

"HOLD YOUR HORSES!" - IMPACT OF A VIRTUAL LEARNING MODULE IN HORSE HANDLING AND SAFETY



Matheus Cezarotto¹, Hannah Bilovesky², Amy Smith Muise¹, and Shannon Norris-Parish³

¹Innovative Media Research and Extension, New Mexico State University

²Animal and Range Science, New Mexico State University

³Agricultural Leadership, Education, and Communications, Texas A&M University

Author Note

Acknowledgements: Stay Safe Working with Horses was designed by the Learning Games Lab at New Mexico State University for the national eXtension HorseQuest and My Horse University at Michigan State University, with funding from the North Central Risk Management Education Center. Original content experts were Kathleen Anderson, PhD, University of Nebraska, Christine Skelly, PhD, Michigan State University, and Karen Waite, PhD, Michigan State University. The updated version was created under the leadership of Barbara Chamberlin, PhD, with John "CC" Chamberlin, programmer, Pamela Martinez, EdD, learning technology specialist, and Philip McVann, artist and animator. A classroom activity at Purdue University informed the overall construction of this research, and we are indebted to Professor Colleen Brady, PhD, for her input and guidance. Thanks also to the Extension Horses working group for help in distributing the learning product.

Conflict of interest: Amy Smith Muise was instructional designer and project manager of the original module and its redesign. Matheus Cezarotto led accessibility design and evaluation for the redesigned module and led data analysis for this study. Hannah Bilovesky, Director of Therapeutic Riding and Equine Instructor, of New Mexico State University, carried out data collection. Shannon Norris-Parish contributed to data analysis. All four authors contributed to writing this article.

Correspondence regarding this article should be addressed to Matheus Cezarotto, via email at matheus@nmsu.edu or via mail at New Mexico State University, Innovative Media, Box 30003, MSC 3AI, Las Cruces, NM 88003

Abstract

Effective worker training is essential for ensuring safety around horses in various contexts, including animal science courses and horse handling safety trainings. Research indicates a growing demand for digital training specifically in horse handling courses. Digital and online resources are improving access to information, opportunities to practice, and learners' engagement. However, further research is needed to measure the impact of this technology in the context of horse safety education. This research evaluates learning outcomes of 76 college students, therapeutic riding volunteers, and community members after engaging with the Stay Safe Working With Horses interactive digital module. Using a mixed-method approach, the research combines qualitative (formative data from development) and quantitative data (retrospective pre and post) to assess the educational module's learning outcomes and the participants' experiences and interactions with the module. The results show that participants enjoyed the interactive experience module, finding it easy to navigate. Participants' perception of knowledge significantly increased after using the module for key concepts *putting*

on the halter properly, positioning myself safely relative to the horse, making sure other horses don't escape, keeping my horse calm, and interpreting horse behavior. Furthermore, open-ended responses indicated that visual graphics, such as illustrations and multimedia elements, crucially helped participants to better grasp concepts and procedures through examples, engaging visual cues, and content summaries.

Keywords: workplace safety, horse handling safety, horse behavior, ethology, multimedia

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The U.S. is home to 6.65 million horses housed on approximately one million farms and facilities and contributing to an economic impact of \$177 billion (American Horse Council, 2023). Employees at horse barns, adult volunteers, and other adults involved with horses require training in safety protocols around horses and ground handling skills (Chapman et al., 2020; Gadd et al., 2018; Martinson, 2006). Interactions with horses in the confines of a stall or paddock, or while leading the horse inform human–horse engagement and form the basis of other activities with horses (Birke, 2015).

Interactive Multimedia Technology for Horse Training

Horses enrich the lives of many Americans. They serve as cherished companions, recreational and competitive teammates, and as working partners to people within the horse industry (Keaveney, 2008), including employees, volunteers, and service providers. They also profoundly impact therapeutic riding programs, which provide various benefits to participants (Saunders-Ferguson et al., 2008; Stergiou et al., 2017; Peter et al., 2020). Audiences served by therapeutic riding programs include people who may never have interacted with horses before, including veterans with post-traumatic stress disorder (PTSD), youth with medical conditions (such as autism), medical students experiencing stress related to their academic efforts, veterinary students, and other audiences (Chakales et al., 2020; Earles et al., 2015; Marchand et al., 2023).

Alongside these benefits, handling horses involves certain risks. One in three horse-related injuries happen to people handling horses on the ground, that is, not while riding. (Beck et al., 2010; Thomas et al., 2006). These risks may be especially salient in therapeutic programs, where workers may be handling horses for participants whose disabilities may limit their mobility or reaction speed (Peter et al., 2021). Many therapeutic riding programs also involve inexperienced volunteers, such as college students,

community volunteers, or participants from community organizations. To ensure the safety of both instructors and participants and the effectiveness of such programs, program leaders must provide comprehensive safety training for those handling horses. Traditionally, and most commonly, training is provided through in-person sessions with an experienced instructor supporting learners to gain skills to safely work with horses (Peter et al., 2021; Speck et al., 2023). Although it should not be replaced, hands-on instruction with horses can be complemented by other forms of learning (Browning et al., 2021). The digital web module Stay Safe Working with Horses serves as a supplemental learning tool that can be used as a pre-lab, companion activity, or as digital online support for in-person training programs. Researchers investigated users' learning outcomes from the module by measuring whether they gained confidence in safe handling techniques for catching, haltering, leading, and releasing a horse, with an understanding of horse behavior.

The practice of using digital technology for teaching is no longer novel. Multimedia design, the base for any digital online training (for example, combining words, such as written text or narration, with images, such as illustrations and figures), has been used for many years to deliver information and support meaningful learning (Mayer, 2021), including in equine related topics (Velasquez et al., 2021). Educators and researchers utilize multimedia learning to teach a wide range of content, from simple knowledge, such as science facts (Ulery et al., 2019), to health behavioral change, such as correctly washing hands (Quick et al., 2013).

Research in multimedia learning has shown that people learn better when words and images are presented together rather than just through text or verbal instruction alone (Mayer, 2024). This can be achieved through animations, virtual interactive modules, graphics, or other multimedia technologies. However, the success of these efforts is moderated by effects that make multimedia learning more effective or less effective (Gui et al., 2023). In a metaanalysis of studies evaluating the success of multimedia design in learning, combining text and diagrams strongly increased

Table 1

Learning Content of the Interactive Module

Topic	Description of Content Covered
Approaching a horse in a stall	Approaching the horse; making sure the horse knows you're there; entering a stall safely; closing the stall door but not latching it.
Catching and haltering	Placing the leadrope around the horse's neck before putting on the halter; putting on the halter; maintaining a safe distance while holding the horse; fully opening the stall door to exit and closing it after.
Leading the horse	Butterflying the leadrope, never wrapping coils around any body part; keeping a safe distance and staying aware of your feet and the horse's feet.
Turning a horse out into a group	Fully opening and closing the paddock gate; latching the paddock gate so other horses don't escape; keeping the leadrope around the horse's neck after taking off the halter; facing the gate while unhaltering; keeping distance from other horses; watching body language to gauge a horse's mood, intention and place in the hierarchy.

In each scenario, the user explores the situation, desired behavior, and possible risks and learns what a handler should do to stay safe and maintain control over the horse.

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both factual, inferential and transfer learning, while interactive simulations helped with inferential and transfer learning (Cromley & Chen, 2025). Different media forms, such as colorful graphics, engaging animations, and interactive features, can make the learning experience more engaging and appealing to learners while addressing procedures, concepts, facts, processes, and principles (see Table 1) (Clark & Lyons, 2011).

In horse handling education, educators have seen the benefits of using digital modules to teach horse-related content (Speck et al., 2023), including in veterinary education (Bing et al., 2011; de Bie & Lipman, 2012). The demand for online education and training in this field evolved as society moved into the digital era. This demand was exacerbated by the COVID-19 pandemic, forcing instructors to find effective learning alternatives to traditional, in-person activities, including equine-focused courses (Greene et al., 2020; Splan et al., 2020). In response to this abrupt transition, numerous studies identified best practices and efficient methods for online horse handling training. For example, Peter et al. (2021) compared three training formats: in-person instruction, standard video models, and interactive computer training. Results showed that while in-person is the best practice, interactive online modules can be an effective and practical way to provide instructions and modeling in a shorter duration of time, especially when resources are limited. In an empirical study, Speck et al. (2023) discovered that college students frequently chose online horse handling and safety courses because of their flexible scheduling and exclusive online availability. This study also emphasized that students value the additional resources offered in online courses, including videos, extra reading materials, and interactive experiences. Additionally, students recognized the quality of traditional, in-person, and online horse handling and safety courses.

Researchers have recognized the value of virtual labs in science education for supporting the acquisition of conceptual knowledge (Pyatt & Sims, 2012), preparing students for real-life scientific investigation (Jones, 2018), replicating expensive labs and materials (Ray & Srivastava, 2020), providing a safe environment for students to explore (Jones, 2018), improving learning through a combination of physical and virtual labs (Olympiou & Zacharia, 2012), and influencing students' self-efficacy with laboratory techniques encountered in physical lab courses (Hegerfeld-Baker, 2013). However, interactive technology-based approaches should not be viewed as a complete replacement for in-person instruction. Instead, they should be utilized as an additional resource to aid learners in comprehending the content or as a supplement to deliver the content.

The digital educational module *Stay Safe Working With Horses* (Figure 1) supports beginning horse handlers in understanding how to manage horses safely and effectively on the ground. Topics include approaching a horse in a stall, catching and haltering, leading, and turning out in a group. Due to limited scope and funding, this module does not address riding topics. For each of these common handling situations, *Stay Safe Working With Horses* provides a scene where the user can explore the equine environment, choose the correct action, learn about typical horse behavior and

Figure 1

Title Screen of the Module



possible risks, and see what a handler should do to stay safe and maintain control over a horse. Each scene provides a range of examples and consequences and acknowledges that some behaviors result in just an inconvenience, whereas in other cases, the risk may be a severe injury. The module takes 10–20 minutes to complete. It is suitable as a component of safety training for youth or adult barn workers or volunteers and has also been used with beginning horsemanship students in a university setting. It is freely available for use online. The module includes an introductory disclaimer: “Stay Safe Working With Horses focuses on working with horses who have been handled and trained to respond to the halter and leadrope. Handling very young or untrained horses requires a different set of skills.”

The research study described in this article evaluates students' learning outcomes after engaging with the *Stay Safe Working With Horses* interactive module and investigates participants' experiences and interactions with the module. The research incorporates formative and summative data to evaluate the effectiveness of the educational tool's design. Formative data supported the design and decision-making processes in developing the tool, including data from user needs assessment and user testing. Additionally, the study employed a retrospective pre-post survey to gather summative data, which helps evaluate participants' enjoyment levels and perceptions of knowledge acquisition from the module. To gather information about how to serve audiences with equine programs (Martinson et al., 2012), the survey also included a question related to the possible future expansion of the audience to youth, given the relevance of this information and the benefits of equine activities for that audience (Saunders-Ferguson et al., 2008). Using a mixed-method approach that combines qualitative and quantitative data, the study assesses the educational module's learning outcomes through the lens of self-reported confidence. The purpose of the research is to collect summative data to evaluate the impact of the *Stay Safe Working With Horses* module. The research team for this study includes the coordinator and instructor of the equine program at New Mexico State University (NMSU),

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an educator from agricultural communications, a researcher/ Extension specialist in educational technology, and the instructional designer from the development team that created the interactive module.

Stay Safe Working With Horses was designed for adults interested in working with horses, which may include college students; volunteers for the Professional Association of Therapeutic Horsemanship International (PATH); ag teachers; university instructors; high school instructors; parents of youth with horses; volunteers with a youth equine program (e.g. 4-H, Pony club); horse owners; horse professionals (e.g. instructors, trainers, barn managers, farriers); or horse enthusiasts (who like horse but don't own horses or work within the horse industry).

Methods

Research Informing Design

Stay Safe Working With Horses is an educational learning module re-designed and released in 2022 from a product originally developed in 2012. Researchers conducted formative research during the iterative design and development phases of the module, allowing developers to identify the product audience's learning needs (see Table 1) and refine the interactive user experience.

These learning objectives were developed in response to suboptimal behaviors observed among new employees/ volunteers on horse farms. For example, content experts on the project team had observed the following sub-optimal behaviors by handlers when releasing a horse into a stall: shooing the horse in (rather than stepping into the stall with the horse); not taking the halter off (simply removing the leadrope); and leaving the stall door open while releasing the horse. During the design process, the team identified barriers to learning, including that handlers may not have had previous experience with horses, that handlers may not realize that there is "a safe way" to do things, or that handlers may never have learned the importance of safety around horses. Other barriers to safe behavior might include undue trust in the horse (i.e., "this horse loves me; he'd never hurt me"); belief that a certain horse is calm and predictable; or

having a set way of doing things without realizing why they are done this way. Content experts noted that not operating from an understanding of horse behavior makes it harder for workers to adapt to new or unpredicted circumstances. Workers may also be under pressure from employers to meet demands (for example, a set amount of time to get all the horses from the paddock to the stalls) and may not feel they are allowed to express that they don't feel competent or safe. Employers/supervisors also may not realize or articulate why they do things a certain way, so workers may copy their superficial habits without understanding the behavioral basis. During the module design summit, horse safety educators from Michigan State University and University of Nebraska identified and discussed these specific scenarios with the development team. In response to these situations, barriers, and behavioral biases identified by the content experts, the Stay Safe Working With Horses module used graphics and animations to address the relevant procedures, concepts, facts, processes, and principles. See Figure 2 and Table 2 for specific examples from the module based on a framework by Clark & Lyons (2011).

Figure 2

Screenshot from the interactive module, showing how it conveys information visually and in written text



Table 2

Procedures, Concepts, Facts, Processes, and Principles Addressed by Digital Multimedia.

Learning Category	Examples from the Module	How Digital Media Helps
Procedures	Putting on the halter; Holding the leadrope safely; Opening and closing gates and stall doors appropriately	Graphics illustrate clearly how the procedure works.
Concepts	Horses' social behavior derives from their identity as prey animals.	"Horse notes" explain context and background.
Facts	Horses have a powerful, dangerous kick.	Visuals provide a "safe" way to view scary consequences.
Processes	When entering a group, horses will respond to the social cues of the other horses as well as a handler	Thought bubbles and animations clarify behavior and motivation.
Principles	Convey confidence and calmness to the horse you are handling.	Animated characters demonstrate shared emotions and behavior.

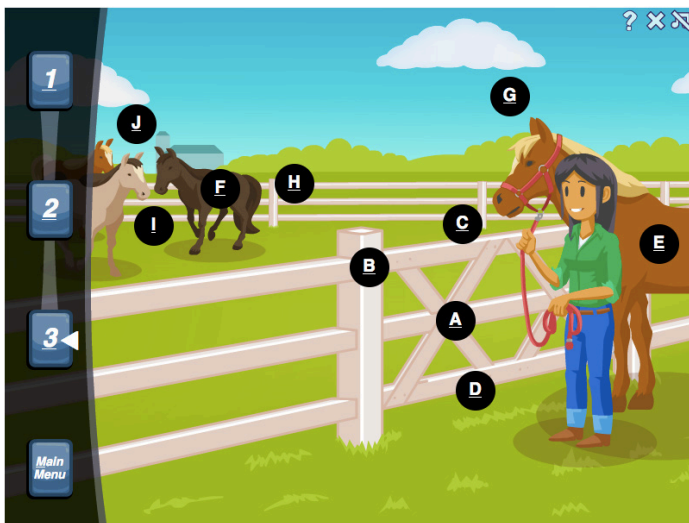
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Making the Module Inclusive: Intentional Design decisions

The module was initially created to support workplace safety training for horse farm workers in Michigan and Nebraska. (It was funded by the North Central Extension Risk Management fund.) It has also been used with populations in New Mexico and Texas. As part of the design team's commitment to ensuring that their designs are relatable to people with diverse backgrounds and needs, during the initial design of the module in 2012, instructional designers considered issues of Diversity, Equity, and Inclusion, including body image. The human character in the module was designed to look plausibly Hispanic. This choice was demographically appropriate for the target locations. This choice was part of efforts to avoid the overrepresentation of white/Anglo characters in multimedia educational tools. After the initial character design and art sample, team members raised a body image concern regarding the stylized drawing of the character's legs. The original drawing showed a body characteristic, "thigh gap," that was becoming trendy/problematic among certain populations, on social media and in thin inspiration ("thinspo") forums (Leboeuf, 2019; Thompson, 2014). In response to this concern, the character was redrawn to have more muscular legs (see Figure 3). This met goals to avoid unrealistic body image and discourage what Leboeuf calls "body alienation."

Figure 3

Main character of the interactive module, showing character re-designed for body realism



Research Measuring Learning Impact

In 2021, the Stay Safe Working With Horses module was redesigned, as part of its transition out of Adobe Flash technology and into the modern web format HTML5. During this redesign, researchers hoped to learn more about how Stay Safe Working With Horses can help handlers learn about safety around horses, as well as learn the best use of this tool for the horse handling industry and education.

The Stay Safe Working With Horses module also

underwent a peer review process as part of the redesign in 2021. Three reviewers whose expertise encompassed equine Extension, instruction, and research reviewed the module and made suggestions. They suggested specific tweaks to content and navigation, and the incorporation of "horse notes": supplemental information that provided context in horse behavior procedures. In response to peer review, the design team added a disclaimer, revised or replaced images, and included supplemental explanations to clarify safety practices and horse behavior. These additions covered topics such as proper handling of the lead rope, speaking around horses, horse vision and attention, and definitions of key terms. The changes aimed to improve user understanding and safety.

The module was also reviewed for accessibility considerations (reviewer was Cezarotto, first author of this study, using the accessibility framework from Cezarotto and Chamberlin, 2021). Changes made in response to this review included text placement, audio leveling, and optimizing for contrast and color blindness. In addition, the redesign of the module included keyboard functionality, to support users for whom mouse or trackpad use is not accessible. Data presented and discussed in this study are part of the summative research of the project, which measures the learning impact of the completed and redesigned version of the module.

Data Collection

In 2023, the Stay Safe Working With Horses module was tested for learning effectiveness at New Mexico State University during university courses (ANSC 1130 Western Equitation I, ANSC 1160 Introduction to Horse Science) and with the NMSU Therapeutic Riding program volunteer training sessions, part of the university's Cooperative Extension services. In these courses or training sessions, students and volunteers are taught the basics of horse safety and handling, typically through a hands-on activity. The learning objective is for students to demonstrate proper handling and basic techniques of control and safety while working with a horse on the ground. Typically, the course concepts of horse safety and handling are presented to students in a PowerPoint while also discussing horse handling senses and behavior. Students then watch an instructor demonstration on proper technique for approaching a horse safely, catching a horse in a group or individual pen, and leading a horse safely. Students then have an opportunity to practice the skills in small groups during a hands-on lab. A similar teaching technique is used when training NMSU Therapeutic Riding volunteers. However, a PowerPoint presentation is not typically used in this setting, and volunteers will usually only watch an instructor's demonstration of skills rather than engaging with other media.

The therapeutic riding program from which volunteers were recruited supports a variety of activities, including Equine Assisted Learning, Equine Assisted Psychotherapy, Hippotherapy, and Therapeutic Riding (Wood et al., 2020). This training module was only considered to serve as a starting point in a more rigorous training program for

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volunteers to interact safely with horses on the ground. It does not address the therapy modalities.

During the study, all students in both classes and training sessions were presented with the material to participate in the study and use the virtual interactive module as part of class learning activities on the Canvas learning management system. Students were presented with the Stay Safe Working With Horses learning module before attending the lecture and hands-on activity covering these concepts. Participants were given an informational letter describing the study and participation, along with a link to the interactive module and survey to use before attending class. Participation in both the interactive module and survey was voluntary. The New Mexico State University Institutional Review Board (IRB) granted ethical approval for this research.

Data Analysis

In the data analysis process, researchers cleaned and categorized survey data into four main groups: *Participants' demographics, experience with the interactive, willingness to share the interactive, and perception of knowledge for the content.* Researchers used descriptive statistics to summarize the data from close-ended and Likert scale questions, calculating percentages and identifying means. Researchers coded responses to open-ended questions and then compared and discussed them as a large group, following qualitative coding steps. This process included organizing data, open coding (by two researchers), axial coding into categories, and a construction-of-meaning process, following the methodology described by Williams and Mose (2019). Researchers analyzed the retrospective pre/post questions using paired sample t-tests in SPSS (version 29, IBM). As part of the data analysis process, one researcher organized the results visually, in tables, and in summaries to facilitate the group discussion among researchers and ensure that all perspectives were considered. Researchers drew conclusions based on the data and compared it with existing literature and empirical studies. This process was followed to maintain a rigorous practice in the interpretation of open-ended study data.

Validity and Reliability

Researchers used a variety of strategies to ensure study data validity and reliability, including piloting instruments, preliminary data analysis, and data triangulation and validation with multiple researchers. The main instrument (a survey) used in this study was created in collaboration with content experts on the module topic. Prior to this study, the survey was piloted with a previous group of 90 students, as part of classroom assignment, to measure data quality and levels of understanding for the survey itself. Based on students' feedback and responses, adjustments were made to improve question clarity and better target survey questions to the research questions. The resulting final survey included questions that focused on participants' level of enjoyment of the lab, and perception of knowledge gain (Tables 4, 5, 8).

The study used a census strategy, offering all students the chance to participate in the study during in-class activity in two courses on horse education at NMSU, and as part of a therapeutic riding program at the same institution. The study used retrospective pre-post questions, along with thematic analysis to contextualize these measures. The data was independently analyzed by two researchers, with their choices compared using a triangulation process, leading to discussions by the whole research team.

The findings should be considered most valid for U.S. audiences aged 18–24, including college students, therapeutic riding volunteers, and community members. This audience represents a part of the overall audience for the training tool. They also explored the potential for extending these findings to additional audiences (Tables 6, 7), by asking respondents whether they would share the tool with others and what adjustments they would make before sharing it with youth.

Results

Demographics

A total of 76 college students, therapeutic riding volunteers, and community members participated in the study (Table 3), ranging in age from 18–64 years old, with 88.2% of participants in the 18- through 24-year-old age bracket. The study also collected data on gender, and 73.7% of participants were female, 23.7% male and 2.6% not reporting. The majority of participants reside in New Mexico (76.3%).

Table 3

Participants' Demographics

Age (n=76)		
18-24	n=67	88.2%
25-34	n=3	3.9%
35-44	n=1	1.3%
45-54	n=5	6.6%
Gender identity (n=76)		
Female	n=56	73.7%
Male	n=18	23.7%
Prefer not to say	n=2	2.6%
Home location (n=76)		
U.S.	n=74	97.40%
Other country: Mexico	n=2	2.60%

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Experience With Interactive Module

Regarding the module experience (Table 4) most respondents enjoyed the interactive module ($n=50$, 65.8% strongly; $n=15$, 19.7% somewhat), with the overwhelming majority finding it *easy to use and navigate* ($n=67$, 89.3% strongly; $n=3$, 4.0% somewhat). Respondents ($n=68$, 91.9%) found the module *accessible*, with many ($n=37$, 50% of all respondents) calling it *extremely accessible*.

Table 4

Participants' Experience with the Module.

I enjoyed the virtual module ($n=76$)		
Strongly Agree	$n=50$	65.8%
Somewhat Agree	$n=15$	19.7%
Somewhat Disagree	$n=2$	2.6%
Neither Agree nor Disagree	$n=4$	5.3%
Strongly Disagree	$n=5$	6.6%
The module is easy to use and navigate ($n=75$)		
Strongly Agree	$n=67$	89.3%
Somewhat Agree	$n=3$	4.0%
Somewhat Disagree	$n=0$	0%
Neither Agree nor Disagree	$n=0$	0%
Strongly Disagree	$n=5$	6.7%
How accessible is the module for multiple audiences ($n=74$)		
Extremely Accessible	$n=37$	50%
Accessible	$n=31$	41.9%
Neutral	$n=3$	4.1%
Inaccessible	$n=2$	2.7%
Extremely Inaccessible	$n=1$	1.3%
I don't know	$n=0$	0%

When asked in an open-ended format (Table 5), participants described the *most helpful* part of the module as having to do with equipment, procedures, and horse behavior (for answers focused on content) and graphics, interactivity, and summaries/reviews (for answers focused on style of delivery). Specific learning items mentioned included haltering (5 respondents), speaking calmly while approaching a horse (4 respondents) and turning a horse out in a pasture with other horses (4 respondents).

Regarding sharing the module (Table 6), respondents (50 of 76) indicated they would share the interactive with *youth in equine-related clubs and associations, adult volunteers working with horses, emergency responders who may work with livestock, employees working with horses, high school students, university students, their social media followers, and friends*. The remaining 26 respondents

indicated they would not share the interactive module, because they *do not know a group or individuals suitable to share the module with* (20), or the *content is not appropriate for the people [they] work with* (3). Two respondents wrote in answers, indicating that they are *not an employee* (1), and *most people [they] know are comfortable handling horses* (1), and one stated they do not like the module format (1).

When asked what they would do to make the module appropriate for youth (table 7), most of the participants found the module already suitable for youth, praising its visually appealing graphics and user-friendly structure. However, they suggest certain improvements to make it even more engaging. For example, turning the tool into a more interactive experience, such as a game, could provide youth with the opportunity to engage actively, allowing them to practice and understand the steps, procedures, and essential concepts with better guidance and more substantial feedback. Moreover, respondents noted that integrating animations and actual videos of horses could significantly enhance youth understanding, especially for those who are not already familiar with the subject matter, making the content more relatable and accessible to grasp for a younger age bracket.

Perception of Knowledge on Working With Horses Content

Using a retrospective pre- and post-survey (Howard, 1980), respondents ranked their perception of knowledge regarding six key topics related to working with horses safely. Researchers conducted paired samples t-tests to determine the effect of Stay Safe Working With Horses on increasing participants' perception of knowledge for each of the six topics (see Table 8).

Approaching a horse safely was the only key topic where participants did not report a significant difference between before and after using the module. Results indicate no significant difference between this key concept score before ($M = 3.47$; $SD = 0.66$) and after training ($M = 3.89$; $SD = 0.42$); $t(74) = -5.0$, $p = 0.259$. On the other hand, participants showed a significantly greater perception of knowledge gain on all other five key topics. The results indicated a statistically significant difference between participants' self-perceived knowledge on:

- **Putting on the halter properly**, before ($\mu = 3.23$; $SD = 0.92$) and after ($\mu = 3.75$; $SD = 0.54$) training; $t(74) = -5.9$, $p = <0.001$

- **Positioning myself safely relative to the horse**, before ($\mu = 3.39$; $SD = 0.85$) and after ($\mu = 3.85$; $SD = 0.45$) training; $t(74) = -4.8$, $p = 0.005$

- **Making sure other horses don't escape** before ($\mu = 3.55$; $SD = 0.70$) and after ($\mu = 3.87$; $SD = 0.44$) training; $t(74) = -3.8$, $p = 0.015$

- **Keeping my horse calm** before ($\mu = 3.20$; $SD = 0.87$) and after ($\mu = 3.76$; $SD = 0.51$) training; $t(74) = -6.1$, $p = <0.001$

- **Interpreting horse behavior** before ($\mu = 3.19$; $SD = 0.83$) and after ($\mu = 3.75$; $SD = 0.52$) training; $t(74) = -5.9$, $p = 0.002$

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Table 5

The Most Helpful Part of the Module for Participants.

What was the most helpful part of the module?		
Themes	n(66)	Example of participant quote
Behavior	16	"The most helpful part was the information about approaching the horse safely."
Graphics	14	"The visual demonstrations of instructions on how to handle a horse."
Procedures	10	"The level of detail was very helpful, like stating every step of putting on a halter."
Summaries	7	"[T]he short video clips at the end of every step to give a quick demonstration."
Explanations	7	"Explaining how to catch and release the horse."
Equipment	3	"The haltering process and how we need to butterfly the lead rope."
Common mistakes	2	"The tips as to why you shouldn't do certain things."
Scene 1	2	"The 'Leading the Horse out of the Stall' section."
Interface	2	"How easy it is to navigate."
Content	2	"Just learning basics about being around horses."
User experience	1	"All of it."

Table 6

Sharing the Module

Do you plan to share this module? (n=76)		
Yes, I do plan to share this module	n=50	65.8%
No, I do not plan to share this module	n=26	34.2%
Why you will NOT be sharing this module (n=26)		
Do not know a group suitable to share module with	n=20	26.3%
Content not appropriate for people I work with	n=3	3.9%
Do not like module format	n=1	1.3%
Other	n=2	2.6%
I plan to share this module with (select all that apply) (n=50)		
Youth in equine related clubs and associations	n=38	50%
Adult volunteers working with horses	n=23	30.3%
Emergency responders who may work with livestock	n=7	9.2%
Employees working with horses	n=14	18.4%
High school students	n=12	15.8%
University students	n=14	18.4%
My social media followers	n=8	10.5%
Other	n=3	3.9%

Discussion

Stay Safe Working With Horses increased respondents' perception of knowledge gain (Table 8) on 5 of 6 key topics (*putting on the halter properly, positioning oneself safely relative to the horse, making sure other horses don't escape, keeping a horse calm, and interpreting horse behavior*). We found it likely that respondents did increase their knowledge in these topics. Answers to open-ended questions showed that respondents engaged with the visuals and enjoyed seeing step-by-step procedures for practices they intended to perform in a hands-on environment. These responses map onto findings that volunteers in Equine-Assisted Services need support in understanding how safety practices relate to horse behavior (Rudd et al., 2022; Rankins et al., 2025). This brings light to how digital learning materials can enhance learning of physical lab-based skills in a college environment by providing an introduction to the material. Instructors often have limited time to cover all aspects of horse safety in one lab, and not all universities or facilities may have access to beginner-safe horses with which to practice these foundational skills safely. By first introducing students to the material in a digital format, instructors can enhance learning through a pre-lab activity that engages and inspires students who are anticipating encountering the same material in a physical space within the timeline of the course. Respondents noted that the module helped them learn about key concepts and common mistakes, and that the summaries reinforced concepts in each part of the module. These aspects of experiencing the digital module may help to build a mental model for new knowledge, which can later be applied within a physical learning space (Clark & Lyons, 2011; Jones, 2018)

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Table 7

Participants' Inputs on How to Make the Module More Appropriate for Youth

What could we do to make this module more appropriate for youth?		
Coded Themes	n(54)	Example of participant quote
No changes needed	31	"The module is already great and very appropriate."
Interactivity	10	"Adding my things to make it more fun, as in a little game for them to play, but using the same methods that were shown."
Animation/Video	6	"Add more detailed animation."
Auto progress	2	"Automatically go through the steps in order when working with a horse."
Simplify	2	"Smaller points/sentence[s]."
Hands on	1	"Practicing on the horse once informed how to do it."
Shorten	1	"Make the slides shorter."
More info	1	"Adding some more definitions for words that may be too complicated for the youth."

Table 8

Participants' Perception of Knowledge Before and After Interacting with Stay Safe Working With Horses.

Key Topics	Before the Module		After the Module		Statistical Significance		
	Mean	Std. Dev.	Mean	Std. Dev.	df	t	Sig. (2-tailed)
Approaching a horse safely	3.47	0.66	3.89	0.42	74	-5.0	.259
Putting on the halter properly	3.23	0.92	3.75	0.54	74	-5.9	<.001
Positioning myself safely relative to the horse	3.39	0.85	3.85	0.45	74	-4.8	.005
Making sure the other horses don't escape	3.55	0.70	3.87	0.44	74	-3.8	.015
Keeping my horse calm	3.20	0.87	3.76	0.51	74	-6.1	<.001
Interpreting horse behavior	3.19	0.83	3.75	0.52	74	-5.9	<.002

Respondents almost universally found the interface user-friendly and easy to use. Designing for useability is key to supporting learning, as users should not be distracted by difficult-to-navigate interfaces or irrelevant distracting information. However, having some novelty within the interaction and having to navigate to find information, or having information presented in a slightly surprising way can help with learning, which is sometimes called "graphics motivational capacity" (Clark & Lyons, 2011.)

Findings from this study can inform the design of future digital learning tools. Respondents spoke up about the usefulness of the visuals and summary animations to explain procedures and step-by-step instructions. They also noted how explanations of horse behavior gave context to the visual instructions. "The most helpful part was emphasizing how to talk to/keep the horse calm, and how not to spook him" [P57]; "...I feel the most helpful part of the module was learning about how to approach a horse and checking the horse's temperament" [P33]. This supports the idea that multimodal learning (visual, animated, written, and spoken) can help learners internalize new concepts (Clark

& Lyons, 2011; Mayer, 2021). Feedback on this module also supported the strategy of delivering key concepts in a visual, interactive way, as a support tool for larger classroom learning or for classrooms with limited access to resources, such as those not housing horses on site (Peter et al., 2021; Ray & Srivastava, 2020). This is in contrast to training that takes place entirely in one mode. The intention for digital modules like Stay Safe Working With Horses is that they be used as one component of a larger course, in combination with in-person lecture, discussion, lab work, and hands-on interactions (Olympiou and Zacharia, 2012). Findings from this study should only be considered as applying to that condition of integrated, multimodal instruction.

Respondents also emphasized the usefulness of identifying common mistakes in horse handling. This connects with ideas of digital spaces as a way to "fail safely" (Jones, 2018). For example, Stay Safe Working With Horses includes a visual of a person being kicked by a horse. Witnessing a kick in real life might motivate someone to learn how to safely navigate the space around a horse. However, we would not hope for anyone to witness such an

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accident, especially if it made them feel anxious, which has been shown to adversely affect human-horse interactions (Keeling, 2009). Being able to visualize bad outcomes in a digital format lets people access the emotion and impact of seeing this event, without the harm of it actually happening. This theory of "failing safely" in the digital mode can be potentially applied to many types of lab work, including lab safety in, for example, chemistry, microbiology, ecology, soil science, or animal science settings (Hegerfeld-Baker, 2013; Jones, 2018; Pyatt & Sims, 2012; Olympiou & Zacharia, 2012).

Most respondents in this study were 18–24 years old and identified as college students, with a few older participants who identified as instructors or volunteers. This is typical of learning research carried out in university classrooms. Extending this study to workers or volunteers outside a college setting would help reveal whether those audiences respond similarly to the interactive module, or whether they have different expectations, preferences, and interpretations.

For the primary target audience of workers on horse farms, this study would also benefit from reaching more male participants, which would require sampling a more representative population. Within many parts of the horse community in the U.S. and English-speaking regions, females predominate in horse handling education, horse ownership, and lower level sport (Berger et al., 2023; Schneider et al., 2011; Smyth & Dagley, 2015; Swinker et al., 2003; Wickens et al., 2011). Some scholars suggest that human patterns of interaction with horses are informed by gender (Finkel & Danby, 2019; Savvides, 2011), and even that this gender-informed interaction may add risks, for example, if horse handlers assume safety due to a feeling of emotional connection with a horse (Williams, 2018). Behavior-based instruction that illustrates why horses don't need ill intent to be dangerous could help alleviate this risk. For the secondary audience of adult volunteers, college students, and pre-veterinary students, the demographic distribution is representative. However, this gender pattern does not extend to those seen as authorities in horse handling training (Plymouth, 2012) or higher-level competition (Dashper, 2012), where males still predominate.

Summary

Educational settings increasingly leverage digital and online tools to enhance student access to information, practice, and engagement with content. For niche topics like horse safety, such tools may be especially useful when they help instructors dive deeper into topics that may not be their primary area of focus. For example, veterinary students (Gronqvist et al., 2016) who are learning about behavior and safe handling of many different animals may be served by individual modules focusing on safety around horses. Similarly, targeted safety training for work environments benefits from having access to research-based, visually appealing digital modules that can be incorporated into a larger curated training for farm workers. Based on feedback from adult participants in this study, the Stay Safe Working

With Horses tool was able to serve the learning needs of adult volunteers and college students while also being potentially suitable for use with youth and potentially reaching 4-H programs in the future.

Study limitations

Limitations of this study included not being able to test with a youth population, in this iteration, due to the complexities of getting parental approval for study participants. Limited scope and funding also meant this research was not designed to directly measure knowledge gain. A more involved study might include testing participants' hands-on skills with horses after use of the digital tool, in addition to lecture or textbook, as compared to lecture or textbook alone. Audiences that would benefit from this module also may be diverse in age, including adults in age brackets beyond college age. Many volunteers with therapeutic riding programs and 4-H programs may be older adults whose learning needs, technology use, and preferred mode of delivery of information may differ from those of college students. Although the study participants were diverse and represented the intended audience of the interactive module, the unbalanced sample size—consisting of more college students and fewer therapeutic riding volunteers—affected the data analysis. Because the subgroup sample sizes were relatively small, we were unable to conduct adequately powered statistical comparisons between the groups. This limitation reduces the study's ability to generalize subgroup-specific findings and underscores the need for future research designed with larger, more balanced samples across different participant types. Additionally, regarding participants' experience with horses, the levels of expertise varied, and a larger sample size would be necessary to enhance the robustness of the study.

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