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**Teaching Animal Science**

# Enhancing equine welfare: a qualitative study on the impact of RAiSE (Recognizing Affective States in Equine) as an educational tool

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## ABSTRACT

The horse industry's growing focus on improving horse welfare stems from stakeholders' desires, increasing public scrutiny, and potential threats to its Social License to Operate. Correctly assessing equine affective states is crucial for enhancing horse welfare. However, horse owners often struggle with this assessment, especially those with limited consistent access to horses. To address this gap, RAiSE (Recognizing Affective State in Equine) was developed as an educational tool aimed at improving horse industry participants' ability to recognize these states. After development of the educational tool, its effectiveness was assessed using an inductive qualitative approach to define themes and patterns. Interview responses were collected through open-ended questions and interviews, with thematic analysis revealing key improvements and challenges of online learning. Participants discussed feeling as if they had achieved improvements in their ability to assess affective states and expressed intent to alter their behavior. Important themes that emerged through the inductive analysis of open-ended questions included: *awareness of horse's emotional state, comprehensive observation of horses' body language, interpreting equine senses, recognizing pain and its impact on equine behavior and well-being, and human influence on behavior and welfare.* Interviews of ten users highlighted key themes regarding improvements needed with RAiSE, as well as the shared positive experiences throughout taking the online course. This study emphasizes the critical role of educational tools like RAiSE and the importance of their evaluation in advancing horse welfare by improving owners' awareness and understanding of equine emotions, thus enabling owners to make better decisions and management practices.

## Lay Summary

To provide for good welfare for horses, it is important for owners and caretakers to be able to recognize the emotional state of the horse. However, horse owners often struggle with their ability to correctly identify equine emotions. Even those engaged in the field of study of equine behavior may have difficulty coming to consensus when assessing affective states. An online educational tool was created with the aim to address these gaps in owner's abilities to recognize equine emotion. The course's effectiveness was analyzed through open-ended questions and interviews. Participants expressed their increased confidence in recognizing equine emotions and their intent to change their behavior. This study emphasizes the role of educational tools like RAiSE and the importance of their evaluation in advancing horse welfare by improving owners' awareness and understanding of equine emotions, thus creating better welfare practices.

**Keywords:** affective state, behavior, education, horse welfare

## INTRODUCTION

For decades, the horse-human relationship has played a significant role in society, but the role of the horse has continuously evolved with time, as noted by (Robinson, 1999). Heleski (2023) amongst many others, noted that today, there is a greater emphasis on the proper management and care of all animals, with a particular focus on improving the care and well-being of the horse. Owners, caretakers, and competitors must all assume responsibility to maintain and improve the standard care of the horse and ensure its welfare (Hemsworth et al., 2021). This responsibility extends beyond physical care to include understanding of the emotional states of horses (Hall et al., 2018; Bell et al., 2019; Braun et al., 2024).

Emotional states, also known as affective states, play a key role in the overall welfare of an animal. These states are increasingly being studied for their impact on animal well-being (Mellor, 2011; Mota-Rojas et al., 2021). Affective states are the underlying experience of feeling, emotion, attachment, or mood (Hogg and Abrams, 2004) and are described in Gasper (2018) as "felt experiences that possess both valence, which indicates the degree of pleasure–displeasure, positivity–negativity, or goodness–badness associated with the experience, and arousal, which indicates the degree of urgency."

It has been suggested that developing and maintaining a positive horse-human relationship is imperative for promoting positive affective states in horses (Hausberger et al., 2008). Accurately assessing these states is essential for maintaining and improving horse welfare. In their study of owner experience as a predictor of ability to recognize equine affective

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states through equine body language, Braun et al. (2024) note that many horse owners misinterpret these states, consequently unknowingly compromising the welfare of the horse. Recognizing subtle behavioral signs and expressions in horses can be challenging, as Della Costa (2014) points out, because they often mask pain and discomfort due to their nature as prey animals. Both physiological and psychological aspects of a horse's health significantly influence its experience of negative or positive affective state. Although physiological measures such as heart rate, temperature, respiration rate, and cortisol levels are often used in research to determine if a horse in pain or distress (Rietmann et al., 2004, Hernández-Avalos et al., 2021, Gehlen et al., 2020), horse owners must primarily rely on behavioral observations (Gleerup and Lindegaard, 2016). Accurate assessment of these behavioral states is key for understanding the horse's mental well-being. Misinterpretation of affective states can result in inadequate responses to stress, anxiety, or pain, which ultimately can negatively impact the horse's quality of life and jeopardize its welfare, as discussed by Fureix et al. (2010).

Horses exhibit a wide range of emotions that can be equated to positive affect such as relaxation and contentment to negative affective states including fear and stress (Boissy et al., 2007). Bell et al. (2019) found that horse owners often fail to recognize signs of stress and discomfort in their horses. Lack of acknowledgement of these behaviors can result in longer periods of pain and suffering, reducing the horse's welfare, as discussed by Hall et al. (2018). Further, there is often little consensus surrounding the level of stress a horse is experiencing (Pearson et al., 2021; Müller-Klein et al., 2024). Misunderstanding of horses' behavioral states can result in inappropriate training methods and management styles that can further compromise the welfare of the horse (McLean and McGreevy, 2010). and many horse owners lack the knowledge and skills needed to correctly assess these affective states (Braun et al., 2024). This gap in knowledge of horse owners and managers and understanding demonstrates the need for educational interventions to improve the recognition of affective states to ultimately promote best practice for welfare improvement.

To mitigate misinterpretation of affective states and to encourage the consideration of affect in equine well-being, an online educational tool known as RAiSE (Recognizing Affective State in Equine), was created. Hausbereger et al. (2008) emphasized that by improving horse owners' ability to distinguish between different affective states, more appropriate management practices can be implemented, ultimately promoting positive affective states and enhancing overall horse welfare. RAiSE was designed to improve horse industry participants' ability to accurately assess equine affective states and thus provide the knowledge and skills necessary for responding appropriately to their horses' physical and emotional needs. The Five Domains framework (Nutrition, Environment, Health, Behavior, and Mental Domains) as described by Mellor, serves as a guiding tool for the course, promoting the importance of addressing not just the physical but mental aspects of horse management (Mellor et al., 2020). Authors hypothesized that utilization of the RAiSE educational tool will improve participants' assessment of affective state and create both attitude and behavioral changes in equine owners/managers to include consideration of affect in horses under their care as a result.

## PURPOSE OF THE STUDY

When considering equine affective states in interactions with or managing horse, the goal should not only be to minimize the risk of experiencing poor welfare but to increase the likelihood of experiencing positive emotions, ensuring that their welfare status at any one time is optimized. Therefore, the purpose of this study was to design, develop, and evaluate the effectiveness of an online educational course, Recognizing Affective States in Equine (RAiSE), aimed at improving horse owners' ability to assess and distinguish equine affective states.

## OBJECTIVES

### Research Objectives

The primary objectives of this research study are:

1. To explore horse industry participants' intent to alter their behavior to include consideration of affective state in their horses' welfare evaluation.
2. To assess user satisfaction with the course and identify areas for improvement.

## MATERIALS AND METHODS

An interactive online course was developed which was divided into 5 modules, each needing completion before access to the next. The five modules were labeled as follows in Table 1. After completion of each module, users answered an open-ended question "What did you learn in Module (1 to 5), that would most likely impact how you interact/manage your horses?, before advancing to the next module.

### Research Subjects

This study was approved by the Oklahoma State University Institutional Review Board (Protocol #IRB-23-368). Participants for this study met inclusion criteria requirements that included: 1. 18 yr of age or older 2. Prior completion of an online course related to equine. By requiring that participants had previously completed an online course, there was assurance that participants were familiar with online learning. Participants emails were generated from an email listserv of those who had completed at least one online educational course through Extension Horses Inc, a not-for-profit coalition of equine academics and extension professionals in the US. To incentivize participation, participants were provided an opportunity to win one of ten $50 gift cards if they completed all parts of the study.

### Pre & Post Survey Tool Development

Prior to course enrollment, participants completed a pre-course survey in Qualtrics. Participants acknowledged informed consent prior to answering survey questions (n=45). Background information included demographic questions (age, gender, ethnicity, education level, horse handling experience, observation experience, contact frequency, ownership, work experience, and associated discipline). See supplemental appendices. To assess participants' initial understanding of equine affective states they were asked to assess 20 videos of horses displaying various affective states, plotting their interpretations on a valence-arousal diagram (Figure 1) via

**Table 1.** The titles and descriptions of the 5 educational modules included in the RAiSE course (Wells et al., 2024)

| Module Number and Name | Material Discussed in Module |
|---|---|
| Module 1: The Importance of Affective States | • Defines affective state<br>• Introduces concepts and definitions related to equine behavior<br>• Discusses valence and arousal as used in behavioral research<br>• Comparison of the Five Freedoms and the Five Domains<br>• Discuss common management practices in relation to the Five Domains |
| Module 2: Interpreting Equine Communication: The Language of the Horse | • Defines behavior and describes the way in which horses communicate<br>• Discusses interpreting behavior through each individual body part and vocally<br>• Head and neck<br>• Eyes<br>• Ears<br>• Muzzle<br>• Tail<br>• Legs<br>• Vocalizations |
| Module 3: Interpreting Equine Communication: The Senses | • Reviews the senses of the horse with comparison to human<br>◦ Vision<br>◦ Hearing<br>◦ Touch |
| Module 4: Identifying Abnormal States | • Discusses stereotypies and how to recognize as well as reduce them<br>• Introduces pain and to the ability to recognize it<br>• Reviews pain in relation to the horse's posture and limbs, head and behavior |
| Module 5: Utilizing Affective State in Assessing Management | • Discusses the horse as an individual<br>• Reviews the body language of a neutral/relaxed horse<br>• Considers the causes of depression in the horse.<br>• Reviews the signs of depression in the horse.<br>• Identifies ways to reduce stereotypies associated with isolation.<br>• Discusses the horse-horse relationship<br>• Reviews the impact of social behavior on equine-well being<br>• Compare the advantages and disadvantages of housing systems on equine well-being.<br>• Reviews ways to mitigate risks associated with social contact in horses.<br>• Explores horse interactions with other species.<br>• Discusses the horse-human relationship<br>• Reviews how human interactions can positively or negatively impact the equine well-being.<br>• Introduces the process by which horses learn.<br>• Describes how horses perceive both mounted and un-mounted behavior.<br>• Reviews pain in the ridden horse. |

the heatmap function of Qualtrics. The videos were selected to cover multiple arousal levels and included both positive and negative states, using videos owned by OSU and the authors. All horses were videoed without interference and no behaviors were staged beyond spontaneous interactions and covered by IACUC protocol 22-01-STW. After viewing each video, subjects marked a graphical representation of the circumplex model of valence (V) and arousal (A) with their perception of the affective state experienced (Wells et al., 2024).

After completion of the pre-survey, participants received an email containing the registration link to the RAiSE course, for which they had a 60-d to complete. Twenty-four participants responded to this question after competing module 1, and 22 responded to the question for module's 2 to 5. After course completion, participants were asked to complete a post-survey to measure cognitive change (n = 20). The post-survey (also developed in Qualtrics), required participants to reassess the same 20 videos and provided feedback on the course itself to guide future revisions. If participants completed the pre-survey, the course, and the post-survey, they earned a completion certificate and entry into the gift card drawing. At the post-survey's end, participants were invited to provide their emails if they were interested in participating in a 20-to-30-min follow-up interview over Zoom. Interviews were conducted until saturation was reached (n = 9), such that no new themes were identified. The questions asked in each interview session are shown in Table 2. Interview questions were subject to change (i.e., the question was revoked if participant already answered it previously during discussion) and were designed to assess user satisfaction with the course, as one goal was to identify areas necessary for revision, while the others addressed course functionality. After all interviews were complete, recordings were transcribed by Zoom and then edited by one of the authors. The same author conducted all interviews and edited transcripts.

## QUALITATIVE DATA ANALYSIS

To ensure anonymity, each participant provided the last four digits of their phone number as identifiers and were assigned a participant number for post course analysis. Responses collected from the open-ended questions at the end of each RAiSE module underwent inductive coding as part of a

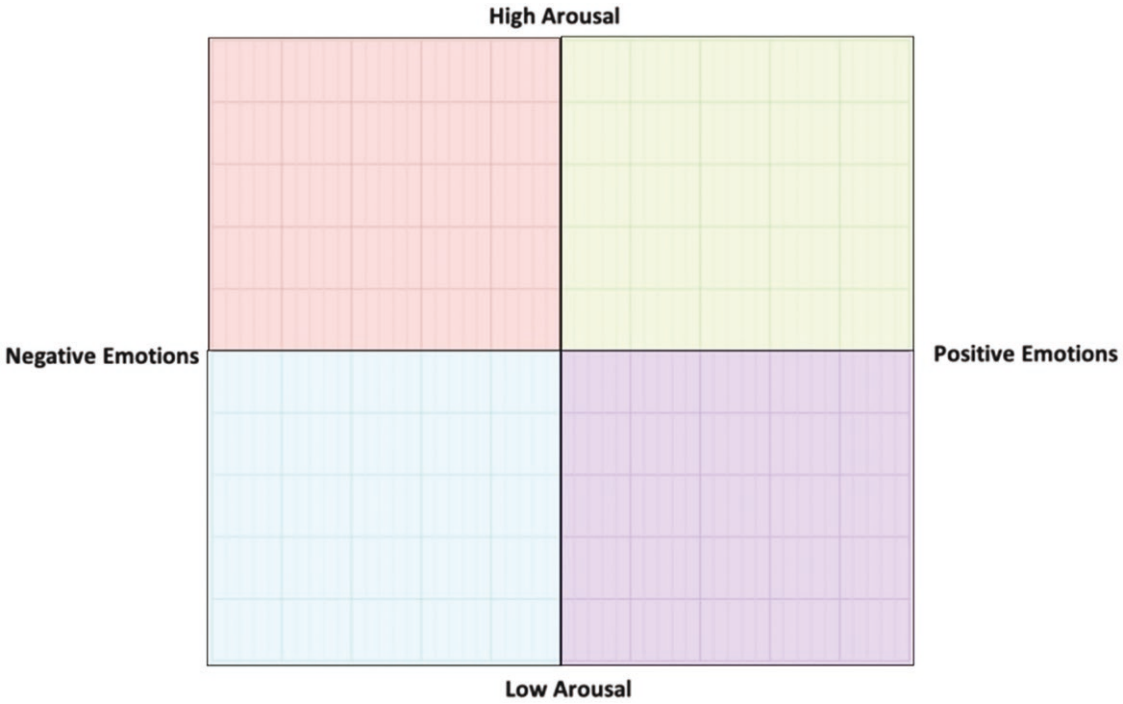


**Figure 1.** The Valence/Arousal diagram displayed after each video in both the pre- and post-RAiSE surveys. Colored regions were described as follows: Red (negative V, high A) Green (positive V, high A), Blue (negative V, low A) Purple (positive V, low A). Participants were asked to indicate their impression of the horse's affect by placing a dot on the image which followed each video.

**Table 2.** Interview Questions asked during each interview process. Questions asked were altered slightly during the interview process based on information provided during the prior asked question to avoid repeatability. (i.e., A participant answered question 12 during their discussion with the interviewer about question 5)

| Interview Question # | Interview Question |
|---|---|
| 1 | What device did you use to take the online course? |
| 2 | Did you experience any technical difficulties? If yes, what issues did you have? |
| 3 | Are the instructions and guidelines for using canvas and RAiSE clear and easy to follow? |
| 4 | How did you feel about the length of the modules in RAiSE? |
| 5 | What features or tools on the platform did you find most useful for your learning? |
| 6 | Does RAiSE offer any unique or standout features that you appreciate? |
| 7 | What specifically did you like and dislike about RAiSE? |
| 8 | Was there any material in RAiSE that you struggled to understand? |
| 9 | Did you find that the modules were easy to navigate? |
| 10 | Did you find the knowledge checks to be useful? |
| 11 | How does your experience with this platform compare to other online platforms you may have used in the past? |
| 12 | Considering your experience with the course, how likely are you to recommend it to others? |
| 13 | What specific changes in your behavior or habits do you hope to achieve as a direct result of taking this course, and how do you plan to implement these changes in your daily life? |

thematic analysis process. Any significant statements were extracted as direct quotations. Additionally, the optional/follow-up interviews, which concluded when saturation was reached, were audio-transcribed and thematically coded. Direct quotations were utilized to emphasize the information received. One author familiarized themselves with the data by reading audio transcripts and coded the data using an inductive approach to identify key themes and patterns. During the initial read-through, the principal investigator noted any significant or interesting aspects of the data and created codes that described chunks of data. After the initial coding, the patterns among the codes were searched for to identify broad themes. The themes were reviewed and refined to accurately represent the data and clear definitions and names of the themes were created. Saturation was identified when responses to questions became repetitive, with no new

relevant information being provided. This process followed the six phases proposed by Braun and Clarke (2019):

1. Familiarizing oneself with the data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

## RESULTS

### Participant Demographics

The respondents in this study were primarily female (90%, n = 18), with an average age of 47.6 yr (median 51.5, age range 18 to 70). Eighty-five percent of respondents were college graduates, with 45% holding a master's degree. Seventy-five percent of participants were horse owners with 70% of participants interacting with horses more than four times a week. Self-rated horse handling experience on a scale of 0 to 100 showed a mean of 74.25 (range 25 to 100). Similarly, the mean score for experience observing horses was 78.20 (range 35 to 100).

Thematic analysis was used to identify common themes related to the answers given by participants for both the open-ended question within RAiSE, which asked, "What did you learn in Module X that would most likely impact how you manage/interact with your horses?" and the post-course interviews. Analysis of all responses, including post modules and interview questions resulted in a list of themes.

### Qualitive Analysis of the Open-ended Questions Following Each RAiSE Module

After completing each module, participants were asked to reflect on the most important information gained. During thematic analysis of these open-ended question, main codes were identified that led to the development of five key themes: Not surprising, the themes largely followed the central objectives presented in each module: Interpreting and Responding to Horse Behaviors, Understanding the Body Language of a Horse, Interpreting Equine Senses, Recognizing Pain and Its Impact on Equine Behavior and Well-Being, and Human Influence on Behavior and Welfare (Summarized in Table 3).

### Module 1 Theme: Awareness of Horses' Emotional States

Participants heavily emphasized the importance of being aware of horses' emotional states as the foundation of affective state assessment. Participant 1 stated:

> *"When I first come into contact with my horse or other horses to be aware of the horse's state of mind, soreness, overall well-being."*

Supporting this, Participant 2 noted:

> *"Horses have the same emotions as humans. We as horse owners need to learn to recognize these emotions for the betterment of the horse's well-being."*

Module 2 Theme: Comprehensive Observation of Horses' Body Language

Module 2 focused on the communication of the horse with humans, horses, and other animals through their body language. When responding to the open-ended question after Module 2, participants commonly discussed their learned experiences surrounding cues of the horse resulting in the theme "Comprehensive Observation of Horses' Body Language." When a horse is left in a state of distress and the handler is unaware of the affective state of the horse, there can be safety issues that arise for both the horse and the rider (Bell et al., 2019). Being able to better understand the affective state of the horse through recognition of bodily cues can reduce the risk involved for both parties. Participant 1 pointed out:

> *"Based on the actions of the horse's eyes, muzzle, ears, neck, and tail you can begin your analysis of what actions you need to take to be safe with your horse."*

Module 3 Theme: Interpreting Equine Senses

Following the discussion of equine communication was the importance of understanding equine senses to better understand their behavioral cues and how to anticipate them. Participant 3 stated:

> *"I really enjoyed the part about vision. I never thought about head set and head carriage affecting how much the horse is able to see while being ridden. It makes a lot of sense and also gives me a better understanding of why I prefer the head set and carriage that I do. The color aspect of their vision has always fascinated me. Knowing that the poles with stripes are more easily seen will make me change some of the arena exercises that I do."*

Most participants highlighted the importance of understanding that horses perceive their surroundings differently than humans, and the necessity of considering this when working with them.

Module 4 Theme: Recognizing Pain and Its Impact on Equine Behavior and Well-Being

Participants highlighted the importance of recognizing and addressing pain in horses. One participant had an interesting realization during this module that added to this theme. Participant 1 stated:

> *"It is extremely important to recognize and address pain in horses. Pain represents a significant detractor to the physical domain, as well as detracting from the horse's mental well-being. Prolonged pain can result in long-lasting changes to behavior in the horse. It may be difficult to always observe pain behavior as horses may mask some signs in the presence of humans. Therefore, careful observation is key to detecting pain. Many unwanted behaviors may originate from pain and harsh punishment may create a negative cycle between the horse and the human. Determining whether yawning is relaxation or pain is a big challenge for me."*

Module 5 Theme: Human Influence on Behavior and Welfare

Participants responses showed self-realization regarding how they personally can affect their horses' affective state. Participant 4 stated:

> *"To be very conscious of the connection between myself and my horse. To look for subtle clues of factors that may*

*be annoying him. Working from the ground, the horse is mostly relying on sight; while mounted, the horse is relying on physical cues. I need to use the least amount of pressure possible in each situation, to get the desired outcome. Too much pressure may result in undesirable behavior outcomes. My tone of voice and body language are HUGE. I need to be more mindful of getting in the right mindset when I go to the pasture or barn and remember to get myself in check first. My horse doesn't care about my bad day or current events."*

## Analysis of the Post-RAiSE Interviews

Thematic analysis of the post-RAiSE audio transcripts resulted in seven themes (summarized in Table 4).

Theme #1: Technical Improvement

Some participants expressed minor concerns regarding technical issues they encountered while taking the course. Of these concerns were the issue of videos not working properly, the course not loading or allowing users to move forward, and other minor concerns. Participant 5 noted:

*"Yes, I did. It wasn't consistent with every module, but sometimes I couldn't seethe continue button no matter what I did with my screen. I had to back out, goback to my courses, and then return to where I was. Sometimes I had to do that a couple of times to move to the next part of the module."*

Participant 6 said:

*"There were maybe two times when I got stuck. I just went back to your email, clicked the link, and then downloaded the app."*

**Table 3.** An overview of major codes and themes identified during analysis conducted on the open-ended question following each module (1 to 5) in RAiSE

| Module | Main Codes | Themes |
|---|---|---|
| Module 1 | - Understanding Affective State<br>- Need for Consistent and Clear Communication<br>- Emotional and Social Needs of the Horse<br>- Approach and Handling<br>- Learning and Practical Application | Awareness of Horse's Emotional State |
| Module 2 | - Body Language and Emotional State<br>- Facial Expressions and Subtle Cues<br>- Comprehensive Observation<br>- Behavioral Indicators and Responses<br>- Learning and Practical Application | Comprehensive Observation of Horses' Body Language |
| Module 3 | - Vision and Perception<br>- Sensory Differences<br>- Behavioral Implications<br>- Learning and Practical Application | Interpreting Equine Senses |
| Module 4 | - Pain Recognition<br>- Behavior and Pain<br>- Subtle Indicators<br>- Holistic Observation<br>- Learning and Practical Application | Recognizing Pain and Its Impact on Equine Behavior and Well-Being |
| Module 5 | - Human-Horse Interaction<br>- Environmental Enrichment<br>- Behavioral Understanding<br>- Learning and Practical Applications | Human Influence on Behavior and Welfare |

**Table 4.** Themes and theme descriptions developed from the thematic analysis of RAiSE participant interviews

| Theme | Theme Description |
|---|---|
| Technical Improvement | Participants discussed several technical issues that arose throughout the course and ways of improvement |
| Addition of Supplemental Knowledge Checks | Participants emphasized the need for additional knowledge checks to be added to ensure they were understanding the material properly. |
| Knowledge Gained | Participants shared their experience with knowledge gained throughout the course and how they planned to implement or already started implementing it into their management style. |
| Prime Material for Educators | Many participants were either extension educators or teachers that expressed the want to share the knowledge gained with students. |
| Intention to Change Behavior | All participants expressed their intent to alter their behavior to better assess affective state and improve the lives of their horses. |
| Overall Positive Experience | Participants emphasized the overall positive experience they had with the course set-up and information. |
| Willingness to Recommend | Participants expressed their desire to recommend the course to others. |

Subsequently, Participant 7 stated:

> *"I think there was maybe one clip that didn't work, but everything else flowed really well."*

Theme #2: Addition of Supplemental Knowledge Checks

This theme was largely developed from answers to the interview question "Did you find the knowledge checks to be useful?" Although the knowledge checks were well received by participants, it was made known that implementing additional knowledge checks may be useful. Participant 3 stated:

> *"I did enjoy those! There was sometimes there was only one or two knowledge checks and I think you probably could have increased that to three or four on some of them just to make sure that people really got a good handle on things. But I liked those at the end just to double-check that the message that you were trying to get across was received. I thought that was very useful. But there were a few instances I think where there might have just been only one or two and I think there you probably could have utilized a couple more just to really make sure people understood the point you were trying to get across."*

Theme #3: Knowledge Gained

Significant statements were made throughout the interviews regarding an increase in knowledge that participants experienced. Participant 8 said:

> *"For the most part, I felt like I already had a good feel for a lot of it, but as I went through, there were things that I didn't know. That was interesting, and I thought I could go through and see what else I could learn."*

Additionally Participant 7 said:

> *"I really enjoyed learning about the different behaviors and the vision aspect of horses. The course was very in-depth and brought a different perspective that people might not think about regarding the overall health and happiness of a horse."*

Theme #4: Prime Material for Educators

The development of this theme centered around participants' expression of their involvement as leaders or volunteers for 4-H and some that were agricultural-education teachers. Participants expressed interest in sharing the material with their students/pupils due to their own keen attitude regarding the course and material learned. Participant 8 remarked:

> *"The only thing is, I am a 4-H leader, and I like to teach kids. I would love to have some material to share with them. That's the only thing I probably miss—having something to share."*

Similarly, Participant 3 said:

> *"So yeah, it actually made me rethink my whole sophomore curriculum and revamp a few things to make sure I included a section on affective states which I think was really good for me to think because you know you work with horses long enough. It's second nature to you and you forget that."*

Theme #5: Intention to Change Behavior

Many participants reported having an intention to change their behavior after learning ways to interact with/manage their horses properly to enhance overall welfare and encourage positive affective state. Participant 9 stated:

> *"I hope to pay more attention to subtle indicators of a horse's mood. I've been looking into pain indicators on the vet's website linked in the course. It's helped me not just dismiss behaviors as the horse being obnoxious."*

Participant 6 mentioned:

> *"I work with standardbred foals twice a week, and I'll pay more attention to little signs from the mares and foals. I'll also incorporate this knowledge into my teaching with 4-H kids, emphasizing behaviors like pinned-back ears."*

Theme #6: Overall Positive Experience

Throughout the interviews, it was apparent that RAiSE was well-liked as a course and that participants were happy to have been a part of the study. Participant 10 said:

> *"I've never taken an online course with so many interactive activities. Usually, it's just pages to read and a quiz. This was much more engaging."*

Additionally, Participant 9 stated:

> *"I think it's a great introductory class for understanding horse body language. I've only had hands-on experience for about four years, so I found it very helpful."*

Theme #7: Willingness to Recommend

In response to the interview question "Considering your experience with the course, are you likely to recommend it to others?" all participants mentioned their willingness to recommend RAiSE. Participant 1 remarked:

> *"Absolutely. I think it would be great for our extension program here. Assomeone who goes out and judges and tests, I think it would be wonderful for others to go through this and pay more attention to the details. It's a great avenue for kids and parents alike."*

Similarly, Participant 6 said:

> *"I would definitely recommend it, even for 4-H teenagers from ninth grade and up. It's detailed and educational."*

## DISCUSSION

The findings from this study demonstrate the substantial impact of RAiSE (Recognizing Affective States in Equine) as an educational tool on enhancing horse owners' ability to recognize and respond to equine affective states. Based on demographics, the study participants were highly educated and experienced with horses yet data collected through open-ended questions and interviews demonstrate how participants improved their understanding of equine emotions, communication, and welfare after completing the RAiSE course. Other studies have shown inconsistencies in assessment of equine affective state by both experts and everyday equine caregivers,

confirming the need for educational intervention's such as RAiSE (Bell et al., 2019), even in experienced populations.

One of the key themes identified during analysis of the open-ended questions following each module was *"Awareness of Horse's Emotional State."* Participants emphasized the importance of being aware of the horse's mental and emotional states as the foundation for all aspects of horse management. This awareness allows owners to alter their interactions and management practices to better meet the horses' needs, ultimately promoting positive welfare outcomes. This aligns with previous research that emphasizes the crucial importance of understanding equine emotionality and how management style changes can impact their emotional state. For instance, Popescu et al. (2022) demonstrated that increased socialization and changes in management practices from tie stalls to group housing, significantly enhanced the overall welfare of a group of stallions, as determined through qualitative behavioral assessment.

Education on the impact of human interaction on horse behavior is emphasized by Starling et al. (2016), showcasing the need for educational tools. The interactive online course RAiSE helps horse owners and caretakers understand the optimal practices for working with horses. Its significance lies in the opportunity to reducing negative affective states and promoting positive emotional well-being in horses through education. Recognizing and mitigating negative affective states can also aid in pain identification and management, as highlighted by van Loon and Macri (2021). The nature of RAiSE's interactive course material was appreciated by users and increased user satisfaction and allowed "practicing" of the principles introduced. The increased confidence of users may lead to welfare improvement through the recognition and increased utilization of equine affective states in making decisions related to horse management and interactions.

Overall, themes such as *"Prime Material for Educators"* and *"Willingness to Recommend"* developed through thematic analysis show how well-received RAiSE was as an educational tool and the impact that it had on educators to change how they currently teach about equine behavior. Research has shown that behavior changes in adults can significantly influence the behaviors and attitudes of children, showing the potential for broader impact beyond the immediate user (Gelman, 2009). By altering the behavior of the adults who teach children, the potential impact of this course is widespread and highlights the need for additional studies to be done on its impact in youth audiences.

Finally, the themes *"Human Influence on Behavior and Welfare"* and *"Intent to Change Behavior"* highlighted the participants' realization of their vital role in directly impacting their horses' affective states. Participants acknowledged the need to adjust their behavior, communication, and handling techniques to foster positive interactions and reduce stress. This aligns with the Theory of Planned Behavior, which suggests that increased knowledge of the learner and self-efficacy, or confidence in their abilities, lead to better behavioral outcomes or likelihood of changing behavior (Azjen, 1991). Improving participants' knowledge of and utilization of affective states can lead to practices which promote equine well-being through daily interactions, riding and training and management systems.

Adjusting human behavior to consider affective state and communication its importance to the overall well-being of the animal can serve as a model for other species as well. Understanding affective states in animals is not subject to horses only and is an increasingly popular research subject as seen in recent studies such as Neave et al. (2024) and Murphy et al. (2021). For instance, understanding the emotional states of companion animals such as dogs and cats can lead to more effective and empathetic handling, reducing stress and promoting well-being. Similarly, in livestock management, recognizing and responding to the emotional states of animals such as cows and pigs has long been known to improve welfare outcomes and productivity (Grandin, 1989) and is the focus of current attempts to utilize machine learning to recognize affective states (Neethiran, 2022). Knowledge gained from RAiSE has the potential to extend beyond horses, improving human-animal interactions and enhancing welfare across various species.

## CONCLUSION

The RAiSE (Recognizing Affective States in Equine) educational tool has proven to be a highly effective intervention in enhancing horse owners' ability to recognize and respond to equine affective states.

The course received high satisfaction ratings from participants, with many expressing their appreciation for the comprehensive and interactive nature of the modules. The positive feedback demonstrates the course's effectiveness in engaging users and enhancing their learning experience.

The in-depth interviews reported here, as well as the quantitative data on pre-post interpretation on valence and arousal, (Wells et al., 2024) demonstrated a marked improvement in participants' knowledge and skills in assessing equine affective states.

Importantly, RAiSE successfully initiated participants' intent to change their behavior towards their horses. The thematic analysis revealed that participants recognized the importance of understanding and responding to their horses' emotional states, this behavioral shift is crucial for implementing better management practices that promote positive affective states in horses, aligning with the study's first objective.

The RAiSE course not only showed potential for behavior change among participants but also revealed a high degree of willingness to continue engaging with the content and recommending it to others. This indicates the course's broader impact on the horse industry, potentially leading to widespread improvements in equine welfare.

RAiSE has demonstrated promise as an educational tool for improving the recognition and management of equine affective states. Despite some technical challenges, the overall positive reception and willingness to recommend the course highlight its value. Future research should focus on the long-term impact of RAiSE on horse welfare and explore the inclusion of youth education to further extend its benefits. Continued development of educational tools like RAiSE are essential for advancing equine welfare and ensuring that horse owners are equipped with the necessary knowledge and skills to provide the best care for their horses. As welfare continues to be a high priority in all facets of animal agriculture, the processes used to develop and evaluate this course may serve as a model in development of educational interventions relative to other species.

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## Author contributions

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## Conflict of interest

No potential conflict of interest was reported by the authors.

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