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A Spanish language narrative simulation to prevent horseback riding head injury among rural youth

Heather E Arrowsmith\textsuperscript{a}, Henry P Cole\textsuperscript{a} and Joan M Mazur\textsuperscript{a}

Abstract

Objective A Spanish language version of an exercise about adolescent horseback riders’ exposure to traumatic brain injuries was integrated into the Spanish curriculum in a rural Kentucky high school.

Design An exploratory case study design with two groups of students.

Setting and Method Thirty-eight students, enrolled in intermediate Spanish IV and advanced Spanish V language classes, completed the exercise as part of their class work.

Results The students’ mean age was 16.3 years with a gender distribution of 32 females, 13 of whom were horseback riders, and six male non-riders. Only six of the 13 female riders reported wearing a helmet at least half the time, and four never wore a helmet. The Spanish V students (11 of whom were riders) scored significantly higher ($p<0.05$) on four of the five exercise items than the Spanish IV students (two of whom were riders). However, the groups did not differ and scored low (55.3 per cent) on an item that involved recognizing pre-event contributors to the injury event. Students with riding experience scored significantly higher than non-riders ($p<0.05$) in recognizing that donning a helmet prior to riding is the most effective way to prevent a head injury. Although students believed that wearing a helmet could prevent brain injuries, they did not think they were at risk.

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Conclusion The exercise was successfully integrated into both classes. Discussing its vocabulary and sentence structure prior to its administration would improve its effectiveness.

Key words: horseback riding, narrative simulations, safety education, traumatic brain injury

Introduction: The problem
Lexington is home to the historic Keeneland racetrack and the Kentucky Horse Park, and there are many world renowned horse farms in the surrounding area. Louisville receives international recognition for ‘Derby Day’ at Churchill Downs. The Kentucky Equine Education Project\(^1\) estimates there are 200,000 horses in Kentucky, making the equine industry the commonwealth’s largest agricultural cash crop.

It is less well known that the most common cause of death and serious injury in all horseback riders is head injury\(^2\). Moreover, those under the age of 21 years are at greatest risk for injury from horseback riding\(^3\).

United States hospital emergency departments annually admit 23,000 youths under the age of 20 years for horse-related injuries\(^4\). Sixty-five per cent of all horse-related injuries are serious, and 10 per cent are severe and life threatening. The American Medical Equestrian Association estimates that 25 per cent of all reported horse-related injuries are to the head\(^5\). The rate of serious injury per number of riding hours is estimated to be seven times higher for horseback riders than for motorcyclists and automobile racers\(^6\). Injury rates are highest for children aged 5–24 years, especially for females\(^2\). This study targeted students from this age group who ride horses or who have family members and friends who ride.

To be used effectively, safety education materials must be integrated into existing required school curricula, rather than being proposed as extra or ‘add-on’ instructional materials\(^7\). The current US public school climate of accountability and pressure to cover academic content that will be assessed on standardized tests introduces severe constraints on classroom instructional time. The English language version of the \textit{Heather on Horseback}\(^8\) simulation exercise was previously researched and successfully integrated into rural high school social studies and business education classes to help teach required civics, public health and economics content\(^9\). Subsequently, it was translated into a Spanish language version\(^10\).

The purpose of this study was to determine whether the exercises could be integrated into the Spanish language curriculum in a rural Kentucky high school. The simulation provides an opportunity for students to identify with the main character, a teenage girl who is learning to ride a horse and is faced with riding safety decisions including whether or not to wear a helmet. Heather’s story proceeds through the stages of the Haddon matrix from the pre-injury circumstances leading to her injury, to the injury event itself and the severe post-injury event consequences\(^11\). The intended outcome was
that students would become emotionally engaged and empathetic with the story characters’ plights and predicaments, thus becoming more aware of and committed to pre-event actions that can prevent injuries.

**Narrative, culture, cognition and behaviour**

Unlike more logical and scientific modes of thought (paradigmatic modes), where less is left to interpretation, narratives allow the reader to infer meanings that are not explicitly stated. Robinson and Hawpe\(^1\) claim that a narrative ‘is a successful method of organizing perception, thought, memory, and action’ (p. 123). The beliefs, attitudes, knowledge and skills to perform work well and safely do not reside mainly within the heads of individuals, but within social group cultural norms and the tools used by that group\(^1\). Vygotsky\(^1\) asserted that culture not only affects what one learns, but also how one learns. Narrative is not the only method for changing attitudes and behaviours, but stories that recreate authentic human experiences are highly effective in teaching beliefs and attitudes that affect individuals’ motivations to acquire new knowledge and skills. Stories can capture experience in a way that facts and rules alone cannot. Stories are far more effective for changing attitudes than is direct instruction, which is often ineffective or counterproductive\(^1\).\(^1\)\(^5\)–\(^1\)\(^7\).

**Description of the intervention: The Heather on Horseback narrative simulation**

The Heather on Horseback exercise depicts a 13-year-old girl, Heather, who falls from her horse and suffers a severe and permanently disabling brain injury. Multiple factors lead to her head injury: she chooses to ride without a helmet, her father fails to intervene, her riding instructor is late, she is inexperienced, and she lives in a region where most riders do not wear helmets. The illustrated narrative-simulation is designed so that learners receive feedback regarding their answers to what the story characters should do at key decision points as the story unfolds. After students complete the simulation, an answer key is distributed. It provides additional information that helps students analyse, reflect upon, and discuss decisions they thought Heather and others in the story should have made to prevent the injury.

The simulation exercise has five major decision points that relate to critical elements of the pre-event, event and post-event aspects\(^1\) of the injury case. Table 1 identifies the sequence of decision points in the story and the cognitive process involved in evaluating each decision alternative. Question A identifies what students infer about the pre-event contingencies from the story introduction, main characters’ actions and setting. Question B asks students to anticipate and predict ‘what … could happen to Heather as she rides?’ In the paragraph prior to Question C, the students read that Heather’s horse was spooked, reared up, and that she was thrown off, falling backwards. The students are asked, ‘What can Heather do to keep from getting hurt?’ As the story continues the students learn that Heather received a severe brain injury.
In Question D, the students analyse how Heather’s injury could have been prevented by discussing each character’s actions prior to the injury event. The next paragraph summarizes Heather’s permanently disabled condition after the injury. In Question E, students examine a list of nine typical activities of high school students and are asked to determine whether or not Heather can participate in these activities given her severe and permanent cognitive and motor disabilities.

**Study design**

An exploratory case study design\(^\text{18}\) was used to examine the feasibility of integrating the *Heather* exercise into the existing Spanish curriculum in a rural high school. The research focused both on students’ exposure to hazards as well as on their attitudes and behaviours concerning wearing a riding helmet, a highly effective action for preventing brain injuries. Five research questions framed the study: (1) To what degree are students in the intermediate Spanish IV and advanced Spanish V classes exposed to horseback riding? (2) To what degree will students who have horseback riding experience make better safety decisions in the simulation than students without horseback riding experience? (3) How will the Spanish V students’ decision scores on the Spanish language version of the simulation compare with the Spanish IV students’ scores? (4) How will students in the Spanish IV and Spanish V classes
respond to the simulation and evaluate its relevance and worth? (5) To what degree can high school Spanish language classes incorporate the Spanish version of the simulation into required curriculum content?

Methodology

Subjects
Thirty-eight high school students enrolled in intermediate Spanish IV and upper-level Spanish V classes participated in the project. In addition, three teachers participated in an interview about their perceptions of the Spanish version of the exercise and its utility as a reading assignment to promote development of students’ Spanish vocabulary and fluency.

Measures
Six measures, both quantitative and qualitative, provided data for the case study. Student measures gathered (a) their demographic information, (b) their exposure to horseback riding, (c) their performance scores on the simulation exercise, (d) observations of their behaviour while they completed the simulation exercise, (e) interviews with a sub-sample of a total of 11 students randomly selected from each class immediately following their discussion of the exercise, and (f) interviews with the teachers, including the substitute teacher, about their perceptions of the Spanish version of the Heather on Horseback exercise.

Results
The results are divided into four parts: (a) the degree to which students in these classes are exposed to horse riding injuries, (b) the students’ simulation exercise performance scores, (c) the students’ evaluation of the exercise’s personal relevance, and (d) student interviews and teacher commentary about the instructional value of the simulation.

Participant demographics and exposure
Females between the ages of 5 to 24 years are at the highest risk of injuries related to horseback riding. The average age of students in both classes fell within this age range. The combined mean age of students in the Spanish IV and V classes was 16.27 years. Each class had a very high percentage of females, the gender most at risk of injury. In the Spanish IV class, 17 students (100 per cent) were female. In the Spanish V class, 15 students (71 per cent) were female.

In the Spanish IV class, only two of the 17 students (11.8 per cent) were riders, and none of the males were riders. In Spanish V \( (n = 21) \), 11 students (52.4 per cent) were riders. For both classes combined, 13 female students (34.2 per cent) rode horses. Their riding experience ranged from 0 to 10 years.
Among the total of 13 females from both the Spanish IV and V classes who rode horses, four had been thrown or fallen off a horse (30.8 per cent); and three of those students (75 per cent) were injured. Eight of the 13 students (62 per cent) who rode had nearly been thrown or fallen from a horse. Only five of those eight students (62 per cent) were wearing a helmet.

Perhaps the most revealing statistic is that one of the two Spanish IV students who rode, and only five of the 11 Spanish V students who rode, reported wearing a helmet at least half of the time. Four students reported never wearing a helmet.

Eleven students interviewed following the simulation provided additional information about other activities that place them at risk of a head injury, see Table 2.

**Student performance scores**

Simulation exercise performance scores were calculated from their responses to the decision alternatives for each of the items. The total possible score for decision alternatives for Questions A through E was 30. The mean raw scores and per cent total scores are reported in Table 3.

### TABLE 2  Number of students who reported engaging in activities at high risk for head injury

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horseback riding</td>
<td>4</td>
</tr>
<tr>
<td>Motorcycle riding</td>
<td>1</td>
</tr>
<tr>
<td>All-terrain vehicle (ATV) riding</td>
<td>3</td>
</tr>
<tr>
<td>Bicycle riding</td>
<td>11</td>
</tr>
<tr>
<td>Skateboarding</td>
<td>0</td>
</tr>
<tr>
<td>Rollerblading</td>
<td>7</td>
</tr>
<tr>
<td>Snowboarding</td>
<td>1</td>
</tr>
</tbody>
</table>

### TABLE 3  Simulation exercise raw and per cent total scores

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Median</th>
<th>Minimum score</th>
<th>Maximum score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spanish IV</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(intermediate)</td>
<td>17</td>
<td>22.9</td>
<td>7.13</td>
<td>76.7%</td>
<td>63.3%</td>
<td>83.3%</td>
</tr>
<tr>
<td>(advanced)</td>
<td>21</td>
<td>26.4</td>
<td>6.23</td>
<td>86.7%</td>
<td>66.7%</td>
<td>96.7%</td>
</tr>
<tr>
<td><strong>Spanish IV &amp; V</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(combined)</td>
<td>38</td>
<td>24.7</td>
<td>8.90</td>
<td>83.3%</td>
<td>63.3%</td>
<td>96.7%</td>
</tr>
</tbody>
</table>
In addition to students’ total scores, the scores from each question were also analysed. Table 4 reports the Spanish IV and Spanish V pooled per cent correct mean total and question scores.

When the data from the Spanish IV and Spanish V classes were pooled, mean scores on most of the items were high. However, the mean score for Question C was only 55.3 per cent. This question required students to select from among alternative actions Heather could take to prevent being injured, after she was thrown and as she was falling backward, head-first toward the ground. Of the alternatives listed, the only correct one is ‘Put her hands and arms out to break her fall and protect her head’. Subsequently, the story reveals that Heather did not have time to initiate this action to prevent her head from striking the ground. Many students failed to acknowledge that the only sure way to prevent a serious head injury was to don her helmet before mounting and riding her horse. This question provoked a lively whole group discussion by the students and teacher.

In order to compare scores of those students with horseback riding experience to those without riding experience, t-tests were conducted for each question. When students in the Spanish IV and V classes were pooled, those with riding experience scored statistically significantly higher (p < 0.05) on Question C than those without riding experience (see Table 4). It is likely that prior experience with horseback riding helped students more accurately evaluate what Heather could and could not do to prevent a head injury when she was thrown while not wearing a helmet.

### Table 4: Pooled Spanish IV and V simulation exercise question scores and total score (per cent correct) (n = 38)

<table>
<thead>
<tr>
<th>Question</th>
<th>Minimum score</th>
<th>Maximum score</th>
<th>Median</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question A – Infer pre-event factors</td>
<td>66.7</td>
<td>100</td>
<td>100</td>
<td>93.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Question B – Predict possible injury events</td>
<td>33.3</td>
<td>100</td>
<td>100</td>
<td>88.6</td>
<td>21.3</td>
</tr>
<tr>
<td>Question C – Select actions to lessen injury</td>
<td>20.0</td>
<td>100</td>
<td>60</td>
<td>55.3</td>
<td>26.5</td>
</tr>
<tr>
<td>Question D – Analyse pre-event preventive actions</td>
<td>50.0</td>
<td>100</td>
<td>100</td>
<td>92.8</td>
<td>15.3</td>
</tr>
<tr>
<td>Question E – Evaluate injury consequences</td>
<td>66.7</td>
<td>88.9</td>
<td>77.8</td>
<td>81.3</td>
<td>7.8</td>
</tr>
<tr>
<td><strong>Total score</strong></td>
<td>47.3</td>
<td>97.8</td>
<td>87.6</td>
<td>82.2</td>
<td>16.2</td>
</tr>
</tbody>
</table>
Statistical $t$-tests revealed that Spanish V students had significantly higher mean scores than Spanish IV students on all questions except for Question A, where no difference was observed. This question asked students to recognize and evaluate pre-event contingencies that led to the injury event including such things as why Heather chose not to wear her helmet, and why her father, who saw her riding without her helmet, did not intervene. This suggests that students in both groups tend not to think about the pre-event factors that contribute to injuries. The higher mean performance scores of the Spanish V students on all of the other questions may be related to two factors: their greater vocabulary and fluency in reading Spanish text, and the greater number of experienced horseback riders in this class compared to the students in the Spanish IV class.

**Participant evaluation of the exercise**
Spanish IV and V students’ evaluations of the instructional features of the simulation exercise used a four-point Likert scale and were pooled. Nearly 45 per cent (44.7) rated the exercise’s written directions (in Spanish) as easy to understand ($M = 3.2$, $SD = 0.95$). Thirty-nine per cent (39.5) of the students reported the exercise was easy to read ($M = 3.1$, $SD = 0.88$). Only 7.9 per cent selected the ‘4’ value that stated that the exercise was too long ($M = 2.6$, $SD = 0.50$). Most students (65.8 per cent) felt they had an opportunity to discuss the exercise story and express their ideas ($M = 3.6$, $SD = 0.68$). Generally, the students did not enjoy working through the simulation ($M = 2.3$, $SD = 0.83$). Only 5.3 per cent responded with a ‘4’ rating to the item ‘I liked doing this exercise’. A minority of 18.5 per cent selected the ‘1’ rating that stated, ‘I learned nothing new from this exercise’.

Despite these negative affective ratings, 44.7 per cent reported that ‘this exercise helped convince me that wearing a helmet while horseback riding can prevent head injuries’. Yet, 18.2 per cent of the students selected ‘the situation described in this exercise could not happen to me’. Nearly 90 per cent (89.5) of the students agreed with the statement ‘When riding horses children should be supervised’. Finally, over half of the students polled (52.6 per cent) said that ‘this exercise will help me to remember the risks of riding without a helmet’.

**Student interviews**
After the simulation exercise and whole classroom group discussions, a total of 11 randomly selected students in four small groups were interviewed to assess their views about the relevance and impact of the simulation exercise. Students were asked, ‘Did you learn anything from the story that will cause you to be more careful in order to prevent an injury to you or a friend or relative?’ Five said they would wear a helmet if they were to ride a horse. The others reported that the exercise helped them to understand better the extent of damage that can be caused by a head injury. One
student said the story would not change her habits, and that she would continue to wear her helmet only under special circumstances. When asked, ‘To what degree did the Heather story broaden your awareness and knowledge of the risks, consequences, and cost of similar injuries?’, one student said it helped her ‘learn about the risks’, and ‘most people from Kentucky know about the risks, but may not know how quickly it can happen’. A final question asked, ‘Do you know of any cases in which friends or relatives may have been able to prevent a similar injury to themselves if they had used appropriate head gear?’ Four students reported such incidents. A cousin of one student fell from the top of a cheerleading pyramid and suffered a brain injury. Another student knew a girl who died during an equestrian competition when she fell from the horse and the horse landed on her, but was not sure a helmet would have helped. Another student reported she had multiple falls while riding, but had been wearing a helmet each time. The fourth reported that a friend had suffered a broken back when she was bucked from a horse. The student was not sure a helmet would have helped to prevent the injury.

**Teacher commentary on instructional utility**

Three teachers stated that reading the simulation exercise and responding to the questions was useful and effective for increasing students’ Spanish language vocabulary and comprehension. The teachers stated that the simulation exercise was most appropriate for students in the advanced Spanish V class because of their greater fluency and interest in Spanish, that it was difficult for the intermediate Spanish IV class, and too difficult for students in introductory Spanish classes. Teachers were asked about ways to adapt and incorporate the simulation into required content in Spanish language instruction classes. One instructor suggested that a discussion of the Spanish vocabulary and sentence structure of the simulation exercise, prior to using the simulation, would make it easier for students to read and comprehend the exercise.

**Discussion and further research**

For the most part, neither the Spanish IV students nor the Spanish V students thought the injury event depicted in the simulation could happen to them. However, 11 students (64.7 per cent) in the Spanish IV class and 16 students (76.2 per cent) in the Spanish V class marked ‘agree’ or ‘strongly agree’ that wearing a helmet can prevent head injuries. Essentially, they agree that wearing a helmet is an effective preventative measure, but do not agree that they are at risk for head injury. Interestingly, in the Spanish V class, where 53 per cent of students rode horses, 66.6 per cent thought Heather’s situation could not happen to them, showing how entrenched beliefs can be, even when the reality of exposure to those risks and the potential injury consequences are understood.
The *Heather* simulation would likely not be perceived as relevant to students and teachers in communities where horses, horse farming and horseback riding are not popular or present. Similar simulations could be created that deal with prevention of traumatic brain injuries related to activities more relevant to other communities: riding bicycles, motorcycles, all-terrain vehicles, or taking part in rollerblading, skateboarding and snowboarding. All of these activities have high rates of serious head injuries that can be drastically lowered by wearing protective headgear.

Students’ fluency level in the Spanish IV and V language courses affected their performance on the simulation. There is a potential, however, for lower-level Spanish language classes to benefit from the *Heather* exercise. Scaffolding techniques, including pre-instructional vocabulary checks and completing parts of the exercise as a teacher-led whole-group activity, might assist students with less Spanish fluency to engage in an interesting story that captures their attention.

Students in this study were eager for more statistics and facts about horse-related injuries. Two resources were identified for this purpose. One resource is the 20-minute educational video *Every Time... Every Ride...*" developed by the Washington State University Cooperative Extension and Washington State 4-H Foundation. The video includes interviews with a wide array of people whose lives have been affected by severe and permanently disabling horseback riding traumatic brain injuries; injuries that an approved riding helmet would have prevented. Another resource is the *Heather on Horseback WebQuest*" created by the first author of this paper. This document assists students (or adults) in searching for information pertaining to who is at risk of horseback-related head injuries, the average cost of a horse-related injury to youth and adults, common misconceptions about who is at risk, and overcoming the widespread social pressure to not wear riding helmets.

### Acknowledgements

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### References


9 Cole HP, Mazur JM, Myers M. *Integrating farm community public health materials within required school curriculum content.* Presentation. Sheboygan, WI: Annual Conference of the National Institute of Farm Safety (NIFS), 2006.


20 Arrowsmith HE. Heather on Horseback Web Quest. Submitted to the National Ag Safety Database (http://www.cdc.gov/nasd/) on 8 June 2007.