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# Protecting Young Agricultural Workers: The Development of an Online Supervisor Training

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## Abstract

Adolescents and young adults working in agriculture are at greater risk of injury. We describe the development of an online safety and health training for people who hire, teach, or supervise young agricultural workers. The online training targeted specific skills supervisors can use to effectively supervise, train, and communicate with young workers about health and safety hazards that impact injury risk. Consistent with NIOSH's evidence-based Total Worker Health® approach, the training integrated safety and health promotion and was also informed by behavioral changes theories. An iterative approach was used to develop and evaluate the training. A content review provided feedback on topics and organization of material. Safety and health experts assessed the revised training content and rated the training topics on clarity, accuracy, and completeness. Finally, a pilot study with employers and health and safety professionals was used to evaluate the training materials. The content review suggested ways to reorganize the material to improve flow and reduce redundancy. Ratings of clarity, accuracy, and completeness were high, ranging from 5 to 7 (mean ratings from 5.8 to 7.0) on a scale of 1 ("does not do this at all") to 7 ("does this very well"). The pilot study led to changes in wording and items used to assess knowledge. A theoretically-informed approach was used to develop an online supervisor training to increase awareness and build skills. An iterative process that included expert review, evaluation of learning competencies, and a pilot study with the end-users is described.

### Keywords

Agriculture; supervisor; young worker; intervention; safety

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Conflict of Interest Statement

Dr. Rohlman has a significant financial interest in Northwest Education Training and Assessment, LLC, a company that owns the platform used to develop the training (cTrain) and may have a commercial interest in the results of this research and technology. This potential conflict of interest was reviewed by the University of Iowa and an approved Conflict of Interest in Research management plan was implemented

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## Introduction

Agriculture is a common employer of youth in the United States and the most dangerous industry for young workers[1]. Children working in agriculture face a four-times greater risk of injury than children in other industries[1], most of these injuries occurred among youth between 15 and 19 years of age[2]. Although there are protections for adolescent workers in the US, including limited hours of employment and regulations related to operation of machinery and hazardous exposures, there are fewer protections for children working in agriculture. Youth workers are inexperienced and may not recognize workplace hazards or the needed steps to mitigate them. Equipment designed for adults may be an issue for younger workers who have not reached their adult body size[3, 4]. While employers are required to provide basic safety and health training to employees[5], there is limited training for supervisors of young workers, who may have a great influence on the safety and health of these workers.

Youth working in agriculture work at younger ages and in more hazardous jobs than youth in other industries. If the farm is owned and operated by the parents, there are no age or work restrictions of any kind. If the youth is a hired employee working on a nonfamily farm, except for a few state child labor laws, there are only limited restrictions on the number of hours and type of work minors can perform[6]. One-third of all farmworkers are hired farm workers, according to the National Agricultural Workers survey conducted by USDA, and 25% are under the age of 25[7]. Many of these hired farmworkers are immigrant and Latino workers for whom English is not their first language; furthermore, many young workers may be traveling independently without their parents[8]. The National Occupational Research Agenda[9] has identified both young workers and immigrant workers as vulnerable worker populations.

Young workers, particularly those in their first job, may be at greater risk because of lack of training and skills that may make them less likely to recognize hazards and speak up regarding safety concerns and less aware of their legal rights as workers[10]. Even some of the most conscientious employers do not recognize the risk factors presented by young workers including their lack of real-world experiences, their desire to please, and their lack of complex decision-making abilities. Furthermore, many younger workers seek supervisory approval and are not always able to exercise appropriate judgment on factors related to their health and welfare, particularly when appropriate health and safety rules and rationale are left undefined by an employer. Therefore, *interventions directed towards supervisors* and *workplace policies* can play a key role in reducing workplace injuries and promoting health.

In addition to being aware of traditional workplace hazards, supervisors also need to be aware of other factors that can impact safety on the job including child development, sleep, substance use, and stress[11–13]. Adolescence is characterized by physical growth, hormonal, and physiological changes, including brain development which enhances the desire for novelty seeking and risk-taking behaviors and continues young adulthood (*i.e.*, age 25)[14]. A Canadian study of farm and non-farm adolescents found that increased risky behaviors among farm adolescents (e.g., smoking, alcohol, no helmet use) increased risks of injuries[13]. Agricultural work typically requires physical labor and, during at least parts of the year,

long hours, which increases young workers' risk for both fatal and non-fatal injuries[3]. For example, a Brazilian study of high school students found that adolescents working 20 hours or more per week during the school year was associated with higher levels of emotional distress, more substance abuse, and earlier onset of sexual activity than that experienced by students working less than 20 hours a week or not working at all[15]. Increased injuries are reported in sleep-deprived adolescents working in agriculture[16–18]. Studies in Brazil have also shown that working adolescents wake up earlier and have shorter sleep durations than nonworking students[19, 20]. Among adolescents ages 14–16 years who work on farms, their sleep durations averaged 23 less minutes for boys and 20 less minutes for girls compared to those not working on farms and approximately one-quarter of 14–16 year old boys who work on farms average less than 8 hours per night of recommended sleep[21]. Similarly, another study reported that among Canadian adolescents who live or work on farms nearly one-third do not get adequate sleep, and 14–16 year-old adolescents have shorter sleep durations than those not living or working on a farm[21]. Therefore, agricultural supervisors need to understand, recognize, and intervene regarding these non-traditional hazards to protect worker well-being.

## Total Worker Health or NIOSH initiatives

Integrating health and safety programs for young workers in agriculture directly aligns with several National Institute for Occupational Safety and Health initiatives (NIOSH). Recognizing that work impacts health, the goal of the NIOSH Total Worker Health™ (TWH) Program (http://www.cdc.gov/niosh/twh/) is to improve worker well-being through prevention of injury and promotion of health through the use of workplace policies, programs, and practices[22, 23]. A second NIOSH initiative, the Safe-Skilled-Ready Workforce Initiative[24], is committed to providing all workers with the basic skills they need to be safe on the job and to contribute to a safe, healthy, productive workplace. This newer NIOSH initiative is an expansion of the Youth@ Work: Talking Safety curriculum[25, 26] that includes both basic and applied skills for young workers. These NIOSH initiatives show a commitment to protecting the welfare of young workers and a strategy for addressing multiple levels of influence.

## Protecting Young Workers

Despite the high injury rates, there are also many benefits for employment of youth in agriculture, including increased self-esteem, autonomy, responsibility, and the development of job skills, as well as earning income. Therefore, it is important to protect young workers rather than exclude them. This can be accomplished by education, supervision, or policies that limit exposure to hazardous work or machinery[27]. The perspective of the Social Ecological Model (SEM)[28, 29] recognizes that individual behaviors are influenced at a variety of levels including intrapersonal, interpersonal, organizational, community, and policy. In the case of young workers, their behaviors are influenced by intrapersonal factors (such as their work and life experience), by interpersonal interactions (with their parents, peers, teachers, and supervisors), by their workplace policies, by their broader communities, and by larger policies including state and federal laws and regulations.

### Training for Supervisors of Young Agricultural Workers

Young agricultural workers are at increased risk for occupational injuries. Youth working in agriculture can work at younger ages and in more hazardous jobs than youth in other industries. Fatigue, substance use, and distracted behaviors are common risk factors that can impact safety, health, and performance both on and off the job. While supervisors can play an active role in protecting young agricultural workers, there are currently no interventions targeting this group. The goal is to describe the development of an online training for supervisors (*i.e.,* employers, parents, educators) of young agricultural workers.

## Methods

### Development of the Training

The training integrated safety and health promotion and was informed by behavioral change theories. First, the Extended Parallel Process Model (EPPM) was used to maximize the likelihood of supervisors' knowledge, attitudes, and skills being changed. EPPM has been widely and successfully used to explain and design health promotion and disease prevention interventions across a variety of health behaviors and a diversity of populations domestically and abroad[30–32]. The EPPM proposes that persuasive messages must address threat and efficacy. Threat includes both severity (how horrible the condition or outcome is) and susceptibility (how likely the person believes he or she is to have the negative outcome). Efficacy includes both self-efficacy (do I believe I have the skills and ability to make the recommended change) and response-efficacy (do I believe if I take the recommended actions that I will avert the threat). EPPM proposes that threat and efficacy must both be high to maximally respond to the threat. Second, we created content that demonstrates best practices to model behavior. This is consistent with Social Learning Theory[33] which suggests that individuals can learn effectively by watching others enacting best practices, including through media (e.g., videos).

The online training focused on changing perceptions of threat and efficacy in supervisors of young agricultural workers. The goal was to address the unique risk factors of this vulnerable population and to emphasize the role supervisors can play in effectively addressing those threats. The supervisor training builds skills and confidence to model safe behaviors, assign tasks based on abilities, train using the Teach Bach method, implement and enforce policies, effectively supervise workers, and communicate with young workers (e.g., ask open-ended questions and how to have difficult conversations). A card sort was used to organize the material into related topics. Each topic had defined competencies (e.g., learning objectives). The training content did not focus on specific agricultural tasks, but emphasized specific behaviors supervisors (*i.e.,* employers, parents, and educators) can use with younger workers. However, examples were selected to show a variety of agricultural settings. Young workers are defined as adolescents and young adults under the age of 21.

Video content was produced to demonstrate best practices. Three short videos, each less than 5 minutes, used bilingual actors to demonstrate interactions between a supervisor and a young worker in typical, age-appropriate agricultural scenarios. For example, a supervisor trains a young worker on how to use a power washer to illustrate the Teach Back method. In

another video, a supervisor enforces a cell phone policy violated by a young worker texting on a ladder. Finally, a difficult conversation with a young worker was demonstrated by a supervisor engaging a young worker who appears tired and upset at the start of a work shift. Videos were filmed in both Spanish and English by bilingual actors and were incorporated throughout the training.

Furthermore, elements from existing safety and health promotion training were incorporated (Table 1). Guidelines developed for parents and supervisors—North American Guidelines for Children's Agricultural Tasks (NAGCAT) and Safety Guidelines for Hired Adolescent Farm Workers (SAGHAF)—focus on recognizing the unique developmental abilities of youth. For example, a young worker's physical strength, decision making, and impulsivity, need to be considered when assigning tasks[29–32]. The NIOSH-developed Talking Safety: Youth@ Work classroom curriculum focuses on training youth to recognize hazards, understand the long-term impact of workplace injury and illness, and build confidence in "speaking up" or talking to supervisors in the workplace. The Promoting U through Safety and Health (PUSH) online training expands Talking Safety: Young@ Work to address the impact of lifestyle factors on workplace safety and health. The Model Policy is a youth-specific policy template that can be adopted by agricultural employers, including assigning tasks, training, and supervision[34].

## Training Evaluation

An iterative process was used throughout the development of the online training and evaluation materials. Key informants and national experts who regularly develop and provide training for agricultural populations and members of agricultural industries that hire or supervise young workers participated in the evaluation process. After each review step, the training was revised to reflect feedback from the participants. The first step was to get feedback on the training topics, content, and the organization of the materials. Reviewers were selected based on their expertise in agricultural and child safety and health and had hired and trained young workers. Next, a different set of reviewers who train agricultural supervisors on health and safety were selected to evaluate competencies. Reviewers evaluated each competency (Table 2) on clarity (content clearly stated and easy to understand), accuracy (content correct and information up to date), and completeness (enough information is provided to fully address the competency). Each competency was rated on a scale of 0 to 7 (0 = "does not do this at all" to 7= "does it very well"). Feedback was incorporated, and the revised training was then entered into the online learning platform, cTRAIN.[39] cTRAIN uses a self-paced format that incorporates videos and real-life examples[40]. Based on psychological principles of learning, the training integrates frequent quizzes throughout that require mastery of the material before proceeding to the next topic. Upon completion of the training, a certificate was provided indicating mastery of the material and the date upon which the training was completed. The final step was to recruit professionals who hire, train, or supervise young workers to evaluate the online training and materials that would be used in a future efficacy trial (*e.g.*, questionnaires, pre/post questions). Participants were recruited via snowball sampling with assistance from external advisors. Participants received $35 for their time and effort. The training was translated into Spanish; a translate-back translate method was used to ensure the accuracy of the

translation. The videos developed to demonstrate best practices by supervisors were filmed in both English and Spanish. All study procedures were reviewed by the Human Subjects Committee at the University of Iowa.

## Results

### Content Review

The initial content review provided feedback on the training topics and the organization of the material. Two professionals with a background in safety, health, and experience working in agriculture provided feedback on the content. The reviewers appreciated the top-down approach that focused on supervisory behaviors, rather than worker behaviors. They indicated that the information characterizing young worker behaviors and developmental stages was suitable and useful for supervisors. For example, a reviewer indicated: “[the training] recognizes that young workers may not want to speak up when they see an unsafe act and asks the Manager to look for and train for this.” Another reviewer wrote, “A great job of explaining how the young body and mind can change rapidly and how to prepare for that”. Reviewers also stated that the skills provided in the training were appropriate, such as, “I use and train on the Teach Back Method. I am glad to see it incorporated into the program.” Reviewers also indicated the content was redundant in places and suggested ways to reorganize the content to flow better and reduce redundancy. All suggested changes were incorporated into the training.

### Competency Review

Four safety and health experts who regularly develop and deliver training to agricultural populations, including supervisors, reviewed the revised training content and rated the learning competencies on clarity, accuracy, and completeness. Individual ratings ranged from 5 to 7 (mean ratings from 5.8 to 7.0). The lowest rated section used stories to emphasize the severity and susceptibility of young workers. The reviewers stated these stories included tasks that were inappropriate for young workers. The reviewers also suggested alternative ways to phrase text (*e.g.*, “correct mistakes” in lieu of “provide feedback”). The study team reviewed all comments and made changes to the training. In general, each competency was rated slightly higher on clarity and accuracy (mean scores of 6.6) compared to completeness (mean score of 6.4).

### Online Training Pilot Study

Seven safety and health professionals, including individuals who work in agricultural industries who regularly hire or supervise young workers, participated in the pilot study. Participants provided written feedback on the training and videos, items used to assess knowledge (pre/post questions), a questionnaire collecting baseline data, attitudes and behaviors, and EPPM components.

Reviewers helped to clarify items included in the baseline questionnaire, items used to assess knowledge, and some of the training content.

## Discussion

A theoretically-informed approach was used to develop an online training for supervisors (*e.g.*, employers, educators, parents) of young agricultural workers. Adolescents and young adults (<25 years) working in agriculture are at greater risk of injury than youth working in other industries. Supervisors play an important role in protecting these young workers who may lack workplace experience and who's bodies and brains are still developing. The training utilized a Total Worker Health approach to address an expanded view of occupational safety that not only addresses injury prevention, but also focuses on health promotion and worker well-being[41, 42]. Total Worker Health has been shown to have good return and value on investment[42]. Adoption of behaviors earlier in life are more likely to be sustainable and become habits that impact future health and well-being[44–47]. The development of material involved the integration of health promotion, health protection, Total Worker Health, and evidence-based communication approaches to provide supervisors the tools to increase the likelihood of impacting worker behavior. Behaviors emphasized in the training (*e.g.*, teach back, role modeling, having difficult conversations, and enacting workplace policies) are transferable to many safety and health risks. These behaviors are not limited to specific agricultural operations, but rather fit all agricultural operations.

The online training used theoretical frameworks, the EPPM, Social Ecological Model, and Social Learning Theory, to organize the content. Focused on supervisors, the training was organized to address the threat to young workers (*e.g.*, that injuries to youth working in agriculture can have serious and long lasting consequences and that young workers are more likely to be injured while working in agriculture compared to youth working in other industries) and to build efficacy among supervisors (*e.g.*, by providing them with specific skills and behaviors that they can incorporate to reduce the risk to youth working in agriculture). The training targeted supervisors[28], which includes not only employers but also parents and teachers, that are responsible for training youth, assigning tasks, and supervising workplace behaviors. Raising awareness about the specific threat to young workers and providing skills is key to reducing injury rates among this vulnerable population.

The training provided specific examples of behaviors that can be adopted by supervisors, focusing on using the teach-back method during training, recognizing how individual characteristics (physical strength, decision making) should be considered when assigning tasks, using open-ended questions to encourage conversations about safety and readiness for work, and the role of workplace policies that can be used to promote safety on the farm, including family farms. Short videos, case studies, and examples were used throughout the training to emphasize these skills. Additional videos and training materials have been developed to supplement the online training (https://hwc.public-health.uiowa.edu/protecting-young-ag-workers).

As workplaces move to more online training, there is a need to include evaluation throughout the development of the training. The use of iterative processes in development of health interventions is an evidence-based practice, which was incorporated at various stages. For example, feedback from content experts and the target audience was incorporated early in the development process. In addition, we utilized training videos which allowed for

vicarious learning of the viewer via the demonstration of a supervisor engaging with young workers in recommended practices (e.g., teach back method, demonstrating how to engage in a difficult conversation).

Online materials have the advantage of being accessible at any time to a range of individuals. However, in-person trainings allow the instructor to tailor the training to their audience, an advantage that is not available in asynchronous online platforms (*e.g.*, recognizing when they do not understand a concept and providing another example). Recognizing the need for training to occur in multiple settings (in the field, in the classroom, at home), the online module was adapted into additional training materials that are available in multiple formats (*i.e.,* one-page toolbox talks that can be used at the worksite, videos that can be used as part of other training opportunities, and a classroom presentation). An online efficacy study was conducted to evaluate the training.

## Conclusion

This manuscript described a successfully implemented iterative process that included expert review, evaluation of learning competencies, and a pilot study with the end-users. While this process is time consuming, it is valuable and often overlooked. Each stage of the multistep process led to revisions to the content, the organization, and tone that increased the likelihood that the final training was appropriate for the target audience. The goal of this training is to increase awareness and build skills among parents, teachers, and employers to address health and safety risks among vulnerable young agricultural workers.

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**Table 1.**

Resources used in the development of the online training.

| Resource | Description |
|---|---|
| NIOSH Talking Safety: Youth@ Work [25, 26] | Classroom-based curriculum developed by NIOSH to teach middle- and high-school students safety skills |
| North American Guidelines for Children's Agricultural Tasks (NAGCAT) [35–37] | Guidelines for parents to assess children's ability to perform specific agricultural tasks |
| Safety Guidelines for Hired Adolescent Farm Workers (SAGHAF)[38] | Guidelines for supervisors describing their responsibilities to ensure safe working conditions for adolescent workers. Available in English and Spanish. |
| Promoting U through Safety and Health (PUSH)[40] | Online Total Worker Health training for young workers promoting safety, health, and well-being |
| Model Policy: Youth Employment in Agriculture (Model Policy)[34] | Model policy for employers that includes voluntary guidelines to protect hired young farm workers |
| Extended Parallel Process Model (EPPM)[30–32] | A behavioral change theory that addresses threats (young workers are at increased risk of injury) to increase efficacy (belief that one can reduce this risk by incorporating new skills and behaviors) |
| Communication Skill Development | Difficult conversations Teach Back |
| Bandura Social Learning Theory | Videos demonstrating supervisor's engaging in evidence-based practices |

* The NAGCAT and SAGHAF are now part of the Agricultural Youth Work Guidelines available at www.cultivatesafety.org

**Table 2.**

Training topics, learning competency, and reviewer ratings on clarity, accuracy, and completeness.

| Section | Learning Competency | Mean Scores | | |
|---|---|---|---|---|
| | | Clarity | Accuracy | Complete |
| Why are we here? | Recognize that work-related injuries and illnesses are predictable and can be prevented. | 6.5 | 6.8 | 6.0 |
| | Define a workplace injury. | 6.8 | 6.8 | 6.5 |
| | Define a workplace illness. | 6.3 | 6.3 | 6.3 |
| Consequences of Workplace Injuries | Recognize that young worker injuries can be severe. | 6.8 | 5.8 | 5.5 |
| | Recognize that workplace injuries and fatalities can happen to young workers they supervise. | 6.3 | 5.3 | 5.0 |
| Young Workers: Vulnerable Workers | Understand the physiological differences that increase young workers' risk of injury. | 6.8 | 6.8 | 6.3 |
| | Understand why young workers are more likely to take risks. | 6.3 | 6.3 | 5.8 |
| Health Behaviors Impacting Safety | Understand the impact of health behaviors on workplace safety. | 6.8 | 6.8 | 6.0 |
| | Understand the impact of workplace hazards on health behaviors. | 6.8 | 6.8 | 6.0 |
| | Believe that you have the skills to train young workers about the impact of health behaviors on workplace injuries. | 6.7 | 7.0 | 6.3 |
| Assigning Tasks to Young Workers | Recognize that job tasks should be assigned based on developmental stage | 6.5 | 6.5 | 6.0 |
| | Understand federal regulations for young workers in agriculture. | 6.5 | 6.5 | 6.5 |
| | Identify that supervisors should frequently reassess young workers' abilities. | 6.8 | 6.8 | 6.8 |
| Modeling Safe Behaviors | Understand that supervisors play a major role in creating a safe work environment. | 6.8 | 6.8 | 6.5 |
| | Recognize the importance of modeling safe behaviors in creating a safe work environment. | 6.5 | 6.8 | 6.5 |
| | Understand that young workers observe supervisor’s behaviors and will model them. | 6.8 | 6.8 | 6.8 |
| Workplace Policies | Understand the essential elements of a good workplace policy. | 6.7 | 6.7 | 6.7 |
| | Understand the purpose of workplace policies. | 6.7 | 6.7 | 6.7 |
| | Believe that you have the skills to enforce workplace safety policies to prevent injuries in young workers. | 6.0 | 6.0 | 6.0 |
| | Believe that you have the skills to enforce workplace health policies to prevent injuries in young workers | 6.0 | 6.0 | 6.0 |
| Workplace Expectations and Training | Recognize that young workers have less experience that older workers and may not be aware of workplace expectations. | 6.0 | 6.7 | 6.0 |
| | Recognize that young workers have less experience that older workers and may not recognize workplace hazards. | 6.7 | 6.7 | 6.7 |
| | Understand that all new workers should receive appropriate training. | 6.7 | 6.7 | 6.7 |
| | Identify when young workers need training. | 6.7 | 6.7 | 6.7 |

| Section | Learning Competency | Mean Scores | | |
|---|---|---|---|---|
| | | Clarity | Accuracy | Complete |
| | Identify the essential elements of training. | 6.5 | 6.5 | 6.5 |
| The Teach-Back Method to Train Young Workers | Understand the teach-back method for training young workers | 6.7 | 6.7 | 6.7 |
| | Understand that training in an ongoing process. | 6.7 | 6.7 | 6.0 |
| | Believe that you have the skills to train your young workers about preventing workplace injuries. | 6.3 | 6.3 | 6.3 |
| Supervision | Understand why young workers do not speak up if they have a concern. | 7.0 | 7.0 | 7.0 |
| | Understand the need for supervision even after young workers are trained. | 7.0 | 7.0 | 6.7 |
| Communicating with Young Workers | Understand the benefit of using open-ended questions when talking with young workers. | 7.0 | 7.0 | 7.0 |
| | Understand that good supervision requires open communication with young workers. | 7.0 | 7.0 | 7.0 |
| | Understand the essential components of good communication with young workers. | 7.0 | 7.0 | 6.3 |
| | Believe that you have the skills to train your young workers about preventing workplace injuries | 6.3 | 6.3 | 6.7 |