



Video Games

as a context for numeracy development

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Troy Thomas and Lynda Wiest share an engaging lesson on statistics using the context of video games. They also include student-generated suggestions for further, real-world investigations based on student interests that could easily be implemented in any classroom.

This article provides a description of a numeracy lesson involving analysis of real-world data on the top ten video game sales in the United States during a one-week period. Three upper-primary classes completed the lesson, providing insight into the lesson's effectiveness.

In today's data-driven world, even young students must be prepared to analyse data within various contexts in order to develop heightened awareness of their surrounding environment and make better daily decisions. McCrone and Dossey (2007) state, "The rising tide of numbers and statistics in daily life signals a need for a fundamental broadening of the concept of literacy: mathematical literacy" (p. 32).

The Australian Curriculum (www.australiancurriculum.edu.au) promotes numeracy across subject areas, especially in mathematics where it has a central and more explicit role. The Curriculum lists numeracy as one of seven general capabilities that students should develop. One of numeracy's six organising elements is "interpreting and drawing conclusions from statistical information" (Australian Curriculum, Assessment and Reporting Authority, 2012, p. 28), which includes exploring data presented in a variety of statistical displays, making data-based predictions, and recognising use of data in the media. The lesson described in this article engages students in these tasks. It thus supports The Australian Curriculum's Statistics and Probability strand in the upper primary years in addition to the Number and

Algebra strand through use of mental and written computation.

In this article, the authors describe a numeracy lesson in which upper-primary students analyse real-world data involving video game sales. The lesson description includes attention to the manner in which students approached the numeracy demands of the task, as well as their motivation for and engagement in doing so.

The video game task

The authors developed a lesson using student-oriented, high-interest data from the Internet. The first author taught the lesson to three upper-primary classes at the end of a school year in the United States: fourth, fifth, and sixth grades (ages 10–12). Two teacher colleagues and the elementary school principal helped take notes on students' comments during the lesson and ensured that students were interacting and explaining their answers during cooperative work time.

For this task, students reviewed a chart listing data for the top ten video game sales in the United States for the week of 22–28 May 2011 in order to answer questions

involving analysis and prediction. The chart listed the week's top ten video games ranked by number of sales. It further provided the type of console needed for each game, the number of units sold for the week, the number of weeks ranked in the top ten, and the total number of units sold to date (see Table 1).

Students worked within cooperative learning groups to answer the following questions (lines were provided for student responses):

1. Which video games in the chart do you consider to be the three most popular overall?
2. List your top three choices in order.
3. Explain how you decided on the top three video games for question 1.
4. Using the information in the table, predict one video game that you think will stay in the top ten for at least one more month. Write the name of the video game below and explain how you made your decision.
5. If you could get additional information to help you answer the questions above, what would you want to know?
6. Video games were the topic of this lesson. What are some other topics you think would be interesting to use for similar lessons?

Table 1. Top ten video game sales for the week of 22–28 May 2011, ranked by the week's total unit sales.

Rank	Console	Game	Units Sold: 5/22 - 5/28	# of Weeks in Top Ten	Total Unit Sales
1	X360	L.A. Noire	237,000	2	779,524
2	PS3	L.A. Noire	169,412	2	530,446
3	Wii	Wii Sports Resort	73,487	96	13,389,383
4	Wii	NASCAR 2011: The Game	70,855	1	70,855
5	Wii	Wii Sports	66,403	236	41,572,188
6	Wii	Mario Kart	58,973	161	11,833,607
7	Wii	Zumba Fitness	38,575	28	1,209,391
8	X360	Kinect Adventures	35,404	30	6,868,143
9	Wii	Wii Fit Plus	34,511	86	8,686,148
10	PS3	Mortal Combat	34,288	6	689,637

(Retrieved 4 June 2011 from www.vgchartz.com/weekly.php?reg=America&date=&console=&maker=)

7. Which types of video games seem to be most popular in general?
8. Why do you think these games (see #6) are popular?

Groups analysed and discussed the data table to determine answers to the questions. Answers could differ among group members as long as individuals could justify their reasoning.

The questions were designed to have students analyse high-interest, real-world data in order to complete an authentic, age-appropriate task that involved applying reasoning and quantitative skill in an everyday context. Further, the questions were intended to stretch thinking beyond merely reading information from the table, such as reporting which video game was presently ranked number one. Asking students to determine the top three video games overall and explain their decision encouraged them to rely on more information than just the data column providing game rankings. Answering this question effectively required students to consider several columns of data and weigh multiple quantitative factors to make informed judgments based on their data analysis.

Student performance and thinking

Students worked in groups of three. About 40 per cent of the fourth graders listed these three choices, in order, as most popular: *Wii Sports*, *Wii Sports Resort*, and *Mario Cart*. Although most of the fourth graders' explanations lacked detail, many of the students that chose this ranking attempted a mathematical approach to solving the question. One student numbered the steps taken to reach his conclusion:

1. I was counting the total unit sales.
2. I uliminated [eliminated] the smallest numbers.
3. I checked the three highest.
4. I saw that the most was *Wii Sports*.
5. I got the other two the same way.

Many others had less detailed responses such as, "I looked at the total unit sales and found the highest ones," or "I decided my three

choices by seeing how many weeks they were in the top ten." Another popular answer for fourth graders was simply to choose the top three based on the week's ranking. These students justified their responses by stating that the games sold the most in the week and so they were the most popular. In general, the fourth graders seemed to focus on one criterion and neglected to address other factors that might have contributed to overall popularity.

The fourth graders seemed to struggle with predicting a video game listed on the chart that would stay in the top ten for an additional month. Many responses entailed personal preference or a narrow use of available data. However, two groups predicted that *Wii Sports* would have staying power due to its longevity in the top ten and the total number of units sold. One student wrote, "I think *Wii Sports* will stay because it has been in the top ten for 236 weeks[,] which is about four years[,] and [it] has sold more games."

The question that seemed to give fourth graders the most difficulty was deciding which types of games seemed to be most popular. This may have been due to the wording of the question, the picture quality of the video game cover on the handout, and/or unfamiliarity with the game theme/content. Nonetheless, one group recognised that video games involving physical exercise held several top ten spots. They explained that this was probably because kids like to move around and parents did not want them just sitting around all day.

Of the three grade levels, the fifth grade had the most varied responses to question one. Many were random combinations of three video games, often justified by personal preference or opinion. One fifth grader wrote that he played *Mortal Combat* all the time and it was the best of the games listed. Similar to the fourth graders, approximately 40 per cent of the fifth graders chose *Wii Sports*, *Wii Sports Resort*, and *Mario Cart* as their top three choices. Most chose *Mario Cart* over *Wii Sports Resort* as their second choice because *Mario Cart* had been in the top ten much longer than *Wii Sports*. During discussion, one student said to her group members, "*Wii Sports Resort* has been in the top 10 for 96 weeks and

Mario Cart for 161 weeks. *Mario Cart* has been in the top 10 for 65 more weeks, which is more than a year. We should put it in second place.”

L.A. Noire (X360) was a popular choice among fifth graders in terms of likelihood of lasting one more month in the top 10. The students explained that *L.A. Noire* was new and was number one in the ranking; therefore, it would take a long time for the game to drop all the way out of the top 10. One of the groups pointed out that *L.A. Noire* was number one and two (X360 and PS3) and sold a lot more in the week than any of the other games, so it would easily remain in the top 10 for one more month.

Two fifth-grade groups chose action as the most popular type of game, explaining that kids like to play action games because they are fun and keep them ‘into’ the games. However, another group stated that exercise was the most popular type of game. They noted that *Wii Sports Resort*, *Wii Sports*, *Zumba Fitness*, and *Wii Fit Plus* are all games in which you exercise while playing. One fifth grader wrote, “Exercise is the new thing, everybody wants to be more healthy. Companies are trying to sell games that will help you be more healthy.” Another student in the same group added, “My mom doesn’t want me and my brother sitting around, so she bought [bought] us a Wii... The Wii makes me sweat sometimes when I get into it.”

All sixth graders chose *Wii Sports Resort* and *Mario Cart* as two of the three top choices. One-third of the sixth graders chose *L.A. Noire* as their first choice. Many justified this choice by noting that the game was new and sold many in a short time; therefore, it must be the most popular game right now. The other two-thirds chose *Wii Sports* as their first choice. One student stated, “We put *Wii Sports*, *Wii Sports Resort*, and *Mario Cart* as the most popular because they had the biggest unit sales and were in the top 10 for the longest time.”

Approximately 50 per cent of the sixth graders predicted *Wii Sports* as the game most likely to stay in the top 10 for an additional month. One student wrote, “The reason I think *Wii Sports* will stay in the top 10 for at least another month is because it has sold a lot of units, and it has been in the top ten for

236 weeks.” Most groups that predicted *Wii Sports* reasoned similarly. Another popular choice was *Nascar 2011* but this was supported with little or no data. One group wrote, “Because *Nascar 2011* is a new game, it takes awhile [sic] for people to save up for new games, and new games cost more than old games.” Although this statement lacks data to support the answer, it was commendable that the students drew from their background knowledge of video game prices to provide a reasonable response.

Two sixth-grade groups identified Wii games as the most popular type of video game. One explained, “These games are popular because they are new types of games... and you can move and interact a lot with these games.” Another group concluded that the most popular type of games were the multiplayer games because people like competition and winning. Three groups concluded that exercise and sports were the most popular types of games. One sixth grader wrote, “I think they are popular because you get to move around instead of just sitting... if you’re driving a race car, you move your arms like you’re actually driving, and you can interact with the game system.”

Overall, several groups at each grade level showed an ability to analyse, interpret, and make reasonable decisions regarding real-world data. Conversely, several groups, especially in the fourth and fifth grades, lacked these basic numeracy skills. Many failed to use multiple data types to justify their answers. Sixth graders were more adept at selecting and interpreting pertinent data from the chart. They were also more likely to use their background knowledge to validate their responses and they had a better command of the mathematics vocabulary. It seems logical that this oldest age group would have shown the most advanced performance on this task. Nevertheless, several fourth- and fifth-grade groups fared well too in that they used good data analysis and problem-solving skills while performing the task.

Fifth and sixth graders made good predictions for games that would have staying power. In doing so, many drew on both the number of weeks in the top 10 and the total unit sales as combined evidence

that the games with the largest numbers across those columns would likely remain in the top 10. Fourth-grade responses tended to be vague, often not using data or focusing on one of several data columns to make choices. However, three fourth-grade groups provided sound quantitative analysis and adequate evidence to support their responses.

Identifying and justifying the most popular video game types (genres) proved to be the most difficult question for students in all three grade levels. Sixth-grade students provided the most well reasoned responses, followed by fifth-grade. Students tended to misinterpret the question, which resulted in erroneous explanations for popular genres. One fourth-grade and several fifth- and sixth-grade groups noted that exercise was a popular type of game and adequately supported their decisions. Other fifth- and sixth-grade groups identified action and sports as popular game types.

Student engagement and understanding

Video games are one of many engaging topics for upper-primary students. Most students who participated in this lesson were highly engaged. Many openly expressed their excitement during the lesson. One fourth grader said, “This isn’t like our math; this is cool!” Although students enjoyed the task, many said parts were unclear and confusing. Some wanted to know the “correct answer” and were surprised to hear that there was more than one. This may be due to students’ limited exposure to real-world data analysis and a faulty belief that all mathematics problems have a single correct answer. Some students found the chart confusing, which may reflect lack of meaningful experience reading and interpreting tables.

Other task topics and resources

Across the three grade levels, students suggested other topics that they believed would interest students their age for similar tasks. The top five in priority order are:

- animals (e.g., most popular, fastest, largest, life span);
- mobile phones (sales, cost, applications, popularity);
- movies (ticket sales and popular genres— one sixth grader suggested that learning more about the amount and type of lollies consumed at movie theaters would be interesting);
- television (most popular shows and sports watched most often);
- books (sales, most popular children’s/ young adult and adult books, hard versus electronic copies).

Information regarding these topics is readily available on the Internet. Selected free websites include:

- Animal Information: www.seaworld.org/animal-info
- Imran’s Everything Cellular: www.mobileisgood.com
- VGChartz Network: www.vgchartz.com

Closing thoughts

This lesson was intended to engage students’ interest in analysing real-world data to enhance understanding of their everyday world. In addition to exercising data-analysis skills, the lesson provided practice for upper-primary students to: use number-sense skills and problem-solving strategies; reason; make data-based decisions and predictions; and support answers. The students who participated in this lesson also gained real-world insight into product development, advertising, marketing and consumerism.

Use of cooperative learning groups allowed students to discuss strategies and to clarify and expand understanding through justifying one’s own responses and reflecting on that of peers. Students were exposed to multiple ideas and strategies which enhanced their mathematical connections and broadened their problem-solving approaches.

Teaching numeracy provides opportunities for students to develop skills that can increase quantitative literacy in everyday contexts. Using real-world data may provide students with heightened awareness of their environment, particularly regarding

information that might directly or indirectly play a role in their lives. More experience in this area is likely to lead to student approaches that involve more defensible and thorough real-world reasoning and decision-making. Using high-interest, authentic data can be the hook that stimulates students' interests and ultimately allows them to connect meaningfully with important mathematical ideas.

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