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Teaching Tip
Active Learning in the IS Classroom: A Student Crowdpolling Exercise for IS Courses

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ABSTRACT

Active learning pedagogy has many documented benefits, and while several positive examples of its recent use in STEM classes have led to better performance, greater diversity, more equity, and improved retention of underrepresented student populations, more research in IS and IT classrooms is needed. Most active learning exercises are in a traditional in-person format; however, the COVID-19 pandemic has created a demand for more online classes. Here we present an easy-to-adopt, active learning crowdpolling exercise that can be used for all modalities, including online, hybrid, and face-to-face, moreover, can be used throughout the semester or for a portion of it. The exercise creates a small crowdpolling results database that can be used to enhance student data literacy and teach a variety of IS topics such as database, systems analysis and design, and data analytics. An extended example of how it is used in the Introduction to IS course is provided.

Keywords: Active learning, Outsourcing, Data analytics, Computer classrooms, Online engagement

1. INTRODUCTION

Active learning works (Prince, 2004): It combines deliberate practice by students with inclusive teaching to improve communication, motivation, engagement, leadership, and responsibility of learning (Johnson, 2019; Mok, 2014; Pirker et al., 2014; Theobald et al., 2020). Further, active learning in STEM courses has been shown to benefit students from underrepresented groups. These research studies suggest active learning can lead to a significant reduction in achievement gaps, promotion of higher diversity and equity in higher education, and growth in competencies, including communication, collaboration, self-motivation, and social skills (Ballen et al., 2017; Johnson, 2019; Theobald et al., 2020).

Most active learning exercises and most research on active learning focus on the traditional face-to-face classroom modality. However, the COVID-19 pandemic has caused unprecedented levels of virtual instruction (Gallagher & Palmer, 2020), making it difficult to use traditional active learning exercises for physically disparate students (American Psychological Association, 2020a, 2020b). As a result, there is a growing need for STEM active learning exercises in non-traditional modalities as well as research on their effectiveness.

This paper describes an active learning crowdpolling exercise that we have used in face-to-face, hybrid, and online modalities in a variety of information systems (IS) and other STEM courses. It is a flexible, easy-to-use exercise that can run over the entire semester or just a portion of it. The exercise creates a small crowdpolling results database for use in teaching

a variety of IS topics such as database, systems analysis, design, and data analytics, as well as improving data literacy in general. The exercise requires students to find useful and interesting current event Web articles on IT and IS topics and evaluate other student articles. While using a current event exercise is not new pedagogy, our use of crowdpolling and how we applied the data generated by the game to a variety of topics in the IS Introduction course are new and constitute the main contributions of this article.

This paper first reviews active learning and crowdpolling research to provide the context in which the exercise can be considered. We then describe the exercise and how we use it in class. We conclude with the benefits of the exercise and lessons learned.

2. BACKGROUND

2.1 Active Learning

Active learning is an activity-based learning approach that enables students to create a meaningful learning experience (Beard & Wilson, 2006). It can take many forms and have positive outcomes in numerous subjects (Strelan et al., 2020; Theobald et al., 2020). Active learning is a first-person experience in which students help create an authentic learning environment. It enables students to take an active part in learning (student-centered) as opposed to passively consuming content by listening and taking notes (teacher-centered; Bernstein, 2018).

Effective active learning exercises and assignments enhance student interactions, promoting motivation, facilitating long-term learning of the class content, and developing skills in communication, leadership, conflict resolution, critical thinking, and understanding context (Conduit et al., 2017; Herrmann, 2013; Johnson, 2019; Romanow et al., 2020; Theobald et al., 2020; Woods, 2020). Results also include psychological impacts, such as improved student attitude and increased ownership of responsibility toward learning (MacVaugh & Norton, 2012; Mok, 2014; Pirker et al., 2014). Active learning is also a way to help students who do not have business experience (e.g., internship experience) appreciate how systems can improve process efficiency (Jewer & Evermann, 2015). Active learning techniques have shown an improvement in exam scores by 6% compared to traditional lecturing, and students in traditional lecturing classes were 1.5 times more likely to fail than students in active learning environments (Freeman et al., 2014).

Although the lecture is the most common pedagogical format in IT and IS courses (Gudigantala, 2013), there are many well-known benefits of using active learning for IT and IS students (Goh et al., 2020; Misseyanni et al., 2018). Flipped classrooms for IT and IS undergraduates have contributed to clear enhancements in student attitudes, ownership, responsibility toward learning, classroom excitement, and teamwork (Astani, 2006; Mok, 2014; Mukherjee, 2005; Van Slyke et al., 1999). More recently, other studies of active learning in IS have shown improvement in outcomes in online IS foundations courses (Goh et al., 2020) and IS strategy courses (Woods, 2020). While encouraging, more research is needed to determine how best to use active learning in IS in general (Abukhader, 2022) and in the IS introduction course in particular (Drake, 2012). These calls for further research are due to several studies that found few positive effects of active learning on student learning outcomes (Fellers, 1996; Wehrs, 2002).

Recent research has linked active learning in STEM classes with better performance, greater diversity, more equity, science self-efficacy, and a sense of social belonging (Ballen et al., 2017; Johnson, 2019; Theobald et al., 2020). These research studies suggest active learning in STEM and IS courses can lead to improved retention of STEM students and, as a result, help offset the exceptional shortage of qualified individuals for the rapidly growing number of roles in this field (Freeman et al., 2014; Theobald et al., 2020).

The shortage has been linked to STEM students switching to non-STEM majors or leaving college altogether. This subset of students is typically from low-income or minority groups, so their departure from STEM majors decreases diversity in STEM graduates (Ballen et al., 2017; Theobald et al., 2020). Students from underrepresented groups will likely benefit the most from active learning (Ballen et al., 2017; Theobald et al., 2020). Underrepresented minority students begin college with about the same level of interest in STEM majors as overrepresented students, but STEM completion rates drop significantly for Asian Americans, African Americans, people of Latinx ethnicity, Native Americans, and students with low income (Theobald et al., 2020). Barriers for these students include social isolation, low confidence, and stereotype threat (Ballen et al., 2017).

Active learning can close the gap between non-underrepresented and underrepresented students by as much as 33% for exam scores and 45% for passing rates (Theobald et al., 2020). Meaningful reductions in achievement gaps for underrepresented student groups occur when course designs combine deliberate practice with inclusive teaching. The IT-IS domain is particularly sensitive to retaining a diverse student population (MacVaugh & Norton, 2012; Mok, 2014; Pirker et al., 2014); consequently, exercises such as the one described in this study are essential.

2.2 Crowdpolling

There are many different approaches to active learning in higher education (De Hei et al., 2015; Johnson, 1991; Johnson, 2019; Knight, 2015). One approach is to apply student crowdpolling, which leverages the various skills and experiences of the students in providing diverse feedback. Crowdpolling in the context of higher education is a method that involves students evaluating or voting on choices or alternatives. Crowdpolling of instruction, review, and grading by students encourages them to build on prior knowledge, think critically, and, as a result, become responsible for the process of learning (Maletić et al., 2019). Crowdpolling has been shown to capture real-world experiences and thoughts and allows for a broader scope of topics than typically covered using the more traditional methods of teaching (Lukyanenko et al., 2019; Tullis & Goldstone, 2020). The skills built by providing insight to others and receiving insight through others can also expand the skill-enhancement opportunities originally conceptualized for the assignment (Ye & Kankanhalli, 2017).

Students also benefit by becoming more engaged, attentive, reflective, and analytical as their accountability for others' work increases (Luaces et al., 2017). In addition, the assignment accuracy, information recall, conceptual understanding, and confidence typically increase when peer-evaluation is present (Maletić et al., 2019; Tullis & Goldstone, 2020; Velichety,

2019). When combined with technology, crowdpolling has the added benefit of training students to embrace new ways to collaborate with teammates in a business environment, especially in uncertain and ambiguous environments (Cattaneo, 2017; Chen et al., 2020). Crowdpolling in the classroom can also relieve the instructor's workload without decreasing the meaningfulness, quality, or quantity of feedback (Ackerman et al., 2017).

Active learning in information systems in general, and crowdpolling in particular, is an under-studied methodology (Rush & Connolly, 2020), which is a barrier to adoption and implementation. In addition, the extant research is at a conceptually high level. Crowdpolling taxonomies have been developed that include the amount of technology, the assignment type (e.g., ranking, qualitative feedback), the level of student guidance to provide (e.g., rubrics), how the final grade is calculated, and how to motivate students to participate (Albano et al., 2017; Luaces et al., 2017; Robinson, 2001; Wright et al., 2015). However, most of the research is on peer evaluation of assignments, and no research has been done on crowdpolling as the key element in active learning.

2.3 Data Literacy

Crowdpolling generates data that can be used to improve students' data literacy. Data literacy is the ability to collect, manage, evaluate, and apply data in a critical manner (Ridsdale et al., 2015). Although important, it is lacking in professionals and students (Carlson et al., 2011; Hamilton et al., 2009; Mandinach & Gummer, 2013). It is also a domain needing more research (Flywel & Jorosi, 2018; Julien et al., 2018; Mandinach & Gummer, 2013; Pothier & Condon, 2020; Ridsdale et al., 2015). Schools are still inconsistently preparing graduates (Ridsdale et al., 2015), and businesses are recognizing that investments in technology are less important than investments in data literacy (Bean & Davenport, 2019; Pothier & Condon, 2020).

To promote data literacy, education research calls for project-based learning. Projects that contain a wide variety of student interactions and use actual data can help students understand the connection between process/theory and practice. Further, projects should "allow evaluators the chance to assess skills practically, instead of formally. Projects should include data, relevant to the students' interests and in an engaging context, not just data for the sake of data. Increased engagement in working with data can foster innovation, improve learning, and increase the likelihood of lifelong learning. Projects should offer students the opportunity to go further than you expect" (Ridsdale et al., 2015, p. 5).

3. OUR ACTIVE LEARNING EXERCISE

At our universities, we have developed and used a student crowdpolling assignment we call the *Current Events Game*. This exercise accounts for 10% of the grade for each student during a semester. This exercise requires students to submit links to Web articles of interesting current events in the field of technology or IS and post them for their classmates to read, respond to, and peer-evaluate. We have used this exercise for several years in classes ranging from freshmen to executive MBAs, in accounting and IT courses, and in two universities simultaneously. We have used it for face-to-face, online, and hybrid teaching and even in classes we have taught in China.

3.1 Game Play

Students are assigned to teams; the number of teams per class has varied depending on class size, but the typical size is three to six students. The competing teams must send their articles and questions about the article to the instructor on Mondays. The instructor then creates a discussion board on Canvas with a link to each submitting team's current event article and their questions regarding the articles (details in the appendices). Students read the articles by following the link provided in the discussion board and respond to the questions related to the article on the discussion board in Canvas before the discussion board closes on Thursdays. The instructor provides a Microsoft Form link in each discussion board description to grade the articles. Each student grades the articles on a 10-point scale. Each week three or four teams submit articles. Figure 1 shows an example of a discussion board, and Figure 2 shows student responses to questions.

All students read each current event article and grade each article: 0 for articles that are neither useful nor interesting and 10 for being useful and interesting, as shown in Figure 3. An overall score for each article is calculated at the end of each week by calculating an average grade on a 10-point scale.

The game can be played over the course of several lessons or for an entire semester. In our Introduction to IS course, we play it through the entire semester. In our database course, we use it only during the second half of the course as a prelude to an assignment to create a database to support the game. In other courses, we have used the game for as little as two weeks.

Each week/round (online or in-person), the instructor displays results during class, as shown in Table 1, with columns for each of the three articles for that round and five rows, for each of the five students' grades (never showing names). The instructor leads a discussion about the main ideas in the articles and often describes how the article helps explain a course topic. We found that by signaling the importance of the exercise and by regularly devoting some class time and public praise for winners, students found better articles, graded more consistently and with greater variety, and participated more often in discussions. We find the game is more effective if it becomes a small but regular aspect of the culture of the course.

	Article 1: Robots in Factories	Article 2: AI in Medicine	Article 3: Driverless Cars
Student 1	8	8	9
Student 2	10	10	10
Student 3	6	8	8
Student 4	4	5	7
Student 5	7	7	7
Totals:	7.0	7.6	8.2

Table 1. Example Results of a Round

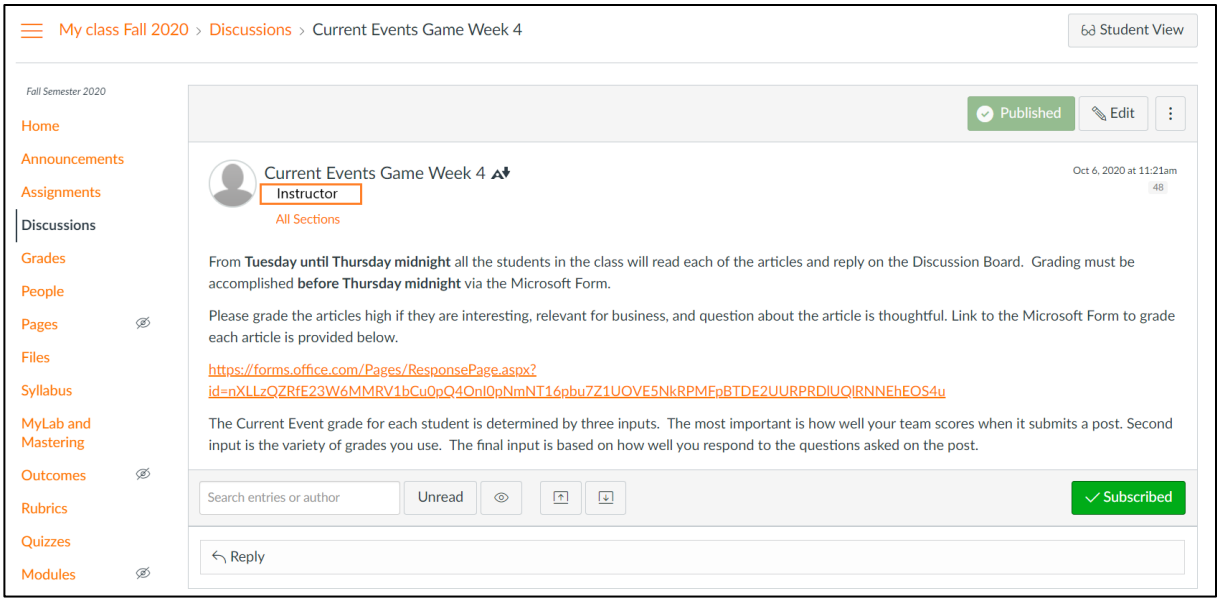


Figure 1. Current Events Game Discussion Board

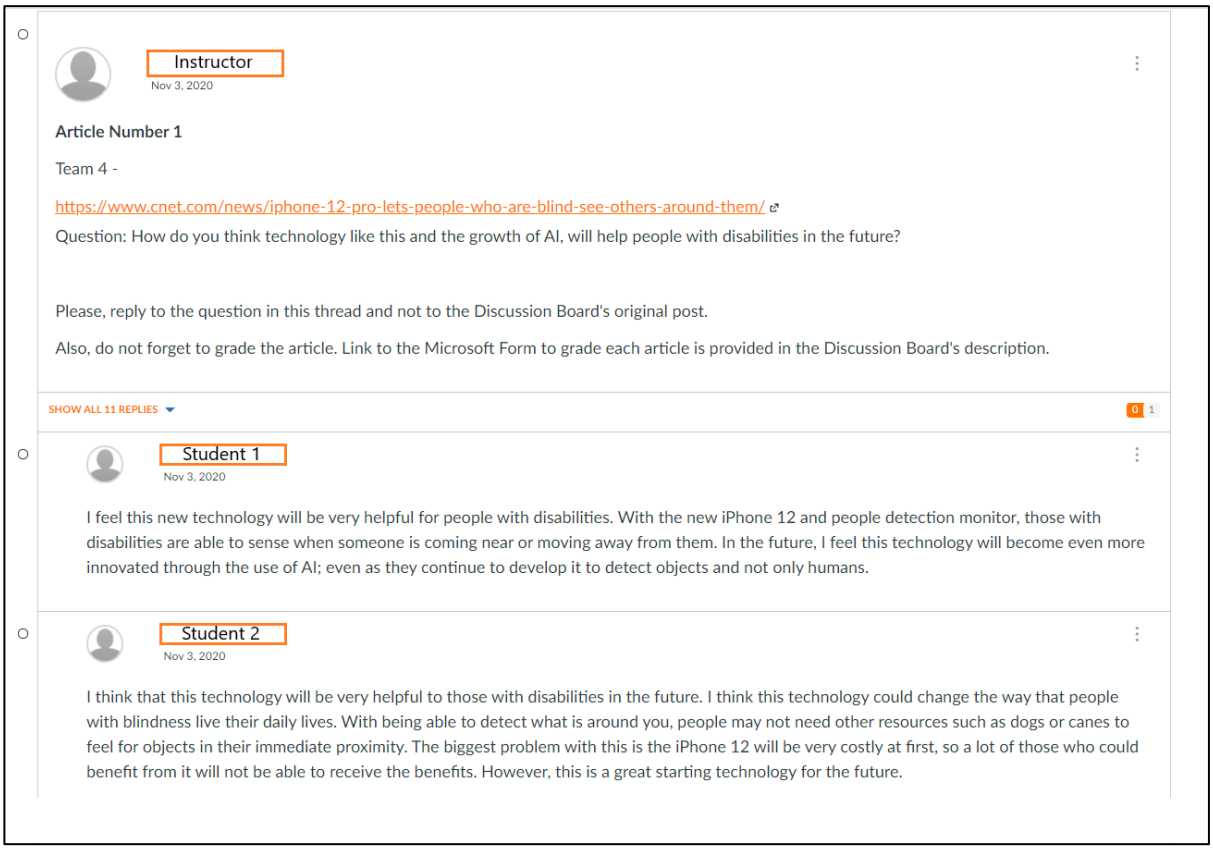


Figure 2. Students Addressing the Questions of the Submitting Teams

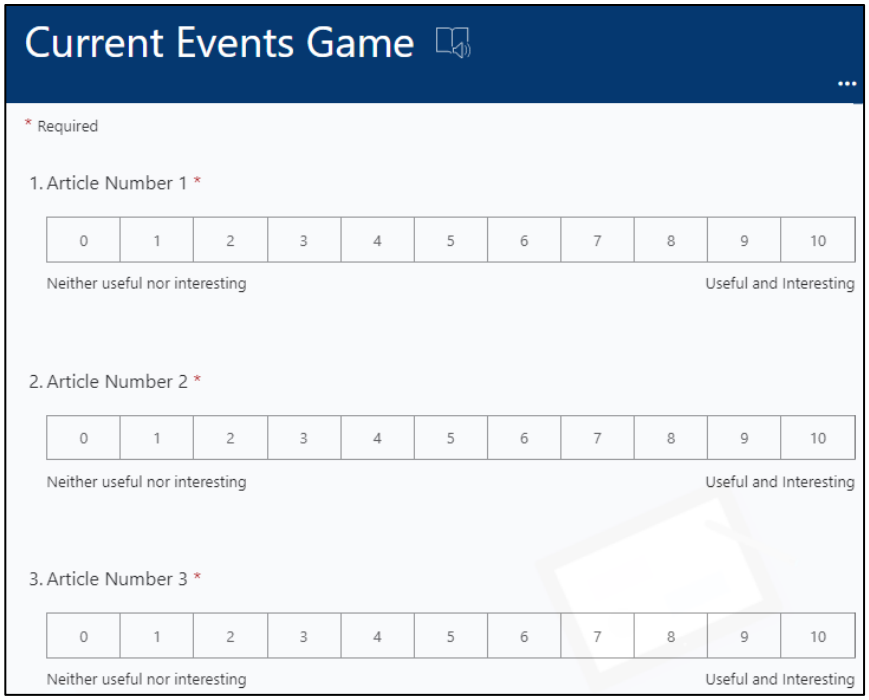


Figure 3. Current Events Game Grading Microsoft Form

3.2 Instructions to Students

Below is our description of the exercise as it appears in the syllabus:

One key aspect of IT is rapid change. It is important to read about current events and developments in the field to stay up to date with new technologies. To do this, we will play a current events game. Each student is assigned to a submitting team. Teams comprise of three to six students each. Each week a certain number of teams will submit. Teams submit links to web articles of interesting current events about trends in Technology or IS to a Discussion Board. All the students read these current events. Each student addresses the question posted by the submitting team regarding their article and gives each article a grade via a Microsoft Form. Then, for each article submitted, an overall grade is calculated from all the individual grades given by the students. When current events are discussed in class, the submitting team explains its submission and leads a discussion of the responses.

3.3 Evaluation Criteria and Student Learning Objectives

Teachers make four assessments of student performance. Table 2 outlines these four criteria in the left column and our learning objectives for the game in the right, and a brief explanation of each criterion follows.

3.3.1 Evaluation Criterion 1: Team Scores on Submitted Articles. The team score is calculated using input from the crowdpolling votes of the students. This component counts for 45% of the total grade for this assignment for each student. We selected 45% to emphasize to the students the importance of selecting good articles. We tried lower percentages in earlier semesters and found the articles to be less valuable. The 45% is divided into two aspects: 15% is based on the article submission—whether the team submitted both an article and a question in time (a pass/fail assessment on every round). The remaining 30% is based on how the other students in the class graded the article on interest and usefulness. We chose interest and usefulness as descriptions because they create subjective grading feedback about which submitting students had to think critically. It takes critical thinking for a student to balance skepticism—the grading data from other students is neither consistent nor accurate—with necessity—no other data is available. We discuss with students that customers often give subjective and vague feedback on products and services in business. To score well on this exercise, teams must analyze articles to choose a good article to submit critically. Through this process, they will gain firsthand experience in delivering a valuable product to a meaningful set of customers and anticipating the needs of their audience.

Evaluation Criteria	Student Learning Objectives
#1 Team scores on submitted articles	• Critical thinking • First-hand experience of delivering a useful product
#2 Variety of grades used by the student	• Peer-evaluation
#3 Participation of the student in the discussion boards	• Critical thinking • Student engagement • Reflection
#4 Submitting team's presentation	• Presentation skills • Public speaking • Audience engagement

Table 2. Evaluation Criteria and Learning Outcomes

3.3.2 Evaluation Criterion 2: Variety of Grades Used by the Student. The variety of grades measures the variance of scores used by a student when evaluating the articles. This criterion supports the objective of helping students peer-evaluate. Low-variance students are unwilling or unable to assess the performance of their peers differentially. This component counts for 15% of each student's total grade for this assignment.

3.3.3 Evaluation Criterion 3: Participation of the Student in the Discussion Boards. The instructor evaluates discussion board participation by each student to ensure students read each article and address the question posted by the submitting team. This evaluation encourages students to think, engage, and reflect on each article. If the game is played in an in-person setting, this component counts for 20% of each student's total grade for this assignment. Otherwise, if the game is played in an online or hybrid setting, this component counts for 40% of the total grade for this assignment for each student. Points are typically deducted for failure to participate or superficial one-sentence responses.

3.3.4 Evaluation Criterion 4: The Submitting Team's Presentation of the Article. During in-person classes, each submitting team is required to briefly present and discuss their submission, which the instructor evaluates. This component counts for 20% of the total grade. The benefits are two-fold: first, the submitting team presents their article and practices presentation and public speaking skills; second, they learn how to effectively lead a discussion as their classmates address the questions about their article.

These four criteria are employed slightly differently when the course is online. In online classes, there is no team presentation (see Evaluation Criterion 4). This grade is absorbed into each student's grade for participation in the online discussion regarding the articles on the discussion forum (see Evaluation Criterion 3). This is the most significant difference with the online version of the game. The only other change is the need for the instructor to help create a back-and-forth discussion among students on the discussion board rather than a simple response to a question. With the in-person modality, a class discussion and exploration of the topic is much easier to accomplish.

3.4 Student Feedback/Evidence of Impact

Recently we have made minor changes in how the exercise is played, particularly in using Canvas, so the most recent quantitative results of student feedback are limited. However, we can report results from the previous version of the exercise that was used in every modality, course type, and geographical location. At the end of each term, we ask students to evaluate the major course activities and materials, including the computer lab sessions, guest speakers, the textbook, tutorials, and presentations. The general prompt is: "*This activity helped me understand course concepts*." In each of the six most recent courses that included the crowdpolling exercise, it scored in the top half of the listed activities. The only other activity listed in the top half of each of the six sections was exams.

In addition, during every semester in which an instructor has participated as an anonymous team and inputted articles to read, the instructor has not been named the top team for any week. The implication is that fellow students are better able to supply useful, interesting current topics with questions than the instructor. This sentiment was echoed by a student's feedback from the most recent course: "*I think the Current Event Game is a great idea. It certainly made me stop and think not just what you might like to see for an article choice but what would be interesting to other students as well. I ended up choosing articles that I enjoyed reading, which made me absorb the information more effectively. I can see how it would also create sort of a domino effect, because you can reuse articles that other students found in future semesters of the same class, and you'll have more of a guarantee that students will be interested in the content*."

While a much more specific quantitative assessment is planned, the initial results of our Canvas-based version of the exercise have been very positive. From the most recent two courses, there have been more positive comments about the exercise than any other topic in our feedback form.

When asked, "*To what degree did the following assignments help you think critically?*", the students scored the current events game, on average, more than 3.75 on a 5-point scale, higher than quizzes, exams, and Pearson's textbook tutorials and readings. When asked, "*To what degree did the following assignments help you become engaged with the class?*" students scored the game, on average, more than four on a 5-point scale, again higher than quizzes, exams, and Pearson's textbook tutorials and readings. More than half of the class agreed with the following statement, "*The Current Event Game articles gave you additional insight in the following areas: Cyber Security, Analytics, Artificial Intelligence, Ethics in IS, and Censorship (ex. social media, Search Results, etc.).*" Additionally, close to 80% of the class agreed with the following statement, "*I would recommend the Current Events Game in future IS classes.*"

3.5 Example Applications

As mentioned, the small database created by the exercise can enhance data literacy and teach topics in database, security, and analytics courses. We also use it to teach several topics in the Introduction to IS courses, such as system design, analytics, process, and database.

The Introduction to IS course instructor can use this exercise to teach lessons from a database chapter or an Access Tutorial. Students can be asked to create a list of the data created by the game. That list can be turned into tables with fields, records, key fields, and foreign keys. An example of a simplified E/R diagram is shown in Figure 4. Then, when discussing the STUDENT and GRADE tables, the instructor can explain the role of primary and foreign keys using an event in the students' live experience—they each graded several articles. Instructors can also discuss various options of entity relationships (e.g., 1:*N*), whether a surrogate key is useful, and the implications of referential integrity options on how the exercise is played (there can be no grade record unless a student record first exists).

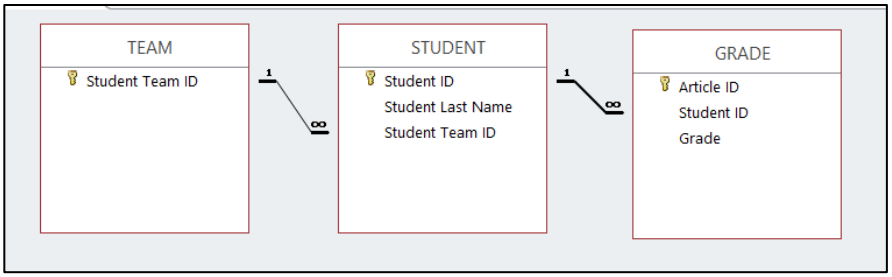
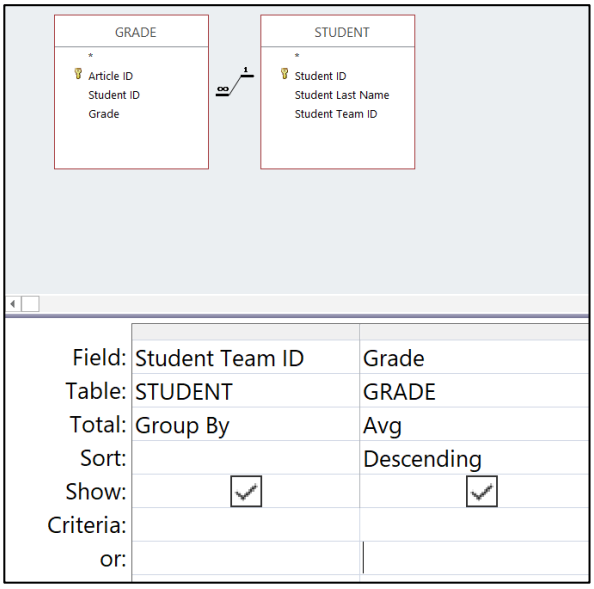


Figure 4. E/R Diagram of Three Tables




```
SELECT STUDENT.[Student Team ID], Avg(GRADE.Grade) AS AvgOfGrade
FROM STUDENT INNER JOIN GRADE ON STUDENT.[Student ID] = GRADE.[Student ID]
GROUP BY STUDENT.[Student Team ID]
ORDER BY Avg(GRADE.Grade) DESC;
```

Figure 5. QBE Access Screen and SQL

The instructor can show SQL statements that would be used to insert new records or SQL queries that would produce the results for the weekly current events standing screen. Figure 5 is the QBE screen in Access that generates the results for the weekly team standings. The Access SQL code for that query is shown in Figure 5. Students, having participated in the game for several weeks, can relate to the idea of GROUP BY and ORDER BY clauses.

Students can also use the game to learn to distinguish the common objects in an Access database, such as Forms, Reports, Queries, and Tables. A simple Access example screen of the three tables and one query is shown in Figure 6.

If the database topic extends over several lessons, other aspects such as E/R modeling, normalization, multi-user concurrency, and record locking can also be applied to the game. When used in a database or analytics class, the E/R diagram becomes more complex and includes tables for rounds, articles, questions, answers, courses, and schools. Further, students have firsthand experience participating in the game's processes (e.g., reading, grading, and submitting), so the link between process and data and databases can be emphasized. In database classes, we also require student teams to suggest improvements to the game and include those improvements in their E/R diagrams. Finally, analytics and management issues and topics are readily recognizable such as privacy, what reports could be created to better manage the game, and how the data may need to be cleaned.

For the Introductory course lessons on security, the game provides an opportunity to teach and apply topics of vulnerability, risk, safeguards, access controls, and backups. The game has a few safeguards—only the instructor has privileges to post links and questions to the discussion board, and students must log in to Canvas to have access to the discussions. A clear contrast between banking assets with many safeguards and this game with few assets helps students understand the difference between vulnerabilities and risks. Other security issues such as cloud security, security audit, encryption options, and attacks such as SQL injection and cross-site scripting can also be applied to the exercise.

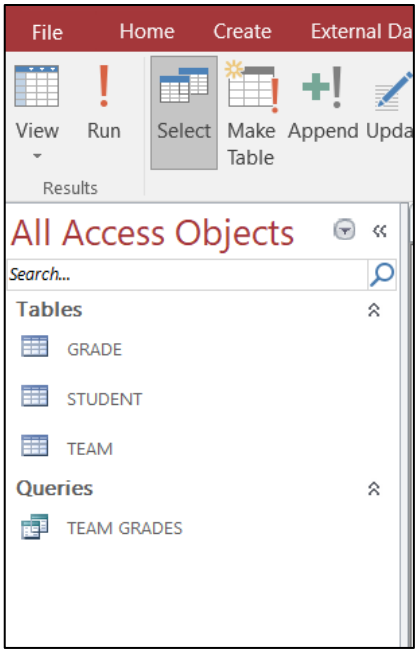


Figure 6. Access Objects Using CE Data

The game can also be used for lessons on social media and crowdsourcing. Students learn firsthand how challenging it is to find content to share with fickle peers whose votes have (small) impacts on the student's grade. The challenge of accurately measuring the usefulness of the articles or even the game itself is like the ROI debate on the value of social media or how to find KPIs that are reasonable for social media. Also, the viability and limits of crowdsourcing can be discussed. Like a business seeking customer input on products or services, this game crowdsources articles to use, but this raises questions. How good are these articles? Does participation in the game increase commitment to the course? How should trolls and unfavorable content be handled? How can the instructor build confidence and trust in the platform?

Finally, the game can be used in analytics courses. Students can use data in the ongoing game to assess current standings (descriptive analytics) as well as suggest future results (predictive analytics). Students can use actual data from the game to create their own visualizations, learning the steps of extracting the data (from Excel or Access), appreciating the challenges of cleaning the data, and choosing a message to convey with a visualization. The game has also been used in classes on systems analysis and design, network flow of packets, three-tier architecture, collaboration, and process improvement.

4. DISCUSSION

We believe this game is an effective use of crowdpolling that creates data that can be used to teach a variety of topics in the IS Introduction course. We think our exercise's success depends on several factors. When building this exercise, we considered a few factors from the technology acceptance model (Venkatesh & Davis, 2000). We have sought to make the technology useful; we emphasize that, via the exercise, students read the most useful articles their peers could find. We make the system easy to use by executing an example round to start the semester during a class when all the students were present in one room on laptops. Each team submits, and others grade, and we show the feedback mechanisms and how totals work; then, we reset the exercise to begin in earnest the next week. Finally, we seek to demonstrate a good fit between the task and technology. As with other aspects of the exercise, we discuss the current events game as an example when we discuss Task-Technology Fit (TTF) during the semester.

Additional factors for success emerged from active learning research, such as building trust, transparency, autonomy, and engagement. We attempt to build trust and engagement by being transparent with students about how their grades from their peers were calculated, often displaying the raw data in class. Further, we also deliberately display a ranking of the articles for each week, the entire semester, and the weekly reward. Autonomy is emphasized as student teams can choose any article and ask any questions about it. To generate engagement and excitement, we reveal the weekly results with some flair and offer rewards at the end of the term. We also typically have a playoff at the end of the term, where the most successful teams have one last competition. Additionally, we have created competition by pitting concurrent classes against each other, even at different universities.

Over the years, we have noticed articles and questions are graded highly if they clearly demonstrate a course topic, such as a security exploit or a privacy issue, in a real-world context or in a context that applies to college students or young professionals. Articles also do well if they describe job opportunities for students after graduation or skills needed based on class topics such as database, analytics, or social media. Finally, articles about the applicability of new technology in business, such as robotics, artificial intelligence, virtual reality, or gaming, also are usually graded high. Articles not well scored by peers are typically one-sided opinion pieces, overly technical articles with unknown jargon, and long academic articles or blog posts.

The game provides an opportunity for students to apply the core lessons in data literacy—to collect, manage, evaluate, and apply data in a critical fashion (Ridsdale et al., 2015). Students see how data is collected and can debate what the data implies. Students manage that data by creating E/R diagrams and then discuss how to handle missing and incomplete data. They evaluate and experience the frustration of subjective data and attempt to assess its reliability and accuracy. Finally, they are encouraged to apply the student grading data, though flawed, to the process of finding useful articles.

4.1 Challenges

Students often object to having their grades determined by other students (Kritikos et al., 2011; Raman, 2014). To reassure students, we remind them the exercise is worth 10% of their grade, and only one of four graded components is peer ratings. We also emphasize that final scores will have minimal variation, reducing the exercise's impact on their final grade.

Students often need to grade articles on time or submit article links on time. We have learned to be consistent throughout the term and provide opportunities early in the semester for students to get into a consistent rhythm of submitting and grading. When we first started using the game several years ago, we would not use it during exam weeks, and

we would create complicated schedules to pit different teams against each other. To minimize the demands on students' memory, submissions and grading are due on the same day of each week throughout the exercise and the number weeks between submissions for each team is also consistent.

Over the course of several semesters, we endeavored to improve our game. We have modified the interface to increase ease of use. We have highlighted the usefulness of the discussion board by interacting with it during class and using student comments posted to facilitate the discussions. We sought to build trust in the concept by telling the students that their inputs to the discussion board were used in Executive MBA classes and that staying current and finding quality professional articles and sources on the Internet is a valuable skill after graduation.

5. CONCLUSION

Active learning pedagogy has many benefits, including boosting performance, diversity, and equity in the classroom. This paper provides an approach that has been executed and improved in various modalities as well as the inputs needed to adopt it efficiently. This exercise has generated consistently positive feedback from students over a period of years in various classes. It offers an opportunity for students to experience crowdpolling firsthand, practice important work skills, and see several course topics in actual use.

More specific research on the type of learning outcomes supported by this type of exercise is needed. Other topics of crowdpolling may also be effective besides current events, for example, having students find and vote on tutorials, case studies, or guest speakers is also effective. Also, researchers need to evaluate other factors that may impact success, such as prior student experience with student crowdsourcing, the type of course, educational level, and specific educational outcomes. Finally, other instructions to students should be considered, for example, a different grading scale that doesn't use the criteria of useful and interesting or to find articles about specific topics on specific rounds.

We believe our exercise is a novel combination of modality, flexibility, crowdpolling, and active learning that creates a meaningful experience in which students in a traditional or online modality can enhance their data literacy skills in many of the topics of an Introduction to IS course firsthand.

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APPENDICES

Appendix A. Faculty Instructions

Here we provide steps that instructors can use to execute the exercise.

1. Create a Submission form to collect students' articles and critical thinking questions. We used the Forms functionality in Microsoft 365 Forms.
2. Create a Peer Evaluation form allowing students to submit their feedback for each week's competing article and generate a link for easy access. We used Microsoft 365 Forms.
3. Create the assignment description to either be placed in the syllabus or as a separate document. Embed the form links from Steps 1 and 2. See Appendix B for details.
4. Set up discussions in your LMS to share the week's competing articles which were submitted in Step 1 (see Figures 1 and 2). Create a new forum titled "Current Events Game". Then create a topic for each week of the competition, titled "Week of X". Under each topic, there will be as many threads as there are competing articles.
5. Assign students to teams. We leveraged a function in our LMS that easily and randomly allocates students to teams and provides a platform for sharing ideas without sharing personal contact information.
6. Set up the structure to support the grading process. Create a rubric to reflect the point weights and associate it with each discussion topic. After the peer evaluation and discussion post deadlines, fill out the rubric per student. It is possible for students in the same group to receive different grades because the discussion replies are individual work.

Appendix B. Learning Management System Description

Each week starting in Week 2, we will run a Current Events Game. The purpose is to help you find sources for technology news that you like so that you can use these ongoing, give you practice in evaluating others, and using feedback from others to improve your future approach.

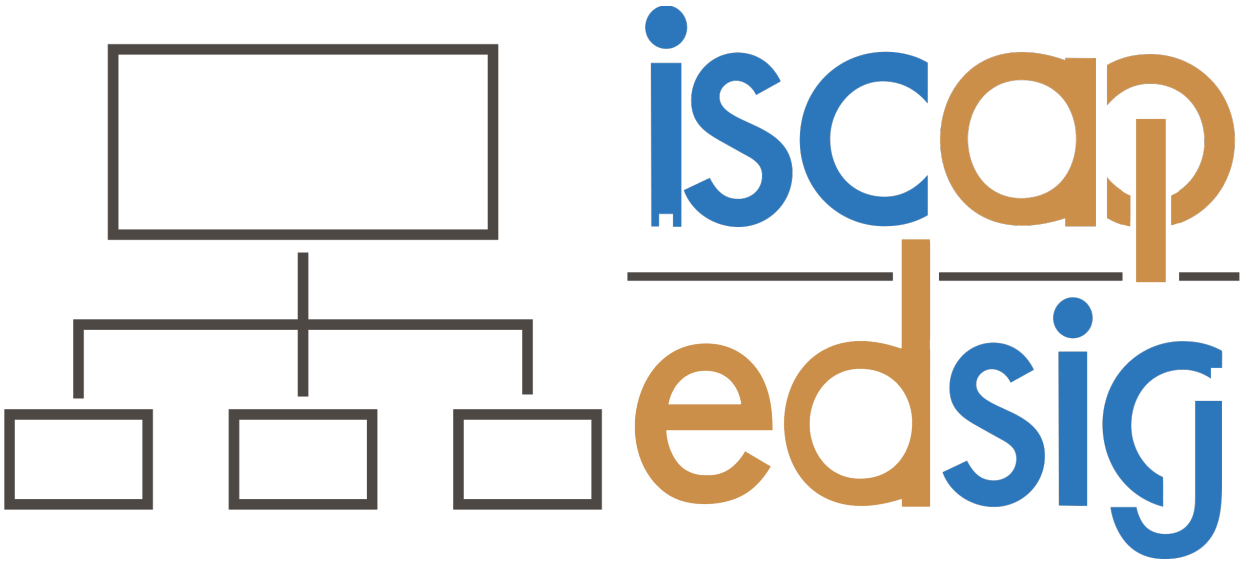
Instructions for teams who are **submitting** an article and question for the week:

- Decide with your team which article you will submit and a question for your classmates to answer in a discussion.
- Submit your article's URL and a critical thinking question in this form <link>. ***Only one member of your team needs to complete this form.*** **Due Monday @ 11:59pm**.
- The instructor will create a discussion board with the links to the three articles and the question regarding the article for the week.
- Instructions for EVERYONE, EVERY WEEK - **grading and responding**. You must grade and reply even if your team is competing for the week.
- Beginning Tuesday mornings, log into the Current Events Discussion Board for the week.
- Read all the articles and the associated questions.
- Reply to the discussion questions in each discussion thread. **Due Thursday @ 11:59pm**
- Open this Form (<link>) and grade each of the articles. **Due Thursday @ 11:59pm**

Grading:

- The grading will be done individually, not as a team.
- If your teammates state that you did not participate in choosing an article and/or discussion question, your grade will be lower than the rest of your team.

Description	Points
Meaningful & thoughtful reply to each article's question	20%
The average grade your peers awarded to your team's article.	30%
On-time submission during your submission week.	15%
Use of the entire grade scale.	15%
Short presentation of your article to the class.	20%
Total Weekly Grade	**100%**



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