#ECON1950: Integrating Twitter and a Learning Management System to reach students outside the classroom

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ABSTRACT

A course specific Twitter hashtag can be used to categorize tweets related to course material. Embedding a Collection of these tweets within a Learning Management System course page is an easy way to share this information with students. A guide to embedding a twitter feed within Moodle, Canvas, and Blackboard Learn is provided. Examples of how Twitter can be used to share information to students in a Macroeconomics course are provided. Student survey results indicate that most students agreed that the Twitter feed helped connect the course material to examples, was worthwhile, and stimulated their interest in economics.

Introduction

Repeatedly in my course evaluations when teaching Principles of Macroeconomics, students request more real-world examples. The heavy use of abstract models in economics may discourage students from pursuing future studies in economics if they cannot see the link to the real-world. This may especially be a problem for economics departments that are in business schools, as the link to the real world for other business major subjects is patently obvious to students. Frank (2006) argues that connecting students with real-world examples stimulates their interest in economics and aids in retention of key concepts. The micro-blogging social media platform, Twitter, can be a useful and low opportunity cost tool for disseminating real-world examples and applications of economics course material.

Twitter is already a useful way for economists to follow and engage on economic policy and economic research issues. Over 1,500 academic economists have registered their Twitter accounts with the online bibliographic database Research Papers in Economics (RePEc) hosted online by the Research Division of the Federal Reserve Bank of St. Louis (https://ideas.repec.org/i/etwitter.html). Holmberg and Thelwall (2014) find that academic economists on Twitter share more links than academics from other disciplines. Many economics and economy-related institutions also have Twitter accounts that disseminate useful information (e.g., @federalreserve, @bankofcanada, @OECD, @StatCan_eng, @BrookingsEcon, etc.). Twitter is also heavily used by journalists to report breaking news and analysis; some of which relates to economic policy and economic indicators. Furthermore, there are also columnists (who also happen to be Ph.D. trained economists) that provide economic policy analysis in real-time (e.g., @paulkrugman, @noahpinion, @stephenfgordon, and many others).

For economics instructors not yet participating on Twitter, there are low adoption costs to begin sharing information from Twitter with their class using a course specific hashtag, Collection (a curated list of tweets), or account. For economics instructors that are already participating in the economics Twitter community the adoption costs are even lower. A hashtag is an alphanumeric label following a pound sign written in a tweet (e.g., #ECON1950, #teachecon, #cdnecon, #econtwitter). Twitter uses these hashtags to categorize tweets,

so entering a specific hashtag into Twitter's search function returns a list of tweets that include that hashtag. A course specific hashtag can then be viewed by students on Twitter. Additionally, TweetDeck (https://tweetdeck.twitter.com/) can be used to create a course specific Collection of tweets; a link to this Collection can then be shared with students. A Collection is a curated list of tweets where the user (the instructor) has complete control over the ordering of the tweets; whereas, Twitter usually displays tweets in reverse chronological order. An alternative option is to tweet from a course specific Twitter account (e.g., @ECON1950). TweetDeck, Hootsuite, and many other applications allow users to tweet from multiple Twitter accounts, and the recent redesign of Twitter's standard browser interface now allows one user to tweet from multiple accounts. Students would then need to follow the course specific account on Twitter using their own twitter account.

However, in informal discussions with students, many indicated that they did not use Twitter or were concerned about privacy. Indeed, Al-Bahrani, Patel, and Sheridan (2015) find that only 67% of students use Twitter and that a small percentage of students have privacy concerns about interacting with professors on social media. Privacy concerns and student non-use of Twitter can be overcome for Collections and accounts. Embedding a Twitter feed of a Collection or an account within a Learning Management System (LMS) course page is an easy way to ensure your use of Twitter for the course is inclusive to students whether they use Twitter or not. In the past, it was possible to embed a feed of a specific hashtag, but this approach was discontinued in July of 2018; however, it is still possible to easily embed a course specific Collection or account in a LMS.

I expand on one use of social media mentioned by Al-Bahrani and Patel (2015): using Twitter to share information (e.g., graphs of economic data, news articles, blog posts, etc.) with students. Many economists have argued in favour of sharing articles in newspapers and business periodicals about real-world economic events as a complement to introductory economics material (e.g., Kelley (1983), Cochran and Brown (1989), Bredon (1999), among others). Creating these supplemental opportunities for students is important, as reading articles in the popular press about real-world economic issues and events has been shown to improve student understanding of the theoretical material presented in-class (Craig and Raisanen 2013). In this article, I focus on my experience combining Twitter with a Learning Management System to provide students with real-world examples relevant to the course material. It merges the two competing methods (Twitter vs. LMS posts) evaluated by Al-Bahrani, Patel, and Sheridan (2017b) into a single teaching tool.

In the next section I review the economics education literature focused on using Twitter to aid in teaching economics. In the third section I provide details on embedding a Twitter feed of a course specific Collection or account into three common Learning Management Systems (specifically Moodle, Blackboard Learn, and Canvas). In the fourth section I provide examples I have shared to students through Twitter. In the fifth section I present and discuss results from a short student survey conducted related to the embedded Twitter feed. In the final section I make conclusions.

Twitter and Economics Education

Kassens (2014) recounts experience using Twitter assignments in a Principles of Macroeconomics class to promote active learning and student engagement. Students were required to tweet in response to questions posed on the course hashtag by the instructor and/or guest tweeters (prominent economists @JustinWolfers and @BetseyStevenson). The students were also asked to tweet reflection on course material. Their tweets were assessed by a rubric created by the students on the first day of class and were worth 15% of their final course grade. Kassens (2014, pp. 107) concludes that the Twitter assignments "have the potential to improve reflection and writing skills." However, she notes that the assignments may not work for larger classes, which are the norm for introductory economics courses at some post-secondary institutions.

However, some economics educators have incorporated Twitter into larger class sizes. For example, Jones and Baltzersen (2017) outline their use of Twitter to facilitate in-class discussions of business cases in large economics lectures. Students in the large class tweet questions and responses related to the case under discussion to a case specific Twitter hashtag. The feed for the case specific hashtag is then displayed on the overhead projector and the instructor can follow the discussion and highlight important comments to the entire class. Jones and Baltzersen (2017) survey participating students and find that a large majority agreed or strongly agreed that using Twitter for this purpose increased their participation and understanding.

Dowell and Duncan (2016) outline a group assignment for Principles of Macroeconomics that uses Twitter and Periscope (a live video application) to help students learn about the connection between standard of living and real GDP per capita. Students use Periscope (a Twitter application) to interview people from other countries about their living standards and then compare the responses to data on real GDP per capita. Dowell and Duncan (2016) argue the assignment increases student engagement, digital literacy, cultural competency, and global awareness.

Al-Bahrani and Patel (2015) provide an introduction to three social media platforms (Twitter, Instagram, and Facebook) and a detailed guide in the many possible uses for teaching economics in and out of the classroom. They highlight both voluntary and mandatory uses, as well as active (students participate and contribute) and passive uses (instructors relaying information). One aspect they highlight relevant to the current paper is that instructors can use social media to connect students with real-world examples relevant to course material to stimulate student learning and interest in economics. They also comment that "the collaboration and engagement culture on Twitter is more developed" than on Facebook or Instagram (Al-Barhrani and Patel 2015, pp. 64). They reiterate that "privacy concerns remain a major issue" (Al-Barhrani and Patel 2015, pp. 64).

Al-Bahrani, Patel, and Sheridan (2015) survey undergraduate students about their use and preferences regarding social media platforms. Almost 80% of students report checking social media multiple times a day, whereas only 48% report checking their LMS several times a day; however, almost 90% of students reported checking their LMS at least once a day. They found that Facebook, YouTube, Instagram, and Twitter were the most popular amongst students; however, only 67% of students reported using Twitter. They also highlight that a small percentage of students had privacy concerns in regards to interacting with professors on social media.

Al-Bahrani, Patel, and Sheridan (2017a) surveyed economics educators who participated in the American Economics Association's Conference on Teaching and Research in Economic Education between 2011 and 2014 about their use of social media. They find that most instructors who use social media in their teaching are using it as a passive instructional tool to share relevant content with students outside the classroom and that most of this material is YouTube videos. A small percentage of respondents were using social media for active learning through graded or non-graded assignments. Their survey results also lead them to conclude that "faculty are reluctant to use it, not because of a lack of understanding, but because they want to limit access to personal information and educational content" (Al-Bahrani, Patel, and Sheridan 2017a, pp. 49).

Al-Bahrani, Patel, and Sheridan (2017b) conduct an experiment over six sections of introductory economics at three institutions to test the effectiveness of Twitter on student learning. For their treatment classes, they use Twitter to share articles related to the course material. For their control classes, they use an LMS (Blackboard) to share the same information. They then use regression methods to estimate the effects of the treatment on various indicators of student learning. They are unable to conclude that using Twitter is more effective than using an LMS. However, they do highlight that their experimental design does not make use of many of Twitter's features that are theorized to increase student learning. Though their study does use Twitter in a similar way to that described in the present paper. Embedding Twitter within a LMS could be viewed as an additional possible treatment that was not tested. Another caveat the authors' add in the conclusion is that the benefits of Twitter may not just be related to traditional indicators of student learning (i.e., grades), "but may rather be in the form of engagement, teacher evaluations, and fostering interest in the topic" (Al-Bahrani, Patel, and Sheridan 2017b, pp. 251). The last benefit is specifically why I began using Twitter to share information with my students: to try to increase their interest in economics!

When using Twitter for sharing content, students without Twitter accounts must "opt-in" to receive the content by joining Twitter. This may be a large default rule to overcome, especially considering that according to Al-Bahrani, Patel and Sheridan (2015) one third of students do not use Twitter. This can also be an issue for students on Twitter who choose not to follow the instructor for privacy reasons; they must opt-in to viewing the course hashtag each time they log in (opt-in by searching it). Kassens (2014) makes Twitter assignments part of the course grade and therefore provides a real, extrinsic incentive to overcome status-quo bias. However, if Twitter is being used as a passive supplemental learning tool (e.g., sharing course relevant news articles), there is no incentive to overcome the default. Embedding a Twitter feed into the LMS eliminates the problem; students no longer have to opt-in to viewing the course specific Twitter feed. This ensures that access to the supplemental learning material provided through Twitter is more inclusive. It also makes the feed incredibly unavoidable for students who check the LMS, which may nudge some students into clicking on the links.

Integrating Twitter with a Learning Management System

In this section I provide a guide for the process of embedding a Twitter feed within a course site in a Learning Management System (LMS). The guide is specific to Moodle as an example LMS, but I also provide instructions for Canvas and Blackboard Learn. The process is simple to generalize to other systems so long as they allow the use of html code.

Rather than displaying your entire Twitter feed for students to see, the use of a course specific hashtag allows an instructor to share targeted information with their students. For my purposes, I have used #ECON1950 and #ECON3410 among others, the subject and course codes for first year Principles of Macroeconomics and third year Economics of Climate Change at Thompson Rivers University. It is important to search the hashtag prior to using it to ensure that it is not already in use by someone else. Unfortunately, a feed of a hashtag can no longer be embedded; however, course specific hashtags are still useful for categorizing relevant tweets for use in a Twitter Collection or for use later.

One way to share course relevant Tweets through a LMS is to curate a Twitter Collection using TweetDeck. In Fall 2018 I created a Collection in TweetDeck and then embedded a feed of this Collection within my Moodle course page when teaching Principles of Macroeconomics. TweetDeck is a browser interface for Twitter that allows multiple columns of tweets to be viewed and I set it up in the following way: One column was a feed of the tweets of all accounts I follow with my personal account, one column was a feed of my own tweets, one column was a search of the course specific hashtag, and one column was the course specific Collection. You can then add tweets by dragging and dropping them into the Collection column. Unlike the rest of Twitter, tweets within a Collection are not necessarily ordered in reverse chronological order; the user has complete control over the ordering of tweets within the Collection. The major advantage of using a Collection is that it allows the most control for the user to choose how the tweets included in the Collection appear to the viewers. It allows for tweets from other accounts to be placed in the Collection; an instructor would not even have to include any of their own tweets, it could consist only of tweets from other accounts if the instructor so desired. This further minimizes the costs of adoption for instructors. They can use relevant tweets from other accounts found easily on economics related hashtags (e.g., #EconTwitter, #TeachEcon) and essentially free-ride on existing economics related Twitter content. The disadvantage of using a Collection is that it requires the use of TweetDeck, which makes it slightly more inconvenient than the discontinued approach of embedding a feed of a course specific hashtag. The collection can then be embedded using an html widget obtained from https://publish.twitter.com or directly from TweetDeck.

Table 1: Directions

Create Widget	Step 1:	Go to https://publish.twitter.com
	Step 2:	Enter the URL to a Twitter account or Twitter collection
	Step 3:	Copy the resulting html code
Embed in Moodle	Step 5:	Click "Edit" on a Moodle module within your course site; Select "Edit Week"
	Step 6:	Select html (<>) & paste the widget. Save.

An alternative approach is to create a course specific Twitter account. The course specific account can then be used to retweet relevant tweets from your personal Twitter account and the course specific hashtag. The normal Twitter browser interface now supports the use of multiple accounts or other interfaces such as TweetDeck and Hootsuite can be used. It is possible to automate the process using Kearney's (2019) rtweet package in the statistics program R (essentially creating a retweet bot that automatically retweets the tweets that contain the course hashtag); however, the process is relatively technical to set up and it is probably easier for most instructors to manually retweet the relevant tweets. The tweets of the course specific account can then be embedded using an html widget.

There are two ways to obtain the needed html widget to embed either a Collection or an account. One way is to go to https://publish.twitter.com and enter the URL of the collection or the account in the box under the text "What would you like to embed?". Alternatively, within TweetDeck, embedding is listed as an option when you click on the "Share" option of a Collection or account column. Either option will provide the required html code that you can now copy.

Within your Moodle course site, click "Edit" on one of the Moodle modules within your site, and select "Edit week" (or "Edit topic") from the drop down menu. Now select the html button (<>) and paste the html code that you copied from Twitter into the text box. If the html button is not visible, you will need to select the button that displays "Show me more options" when you hover the cursor over it. Finally, by clicking on Save Changes, you have now embedded a Twitter feed of your course specific Collection or account into your Moodle course site. The Twitter feed should now be displayed as in Figure 1.

The process to embed a Twitter feed in Blackboard Learn is similar to in Moodle. According to Linzy (n.d.), you go to the desired content area within your Blackboard Learn coursesite and choose "Build Content" and "Item". In the resulting text editor, click the "HTML Code View" button and paste the Twitter widget. After clicking through to finish the process, the Twitter feed should appear.

The process in Canvas is quite more involved[2] and detailed instructions have been provided by Gibbs (n.d.) at the following website, https://canvas.ou.edu/courses/56095, and are summarized in the following sentences. Once you have the html widget, you need to paste it into a text editor (e.g., Notepad) and save the .txt file. Rename the .txt file as .html and upload this file to Canvas. Click on the file to get three key pieces of information from the file address, e.g., if the address is https://canvas.instructure.com/courses/2002536/files?preview=93780762, the needed information is canvas.instructure.com, 2002536, and 93780762. Now create a Canvas Page, name the page and click the "html" button. You now need to insert the following iframe code using the three pieces of information you obtained:

<iframe src="https://canvas.instructure.com /courses/2002536/files/93780762/download" width="450" height="850"></iframe>

You can now click "Save and Publish" and the editor should display on the page.

If you want the feed to be displayed as the course homepage so that it is the first thing students see when they go into the course page do the following. When viewing the page, click on the three dots in the upper right corner and select "Use as Front Page". Then exit to the "Home" and select "Choose Home Page" on the right hand side. Select "Pages Front Page" from the listed options, and the Twitter feed should now display as the home page for the coursesite.

Using Twitter as a Tool to Promote Learning

In the first class of the semester I provide students with my Twitter handle and the course hashtag when providing my other contact details (e.g., office location, email address, etc.). I provide a brief overview of why I think Twitter is useful for connecting the course material to real-world applications in the news, current events, and public policy. I also mention that I embed a Twitter feed in the Moodle course site, so students who prefer not to use Twitter can still access the information.

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[2] Canvas does have a Twitter app that makes it very easy to embed a Twitter feed; however, the app does not display the pictures from tweets, only the text.

I have used Twitter mainly as a tool for sharing information about current events, economic research, and public policy to supplement the course material in an effort to stimulate learning and to foster interest in economics. This is consistent with the way that most economic educators are currently using social media (Al-Bahrani, Patel, and Sheridan 2017a). For example, the two tweets displayed in Figure 1 provide supplemental information about monetary policy, specifically inflation targeting. One tweet repeats information from their last lecture on the mandate of the Bank of Canada, but supplements with a time series graph displaying annual inflation in Canada between 1962 and 2015 with lines indicating the bounds of the inflation target. The second tweet visible in Figure 1 provides a link to a Bank of Canada document outlining the benefits of low, positive inflation; the document is written in a way that is accessible to the general public.

Figure 1: Moodle screenshot with embedded Twitter feed

There is potential for the shared information to encourage more than just passive learning, for example, when sharing an article in a tweet, the instructor can pose a question in the tweet for students to consider while reading the article; thus, encouraging students to think critically about the material they are reading. As pointed out by Cochran and Brown (1989), many articles about economics topics in the popular press make mistakes about introductory economics concepts, and can potentially impede student learning about those concepts. When sharing a tweet about an article that makes a mistake, the instructor can point the error out in the tweet. This will aid students in learning to identify these types of mistakes themselves. For example, when sharing news articles about changes in the local unemployment rate, I have pointed out in the tweet that the changes are not statistically significant due to the small number of people sampled in the local area.

A useful technique for sharing a linked series of tweets (a "Twitter essay") is called "threading". This technique can be used to provide a longer narrative than is allowed by the character limit (280 characters per tweet) of Twitter. To thread a series of three tweets, write and then post the first tweet in the series, then use

the reply button on that tweet to send the second tweet in the series, and then reply to the second tweet to send the third tweet. Rather than replying to each tweet, it is possible to make the thread all at once. If you write out the first tweet, before sending it, you can click on a "plus" sign to add an additional tweet. If a student clicks on the third tweet, the series of three tweets is displayed; the link to this tweet can also be shared as a link to the thread of tweets. It is also useful to number the tweets in a series, so that when they show up in the Twitter feed, students know the order (e.g., 1/3, 2/3, and 3/3).

Figure 2: Threaded tweets

An example of a Twitter thread in #ECON1950 is displayed in Figure 2. The first tweet in the series references an example explored in class: the impact of the 1973 OPEC oil embargo in the standard Aggregate Demand- Aggregate Supply model. The next three tweets display related time series data: tweet number two has the nominal oil price, tweet number three has the growth rate of Canadian real GDP, and tweet four has the inflation rate. The text of the tweets point out that the prediction of our AD-AS model was not entirely correct for real GDP, but correct for the price level.

When creating a feed (either a Collection or an account) that is going to be embedded, Quote Tweets should be avoided. A Quote Tweet allows the user to provide comment with a link to a specific tweet. Within Twitter's browser interface, the quoted tweet will be visible; however, when a Quote Tweet is displayed in the embedded feed within the LMS, the quoted tweet is not visible, only the comments you tweeted about it.

By embedding a course specific Twitter feed, students are exposed to new examples related to the course whenever they sign in to the LMS. Hopefully, the supplemental content encourages learning and stimulates interest in economics. If the Twitter feed stimulates interest in economics, this could potentially also help foster increased engagement, participation, and active learning within the classroom. The next section presents results from a short survey about students' perceptions of the Twitter feed.

Survey Results

The #ECON1950 Twitter feed was embedded in the Moodle course sites of two sections of Principles of Macroeconomics at Thompson Rivers University (TRU) in the 2017 Fall semester. TRU is a small, undergraduate focused public university located in western Canada. One section contained 43 students and the other contained 52 students[3].

With Research Ethics Board approval, a short six-question anonymous survey was administered in-class concurrently with regular course evaluations. The survey was administered by a third party and was not reviewed until after the final grades for the course were submitted. Students had the option of opting out of participation by leaving the survey blank or not handing it in.

The first three questions of the survey were the following:

1. What type of student are you? (Domestic, International or Prefer not to say)
2. Do you have a personal Twitter account?
   (Yes (use regularly), Yes (but do not use regularly), or No)
3. How frequently did you click on links posted on the Twitter feed embedded in Moodle?
   (Never, Once, Once a month, Once a week, or Multiple times a week)

Students were then asked to indicate whether they "Strongly disagree", "Disagree", "Agree", or "Strongly agree" with the following three statements:

4. The Twitter feed embedded in Moodle helped connect the course material to real world examples and current events.
5. The Twitter feed embedded in Moodle was a worthwhile addition to the course.
6. The Twitter feed embedded in Moodle helped stimulate my interest in macroeconomics and current events.

In total 56 surveys were fully completed[4] reflecting 58.9% of the enrolled students. The survey was administered in the final class of the course when attendance turned out to be low; however, 56 is still a reasonable sample size. The low attendance on the day the surveys were administered may add selection bias if a particular type of student was less likely than usual to attend. Attendance records for the day of the survey are only available for the 43 student section of the course. In this section, the average final grade of the 31 students in attendance was 72.5%; whereas, the average final grade of absent students was 52.1%. In the other section, although attendance records are not available for the specific day of the survey, records of past

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[3] There were originally an additional 11 students enrolled in the course, but these students withdrew, either officially or unofficially (Did Not Complete) during the semester.

[4] 59 surveys were returned, but three were only partially completed.

attendance indicate that the average final grade of the 28 students who missed fewer than two classes (the most likely students to be in attendance on the day the survey was administered) was 70.4%; whereas, the final average grade of the students who had missed three or more classes was 55.8%. This information on class attendance suggests a selection bias towards high achieving students.

The responses to question 1 were coded 0 if a respondent indicated they were an international student and 1 if they indicated they were a domestic student. The responses to question 2 were coded 0 for no Twitter account and 1 for having a Twitter account (regardless of whether they use it regularly or not). The responses to question 3 were coded on a 1-to-5 scale with 1 being "Never" and 5 being "Multiple times a week". The responses to questions 4, 5, and 6 were coded on a 1-to-4 scale with 1 being "Strongly disagree" and 4 being "Strongly agree".

**Figure 3: Survey Results Part 1**
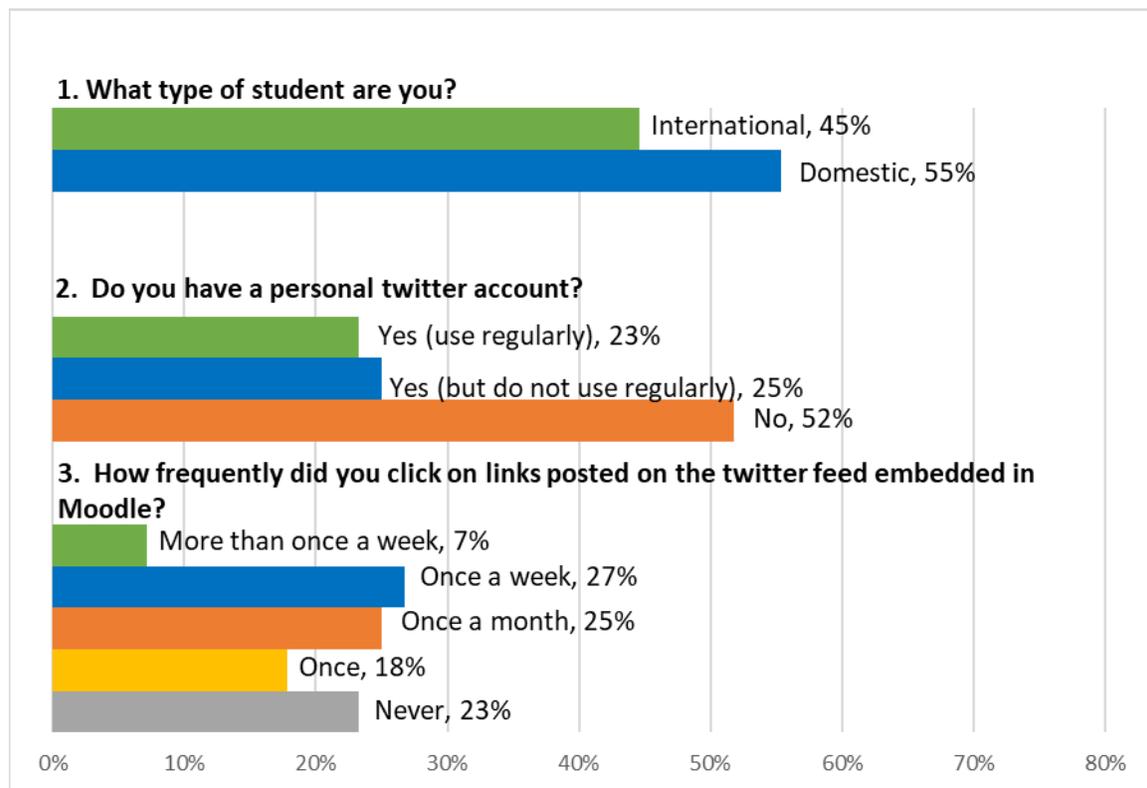
The results for questions 1, 2, and 3 are displayed in Figure 3. The survey responses are from a relatively even mix of domestic (55%) and international (45%) students. Nearly half of the respondents had a personal Twitter account. Thirty-four percent of the responding students clicked the links posted to the Twitter feed at least once a week and a majority of responding students clicked the links at least once a month. A large share (41%) of responding students reported only clicking on a link once or not at all; this is concerning considering that an average of 4.21 tweets shared per week included only text and a link. However, this may not indicate that the feed was not worthwhile for these students because posting additional readings related to the course material was not the only way in which the Twitter feed was used. Graphs of economic data as well as threaded series of tweets referencing course material were also used. Two tweets a week, on average, included graphs/images; therefore, the feed may have been valuable in other ways for students who did not click on the links.

Indeed, 85% of the responding students agreed or strongly agreed that the Twitter feed helped connect the course material to real world examples, even though some of these students did not regularly click the provided links. In this sense, the Twitter feed helped address prior feedback from students requesting more

examples- whether they used those examples or not. Forty-five (81%) respondents felt the Twitter feed was a worthwhile addition to the course. However, only 38 (68%) felt that the feed helped encourage their interest in macroeconomics.

Figure 4: Survey Results Part 2
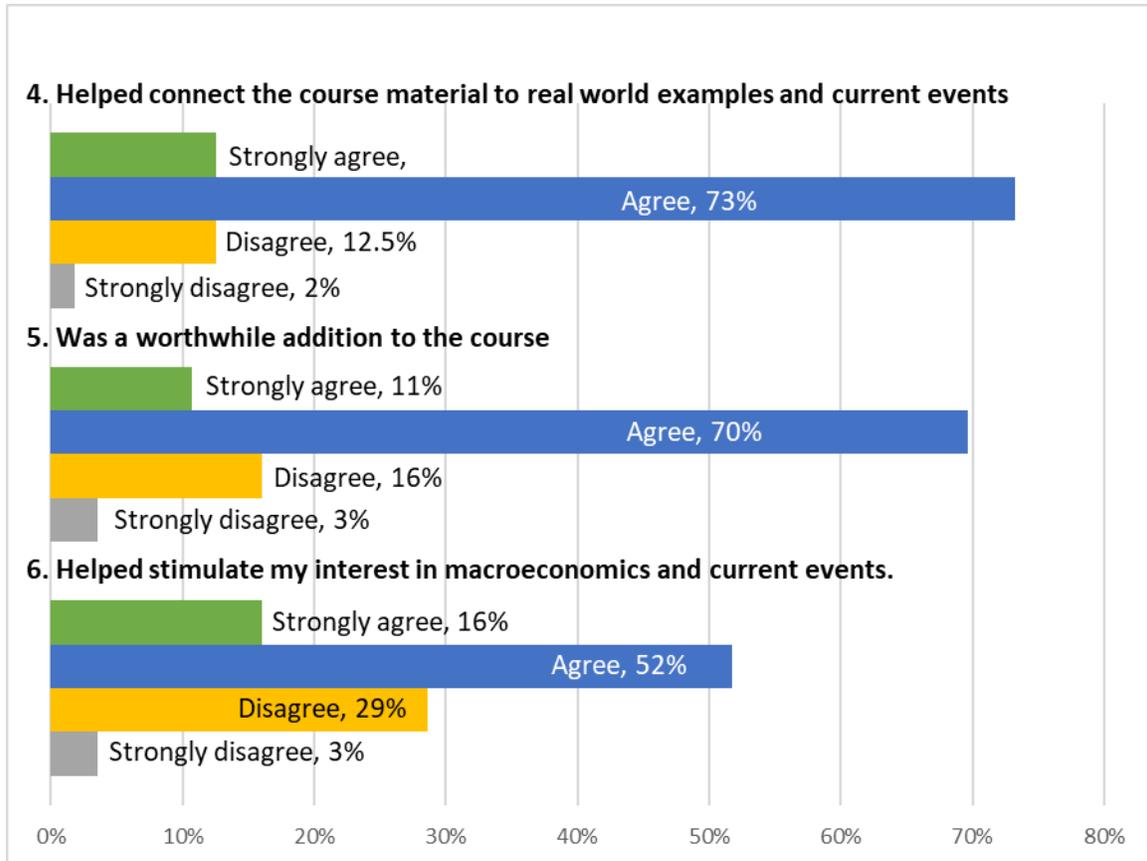
In summary, most students did not click, at least weekly, on the links to supplemental readings provided through the feed. However, an overwhelming majority of students thought the feed helped connect the course material to real-world examples and was a worthwhile addition to the course. In addition, a majority of students felt the feed increased their interest in macroeconomics.

Table 2 displays t-tests conducted on the difference in mean responses between different groups of students. On average, international students clicked on links in the feed more frequently than domestic students (statistically significant at a 90% confidence level, but not a 95% confidence level). For all the other questions, I cannot conclude that the mean responses of the international students differs from that of the domestic students.

Column three of Table 2 compares the responses of students who have Twitter accounts with those who do not. For all questions, I fail to reject the null hypothesis that the mean responses between these two groups are different. Finally, column four compares the responses of users of the embedded Twitter feed (students who reported clicking the links at least once a month) to those who did not use the Twitter feed (students who reported never clicking on the links or clicking on only one link). The null hypothesis of no difference in means is rejected for questions 4, 5, and 6. The students who chose to access the linked information in the Twitter feed had a more positive view of the Twitter feed for connecting the course material to real world examples and felt more strongly that it was a worthwhile addition to the course. These students also felt more strongly that the feed stimulated their interest in macroeconomics and current events.

Table 2: Difference in Means

	Domestic vs. International	Twitter account vs. no Twitter account	Clicked on links vs. Did not
Q2 Have personal Twitter account?	0.12 (0.429)	-	-
Q3 Frequency of clicking on links?	-0.64 (0.072)	-0.32 (0.340)	-
Q4 Connects to real world examples?	-0.05 (0.730)	-0.13 (0.410)	0.48 (0.003)
Q5 Worthwhile addition to the course?	-0.07 (0.697)	-0.01 (0.916)	0.58 (0.001)
Q6 Stimulated interest in macroeconomics?	-0.19 (0.340)	-0.05 (0.790)	0.79 (0.000)

Notes: t-test p-values in parentheses.

Data obtained from Twitter Analytics was used to compare my course related tweets with my non-course related tweets between September and December 2017. Course related tweets received on average 6.95 twitter engagements, whereas non-course related tweets received on average 11.34 twitter engagements; a t-test of means indicates the difference is statistically significant at the 1% level. Course related tweets that contained a weblink received on average 2.72 link clicks; whereas, non-course related tweets that contained a weblink received on average 2.25 link clicks. However, the difference is not statistically significant from zero. Ultimately, when using an embedded Twitter feed, it is difficult to obtain meaningful information using Twitter Analytics because student views of the feed will not register as "impressions", and the only way for students that do not have Twitter accounts to engage with a tweet is to click the link (they cannot retweet or like a tweet).

Conclusions

In 1999, Bredon theorized that there were three factors that influence whether an instructor will choose to share course relevant news articles with their students: 1) Perceptions of educational value, 2) the search costs of finding suitable articles, and 3) the costs of reproducing the material. Bredon argued that the internet had reduced the costs related to 2) and 3), making it easier for instructors to share material with students. If the internet initially lowered theses costs, the combination of social media and Learning Management Systems has further reduced these costs in a drastic way. Twitter is useful for academic economists to follow current events and research and to engage with their colleagues, students, and the general public. It is also a great place to gather information relevant to undergraduate economics courses; drastically reducing the time and effort required to find suitable examples. A course specific Twitter feed embedded in a Learning Management System is a relatively easy way to share this supplemental information with students. The costs of an instructor joining Twitter and sharing course relevant tweets with their class through an embedded feed are extremely low. Furthermore, for instructors that are already active on Twitter, the adoption costs are even lower.

The approach of embedding a Twitter feed in a LMS avoids the issue of choosing between Twitter and the LMS for sharing information with students studied by Al-Bahrani, Patel, and Sheridan (2017b). It also makes accessing the information as easy as possible for the students; there is no need to join Twitter or search a hashtag or account. And since there is no need to join Twitter, it also ameliorates the concern over privacy and social media that a small percentage of students have.

Unfortunately, a slight majority of students do not access the supplemental information on a weekly basis (though a slight majority reported clicking on links at least monthly). Despite this, most students thought the

embedded Twitter feed and supplemental information was a worthwhile addition to the course and helped stimulate their interest in economics. International students clicked on the links more frequently than domestic students; this may indicate a fruitful avenue for additional research. I failed to identify a difference in responses between students with Twitter accounts and those without. Perhaps unsurprisingly, the students who accessed the linked information in the Twitter feed responded more positively about the feed than students who did not access the linked information. The students who clicked on links at least monthly responded more strongly that the feed helped connect the course material to real-world examples, was worthwhile, and stimulated their interest in macroeconomics and current events. This is *prima facie* evidence that the approach is worthwhile; however, the sample was relatively small and relied only on student ex-post perceptions. More detailed studies using larger sample sizes and more sophisticated research designs are needed to provide greater insight into the impact on student learning and interest in economics.

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