

Economics Across the Curriculum: Impact on Knowledge Acquisition ¹

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The Economics-Across-the-Curriculum approach encourages the infusion of economic concepts into various disciplines. This paper describes the results of field tested lessons generated at the professional development workshops for middle and high school teachers. Based on the assessment data, the impact on teachers' and students' knowledge acquisition is deemed to be positive. The conclusion is reached that this approach is useful for teachers' professional development. The paper contributes to the literature by showcasing the economics-across-the-curriculum approach and proposing new ways of student engagement.

INTRODUCTION

The program described in this paper is a multi-day workshop that provides high and middle school teachers of various disciplines with the understanding of economic concepts. In addition, teachers learn numerous instructional strategies and assessment methods as well as how to actively engage students to ensure knowledge retention.

The novelty of the program is the Economics-Across-the-Curriculum (EAC) approach, which encourages teachers to incorporate economic concepts into various fields of study. The program, therefore, appeals not only to economics teachers but also to teachers of English language arts, social studies, math, foreign languages as well as science, career prep, culinary arts, and others.

The infusion-based approach to enriching the curriculum was pioneered by Joseph S. Renzulli in the late 1970s. An infusion-based approach, according to Renzulli, means that teachers “review and select highly engaging enrichment-based activities related to particular topics; inject them into the curriculum to make topics more interesting; and provide support and encouragement for individuals and small groups who would like to extend their pursuit of the enrichment activities” (Renzulli & Waicunas, 2016, p. 412). Our application of the infusion approach proved beneficial to students and teachers in terms of their knowledge acquisition, the evidence of which is presented in this paper. The program's setup details as well as the literature review of the best practices on which the program is built are presented in Smirnova (2016).

This paper describes the results of field tested lesson ideas generated at the Economics Across the Curriculum workshops during the summer of 2016. The lessons were implemented in the classrooms in the subsequent semester, and students' knowledge was assessed before and after each lesson. Based on the assessment data, the impact on teachers' and students' knowledge acquisition are analyzed and conclusions are made about the usefulness of this approach for teachers' professional development.

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BEST APPROACHES TO INCREASE IMPACT ON LEARNING

The setup of the Economics Across the Curriculum (EAC) program is based on the scientific evidence of the best contemporary methods of educating teachers. The evidence shows that the contemporary dynamics of the classroom call for active learning, authentic assessment, teamwork and flexibility (see Gulamhussein, 2013; Lantis, Kent & Krain, 2010; Lopus & Hoff, 2009; Swinton, Scafidi & Woodard, 2012; Walstad & Watts, 2015). Thus, we argue that our program helps teachers gain deeper knowledge of economic concepts and develop creative pedagogical approaches to deliver this knowledge to students. Students, then, gain skills to become critical thinkers and knowledgeable participants in the workplace after graduation.

The program also embraces John Dewey's approaches to empirical and scientific thought and his ideas on the education of young minds. In his book "How We Think", Dewey postulates that it is important to develop "empirical" or "experimental attitude of mind" and to stimulate students' and teachers' intellectual eagerness (Dewey, 1933, pp. 201, 262). Dewey considered a systematic education in the subject matter as the first and the most crucial step for a teacher in becoming "the intellectual leader". When teachers master the content, they are able, Dewey wrote, to "take advantage of unexpected questions or unanticipated incidents. [Their confidence in the content knowledge will] be accompanied by a genuine enthusiasm for the subject that will communicate itself contagiously to pupils" (Dewey, 1933, p.275).

We use Dewey's mandate in our Economics-Across-the-Curriculum approach. Our team of experts demonstrates the application of the economic concepts using role-play and hands-on activities. In addition, we include time for reflection and discussion. Reflection was considered a vital part of the learning process by Dewey, and our program aims at "arousing enthusiasm, ... [and] evoking energy" in teachers (Dewey, 1933, p. 288), who will bring economics content knowledge into their classrooms.

While following the ideas of John Dewey, the EAC program adopts the best contemporary methods of educating teachers, such as active learning techniques, discussions, and reflection. In our program, in addition to helping teachers gain deeper knowledge of economic concepts, we introduce creative pedagogical approaches to assist them in delivering these concepts to students.

One more aspect of Dewey's philosophy is incorporated into the EAC program. This aspect is practical application of the learned material, which we call fieldwork. The fieldwork begins when teachers are back in the classroom after the EAC workshop is completed. Teachers have an option to refine and implement their lesson idea that was developed and evaluated during the workshop. We help teachers to create pre- and post-assessment instruments for students and provide feedback for their proposed application of pedagogy and the use of instructional resources. The actual implementation of the lesson in the classroom is called field test.

The field test is the most exciting part of the workshop, as we learned from the participants. It allows teachers to be creative and to embed the economic concepts they learned at the workshop into their classroom instruction. Many creative lessons were executed through the three years of the Economics Across the Curriculum program. Several of them are described in Smirnova (2016, 2017).

Teachers' feedback about the field-test assignment, which we obtain from evaluation forms as well as from reflection essays submitted to us, has been very positive and encouraging. It shows that the exercise is job-embedded, and therefore presents long-lasting benefits according to the Frontline Research (2016) report. After the field test, teachers reflect on and describe their improved understanding of economic concepts, which suggests that they will become better instructors for years to come. This is exactly what we want to see, since our goal is to have an impact on more and more students as they go through their high school careers.

Economics-Across-the Curriculum approach attracts participants who teach the broad range of subjects which results in a wide variation in the understanding of economic concepts among them. This presents a challenge of bringing all teachers to the same level of content knowledge before the start of the workshop. As a solution, we developed a rigorous 13-hour online course for teachers to complete prior to the workshop using the EconLowdown portal. The online activities provide participants with a common

understanding of the concepts presented at the workshop. In addition, completion of these activities prior to the workshop allows for more time for teachers to engage in activities related to pedagogy and implementation of the economics concepts within the classrooms during the face-to-face portion. Results of the online pre-work, described in the next section, reflect consistent, and sometimes striking, improvement in overall understanding of the economic concepts. As we hear from our partners and teachers themselves, the rigorous online preparatory work is a unique feature which strengthens the EAC program.

IMPACT ON LEARNING

The Economics-Across-the-Curriculum approach encourages the integration of economic concepts into various disciplines. This helps teachers and students to experience the beauty of interdisciplinary connections among topics and to engage in intellectual inquiry beyond the impermeable walls of a single-subject area. The participants' diversity generates a cross-pollination of ideas, dynamism, and discovery of many interdisciplinary connections to be used in the classroom. These innovative pedagogical ideas are beneficial for students as they encourage critical thinking, real-world application of a concept, and other skills that are transferable to various fields of study, academia, and the workplace.

TABLE 1
PROGRAM IMPACT: NUMBER OF PEOPLE SERVED

Impact	2014	2015	2016	Total
Teachers				
Participated in the workshop	22	17	83	122
Field-tested the lesson	11	13	34	58
% field-tested	50%	76%	41%	48%
Students				
Direct impact: attended the field-tested lesson	173	310	831	1,314
Indirect impact: 75 students per teacher annually	1,650	4,575	13,725	13,725

In 2016, the EAC program was presented in three locations: Boston, Chicago, and Philadelphia. The total number of participating teachers was 83. It is worth noticing that the economic education industry normalizes that each teacher effects on average 75 students annually (Yetter, 2017). The idea is that the teacher who went through a rigorous professional development workshop like ours, will become a better educator for years to come. Table 1 presents the indirect as well as direct impact numbers of all three cycles of the program. Students whom we consider directly impacted by our teachers are the ones that experienced the field test of the lesson, i.e. students who actually were in attendance on the day of the field test, who took pre- and post-tests, and filled out the lesson evaluation survey. Even with only the direct counting of the students, our impact through three years is impressive – 1,314 students.

Teachers' Knowledge Acquisition

During the first two cycles of the program, we were developing and testing the knowledge acquisition assessment instruments for teachers. The challenges were in readability, common knowledge-base, congruency with different experts' approaches, and stylistic coherency. Therefore, we do not have scientifically sound results on teachers' knowledge improvement for 2014 and 2015. The results of the qualitative assessments in 2014 and 2015 are presented in Smirnova (2016).

The program went on the road in the summer of 2016 as we collaborated with the Federal Reserve Banks of Boston, Chicago, and Philadelphia. Our partners also included the Massachusetts and Illinois Councils for Economic Education. Three sessions of EAC were held and a total of 83 teachers attended the program. Table 2 summarized the states and disciplines represented at each location.

The broad range of subjects taught by teachers attracted to our workshop presents a challenge. The challenge lies in the wide variation among our participants in their understanding of economic concepts. To level the playing field for all participants, we developed a rigorous 13-hour online course for teachers to complete prior to the workshop using the Eco Lowdown portal of the Federal Reserve Bank of St. Louis. The online activities provided participants with a common understanding of the concepts that are presented during the program. In addition, by completing the online pre-work portion, more face-to-face time during the workshop are used to engage in activities related to pedagogy and implementation of the lesson ideas within their classrooms.

TABLE 2
PROGRAM PARTICIPANTS, 2016, NUMBER OF TEACHERS = 83

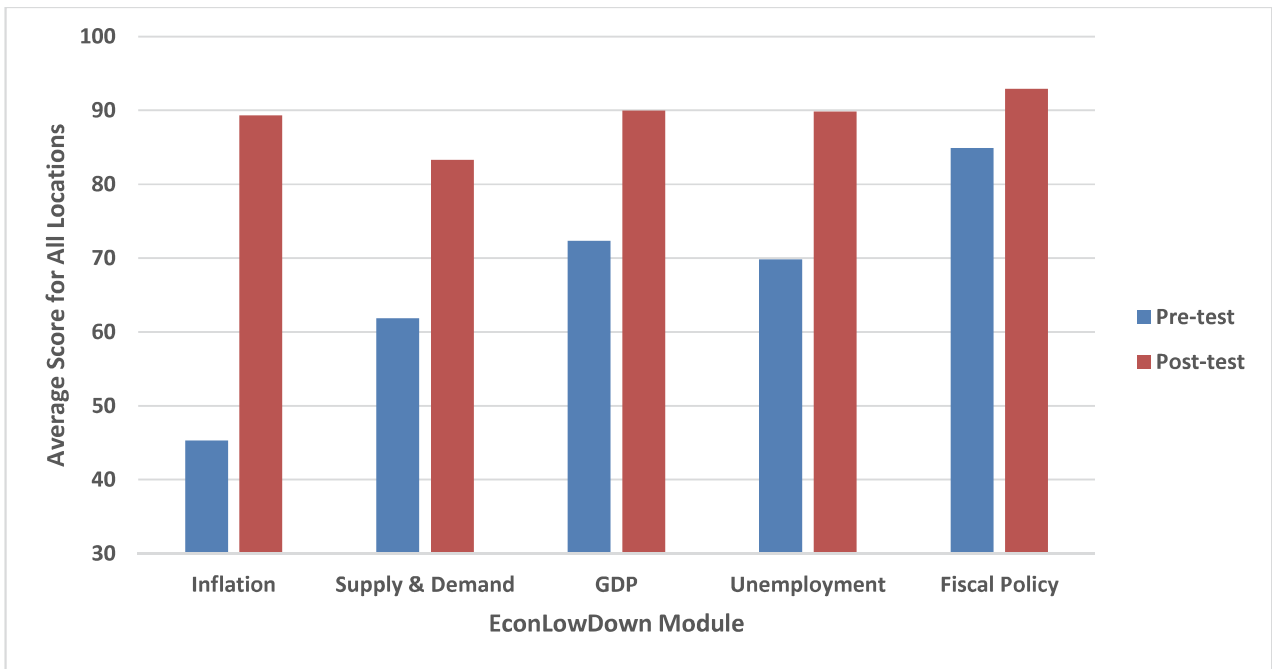
TTI Location	States Represented	Disciplines Represented
BOSTON (36):	MA=34 (23 from Boston Public Schools) NJ=1 NY=1	History=19, Math =5, Economics =3, Personal Finance/Financial Literacy=2; English=2; ESL (English as a Second Language) =2; Humanities=1; Biology=1; Psychology=1.
	Public schools = 34 Private schools = 2	
CHICAGO (29):	IL=28 (8 from Chicago Public Schools) MO=1	Consumer Science/Ed=6; History=5, Economics =5, Business=4; Instructional Technology=2, Elementary schools=2; Graphic Design=2; Enrichment=1; School Counsellor=1.
	Public schools = 28 Private schools = 1	
PHILADELPHIA (18):	PA =10 NJ=7 NC=1	History=5, Economics =4; Financial Literacy =3, Consumer Science=2; Math=2; Business=1; Humanities = 1.
	Public schools = 15 Private schools = 3	

Eighty-three teachers who went through the program during the summer 2016 represented many disciplines summarized in Table 2: history (24 teachers), math (7 teachers), financial literacy (5 teachers), technology and computer science (4 teachers), economics (12 teachers), and consumer science (8 teachers). The topics covered in the online modules were inflation, supply and demand, GDP, unemployment, and fiscal policy. Each participant took a pre-test to measure their understanding of the concept prior to studying the module. After completing the online work, each participant took a post-test.

We were impressed with the teachers' learning. The difference in scores between pre- and post-tests reflect improvement in overall understanding of the economic concepts. These results are shown in Figure 1. As one can see, the inflation topic produced the biggest improvement in teachers' knowledge, while understanding of fiscal policy improved only slightly. Interestingly, the starting knowledge of fiscal policy was already high (average pre-test score was 85 percent), while the inflation concept was quite unfamiliar (average pre-test score was 45 percent). The main takeaway is that after the online work, teachers mastered each topic, reaching a score of 90 percent or better.

Armed with this solid knowledge, participants came to the workshop. The workshop therefore was robust with discussions, demonstrations, constructive criticism, and sharing of best practices. Participants focused on finding ways to integrate economic concepts, now clearly understood by the teachers, into the curricula of diverse subjects and grade levels. Based on the material presented during the workshop, including content, pedagogy, and assessment, each teacher developed a lesson idea to be field-tested in their classroom.

FIGURE 1
PRE- AND POST-TEST SCORES OF ONLINE PRE-WORKSHOP MODULES, 2016,
NUMBER OF TEACHERS = 83



Of the 83 participants in the 2016 cycle of the EAC, 34 teachers conducted the field test, a 41 percent completion rate. After administering the lesson, the teachers are asked to complete a feedback form containing 10 qualitative questions. The questions are the following: 1) The goal for the lesson was achieved; 2) The materials used seemed interesting to students; 3) Students actively engaged with the materials; 4) Students followed the directions with ease; 5) The options for assessment were helpful; 6) Students interacted with the teacher and others; 7) My understanding of the topic improved; 8) I am confident in my knowledge about this topic; 9) The lesson was a memorable teaching experience; 10) Students identified how to apply the topic in daily life. The answers are recorded on a Likert scale from strongly agree to strongly disagree.

The results from the 2016 cohort are very encouraging. Figure 2 shows that more than 90 percent of teachers felt strongly that their understanding of the (economic) topic improved. More than 70 percent strongly agreed and an additional 25 percent mostly agreed that students interacted with the teacher and others. More than 60 percent strongly agreed and an additional 28 percent mostly agreed that the lesson was a memorable teaching experience. It is useful to note that only three responses out of total of 340 were “Disagree”, and there were no “Strongly Disagree” responses.

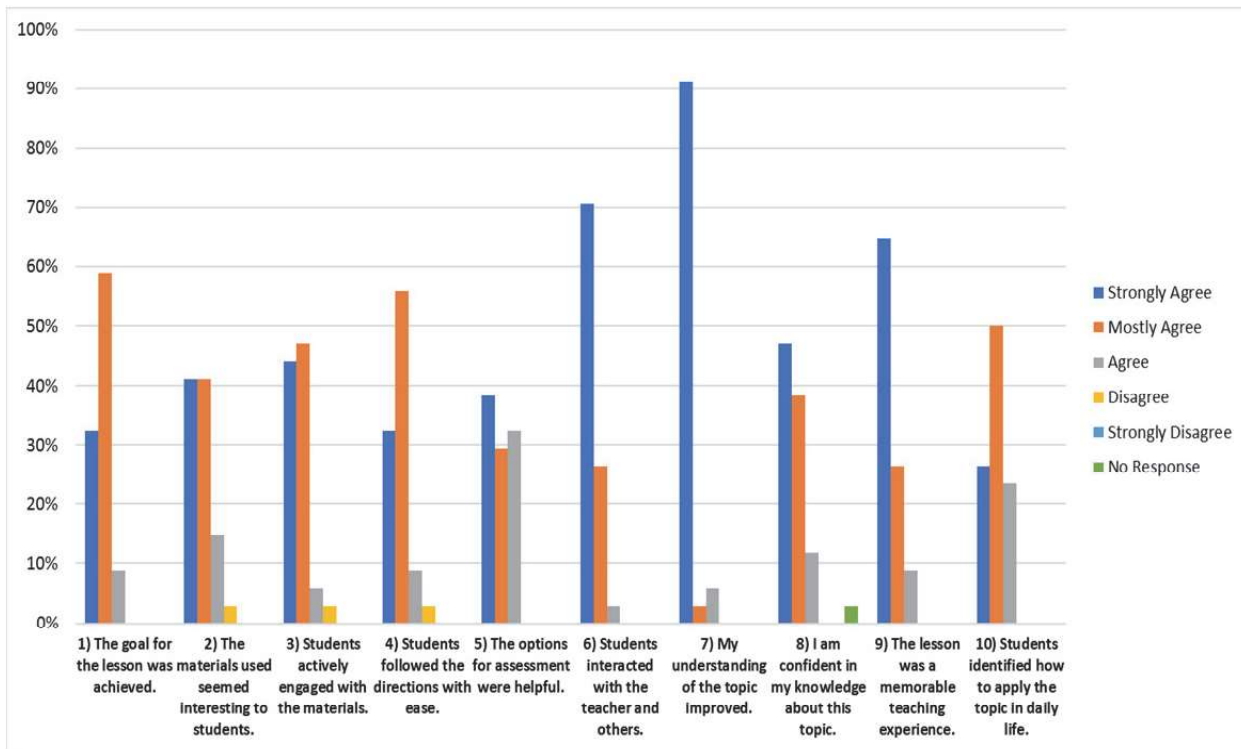
The goals of the EAC program are to increase teachers’ understanding of economic concepts and to stimulate interest in applying economics to daily life. Based on the evidence presented in Figure 2, we are confident that the teachers are mastering the subject matter and the pedagogy for presenting it to students. The impact on students’ outcomes is analyzed in the next section.

Students’ Knowledge Acquisition

We collected two sets of assessment instruments from students: the content and the opinion. The content set is the pre- and post-test where students answer questions pertaining to the topic presented at the beginning and at the end of the class. The opinion set is the lesson evaluation form which is a qualitative questionnaire asking students to agree or disagree with ten characteristics of the class. Sometimes the lessons were given in multiple class sessions so there is a difference between the number

of students who took the content assessment and the number of students who took the opinion assessment. The content assessment to be valid must contain both pre- and post-tests for each student. The opinion assessment is given to every student who is present at the end of the treatment. In 2016 cycle, we have 831 opinion surveys, and 778 valid matched pairs of pre- and post-tests. Of the 778 students who took the content assessment, 249 were in Boston, 246 were in Philadelphia, and 283 were in Chicago.

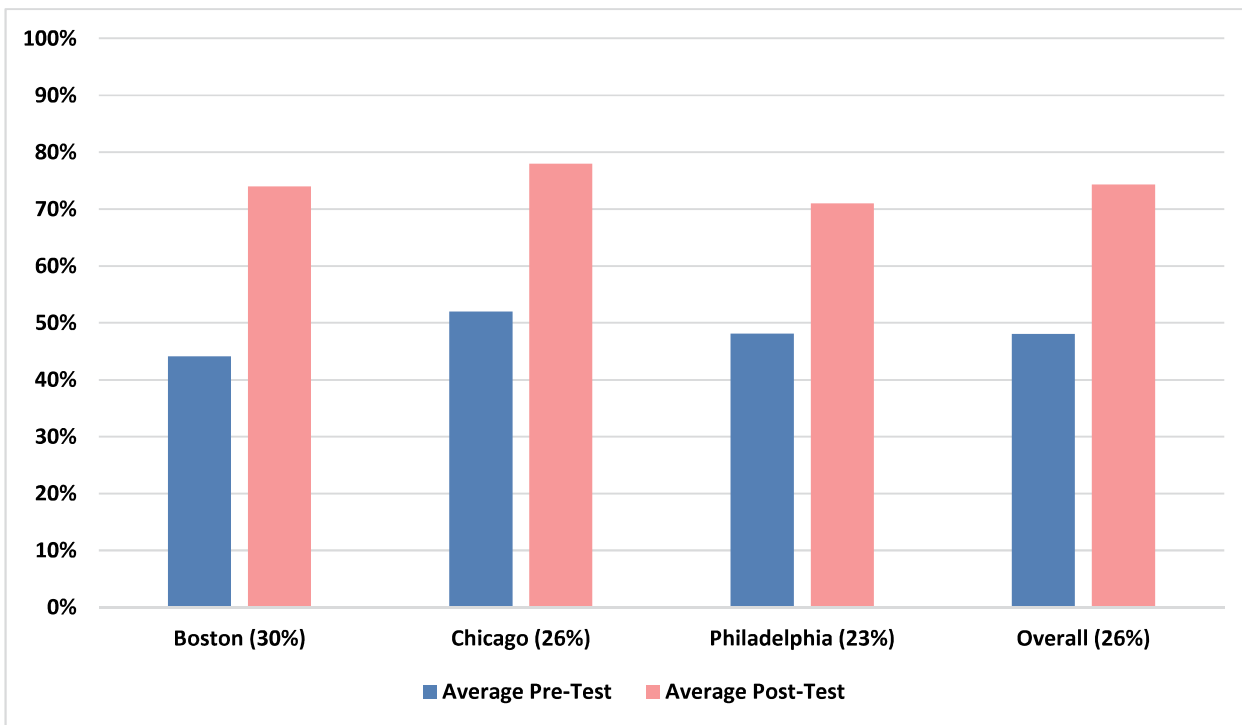
FIGURE 2
TEACHERS' FEEDBACK ABOUT THE FIELD TEST, 2016, N = 34



The content assessment was designed by the teachers and approved by the EAC expert-presenter before administration in their respective classes. Because each teacher had to infuse an economic concept into their subject curriculum, each pre- and post- assessment instrument was different. Most of the pre- and post-tests consisted of up to 10 multiple choice and/or short response questions. The questions ranged from critical thinking queries to statistical and mathematical calculations. To make the comparison among different classes meaningful, we took the average of pre- and post-test scores in each location. Figure 3 summarizes the content assessment results. It shows the improvement in students' knowledge between pre-test and post-test by location. Overall, the average improvement of scores for students from pre-test to post-test was 26 percentage points. The biggest gain in knowledge from the pre-test score average of 44 percent to the post-test score average of 74 percent was in Boston – 30 percentage points. The highest average pre- and post-test scores were in Chicago (52 percent and 78 percent, respectively), showing the improvement of 26 percentage points.

The average improvement of students' scores by 26 percentage points is very impressive. It shows that well-trained teachers who understand the content and the delivery system of their subject matter are instrumental in transmitting the knowledge to students in an impactful way. In addition, the teachers who self-select to test their ideas in the classroom after the program are very creative in the infusion of economics into their fields of study. The creative ideas of several implemented lessons are described in Smirnova (2016, 2017).

FIGURE 3
CHANGE IN STUDENTS' SCORES, 2016, NUMBER OF STUDENTS = 723



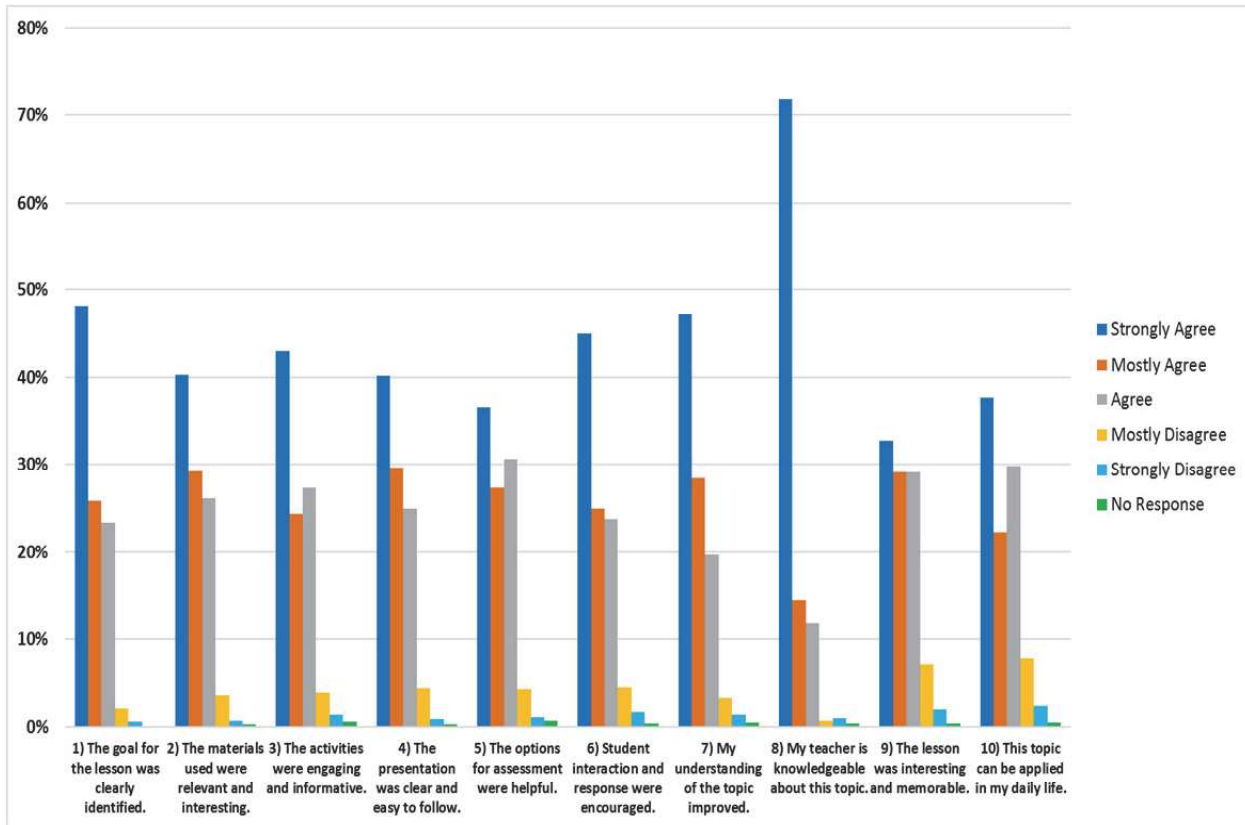
The field-tested lesson ideas and topics were diverse, representing the various subjects and grade levels of participating teachers. But at the end of the lessons, all students who were present had to fill out a common evaluation form allowing to gather their opinion about how well the lesson was implemented. The form contained 10 questions with a Likert scale for answers: strongly agree, mostly agree, agree, mostly disagree, strongly disagree. The questions were the following: 1) The goal for the lesson was clearly identified; 2) The materials used were relevant and interesting; 3) The activities were engaging and informative; 4) The presentation was clear and easy to follow; 5) The options for assessment were helpful; 6) Student interaction and response were encouraged; 7) My understanding of the topic improved; 8) My teacher is knowledgeable about this topic; 9) The lesson was interesting and memorable; 10) This topic can be applied in my daily life.

Figure 4 summarizes the results from the end-of-class evaluation form. As one can see, the overwhelming majority of students either strongly agreed or mostly agreed with statements like “The goal of the lesson was clearly identified,” “The activities were engaging and informative,” “Student interaction and response were encouraged,” and “My understanding of the topic improved.” Seventy-two percent of students strongly agreed, and an additional 15 percent mostly agreed, with the statement “My teacher is knowledgeable about this topic.”

Since the focus of the Economics Across the Curriculum program is on teaching the teachers how to teach students, the highest approval rating for question #8 about teacher’s knowledge of the topic from the standpoint of students is of most importance and of most success. It shows that the program has successfully created the knowledge transmission mechanism from experts through teachers to students.

The other features of the field-test such as setting and achieving a clear goal (Q#1), relevant materials (Q#2), engaging activities (Q#3), and interaction among students (Q#6) present the evidence that the Economics Across the Curriculum workshop is an impactful professional development program. It impacts not only participating teachers, but also students benefiting from teachers who have strong knowledge of content and pedagogy, and excellent resource materials to share.

FIGURE 4
STUDENTS' FEEDBACK ABOUT THE FIELD TEST, 2016, N=831



CONCLUSION

The Economics Across the Curriculum program is a multi-day professional development workshop for teachers of middle and high school. It encourages the infusion of economic concepts into various fields of study. The program combines three components: online pre-work, face-to-face instruction, and the field-test. The rigorous requirements of the program result in the positive impact on teachers' and students' knowledge acquisition, which is supported by the evidence presented in this paper.

The education literature and state and federal mandates suggest that the expectations for student learning, the instructional program that students experience, and student success depend on the effectiveness of the teachers. If the goal is to have students attain ambitious academic standards and be well prepared for the transition after high school, we need to ensure their access to great teachers. Using successful teacher preparation programs, such as Economics Across the Curriculum described in this paper, will help to achieve this goal.

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