Farmworkers at the Border: A Bilingual Initiative for Occupational Health and Safety

Martha Soledad Vela Acosta, MD, MS, PhD[a]
Lee Sechrest, PhD[b]
Mei-Kuang Chen, MA, MS[b]

SYNOPSIS

Objective. Bilingual and bicultural occupational health and safety interventions for Hispanic farmworkers are extremely rare and, because of language barriers and cultural differences, issues important to their health and safety on the job remain unaddressed. We designed, conducted, and assessed the first bilingual occupational health and safety education program for farmworkers attending High School Equivalency Programs (HEPs).

Methods. We took an interdisciplinary participatory approach by integrating educators and researchers with a community advisory board to guide development, evaluation, and implementation of *Work Safely–Trabaje con Cuidado Curriculum* (Curriculum), a bilingual occupational health and safety curriculum. We created a quasi-experimental design using mixed-method evaluation (quantitative and qualitative elements) via pre- and posttest comparisons, follow-up surveys, and focus groups assessing the Curriculum effect on knowledge, safety risk perception (SRP), and safety behavior. Focus groups and follow-up surveys reflected success and acceptance of the Curriculum among participating farmworkers under the study's logic model.

Results. Completion of the Curriculum resulted in statistically significant improvements in the combined score of knowledge and SRP at the posttest (p=0.001) and follow-up survey (p=0.02) in the intervention group. After completing this study, the Curriculum was permanently adopted by the two high school equivalency sites involved.

Conclusion. The participatory approach resulted in integration of community and applied research partnership. The potential to expand use of this Curriculum by other HEP sites can further assess effectiveness and external validity among underserved minority groups.

[a]Division of Occupational and Environmental Health Sciences, University of Texas–Houston, School of Public Health at Brownsville, Brownsville, TX [current affiliation: The Kresge Foundation, Troy, MI]

[b]Evaluation Group for Analysis of Data, Department of Psychology, University of Arizona, Tucson, AZ

Address correspondence to: Martha Soledad Vela Acosta, MD, MS, PhD, The Kresge Foundation, 3215 W. Big Beaver Rd., Troy, MI 48084; tel. 248-643-9630; fax 248-643-0588; e-mail <martha.soledad10@gmail.com>.

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Culturally appropriate and innovative bilingual occupational health and safety interventions for Hispanic farmworkers are rare.[1–4] Those that address the complex environmental exposures that place farmworkers at unique risk for occupational injuries, which are almost three times higher than the overall U.S. work-related injury rate, are particularly scarce.[5] For this study, we established partnerships with community networks to provide occupational health and safety education to migrant and seasonal farmworkers (referred to hereafter as "farmworkers"). We addressed several crucial issues, including: (*1*) fear of asking supervisors about working conditions, (*2*) knowing how to recognize work hazards, and (*3*) knowing what resources are available for them when injured. As recommended,[6] we evaluated program effectiveness and sustainability.

Since 1967, more than 7,000 farmworker/students nationwide have been served annually by the High School Equivalency Program (HEP), which is funded by the U.S. Department of Education. In response to farmworkers' lack of literacy skills, limited English proficiency, and highly mobile lifestyle, HEP allows farmworkers or their dependents to prepare for the general educational development high school equivalency diploma. There are 11 such programs in Texas alone.[7] By forming research partnerships with HEPs, interventions can reach farmworkers in existing community settings designed to address educational needs. The *Work Safely–Trabaje con Cuidado Curriculum* (referred to hereafter as "Curriculum") is the first bilingual, high school-level occupational health and safety intervention available to Hispanic farmworkers. In this article, we describe the processes and outcomes relevant to implementation; Curriculum development leading to this program has been described elsewhere.[8]

METHODS

We evaluated the Curriculum's effectiveness using a quasi-experimental, nonequivalent intervention/comparison group study design. An evaluation consultant used a logic model that included an advisory board, the study team, and the HEP. Students enrolled in a HEP typically graduate within three months of their starting date, and new students are enrolled quarterly. Working closely with the HEP counselors and teachers at both sites allowed this 12-month study to begin in June, when farmworker students have migrated to work. At HEP sites in two different cities in south Texas, farmworker students were invited to participate in this study. The Curriculum was taught at one site while students at the other site served as a comparison group. Table 1 reflects the logistics and timeline at each site. To reduce the potential for cross-contamination, the two study groups were temporarily and spatially separated as follows:

- Two HEP sites in different cities, 25 miles apart, were chosen as study sites in an area of south Texas where public transportation is very limited.
- In alternate quarters, at both sites, all newly enrolled students were invited to participate in this study. All participants at a given site were assigned to either an intervention group (to whom the Curriculum was taught) or to a comparison group.

The Curriculum was then taught to farmworkers in the intervention groups using the following guidelines: (*1*) although student enrollment and recruitment for this study occurred at the same time, the two sites didn't offer the Curriculum at the same time; (*2*) students enrolled in quarters in which the Curriculum was not taught composed the comparison/control group; and (*3*) only one site had the Curriculum underway during any one quarter. Indeed, the year this study took place, HEP enrollment was the lowest of the previous few years. A certificate of achievement was given to students who completed the Curriculum. The University of Texas Health Science Center at Houston Committee for

Table 1. Recruitment calendar of farmworkers participating in the *Work Safely–Trabaje con Cuidado Curriculum*

Months	*Site one*	N	*Site two*	N
June to September	No enrolled students		No enrolled students	
October			Experimental group	6
November	Comparison group	21	No enrolled students	
December	No enrolled students		No enrolled students	
January			Experimental group	8
February to March	Experimental group	10	No enrolled students	
April	No enrolled students		Comparison group	4
May to June	No enrolled students		No enrolled students	

the Protection of Human Subjects (Protocol Number HSC-SPH-04-146) approved this study.

Intervention

A one-day workshop, conducted by a professional trainer and study personnel, was held for participating HEP teachers to familiarize them with the Curriculum background, content, learning objectives, and teaching techniques. The Curriculum has eight lessons (each lasting approximately one hour) about hazard recognition, injury prevention, post-injury strategies, workers' rights, and communication skills needed to confidently discuss work-related safety concerns with employers and coworkers.[9–11] Teachers received continuing education units provided by each school district, a certificate of accomplishment, and a small monetary incentive. Teachers provided feedback about workshop effectiveness. Regular meetings between study personnel and the HEP team (including teachers, counselors, and administrators) and post-intervention interviews with teachers took place.

Bilingual (English/Spanish) adaptation

We based the study's cultural and appropriate bilingual format on the number of years of schooling completed by farmworkers, reported nationwide as a mean of six years.[12] Any additions to or modifications of the English content of the Curriculum, or of questions for this study, followed a specific series of steps:

1. Careful selection of two independent bilingual translators;
2. Review by Spanish-speaking audiences such as community members, local farmworkers, high school students, and teachers (some of whom were not be able to fluently read or write in Spanish or English);
3. Assessment of both the adaptation to match the reading level for those who can read and the applications for such translated instruments for understandability;
4. Modification of questions/text to improve comprehension, based on feedback and going back to previous assessment among Spanish/English-speaking audiences before moving to the next step; and
5. Translation back to English of the resulting changes of text to ensure consistency in meaning of the intended content and to preserve all materials available in both languages.

The process was repeated as needed to ensure the Spanish translation of additional materials and make all materials as easy to read as possible and suitable both linguistically and regionally.

Data collection

Data were collected using pretests, posttests, follow-up surveys, and focus groups. All participants received a modest incentive (gift card) per test. All instruments were developed by the study personnel, evaluator, and trainer. The pre- and posttest questionnaires included identical questions about knowledge and safety risk perception (SRP), and some items were adapted from similar tools from other interventions and studies.[8,11,13] In addition to some questions about knowledge and SRP, the six-week follow-up survey included selected questions about the students' most recent employment, job-related injuries, and whether they were able to apply at their workplace any of the information they had learned from the Curriculum. Quantitative and qualitative measurements were used to evaluate the Curriculum effect on knowledge and SRP among students. The qualitative aspect was used to capture indicators that may not easily be defined in numeric terms—an especially important provision when addressing issues with cultural implications. We gathered demographic information to help understand any moderator or confounding factors.

All students took identical pre- and posttests to assure consistent measurements for each testing period. We mailed the follow-up survey, guided by the Tailored Design Method,[14] six weeks after the posttest in an effort to increase the response rate from what had been achieved in the pilot study (i.e., 33% among farmworkers/students).

Based on data after completion of follow-up surveys, we conducted focus groups at each site. The discussion guide inquired about Curriculum recall, examples of utilization, and program recommendations. Two bilingual and bicultural moderators conducted each focus group and one took notes. Discussions were recorded and transcribed.

Data analysis

We conducted quantitative data analysis using SPSS® software.[15] Descriptive analyses yielded means and standard deviations, cross-tabulations, and correlations for demographic variables. Changes in scores from pretest to posttest were calculated for the 12 items of the knowledge component and 10 items of the SRP component. Each scored item addressed a different aspect of the Curriculum. To enhance follow-up rates, the follow-up survey was shorter and included six knowledge items and five SRP items. All scores for pretests, posttests, and follow-up surveys were standardized

at the item level, and the means were calculated to compare the scores.

To assess the intervention effect, we calculated a combined score from the standardized mean scores of knowledge and SRP components. The standardized posttest and follow-up survey mean scores for knowledge and SRP were compared by group, using multiple regression models and analysis of covariance, with the corresponding standardized pretest mean score as covariate. Significant covariates remained in the final models ($p \leq 0.05$).

Three coders analyzed qualitative data gathered from focus group discussions. Critical points related to Curriculum content were organized to identify themes in content analysis consistent with recommended guidelines.[16]

Validity and reliability

To the authors' knowledge, there are no other instruments designed to measure occupational health knowledge and risk perception among Spanish-speaking farmworkers. Therefore, there is no "gold standard" available for measuring these components in this population. The study team, educational specialist, and evaluation consultant reviewed each instrument for content validity. Prior to the intervention, Hispanic bilingual young adults reviewed all instruments for clarity. Cronbach's alpha coefficients were calculated within the knowledge and SRP question sets for the intervention and control groups as a measure of internal consistency.[17] We calculated correlations (Pearson's) between pre- and posttest instruments to assess stability of the relative positions of students on the characteristics being assessed.

Advisory Board

The Advisory Board guided project development, implementation, and evaluation of the study. It consisted of 11 advisors: educators, school administrators, health department officials, community outreach educators, agricultural extension agents, a state legislative aid, local university staff, counselors, and former farmworkers. They provided perspective during three in-person meetings focusing on study approach, progress reports, and final recommendations. The evaluation consultant collected a summative query of the Advisory Board's perspectives.

RESULTS

After the workshop, teachers (n=12) rated objectives as clear, the agenda as well-organized, and materials as easy to understand and adequate in content. They reported increased self-efficacy and demonstrated statistically significant increased knowledge about the Curriculum content ($p<0.05$, data not shown). Adopted recommendations from teachers were designed to provide students with a master document with relevant toll-free numbers and an additional handout with information about state and federal laws.

No farmworkers/students enrolled at HEP sites refused to participate in this study. Forty-nine students agreed to participate and completed the pre- and posttest in the intervention (n=18) and comparison (n=31) groups. Intervention students attended all Curriculum lessons. In all, 33 students responded to the follow-up survey: 11 from the intervention group (61%), and 22 from the comparison group (71%). The overall response rate for the follow-up survey was 65%, reflecting the exclusion of one survey due to incomplete data (<50% of questions answered).

The mean age at which students had started to work was 16.3 years (standard deviation ±−2.8). Table 2 describes the demographic characteristics of

Table 2. Demographics of farmworkers participating in the *Work Safely–Trabaje con Cuidado Curriculum*

	Intervention group (n=18)		*Comparison group (n=31)*	
Characteristic	N	*Percent*	N	*Percent*
Age range (in years)				
18–30	11	61	18	58
31–50	6	33	11	35
>50	1	6	0	0
Missing	0	0	2	6
Mean age (in years) (SD)	30.5 (11.7)		27.2 (8.7)	
Gender				
Female	12	67	22	71
Male	6	33	9	29
Education (grade)				
5–8	7	39	7	23
8–12	11	61	24	77
Current work status				
Employed	3	17	6	19
Unemployed	15	83	23	74
Missing	0	0	2	6
Agricultural work (number of months)				
>12–23	13	72	17	55
24–48	4	22	2	6
Missing	1	6	12	39
Ever injured				
Yes	3	17	1	3
No	15	83	27	87
Missing	0	0	3	10

SD = standard deviation

the groups, which were substantially similar (with no statistically significant differences) in age, gender, education, and pretest scores between groups. In addition to agricultural work, 78% of students (38/49) reported having worked with or near machinery (e.g., a tractor or forklift). Forty-three percent of the students (21/49) reported also working in several occupations within service industries.

Table 3 shows the results of the multiple regression models predicting the standardized posttest mean scores. The standardized adjusted means for the combined score of knowledge and SRP (p=0.001), and the individual components (knowledge: p=0.02, and SRP: p=0.005), demonstrated statistically significant improvement for the intervention group when adjusted by pretest score.

Table 4 presents the multiple regression models predicting the standardized adjusted means from the follow-up survey. The intervention remained statistically significant during the follow-up for the standardized adjusted means of the combined score of knowledge and SRP (p=0.02) and the knowledge component separately (p=0.03).

Internal consistency for the SRP component increased from the pretest (alpha = 0.37) to the posttest (alpha = 0.79). For the knowledge component, internal consistency increased from the pretest (alpha = 0.23) to the posttest (alpha = 0.63). The correlation coefficients of each item for the comparison group showed that, for most of the items, the responses of these students tracked over time were stable (i.e., the ordering of respondents was maintained even if the level changed). Only two items of knowledge and three items of SRP components had a test-retest correlation of <0.4.

In the follow-up surveys that inquired about the experiences of the previous six weeks, most students (57%) were unemployed vs. employed (24%). Students reported not having talked to their supervisor about any job hazard, their safety, or the safety of a coworker (48%), with the reasons cited as lack of employment or lack of time. Typical comments included: "It's only work" (Spanish: "es puro trabajar"); "I didn't need to talk"; "I didn't know how"; and "I talked with family members." Most students reported not having an injury (58%) or having a near-miss incident (70%). The topics most often mentioned by students as something they would like to know more about included workers' rights, machine safety, sexual harassment, and first aid and cardiopulmonary resuscitation.

The majority of student focus group participants were female (75%), and written responses indicated a variety of employment (e.g., fieldwork, canning, warehouse, and restaurant). Results from content analysis of focus group responses are shown in the Figure, reflecting the themes relevant to the Curriculum and including quotes to illustrate critical points. Topics included awareness of work safety resources, improvement of self-efficacy, and willingness to request safety instructions. Students stated that they shared Curriculum information with others, such as encouraging coworkers in the use of proper gloves and shoes. They provided examples for the importance of safety training, workplace hazards, and personal protective equipment.

Students inquired about future dates for the Curriculum to facilitate access for their children or other family members. They suggested sharing content with employers and implementing a policy requiring all

Table 3. Adjusted multiple regression models of the standardized post-test mean scores, hierarchical partitioning of variance, in the *Work Safely–Trabaje con Cuidado Curriculum*

	Statistics		*R-square*
Model characteristics	*F*	*P-value*	
Combined scores			
Pretest	14.4	0.000	0.38
Intervention	13.5	0.001	
Knowledge			
Pretest	29.7	0.000	0.44
Intervention	6.2	0.020	
Safety risk perception			
Pretest	13.4	0.001	0.32
Intervention	8.6	0.005	

Table 4. Adjusted multiple regression models of the standardized follow-up mean scores, hierarchical partitioning of variance, in the *Work Safely–Trabaje con Cuidado Curriculum*

	Statistics		*R-square*
Model characteristic	*F*	*P-value*	
Combined scores			
Pretest	1.1	0.31	0.23
Education	1.4	0.24	
Intervention	5.8	0.02	
Knowledge			
Pretest	2.9	0.10	0.34
Education	6.1	0.02	
Intervention	5.4	0.03	
Safety risk perception			
Pretest	<0.1	0.80	0.23
Age	7.9	<0.01	
Intervention	0.6	0.44	

Figure. Summary of themes and selected quotes from focus group discussions with Hispanic students/farmworkers in the *Work Safely–Trabaje con Cuidado Curriculum*

Theme: awareness of resources, worker empowerment, and self-efficacy

"I had no idea that there were some organizations that could help. I have now learned phone numbers that I can use to get help if I have an accident or if I am discriminated against."[a]

"About the lesson using role-playing, when the employer was trying to harass the worker, we learned that we need to put a stop to it, and not to give the 'green light' because he may think we agreed; so we need to stop that."[a]

"Now I am coming back to work after studying so I can ask the person in charge what machines can I handle and to instruct me about how to do it."[a]

Theme: sharing with others

"After taking the class I called my sister-in-law, who is working in a fried-chicken production plant. I asked her about what tasks she was doing and recommended that she wear appropriate footwear so she wouldn't slip, also to protect herself from spills from hot oil. She had not received any training and was very grateful to me for sharing this information with her."[a]

Theme: sense of importance of safety training

"In my job we never received training of any kind. I was only told to remove the spoiled corn, but no warning or information was given about the sharpness of the machines or where the corn was being separated. You can lose your hands in those machines."[a]

"Where I work, at the beginning of employment they show us a video about safety, but it is about pesticides. What we really need is safety about the machinery. I think they have to include other safety training to prevent incidents like losing fingers."

Theme: workplace hazard

"Teaching identification of hazards such as slippery floors, falls, etc., is important for young workers, also regarding age limitations and use of gloves. Training should be provided regardless of age or if you are a part- or full-time employee; ultimately, we all are doing the same tasks."[a]

Theme: relevance for occupational injuries

"In the year 2000, while I was pregnant I walked into the restroom (they had just finished cleaning it, but there was no sign posted about slippery floors), and I fell down. No one offered to take me to the hospital; all by myself, I left and went to the hospital. If that would happen now, after the class, it would be different because I know that it is the employer's responsibility. So I would tell my employer and know that they are in charge of the procedures that need to be taking place."[a]

Theme: personal protective equipment

"There is water in half of my workplace, so you get wet; but employers do not provide boots. After the first two weeks of working, wearing my brand new tennis shoes—not fancy—they were completely destroyed because of the water and the chemicals. So your feet get humid and you do not earn enough to save. You go to work and cannot pay extra expenses. We want to save money for coming back. I met a man working who had to buy boots, but the water and chemicals destroyed them. His feet were totally destroyed. He had blood between his toes."[a]

Theme: importance of teaching Curriculum *to adolescents*

"I am interested that my daughters who are teenagers, therefore interested in working, receive the information that we have received, because they will not receive this type of education at their workplace that can protect them from getting injured. Because all that youngsters want is to get a job, they do not anticipate the consequences of getting injured. It would be great to give them the information so they can ask their employer for information that prevents them from being injured, like in a fast-food restaurant when frying potatoes."[a]

[a]These statements were translated into English from an original discussion in Spanish.

adolescents to be certified in this Curriculum before they enter the workforce. One respondent said, "It (this Curriculum) should be a requirement, like a driver's license for our children, before they take any job." Workers' rights topics that were discussed included discrimination, safety violations, and occupational injuries. Participants expressed fear of retribution if they complained or declined to take on new tasks. Being treated without respect by employers was another common theme.

Advisory Board observations regarding their own roles, function, and views of the project implementation were extremely positive, as supported by qualitative data from e-mail queries and notes from the final board meeting. A final recommendation was to disseminate the Curriculum into HEPs and College Assistant Migrant Programs nationwide. Thus, this study was presented at the first national HEP conference. Conference participants indicated an interest in implementing this Curriculum in their own states.

DISCUSSION

This study indicates that the Curriculum improved occupational health and safety knowledge and SRP among farmworkers attending a HEP. The ultimate goal of this program was to improve farmworkers' knowledge and perception to recognize hazards, adopt safety behaviors, and exercise their rights by using interactive exercises designed to engage students with a variety of learning styles, as others had demonstrated for school settings.[18,19] The HEP intervention improved knowledge in a way that was complementary to results of other interventions aimed at preventing injuries.

The innovative approach used in this study produced follow-up data by means of surveys, and focus groups added qualitative information to scores showing differences in knowledge and SRP. The fact that program effects were generally maintained during a six-week follow-up period is important, especially given the necessity to decrease the number of items in the assessment. That decrease likely accounted for the fact that the SRP portion was not significant at follow-up.

The increase in internal consistency (Cronbach's alpha coefficient) from pretest to posttest supports the idea that the intervention did have a positive effect on those scores.[17] Such an increase in reliability suggests that, at posttest, the responses of individuals to SRP and knowledge items were more consistent, reflecting the acquisition of some general principles regarding knowledge and safety acquired during training. The measures had reasonable construct validity, as indicated by how they performed in this practical setting. The knowledge component scores for students in the intervention group were statistically significantly higher than those for students in the comparison group at both posttest and follow-up (p=0.03). Because not all students responded to the follow-up, it is possible, but we think unlikely, that bias in choosing to respond could have occurred. It is noteworthy that approximately the same proportion of subjects from each group responded to the request for follow-up survey, and that no significant differences from nonrespondents were found. The follow-up results were consistent with those from the posttest for both groups. We think the results support the idea that the effect of the intervention did persist over time and change the circumstances for the respondents.

School-based programs have demonstrated effectiveness,[18–21] feasibility, and safety[22] for specific behaviors that can be monitored. In this study, recognition of changes in student behavior[23] was limited because the students had not been working between the posttest and the follow-up survey. Themes reflecting intended change in work-related safety behavior due to the Curriculum support the need to further determine the intervention's external validity.

This study supported the importance of implementation quality for school-based programs.[24] A time-consuming interactive approach was necessary to prevent cross-contamination.[25,26] Even though obtaining responses for the follow-up survey was labor-intensive, the response rate of 65% was greatly improved from the rate for the pilot test (33%), the higher rate of response being comparable to other studies in this population. By using separate sites for intervention and comparison groups, we minimized methodological problems. Teachers were made aware of the importance of the study design to avoid cross-contamination between groups. After study completion, both HEP sites adopted the Curriculum. Further development and elaboration of the Curriculum is needed to address farmworkers' concerns, such as recall of occupational injuries and safety violations, job demands for young workers, the need for personal protective equipment, and the lack of training. Both the students and the HEP team recommended that young workers have work permits.

Limitations

This study had some limitations. The unexpectedly low annual enrollment at each HEP site (100 students expected per year) limited the overall study sample, despite the fact that no one refused to participate. Nonetheless, this study had value in that there had not been any previous school-based studies of this nature among farmworkers, and the high participation

rate enhanced the likely representativeness of the sample.[26]

All data were self-reports, but we do think that the data from different facets of the study were internally consistent, and the measures reflecting program effects were not likely to have been biased upward. Some of the potential problems with a study of this nature (e.g., cross-condition contamination and measurement error) would have reduced rather than enhanced any apparent program effects. In any case, we do not think those effects were likely for reasons referred to previously.

Some cognitive demands were placed on research participants. Information is needed to adopt behavior (i.e., individuals must have a perception of a risk to self before taking action to modify any hazardous behavior).[22] Behavioral changes have been described as a series of steps leading to new behaviors.[23] Evaluation of the program's impact,[27] in terms of specific differences in behaviors related to work safety, was beyond the planned scope of this study and the resources available for it.

This study involved evaluation of a fairly brief and focused intervention during a fairly brief period of time. The results are suggestive of potentially important changes in knowledge and perspectives on safety, but long-term efforts are needed. If we identify a segment of our population that is likely to be involved in hazardous work during their entire working careers, considerable effort to enhance their safety and health is warranted.

CONCLUSION

This program shows qualitative and quantitative evidence to support the augmentation of instructional methods for reaching farmworkers. The sustainability at HEP sites illustrates a successful integration of applied research partnership and community. Using this Curriculum in other locations will help to assess effectiveness and external validity.[25]

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