strategy creates an opportunity for students to teach concepts to each other. Note that this requires enough board space and chalk for all students to participate. In good weather, I have also taken the class outside to draw graphs on the sidewalk with chalk.

These activities do not replace class lectures but rather act as a complement to them. I limit the time I lecture in front of the class to small time increments and intersperse body-engaging activities throughout the class period. The interactive activities do use time in class that could be spent on new content. My hope is that the additional time is recovered from students learning concepts on the first or second time, without the need for repetition.

Since I spend less time doing traditional lectures in my classes, I encourage students to watch Khan Academy or YouTube videos I have preselected that cover the same material we are discussing in class. It is much easier for students to access substitutes for traditional lectures than to do interactive and body-engaging activities on their own. For a longer discussion on the use of video lectures outside the classroom see the literature on flipped classrooms.[6]

[6] Bishop and Verleger (2013) explain flipped classrooms as a pedagogical method that uses asynchronous video lectures and problem sets outside the classroom and group-based problem solving in the classroom with the guidance of the instructor. Students benefit from a higher engagement between classmates and

I also developed student-centered activities for my classes that are more time-intensive.[7] For a lesson on monopoly power and price discrimination in my microeconomics course, I use an activity that takes about 10 to 15 minutes of class time. I have student count off by 5 and instruct students to get into groups according to their number. Having students form groups in this ways is an easy method of getting students to move around the class and interact with each other (see Wilson, 2010). Once students are in the groups, one person is chosen to be the seller and the rest are the buyers. Slips of paper are used as currency. It is assumed that marginal cost is a constant 1 slip of paper and there are no fixed costs. The seller is instructed to sell the candy bars and try to make as much profit as possible. To add incentive to the activity, I have buyers write their name on remaining slips of paper and add them to a raffle for cash or prize of some sort.[8] Following the activity, each group reports their producer and consumer surplus. If the seller is able to conduct perfect price discrimination, the consumer surplus is zero. Perfect price discrimination does not always happen but the activity creates a useful discussion of price discrimination and monopoly power that can be referenced throughout the rest of the class.

Another example is an activity used to teach about asymmetric information. It can take 5 to 10 minutes depending on how long you allow transactions to take place. The following instructions are given:

> Sellers: Think of one used product that you own (laptop, car, smart phone, item of clothing). You are going to try to sell the product at the highest price possible. If you have a picture of it, you can show it to the buyers.
>
> Buyers: You are going to "shop" and try to find a product you are interested in.

During this activity, I make sure students are up and walking around the class. I give students a time limit, which heightens energy level given the sense of urgency. This activity is followed by a very simple question of who knew more about the product being sold. The difference of knowledge between the seller and the buyer is discussed, prompting students to understand a seller's capability to exploit a buyer's lack of information about the good.

When I first covered marginal productivity of labor in my microeconomics course, I had my students work in groups to simulate a paper airplane factory.[9] I had mixed success with this activity. After speaking with a colleague, Alex Binder, about this activity, he

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teachers during class times, attaining additional content from students when they provide different methods of approach to answer specific problems in class discussions (Bishop & Verleger, 2013, p. 2). Limitations of flipped classrooms include the prevention of students to ask questions during video lectures viewed outside the classroom and the inability to monitor student engagement during video viewings (Milman, 2012).

[7] For a much more exhaustive list of student-centered activities see Delemeester and Brauer (2000). They have compiled and contributed to a list of more than 113 classroom games for college instructors on fundamental macroeconomics and microeconomics concepts, available at http://w3.marietta.edu/~delemeeg/games/.

[8] The sellers do the same with the slips they received but must throw out 1 slip of paper per candy bar sold.

[9] An anonymous referee has pointed out that a similar paper airplane activity was previously developed, for more details see Owens (2001).

improved the exercise by having students manufacture a more sophisticated product. In his Introduction of Economic Principles class, he has students make "Have a nice day!" favors. The activity takes about 30 minutes. The directions for this activity are as follows:

1. Break the class up into teams of 6 to 7.
2. Each team gets one pair of scissors, one stapler, one pen, and as much papers and mini candy bars as they need.
3. The task of the factory is to make "Have a nice day!" favors. Workers must cut a small strip of paper, write "Have a nice day!" on it, then staple it to a mini candy bar.
4. Each team starts with one worker (student).
5. The single worker is instructed to make as many "Have a nice day!" favors as possible in one minute.
6. The team records the amount of favors made.
7. The next round, two "workers" have one minute to make as many favors as possible. The amount is recorded. After each round the material used in the previous production are discarded, i.e. cut paper from round 2 can't be used in round 3.
8. This is repeated until all team members are involved in the production process.

After students complete the activity, they are asked to calculate the marginal productivity of labor, and examine the data. The objective is that students will identify an initial increasing and subsequently diminishing marginal returns to labor.

Another activity I have used when teaching an introductory level course at another institution comes from Holt (1996). The activity simulates a market in the classroom by giving half the students prices at which they would be willing to buy a ticket and half the student's prices at which they would be willing to sell a ticket. The end result of the activity is that an equilibrium quantity and price is found. For more detail on this activity see the write up in Holt (1996).

In a macroeconomics course, similar interventions, such as having students draw graphs on the board or trace graphs in the air, can be used. There are also other opportunities for more time-intensive interactive activities that get students moving. When teaching about expenditure multiplier in an Introduction to Macroeconomics class, I start by giving one student $100 (fake money) and have them save a little (given by the marginal propensity to save) and spend the rest on transaction with another student. The next student repeats this step. They continue for several rounds, keeping track of economic transactions in each round. Finally, as a class we calculate the total increase in aggregate demand as a result of the initial injection of $100.

Interactive activities can also be used in an economic history of thought class. For example, particular theorists can be embodied through role-play or short skits to portray the economic context in which certain theories were developed. Such interactive activities

would hopefully aid in information retrieval and provide a student with a more concrete grasp of abstract material.

As discussed above, there are several channels through which these activities can improve learning. First, as Willis (2010) explains, when students get up and move, dopamine levels increase, which enhances the capacity to learn. Second, each activity presents an economic concept in a novel way. Use of novelty has been documented as an effective pedagogical practice (Willis 2010, Pellegrino & Hilton, 2012, p. 9). Third, several of these activities require students to interact with each other and create a space for social learning (Willis, 2010; Pellegrino & Hilton, 2012; Kober, 2015). Finally, there is likely a positive effect from humor, as many of these activities invoke laughter, and at the very least these activities help create a more positive and relaxed learning environment (Garner, 2006; Willis, 2010; Pellegrino & Hilton, 2012).

Trade Offs and Limitations

Including body-engaging activities in an economics classroom is not without trade offs and limitations. The issue of time has been noted above. While these activities are intended to complement traditional lectures, there is also a degree of substitution that takes place. If a concept can be introduced or reviewed via a body engaging activity then less 'chalk and talk' time on this subject is required. If students feel that they need more time listening to lectures, alternative resources such as recorded lectures can easily be made available and accessed outside of class time.

Instructors with classes of large numbers may have problems implementing interactive activities. Providing clear instructions and explanations to students in advance can help with class coordination. Another solution is to utilize teaching assistants to make implementation of such activities more manageable.[10] Student engagement exercises can cause confusion if students are unclear about the objective of the exercises. Time must be set aside before and after the activity to make sure the main objective of the activity is understood.

Another important issue to consider is student capabilities. For example, if there is a student in the class with a physical disability, the instructor should be conscious of what activities are chosen to avoid alienating the student with the disability or preventing them from participating. Many of these activities could be adapted depending on the specific physical disability of the student. For example, in cases where a student is visual impaired, the student can work with a three dimensional tactile graph instead of writing on the board.[11] For a larger discussion of the application of Universal Design Learning to college classrooms see Scott and McGuire (2017).

[10] Dr. Mary Hansen from American University has had success-utilizing TAs for successful engaging activities in a large classroom setting. For more guidelines on interactive learning in a large classroom setting see Bransford et al. (2000).

[11] As a graduate student in collaboration my advisor, Mary Hansen at American University, I created tactile graphs with moveable parts for an online microeconomics course for students who were visually impaired.

Finally, the instructor's preferences and objective of the course plays an important role in the decision to incorporate body-engaging activities. We acknowledge that not all instructors may be comfortable including movement into the class and recommend that instructors find pedagogical interventions that align with their preferences and course objectives.[12] For example, instead of body movement, some instructors may incorporate music as a novel way of representing a concept and means of creating a relaxing and positive environment (Willis, 2010, p. 54). We also acknowledge that students respond differently to different pedagogical approaches. Sensitivity to the diversity of cultural backgrounds, personalities traits and learning styles of students is important. Utilizing a variety of different pedagogical approaches is important for the creation of an inclusive classroom environment (Chavez, 2007).

Student Perceptions

In theory, the effectiveness of body-engaging activities in the learning process could be evaluated with an experiment in which there is a control and a treatment group. Unfortunately, setting up such an experiment was not possible given the selection bias created by the registration process at Franklin and Marshall College. Furthermore, given the expectation that these activities are in fact useful for learning, there are ethical implications for intentionally teaching one class without these activities. For a longer discussion of the limitations of experimental and quasi-experimental design for evaluating learning see Sawyer (2014).

Students' perceptions of the teaching process and learning experience provide some insights into the effectiveness of new pedagogical techniques. The use of student evaluations as measure of teaching effectiveness is at times viewed with skepticism, as several factors such as the instructor's personality, difficulty of the course, and expected grade may affect student evaluations. In a review of research on student evaluations, Benton and Cashin (2012) acknowledge that interpretation of findings is complex, yet summarize the literature as follows,

> "Nonetheless, the multi-section studies show that classes in which the students gave the instructor higher ratings tended to be the ones where the students learned more (i.e. scored higher on the external exam)." (Benton & Cashin, 2012, p. 4)

Still, given that pedagogical practices in my courses include a wide variety of methods, such as incorporating student discussion, in class practice problems, and connection of theory to student experiences, it is difficult to isolate the effect of body-engaging activities in particular. Acknowledging these limitations, we use the student evaluations as a starting point for analyzing teaching effectiveness. We consider student evaluations from five different sections of my microeconomics class, taught in the fall of 2014, spring of

[12] McDonough, Forgasz, Berry, and Taylor (2016) conduct a self-study of embodied pedagogy as teachers. They explore what barriers exist not just among students but among instructors as well when moving toward an embodied pedagogical approach (McDonough et al., 2016).

2015, and fall of 2015. Each section of the course ranged from 19 to 22 students, primarily comprised of sophomores and juniors who are either economics majors or minors.

Using a scale from one to five, one being "Not clearly at all" and five being "Very clearly," students were asked, "How clearly did the instructor present the course material whether through lecture, class discussion or other activities?" The average score across all sections of the course was a 4.4 out of 5. In four of the five course sections, student evaluations were more favorable than the college overall and for one section student responses were on par with the college average.[13]

For the question, "Please characterize the instructor's performance in the following terms: Quality of exercises and assignments" the average response was a 4.2 out of 5.

Finally for the question, "To what extent did the instructor involve you as an active participant in the learning process?" the average response was 4.6 out of 5.

In addition to quantitative evaluations, we provide example comments selected from the evaluations:

> "Professor Roncolato engaged the class through interesting exercises in class that were well received by the students"
>
> "…. some activities were always involved in class which made us relaxed and more eager to study...."
>
> "It was really helpful that instead of just lecturing we would do group activities or draw graphs on the board to reinforce the material."
>
> "You had no choice but to be active in Roncolato's class. Having us get up every so often to sketch a graph really helped keep my attentiveness at its max."

Many other comments of a similar nature were made in the evaluations. There were only two students who expressed negative reactions to the amount of standing up and moving that occurred in the course. The majority of the students made positive comments both in written evaluations and verbal feedback about the course.

Again, as discussed above, such activities and classroom structure is not without limitations. Covering the appropriate amount of course content and preparing students for future course work, while making the class interactive and accessible, is an ongoing challenge. To address this concern, we turn to student's perception of their intellectual development.

The student response to the question, "To what extent did this course enhance your intellectual development?" was higher than the college average for all sections of the course.

[13] A graphically representation of the comparison with the college-wide responses is available upon request.

To verify these results, a few comments are selected among similar statements from the evaluation forms:

> "By far the most material I have learned from an economics course at F&M, Junior, required for major"
>
> "I learned a lot, feel prepared to continue to more advanced material."
>
> "The course enhanced my intellectual development a lot by all the creative activities and energetic class atmosphere."

There were only four negative comments out of 92 total evaluations related to the effectiveness of the course and amount of content covered.[14]

Conclusion

Many other disciplines, especially in STEM, have embraced the scientific research on the advantages of active learning and developed creative pedagogical methods to engage students during class. Economic instructors on the high school level have developed ways of engaging students through dance and a few undergraduate instructors have developed other innovative ways of engaging students in their economic courses (Luccasen & Thomas, 2010; Buchs & Blanchard, 2011; Watts & Schaur, 2011; Vachris & Bohanon, 2012; Morgan, 2012; Zhang, 2012; Green et al., 2015). Still, the majority of instructors in the field of economics are reluctant to step away from traditional lectures (Watts & Schaur, 2011; Goffe & Kauper, 2014). In this paper, we outline the experimentation with body engagement in an undergraduate level economics classroom in hopes that it will inspire other instructors to use and or develop creative and innovative methods to improve learning outcomes.

We have discussed several body-engaging and interactive activities for college-level economics classrooms. The goal of these activities is to improve retention and understanding, increase students' alertness and interest in the subject, and create a more positive and relaxed learning atmosphere. While we were unable to conduct an analysis to isolate the channels through which learning took place, we do provide some evidence of effectiveness from student evaluations.

We make a key contribution to the literature by exploring innovative pedagogical techniques within a discipline that has been resistant to change. In addition to providing examples for economics instructors, our work contributes to the existing interdisciplinary work on the power of the mind body connection. We encourage instructors to find ways to connect movement to content, however we find that even when students' movement is not explicitly connected to content, there are advantages to physical activity. Our hope is

[14] These four students noted that they had covered similar material in a course taken in high school.

that this work will push instructors across all disciplines to explore body engagement as a way to enhance learning.

References

Bishop, J. L., & Verleger, M. A. (2013). "The flipped classroom: A survey of the research." In *ASEE National Conference Proceedings, Atlanta, GA*.

Benton, S. L., & Cashin, W. E. (2012). "IDEA PAPER# 50 Student Ratings of Teaching: A Summary of Research and Literature." *The Idea Center*.

Blatt-Gross, C. (2015). "Why Do We Make Students Sit Still in Class?" CNN. January 3, 2015. Accessed November 14, 2015. http://www.cnn.com/2014/03/30/living/no-sitting-still-movement-schools/.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school (expanded edition)*. Washington, DC: National Research Council.

Brownell, S. E., & Tanner, K. D. (2012). Barriers to faculty pedagogical change: Lack of training, time, incentives, and… tensions with professional identity?. *CBE-Life Sciences Education*, vol. 11, no. 4, pp. 339-346.

Buchs, A., & Blanchard, O. (2011). Exploring the concept of sustainable development through role-playing. The Journal of Economic Education, vol. 42 no. 4, pp. 388-394.

Chávez, A. F., (2007). Islands of Empowerment: Facilitating Multicultural Learning Communities in College. *International Journal of Teaching and Learning in Higher Education*, 19(3), pp. 274-288.

Delemeester, G., & Brauer, J. (2000). Games economists play: Noncomputerized classroom games. *Journal of Economic Education*, vol. 31, no. 4.

Flatow, I. (2014). "To Master Test Material, Give Your Brain a Break," *Science Friday*. 5 September 2014. Available at http://www.sciencefriday.com/segments/to-master-test-material-give-your-brain-a-break/

Garner, R. L. (2006). "Humor in pedagogy: How ha-ha can lead to aha!." *College Teaching*, vol. 54, no. 1, pp. 177-180.

Goffe, W. L., & Kauper, D. (2014). "A survey of principles instructors: Why lecture prevails." *The Journal of Economic Education*, vol. 45, no.4, pp. 360-375.

Green, G. P., Kelly, B. D., Peterson, D. J., & Bean, J. C. (2015). Using Integrative Graphic Assignments to Promote Deep Learning of the Market Mechanism. *The Journal of Economic Education*, vol. *46*, no. 1, pp. 28-44.

Hall, R., & Nemirovsky, R. (2012). Introduction to the Special Issue: Modalities of Body Engagement in Mathematical Activity and Learning, Journal of the Learning Sciences

Holt, C. A. (1996). "Classroom games: Trading in a pit market." *The Journal of Economic Perspectives*, pp. 193-203.

Jensen, E. (2005). "Movement and Learning." In *Teaching with the Brain in Mind*. 2nd ed. Alexandria, VA: Association for Supervision & Curriculum Deve.

"Kinesthetic Learning Activities." 2015. *Kinesthetic Learning Activities - Home*. Web. 11 Nov. 2015. http://www.cs.ubc.ca/~kla/pageindex.php.

Kober, N. (2015). *Reaching Students: What Research Says About Effective Instruction in Undergraduate Science and Engineering*. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Acad-

emies Press.
Luccasen, R. A., & Thomas, M. K. (2010). "Simpsonomics: Teaching Economics Using Episodes of The Simpsons." *The Journal of Economic Education,* vol. 41, no. 2, pp. 136-49. *360 Link*. Web.
McDonough, S., Forgasz, R., Berry, A., & Taylor, M., (2016). All brain and still no body: Moving towards a pedagogy of embodiment in teacher education. *Enacting self-study as methodology for professional inquiry*, p.433.
Milman, N. B. (2012). "The flipped classroom strategy: What is it and how can it best be used?." *Distance Learning*, vol. 9, no.3, pp. 85.
Moerman, P. (2013). "Dance and learn! Why dancing is fun and fruitful in learning." *International Journal of Pedagogy and Curriculum,* vol. 19, no. 4, pp. 1-20.
Morgan, J. (2012). ""Physical Economics": Get Students Moving While They Learn Economics." Federal Reserve Bank of Atlanta. March 29, 2012. Accessed November 14, 2015. https://www.frbatlanta.org/education/publications/extra-credit/2012/spring/lessons-and-activities/middle-school/microeconomics/physical-economics-get-students-moving-while-they-learn-economics.aspx.
Nemirovsky, R., Rasmussen, C., Sweeney, G., & Wawro, M. (2012). "When the classroom floor becomes the complex plane: Addition and multiplication as ways of bodily navigation." *Journal of the Learning Sciences*, vol. 21, no.2, pp. 287-323.
Owens, K., (2001). The Paper Airplane Challenge: A Market Economy Simulation. Lesson Plan. Available at < http://eric.ed.gov/?id=ED459101>
Pellegrino, J. W., & Hilton, M. L., eds. (2013). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Washington DC: National Academies Press.
Sawyer, R. K., ed. (2014). *The Cambridge handbook of the learning sciences, 2nd edition*. Cambridge: Cambridge University Press.
Scott, S., & McGuire, J., (2017). Using Diffusion of Innovation Theory to Promote Universally Designed College Instruction. *International Journal of Teaching & Learning in Higher Education, 29*(1).
Tews, M. J., Jackson, K., Ramsay, C., & Michel, J. W. (2015). Fun in the college classroom: Examining its nature and relationship with student engagement. College Teaching, 63(1), 16-26.
Thomas, A. M., Berrier, K., & Guggenbuehl, A. (2011). "Daring Young Engineers on the Flying Trapeze: Using Circus Arts to Teach Dynamics." In *American Society for Engineering Education*. American Society for Engineering Education.
Tranquillo, J. V. (2008). "Kinesthetic Learning in the Classroom." American Society for Engineering Education. Web. 11 Nov. 2015. http://www.facstaff.bucknell.edu/jvt002/Docs/ASEE-2008b.pdf.
Vachris, M. A., & Bohanon, C. E. (2012). "Using illustrations from American novels to teach about labor markets." *The Journal of Economic Education,* vol. 43, no. 1, pp. 72-82.
Watts, M., & Schaur, G. (2011). "Teaching and assessment methods in undergraduate economics: A fourth national quinquennial survey." *The Journal of Economic Education*, vol. 42, no. 3, pp. 294-309.

Willis, J. (2010). "Current Impact of Neuroscience in Teaching and Learning." In *Mind, Brain, and Education,* ed. D. Sousa, pp. 45-66. Bloomington: Solution Tree Press.

Wilson, M. (2002). "Six views of embodied cognition." *Psychonomic bulletin & review*, vol. 9, no. 4, pp. 625-636.

Zhang, Y. A., (2012). Developing animated cartoons for economic teaching. *Journal of University Teaching & Learning Practice*, vol. *9, no.*2, pp. 5.

Zimmerman, V. (2002). "Moving poems: Kinesthetic learning in the literature classroom." *Pedagogy*, vol. 2, no. 3, pp. 409-412.

Zull, J. E. (2002). The art of changing the brain: Enriching teaching by exploring the biology of learning. Stylus Publishing, LLC.