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LIST OF TERMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
CCD	Common Core of Data
CI	Confidence Interval
LOHP	Labor Occupational Health Program
NCES	National Center for Education Statistics
NIOSH	National Institute for Occupational Safety and Health
OLS	Ordinary Least Squares
OSH	Occupational Safety and Health
PR	Prevalence Ratio
SD	Standard Deviation
TSC	Talking Safety Curriculum
WRI	Work-related Injury

ABSTRACT

Title: Factors Affecting Teachers Adoption of Youth at Work Talking Safety Curriculum

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The major objective of this study was to identify the individual- and organizational-level factors that affect high school teacher adoption, sustainability, and fidelity to the evidence-based OSH curriculum, Youth@Work:Talking Safety (TSC). The goal is to increase the effectiveness of efforts to integrate OSH curricula into high schools.

Data were collected via telephone interview with a sample of 104 high school teachers across the US who have been trained in the TSC between 2004 and 2012. "Adoption" was measured as whether a teacher had ever used the TSC. "Usage Levels" were measured two ways: 1) mean number of lessons delivered (range: 1-6) and; 2) mean number of activities used (range: 1-26). "Sustainability" was measured two ways: 1) whether a teacher taught the TSC more than once and, 2) a score derived from the frequency with which each lesson was delivered across all the times s/he taught the TSC (range: 0-18). "Fidelity" was measured as a score representing the number of lessons taught which were not modified in any way (range: 0-6). Independent variables consisted of six individual-level factors (teacher's acceptance, teachers' enthusiasm, perceived complexity, perceived benefit, self-efficacy, teaching methods fit) and six organizational factors (classroom resources, equipment resources, administrator support, supportive organizational climate, priority for non-academic coursework, priority for OSH coursework) largely measured using validated scales from prior studies. Linear regression was used to examine bivariate associations between the individual-level and organizational-level factors and the continuous outcomes of interest, and Cox regression was used with our dichotomous outcomes due to their high prevalence.

Sixty-nine percent of teachers adopted the TSC; among them, nearly 81% taught it more than once. The mean number of lessons delivered was 5.1 (SD=1.3) and the mean number of activities used was 14.9 (SD=6.6). The mean sustainability score was 10.1 (SD=6.6) and the mean fidelity score was 2.1 (SD=2.2). With regard to individual-level factors, teacher's acceptance, teacher's enthusiasm, and self-efficacy were all positively associated with curriculum adoption. Perceived complexity was negatively associated with adoption and with the number of lessons delivered. Teaching methods fit was positively associated with the number of activities used. Among the organizational-level factors, supportive organizational climate was negatively associated with the number of lessons delivered. Among the individual-level factors, teachers' acceptance and teaching methods fit were each positively associated with sustainability as measured by the sustainability score. For the organizational-level factors, priority for non-academic courses was negatively associated with sustainability as measured by the sustainability score. Teacher's enthusiasm was positively associated with fidelity.

The key finding is that individual-level factors appear to have the greatest influence on teacher adoption, and to a lesser extent on usage levels, sustainability, and fidelity to the Youth@Work:Talking Safety curriculum and should be considered in future attempts to institutionalize and promote this curriculum in high schools. Due to the small sample size, our ability to generalize these findings to a larger population of teachers is limited; therefore, the findings should be interpreted with caution. The modest evidence found suggests that further study, with a larger sample, is warranted.

Significant (Key) Findings

Adoption & Usage Levels

Adoption of the Youth@Work:Talking Safety curriculum (TSC) was high with nearly 70% of teachers using it at least once since they attended the curriculum training. Lesson use was high (mean of 5.1, range 0-6) and activities use moderate (mean 14.9, range 0-26). School and teacher characteristics were generally shown to have limited influence on adoption or curriculum usage levels. Those in traditional high schools (p=0.02) and those in rural schools (p=0.03) taught more lessons on average than those who worked in non-traditional schools or those who worked in either urban or suburban schools. Teachers who had never experienced a work injury in their lifetimes were more likely to adopt the curriculum (p=0.03). Teachers with at least some graduate education taught more lessons on average than those who held a bachelor's degree (p=0.02). Individual-level factors had the greatest influence on teacher adoption while organizational-level factors had no influence on adoption. Specifically, teacher's acceptance (p=0.001), teacher's enthusiasm (p<0.001), and self-efficacy (p=0.010) were all positively associated with curriculum adoption, and perceived complexity was negatively associated with adoption (p=0.009). In terms of usage levels, teaching methods fit was positively associated with the number of activities used (p=0.012) while perceived complexity was negatively associated with the number of lessons delivered (p=0.009).

Sustainability & Fidelity

Among those who taught the curriculum, nearly 81% taught it more than once and the mean sustainability score was 10.1 (SD=6.6) (range: 0-18). The mean fidelity score was 2.1 (SD=2.2) (range: 0-6). School and teacher characteristics were found to have limited influence on sustainability or fidelity. Female teachers (p=0.03) and those who had never experienced a work injury in their lifetimes (p=0.03) had higher fidelity scores. Few associations were found between either the individual- or organizational-level factors and the outcomes of sustainability or fidelity. Among the individual-level factors, teachers' acceptance (p=0.031) and teaching methods fit (p=0.011) were each positively associated with sustainability and teacher's enthusiasm (p=0.012) was positively associated with fidelity. For the organizational-level factors, priority for non-academic courses was negatively associated with sustainability (p=0.035).

Translation of Findings

Due to the small sample size, our ability to generalize these findings is limited; therefore, the findings should be interpreted with caution. However, the modest findings suggest that individual-level factors may play a role in how teachers approach using the TSC and should be considered in efforts to integrate the curriculum into high schools. If our findings hold, the successful integration of the TSC into high school classrooms will require efforts that: 1) foster teacher acceptance and favorable attitudes toward the curriculum, 2) build teacher enthusiasm for and interest in the curriculum, 3) promote a feeling of self-efficacy in teachers so that they feel capable of teaching the curriculum, and 4) help teachers understand the curriculum to ensure they don't feel the curriculum is too complex for them to use. It should be possible to address these issues during the training sessions which teachers go through to learn the curriculum and through various marketing strategies used to educate teachers about the curriculum's purpose and content. It will also be important to work with teachers for whom there is a strong fit between the methods required to teach the curriculum and the methods they typically use in their classrooms; without such a fit adoption and sustainability is less likely. If the teaching methods fit is not currently there, it will likely be necessary to spend time training teachers in the various methods they feel less comfortable with such as role playing or group activities for example. However, if these teaching methods are, ultimately, not appropriate for use with their students (e.g., special education students) the lessons that require those methods may need to be modified to allow for their use.

Outcomes/Impact

Potential Outcomes

As stated above, the modest findings of this study suggest that individual-level factors are more strongly associated with adoption, sustainability and fidelity to the TSC than organizational-level factors. However, the size of this study does warrant a cautious interpretation of the results. Further study, with a sample sufficient to power a more thorough analysis, is clearly warranted. Until then, these early findings can be used by those working to integrate the TSC into high school classrooms to improve their current efforts.

Intermediate Outcomes

There are no intermediate outcomes to report at this time.

End Outcomes

There are no end outcomes to report at this time.

Background

In recent years, the number of occupational injuries among teenaged workers has been decreasing yet there are still thousands of young people who suffer injuries on the job every year (1, 2). Improving access to workplace health and safety training is one way to help reduce these injuries (3-6) yet studies consistently show that many young workers do not receive such training from their employers (7-13). Recognizing this gap, scholars from the National Institute for Occupational Safety and Health (NIOSH) have called for increased efforts at integrating occupational safety and health information into vocational education programs and high school curricula (2, 14, 15). Such a strategy they suggest, "could be effective in transferring information and increasing awareness of occupational safety and health" (14). While the learning environment of the high school classroom indeed presents an ideal setting in which to engage young people about workplace safety, and various efforts to incorporate occupational safety and health topics into vocational and general high school curricula are ongoing (16-18), there has been no research on the success or sustainability of these efforts (19). With ever increasing and often conflicting demands being placed on high school teachers (20), the viability of their implementing an occupational health and safety curriculum into their classrooms in a sustainable way remains a question. The current study was designed to gain an understanding of the factors that affect curriculum adoption, sustainability, and fidelity among high school teachers so that we can increase the effectiveness of efforts aimed at integrating occupational safety and health curricula into high schools.

Specific Aims

The specific aims of this study were as follows:

1) Determine whether teachers trained in the Youth@Work: Talking Safety curriculum have adopted it (i.e., have ever used it in their classrooms) and if so, describe their level of sustainability (i.e. continued use) and fidelity to the curriculum activities and materials;

2) Describe the barriers faced by teachers in adopting the curriculum, sustaining its use and doing so with fidelity, and describe their suggested strategies for overcoming these barriers; and

3) Identify the individual-, classroom-, and institutional-level factors that are associated with teachers':
   a. initial adoption of the curriculum;
   b. sustainable adoption; and
   c. fidelity to the curriculum activities and materials.

Methodology

The Youth at Work: Talking Safety Curriculum
The evidence-based, NIOSH sponsored curriculum "Youth@Work: Talking Safety" (TSC) was the focus of this study. This curriculum was adapted from two earlier curricula, "Worksafe," developed by the Labor Occupational Health Program at the University of California, Berkeley, and "Safe Work/Safe Workers," developed by the Education Development Center in Newton, MA [37]. Its content and teaching methods were developed with teachers and staff from general high schools, school-to-work and vocational programs and through extensive formative evaluations and pilot testing [37]. It is made up of six lessons: 1-Young Worker Work Injuries, 2-Finding Hazards, 3-Finding Ways To Make the Job Safer, 4-Emergencies at Work, 5-Know Your Rights and 6-Taking Action. Materials include a course booklet, PowerPoint presentations, overheads, handouts, and a video (all downloadable from NIOSH's website www.cdc.gov/niosh/talkingsafety). In one evaluation, where 148 students were given pre- and post-tests of Safe Work/Safe Worker, participant's ability to name hazards and identify prevention strategies significantly increased [17]. In a quasi-experimental evaluation with 97 students, those receiving the curriculum scored higher on child labor law knowledge, health and safety, worker rights, and the ability to apply OSH information than the control group [17]. In the 2004-05 school year, NIOSH evaluated the TSC in 16 schools in 10 states [18]. Pre- and post-tests from 764 students taught the curriculum were compared to 200 students who were not taught it. The intervention group scored higher on knowledge gains on the post-test than on the pre-test. No improvement was found among those not given the curriculum. The greatest knowledge gains were in controlling hazards, worker rights, and what to do in an emergency [18]. The TSC has been designated as meeting three of the eight National Health Education Standards [38] and five of the fourteen "characteristics of an effective health education curriculum" put forth by the CDC [39].

Data Collection

Study Population and Eligibility Criteria

Data were collected via telephone interview with a sample of high school teachers who taught classes in vocational and traditional high schools from across the US who have been trained in the TSC between 2004 and 2012 (the year of data collection) by trainers from the Young Worker Safety Research Center, which is staffed by a partnership between the University of California Berkeley's Labor Occupational Health Program (LOHP) and the Educational Development Center in Newton, MA. A database of trainees and their contact information maintained by the LOHP, was used to identify and recruit teachers into the study. We first sorted the database to remove any trainee that did not appear to be a teacher on the basis of the job title they provided (e.g. administrator) and we removed any trainee for whom we did not have good school contact information as this was used to obtain school-level data from the National Center for Education Statistics (NCES) Common Core of Data (CCD) used in our analysis. We made successful contact with 344 out of 781 trainees (many teachers had retired or their contact information was no longer current). Among the 344 we spoke to, 242 met the eligibility criteria when screened by interviewers; most of those who did not meet the eligibility criteria were not teachers or were teachers but they did not remember being trained in the curriculum. A total of 104 eligible teachers participated in the interview for a response rate of 43%.

Our original intention was to develop our sampling frame as follows: (1) Teachers in the trainee database would be stratified by school locale (urban, rural), school size (0-999, 1,000+ enrollment), school type (general, vocational/technical), and year of training (2004-2007, 2008-2010) (school-level data will be extracted from the CCD maintained by the NCES [44]); and (2) teachers would be proportionately sampled by all school-level variables described above and disproportionately sample teachers trained in the past 3 years (2008-10) to reduce recall bias (nonparticipating teachers would be replaced from the same stratum to obtain the desired sample size). However, we experienced significant difficulties reaching teachers in the data base and needed to change our strategy. Many teachers had retired or moved to different schools so we could not reach them. Some had died and for many, the contact information was simply out of date or incorrect. We had significant challenges getting teachers to agree to participate and the time spent following-up with potential participants was often very long and did not result in participation. Therefore, we ended up attempting to reach any and all teachers in the database without regard for stratum. If a teacher was at all reachable, we attempted to recruit them into the survey.

Survey Development

The survey instrument used was developed for the purposes of this study. It contained questions about teacher demographics and items designed to measure the individual-level and organizational-level factors known to affect teacher adoption, sustainability, and fidelity to school-based health curricula as well as items measuring these three outcomes. All of these variables and their measures are described in detail in the following section. The draft instrument was pilot tested for clarity, content relevance, and length with 15 teachers from the database who met the eligibility criteria. The pilot test occurred over the summer months which hampered our ability to reach the full number of teachers (20) as originally proposed. Minor changes were made to the instrument prior to full survey administration.

Variables and Measures

Outcomes

Adoption and Usage Levels

Using the following Centers for Disease Control and Prevention definition, "the uptake of the desired intervention into the target population or uptake by the implementers" [23], we measured adoption as simply whether teachers have ever used the TSC with their students (yes/no). Among those who adopted the curriculum, we measured "usage levels" by asking teachers to tell us how many of the six lessons in the curriculum they delivered and how many of the twenty-six total activities within these lessons they used the *last time* they taught the curriculum. Originally, activity use was proposed as a measure of fidelity. However, because the curriculum affords teachers a great deal of flexibility in terms of which activities they use (teachers may want to focus on a particular set of topics and forgo others that are less relevant to their educational setting and students), we opted to not include activity use in our measure of fidelity but rather include in a measure of a new outcome: curriculum "usage levels."

Sustainability

Among those who adopted the curriculum, we used two measures of sustainability. The first was whether or not the teachers taught the TSC more than once since being trained in the curriculum (yes/no). For the second, we constructed a sustainability score using the frequency with which each lesson was delivered across all the times the teacher had taught the curriculum as follows. For each of the six lessons we asked teachers, "Thinking of all the different times you taught the curriculum, would you say you covered Lesson [1], *some* of the time (score value=1), *most* of the time (score value=2), *all* of the time (score value=3). Teachers who taught all six lessons every time they taught the curriculum, for example, received a score of eighteen; those who taught the curriculum only once and therefore only taught the lessons once, were given a score of zero, indicating no sustainability. Our original proposed measure of sustainability called for including the number of cohorts taught in the sustainability score; however, after the pilot testing of the questionnaire, we found that teachers did not properly interpreting the questions so we could not capture quality data on cohorts taught.

Fidelity

As mentioned above, the TSC offers teachers a great deal of flexibility in terms of which lessons they deliver and which activities and materials they use. Therefore, we opted to not use our originally proposed measure of fidelity which took into consideration the number of activities *and* materials used when teaching the curriculum and instead focus on whether the teachers used the activities provided with each lesson as designed or if they were modified them in any way. Among those who taught the curriculum, we measured fidelity to the curriculum's activities by asking participants the following question for each lesson they delivered: "Of the lesson [1] activities you used the last time you delivered the curriculum, would you say you used them as designed or that you made your own modifications to them by changing the content and/or using different materials than those provided with the curriculum?" These answers were used to construct a fidelity scale representing the number of lessons whose activities were delivered with fidelity/as designed. The scale range is 0-6, with zero indicating none of the lessons were taught with fidelity/as designed and six indicating all of the lessons were taught with fidelity/as designed.

Independent Variables

Factors Associated with Adoption, Sustainability and Fidelity

As this is the first study to examine factors affecting teacher adoption of an occupational safety and health curriculum, no models exist for approaching this specific research question. Therefore, to ground our study we used both select concepts of Rogers' Diffusion of Innovations theory, which posits an individual's decisions to adopt an innovation is contingent upon attributes of the innovation itself [43] (e.g., its complexity), and evidence from prior studies that have identified both individual- classroom-, and institutional-level factors that influence adoption, sustainability, and fidelity to health related programs/curricula among high school teachers. Table 1 below displays these factors along with their related Diffusion of Innovation concepts, and the outcomes with which they are associated. It should be noted that in our original application we referred to the organizational-level factors as "institutional-level factors;" we now use the term organizational-level factors. Chronbach alphas are found in parentheses for each scaled construct described below. The majority of factors examined in this study were measured using validated scales constructed by Rohrbach [40] and Steckler [62]. Where necessary, items in these scales were slightly reworded to properly reflect elements of the particular curriculum (Talking Safety) being studied. Where a measure or scale was not available, we constructed one. Except where noted below, all scales captured teachers' perspectives after they completed the TSC training. Below we describe the scales used to measure each factor and provide their respective Chronbach's Alpha coefficients in parentheses.

Individual-level Factors: Teacher's Acceptance (α=0.54) was measured using Rohrbach's "Program Acceptance" scale [40] which consists of three items capturing the level (on a scale of 1-4) of teachers anticipated enjoyment teaching the curriculum, their comfort with the activities of the curriculum, and their comfort with the teaching methods it requires. *Teacher's Enthusiasm* (α=0.83) was measured using Rohrbach's "Enthusiasm for Implementation" scale [40] which consists of two items that captured how much (on a scale of 1-4) teachers looked forward to teaching the curriculum and how much enthusiasm they had for teaching it. *Perceived Complexity* (α=0.69) was measured using Steckler's "Complexity" scale [62] which consists of three items that capture teacher agreement (1=strongly disagree to 4=strongly agree) with a series of statements about how difficult they felt it would be to teach the curriculum, how complex they thought the curriculum was, and whether they had difficulty understanding the curriculum.

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Table 1. Factors Affecting Teacher Adoption, Sustainability and Fidelity to New Health-related School Curricula			
	OUTCOME VARIABLES		
INDEPENDENT VARIABLES	**Adoption**	**Sustainability**	**Fidelity**
Individual-level Factors *(related "Diffusion of Innovations" concepts are in parentheses).*			
1-Teacher's acceptance or favorable attitudes about the curriculum	[26, 40-41]	[26]	[26, 40, 56]
2-Teachers enthusiasm toward or interest in the curriculum	[16, 40]		
3-Perceived complexity of the curriculum ("*complexity*")	[43, 57]		[58]
4-Perceived fit between teacher's and curriculum's goals ("*compatibility*")	[16, 43, 57]		
5-Perceived benefit of the curriculum ("*relative advantage*")	[16, 41, 43, 57]		
6-Self-efficacy/confidence of teacher in their ability to teach the material	[26, 40, 42]	[26]	[40]
Classroom-level Factors			
1-Teaching context in which the curriculum is delivered (i.e., subject)	[46, 59]	[46]	[60]
2-Physical resources available (e.g., classroom space)	[46, 57]	[46]	[60]
3-Available time to teach the curriculum	[46, 59]	[40]	[60]
4-Teaching methods fit between teachers' normal method of teaching and that required by the curriculum	[40, 61]		[40, 47, 59]
Organizational-level Factors			
1-Administrator support for the curriculum	[22, 26, 40, 46, 57]	[40]	
2-Priority for non-academic courses	[57]		
3-Supportive organizational climate	[16, 47]		

Perceived Benefit (α=0.84) was measured using Steckler's "Relative Advantage" scale [62] which consists of three items that capture teacher agreement (1=strongly disagree to 4=strongly agree) with statements about whether the Talking Safety curriculum was a better alternative than other approaches that have been taken by their schools to teach students about workplace health and safety and how to avoid injury on the job. Only those who said their school had used an alternative method were included when constructing this scale. *Self-efficacy* (α=0.80) was measured using Rohrbach's "Implementation Self-Efficacy" scale [40] which consists of six items capturing the level (on a scale of 1-4) of teacher confidence and comfort teaching the curriculum, leading the activities, and controlling the classroom and lesson flow while teaching the curriculum. *Teaching Methods Fit* (α=0.76) (originally under classroom-level factors--see below explanation for its move) was measured using Rohrbach's "Compatibility of Teaching Methods" scale [40] which consists of six items that capture how much (on a scale of 1-4) the teachers normally use the types of different teaching approaches required by the curriculum (e.g., critical thinking, role play, small group activities) and how comfortable the teachers feel using each of these teaching approaches. One individual-level factor, "perceived fit" or compatibility (between teacher's and curriculum's goals) was measured but we were not comfortable with the validity of its measurement and therefore did not include it in our analyses.

Classroom-level Factors: We collected data on all the classroom-level factors, however, there were challenges with the measurement and value of some of these and thus, not all of them were used in our analyses. Because we had so few observations overall, the number in any one "teaching context" was so small it precluded us from analyzing this as a factor. Also, the variable "available time" was dropped from our analysis becasue we were not comfortable with how we measured it in the survey. The question was worded too specifically to accurately capture global time demands and rather then include an invalid measure, we felt it was more appropriate to exlude it. The remaining classroom-level factors, "physical resources" and "teaching methods fit" were each reclassified and moved out from under classroom-level factors; "teaching methods fit" was moved under individual-level and "physical resources" was moved under organizational-level factors as we feld these were more accurate categorizations.

Organizational-level Factors: We measured "physical resources" with two scales. The first, *Classroom Resources* (α=0.90), was constructed from two items that captured teacher agreement (1=strongly disagree to 4=strongly agree) with statements about the adequacy and availability of the classroom space needed to teach the curriculum. For the second, *Equipment Resources* (α=0.89), we took the same approach to measure the adequacy and availability of the equipment (e.g., overhead projector, DVD player) needed to teach the

curriculum. *Administrator Support* (α=0.77) was measured using Rohrbach's "Principal Encouragement" scale [40] which captures the level (on a scale of 1-4) of teachers' perceived support for teaching the Talking Safety curriculum from the school principal and from the school superintendant. We asked about these separately and then combined responses into one encouragement scale. *Supportive Organizational Climate* (α=0.90) was measured using five items with factor loadings above 0.70 from Steckler's 27 item "Organizational Climate" scale [62]. Examples of items in this scale include how much (on a scale of 1-4) teachers were included in decision making at their school; upper-level administrators expressed an interest in the well-being and happiness of those who work at the school; and administrators discussed teachers' career aspirations with them. *Priority for Non-academic Courses* was measured using responses to the following question: "What is the level of priority given to non-academic courses within your school?" We also added a measure more specific to the topic of the curriculum being studied, "*Priority for Work Safety Courses."* This was measured using responses to the following question: "What would you say was the level of priority given to teaching job safety and health topics within that school?" For these questions, a scale of 1 (not at all a priority) to 4 (very much a priority) was used.

Other Variables of Interest
In addition to examining the factors above, we also investigated whether various teacher, class and school, characteristics influence teacher adoption, sustainability and fidelity. This is a slightly modified approach in that we did not originally propose to examine "school characteristics."

Teacher Characteristics
The below characteristics were collected from all teachers. Job title, grade(s) they teach, years of teaching experience (original responses were coded into three categories: <10, 10-20, >20), highest level of education achieved, gender, and history of work injury (e.g. whether they ever had a work injury in their lifetimes).

Class Characteristics
We originally proposed to look at the following class characteristics: average class size in which the curriculum was typically taught, grade level(s) in which the curriculum was typically taught, and the subject in which the curriculum was typically taught. After piloting the survey instrument, we found that average class size cannot be captured because of the variation in teaching settings which are sometimes very different from conventional classroom teaching (e.g., a teacher may do one-on-one teaching with a student they are getting ready to place in a work site). We were able to collect data on the other two class characteristics; however, they were not used in our final analyses due to the coding challenges presented by having too few like observations.

School Characteristics
All data on school characteristics were taken from the NCES CCD (http://nces.ed.gov/ccd/districtsearch/). The characteristics of interest are as follows: location (categorized into rural, suburban, urban using the CCD scheme); size (student enrollment categorized into <500, 500-1500, >1500, which follows that used by the NCES), type (traditional, non-traditional which includes special education and vocational schools), and pupil-teacher ratio (dichotomized around the mean).

Statistical Analysis
Descriptive statistics were used to examine the school and teacher characteristics of the sample. Bivariate analyses (proportions and means) were conducted to examine adoption, sustainability, and fidelity by school- and teacher-level characteristics. Chi-square tests of significance (for proportions) and ANOVA and t-tests (for means) were used to examine statistically significant associations. Linear regression was used to examine bivariate associations between each of the individual-level and Organizational-level factors and the continuous outcomes of interest (mean number of lessons delivered, mean number of activities uses, sustainability score, and fidelity score). In order to examine bivariate associations between each of the individual-level and Organizational-level factors and the dichotomous outcomes (adopting the curriculum, teaching the curriculum multiple times), Cox regression was used to calculate prevalence ratios, in a manner described by Barros [133]. This approach was used to account for the high prevalence of the outcome [133] and has been previously implemented in a study of workplace injury to teens by Rauscher and Myers [78].

Results & Discussion

The school and teacher characteristics of the study population are shown in Table 2 below. The schools in which teachers worked were mostly traditional high schools (73%). Mean student enrollment was 1100 (SD=780.2) with a mean student-teacher ratio of 19:1 (SD=37.8). Schools were about evenly distributed between rural,

suburban, and urban locations. The majority of teachers were women (70%) and more than half (55%) had a Master's degree. The mean years of teaching experience was 17.4 (SD=9.4). Half had experienced a work injury in their lifetimes. Although the majority of teachers worked in traditional schools, most of them (85%) worked as career/vocational teachers, transition/special education teachers, or similar coordinators who teach.

Table 2. School and Teacher Characteristics	
SCHOOL CHARACTERISTICS	**Percent**
Type (n=101)	
Traditional	73.3
Special education	8.9
Vocational	9.9
Other/alternative	7.9
Size (enrollment) (n=94)	
<500	25.0
500-1500	39.4
>1500	35.6
Student-teacher ratio (n=86)	
<19:1	57.7
≥19:1	42.3
Location (n=95)	
Rural	32.6
Suburban	36.8
Urban	30.5
TEACHER CHARACTERISTICS	
Job Title (n=104)	
Community Technical Education Instructor	34.6
Transition/Special Education Coordinator/Instructor	32.7
Work Experience Coordinator	11.5
Community Technical Education Internship/Work Study Coordinator	10.6
Academic Instructor (e.g., Math, English)	5.8
Other	4.8
Grades taught (n=101)	
12th grade only	6.9
9th grade only	3.0
Multiple grades	90.1
Years of teaching experience (n=102)	
<10	15.7
10-20	53.9
>20	30.4
Highest level of education (n=103)	
Associate's degree	2.9
Some 4-year college	6.8
Bachelor's degree	30.1
Some grad school	2.9
Master's degree	55.3
Doctoral degree	1.9
Gender (n=104)	
Female	70.2
Male	29.8
Experienced a work injury (n=104)	50.0

Classroom characteristics are as follows:

Grade in which they typically delivered the TSC

	Freq.	Percent	Cum.
10	1	0.96	0.96
10-11	2	1.92	2.88
10-12	12	11.54	14.42
11	2	1.92	16.35
11-12	16	15.38	31.73
12	6	5.77	37.50
6-12	1	0.96	38.46
8-9	1	0.96	39.42
9	4	3.85	43.27
9 & 10	1	0.96	44.23
9-12	26	25.00	69.23
did not teach the TSC	32	30.77	100.00
Total	104	100.00	

The below list includes courses in which teachers typically delivered the TS curriculum. Accept where noted each course was named by one survey participant. Please note the list does not total 72 (the number of participants who taught the TSC) due to missing values.

- Academic Support
- Agroscience
- Animal science, food science, ag-mechanics
- Automotive (n=2)
- Basic Trait Skills
- Business (n=2)
- Career & Financial Management
- Career Education
- Career jumpstart
- Consumer Math Skills
- Cooperative education
- Culinary Arts
- Employment Skills
- English
- Exploratory vocational shops
- Exploring Career Choices
- Food and Nutrition
- Health (n=3)
- High School Internship program
- Horticulture
- Individual instruction in teachers office
- Internship
- Job Club
- Job Skills (n=2)
- Job Training
- Laboratory Procedures for Health Assistants
- Pull-out class
- Resource Program-- Special Education
- ROP
- Science
- Social Skills
- Special education internship program
- Study Skills
- Tools and organizational planning
- Virtual enterprise
- Vocational education
- Workability one or TPP (Transition Partnership Program)
- Woodworking & Construction (n=2)
- Work experience
- Work readiness and life skills (n=2)
- Work study
- Workability
- Workplace safety (n=3)

Aim 1) Determine whether teachers trained in the Youth@Work:Talking Safety curriculum have adopted it (i.e., have ever used it in their classrooms) and if so, describe their level of sustainability (i.e. continued use) and fidelity to the curriculum activities and materials.

Overall Adoption, Usage Levels, Sustainability, and Fidelity
For the sample as a whole, 69% of teachers had adopted the TSC meaning they taught it at least once (see Table 3 below). The mean number of lessons teachers delivered was 5.1 (SD=1.3) and the mean number of activities they used was 14.9 (SD=6.6). Among those who did teach the curriculum, nearly 81% taught it more than once and the mean sustainability score was 10.1 (SD=6.6) (range: 0-18). The mean fidelity score was 2.1 (SD=2.2) (range: 0-6).

School and Teacher Characteristics Associated with Adoption, Usage Levels, Sustainability, and Fidelity
Table 3 below displays the bivariate associations between each school- and teacher characteristic and the outcomes of adoption, usage levels, sustainability, and fidelity. Several statistically significant results were found. With regard to school-characteristics, those working in traditional high schools (p=0.02) and those teaching in rural schools (p=0.03) taught more lessons on average than those who worked in non-traditional schools or those who worked in either urban or suburban schools. In terms of teacher characteristics, those who had never experienced a work injury in their lifetimes were more likely to adopt the curriculum (p=0.03) and to have higher fidelity scores (p=0.03) than those who had experienced a work injury in the past. Teachers with at least some graduate education taught more lessons on average (p=0.02) than those who held a bachelor's degree and female teachers had higher fidelity scores (p=0.03) compared to their male counterparts.

Table 3. School and Teacher Characteristics Associated with High School Teacher Adoption, Usage Levels, Sustainability, and Fidelity to the Youth@Work:Talking Safety Curriculum								
	Adoption		**Usage Levels**[a]			**Sustainability**[a]		**Fidelity**[a]
	% Taught Curriculum		**Mean # of Lessons Delivered**[b]	**Mean # of Activities Used**[c]		**% Taught Curriculum MultipleTimes**	**Mean Sustainability Score**[d]		**Mean Fidelity Score**[e]
n	*104*		*72*	*72*		*72*	*72*		*68*
All	69.2		5.1 (SD=1.3)	14.9 (SD=6.6)		80.6	10.1 (SD=6.6)		2.1 (SD=2.2)
SCHOOL CHARACTERISTICS								
Type								
n	*99*		*69*	*69*		*69*	*69*		*65*
Traditional	73.6		5.3**	15.2		83.0	10.7		2.5*
Non-traditional^	59.3		4.6	14.7		81.3	9.9		1.5
Size (enrollment)								
n	*104*		*71*	*71*		*72*	*71*		*67*
<500	61.5		4.9	15.6		68.8	8.3		1.7
500-1500	75.6		5.2	15.6		87.1	11.0		2.1
>1500	67.6		5.0	13.6		80.0	10.0		2.4
Student : teacher ratio								
n	*104*		*72*	*72*		*72*	*72*		*68*
<19:1	70.0		5.1	15.3		83.3	10.5		2.0
≥19:1	68.2		5.0	14.2		76.7	9.4		2.4
Location								
n	*95*		*67*	*67*		*68*	*67*		*63*
Rural	74.2		5.5**	17.7		78.3	10.8		2.5
Suburban	68.6		4.9	14.4		79.2	9.4		2.2
Urban	72.4		4.9	12.9		90.5	11.1		2.0

continued on next page...

TEACHER CHARACTERISTICS										
Years of teaching experience										
n	*102*		*70*	*70*		*71*	*70*		*67*
≤10	68.8		4.5*	12.8		90.9	10.6		1.5
11-20	72.7		5.2	15.1		80.0	10.0		2.6
>20	64.5		5.3	16.0		80.0	10.4		1.5
Education level										
n	*103*		*72*	*72*		*72*	*72*		*68*
≤ Bachelor's degree	78.1		4.7**	14.2		78.1	9.4		2.1
≥ Some graduate school	64.5		5.4	15.5		82.5	10.6		2.2
Gender										
n	*104*		*72*	*72*		*72*	*72*		68
Male	58.1		5.2	15.5		88.9	12.0*		1.3**
Female	74.0		5.0	14.7		77.8	9.4		2.4
Had a work injury ever										
n	*104*		*72*	*72*		*72*	*72*		*68*
Yes	59.6**		5.1	14.9		80.5	9.9		1.6**
No	78.9		5.0	14.8		80.7	10.3		2.6

p values: ***$p<0.01$, **$p<0.05$, *$p<0.10$
[a]Among those who adopted the curriculum.
[b]Range: 1-6
[c]Range: 1-26
[d]Range: 0-18
[e]Range: 0-6
^Non-traditional schools include "special education," "vocational," and "other/alternative" schools as categorized in the National Center for Education Statistics Common Core of Data.

Aim 2) Describe the barriers faced by teachers in adopting the curriculum, sustaining its use and doing so with fidelity, and describe their suggested strategies for overcoming these barriers.

Among those who did not adopt the curriculum, the two most common reasons for not doing so were that they faced time constraints (27%) and that they already used other educational materials to teach about workplace safety and health (10%). Among those who did not teach all six lessons, the most common reason given was time constraints (59%). Some teachers also told us that they wanted to focus only on what they viewed as being most important/relevant to their students (15%) and some felt that it was not necessary or useful, after a certain point, to keep teaching more lessons on the same topic because the first few provide a good overview and it is hard to hold students' attention on one thing for very long (15%). Among teachers who modified the curriculum activities, nearly 29% reported they changed the content to better fit their students' intellectual abilities, 22% said they had to shorten some of the activities because of time constraints, 19% said they modified the activities to make them more relevant to the types of jobs their students were being placed in or being trained to do upon graduation, and finally, 10% said they modified the activities to be more timely and reflect current or local events. We neglected to include an open-ended question regarding strategies for overcoming these barriers so we were not able to complete this portion of Aim 2.

Aim 3) Identify the individual-, classroom-, and institutional-level factors that are associated with teachers': initial adoption of the curriculum; sustainable adoption; and fidelity to the curriculum activities and materials.

Factors Associated with Curriculum Adoption and Usage Levels

Table 4 below shows the bivariate associations between each of the individual-level and organizational-level factors and the outcomes of adoption, curriculum use, sustainability and fidelity. With regard to individual-level factors, teacher's acceptance, teacher's enthusiasm, and self-efficacy were all positively associated with curriculum adoption. Perceived complexity was negatively associated with adoption and with the number of

Table 4. Bivariate Associations between Individual-level and Organizational-level Factors and Measures of Adoption, Usage Levels, Sustainability, and Fidelity to the Youth@Work:Talking Safety Curriculum among High School Teachers						
	Adoption	**Usage Levels**[a]		**Sustainability**[a]		**Fidelity**[a]
	Taught Curriculum PR^ (95% CI)	**Mean # of Lessons Delivered OLS+ (95% CI)**	**Mean # of Activities Used OLS+ (95% CI)**	**Taught Curriculum Multiple Times PR^ (95% CI)**	**Mean Sustainability Score OLS+ (95% CI)**	**Mean Fidelity Score OLS+ (95% CI)**
INDIVIDUAL-LEVEL FACTORS						
n	*99*	*70*	*70*	*70*	*70*	*66*
Teacher's acceptance	1.68*** (1.2, 2.3)	0.5 (-0.2, 1.2)	3.36* (-0.3, 7.1)	1.14 (0.8, 1.5)	3.96** (0.4, 7.6)	0.55 (-0.8, 1.9)
n	*101*	*72*	*72*	*72*	*72*	*68*
Teachers enthusiasm	1.79*** (1.4, 2.3)	0.40 (-0.2, 1.0)	2.45 (-0.8, 5.7)	1.14 (0.8, 1.5)	2.74* (-0.5, 6.0)	1.44** (0.3, 2.6)
n	*103*	*72*	*72*	*72*	*72*	*68*
Perceived complexity	0.70*** (0.5, 0.9)	-0.79*** (-1.4, -0.2)	-2.91* (-6.0, 0.2)	1.05 (0.8, 1.3)	-1.05 (-4.2, 2.1)	-0.19 (-1.3, 0.9)
n	*45*	*34*	*34*	*34*	*34*	*34*
Perceived benefit[b]	1.12 (0.8, 1.5)	0.37 (-0.3, 1.0)	3.15* (-0.3, 6.6)	1.03 (0.7, 1.5)	0.16 (-4.1, 4.4)	0.73 (-0.6, 2.0)
n	*99*	*71*	*71*	*71*	*71*	*67*
Self-efficacy	1.64*** (1.1, 2.4)	-0.03 (-0.9, 0.9)	1.29 (-3.4, 6.0)	0.98 (0.7, 1.3)	1.83 (-2.7, 6.4)	-0.35 (-1.9, 1.2)
n	*96*	*67*	*67*	*67*	*67*	*63*
Teaching methods fit	0.82 (0.6, 1.1)	0.30 (-0.3, 0.9)	3.94** (0.9, 7.0)	1.16 (0.9, 1.5)	3.94** (0.9, 7.0)	1.01* (-0.03, 2.1)
ORGANIZATIONAL-LEVEL FACTORS						
n	*102*	*72*	*72*	*72*	*72*	*68*
Equipment resources	1.04 (0.8, 1.3)	0.13 (-0.3, 0.6)	1.27 (-1.1, 3.6)	1.05 (0.9, 1.3)	1.05 (-1.3, 3.4)	0.57 (-0.4, 1.5)
n	*100*	*71*	*71*	*71*	*71*	*68*
Classroom resources	1.11 (0.9, 1.4)	0.32 (-0.2, 0.8)	1.18 (-1.3, 3.6)	1.01 (0.8, 1.2)	0.23 (-2.3, 2.7)	0.36 (-0.5, 1.2)
n	*100*	*68*	*68*	*68*	*68*	*64*
Administrator support	1.04 (0.9, 1.1)	0.16 (-0.1, -0.4)	1.25* (-0.06, 2.6)	0.95 (0.8, 1.1)	-0.07 (-1.4, 1.2)	0.23 (-0.2, 0.7)
n	*97*	*68*	*68*	*68*	*68*	*65*
Supportive organizational climate	1.21* (1.0, 1.5)	-0.50** (-1.0, -0.03)	-1.55 (-4.1, 1.0)	1.02 (0.8, 1.2)	-1.33 (-3.8, 1.2)	0.05 (-0.8, 0.9)
n	*92*	*61*	*61*	*61*	*61*	*57*
Priority for non-academic courses	1.13 (1.0, 1.3)	-0.27 (-0.6, 0.06)	-0.66 (-2.4, 1.0)	0.91* (0.8, 1.0)	-1.72** (-3.3, -0.1)	-0.20 (-.08, 0.4)
n	*98*	*67*	*67*	*67*	*67*	*63*
Priority for work safety courses	1.05 (0.9, 1.2)	-0.23 (-0.3, 0.3)	0.54 (-0.9, 2.0)	0.92* (0.8, 1.0)	-0.87 (-2.3, 0.5)	0.01 (-0.5, 0.5)

p values: ***p<0.01, **p<0.05, *p<0.10
[a]Among those who adopted the curriculum.
[b]Among only those who reported their school has used some alternative method for teaching students about work safety.
^Prevalence Ratio
+Ordinary Least Squares

lessons delivered. Teaching methods fit was positively associated with the number of activities used. Among the organizational-level factors, supportive organizational climate was negatively associated with the number of lessons delivered.

Factors Associated with Sustainability
Among the individual-level factors, teachers' acceptance and teaching methods fit were each positively associated with sustainability as measured by the sustainability score. For the organizational-level factors, priority for non-academic courses was negatively associated with sustainability as measured by the sustainability score.

Factors Associated with Fidelity
Teacher's enthusiasm was positively associated with fidelity.

Conclusions
School and teacher characteristics were generally shown to have limited influence on the outcomes of interest. The key finding in this study is that individual-level factors appear to have the greatest influence on teacher adoption, and to a lesser extent on usage levels, sustainability, and fidelity to the Youth@Work:Talking Safety curriculum and should be considered in future attempts to institutionalize and promote this curriculum in high schools. Due to the small sample size, our ability to generalize these findings to a larger population of teachers is limited; therefore, the findings should be interpreted with caution. The modest evidence found suggests that further study, with a larger sample size, is warranted. With adequate power, a larger study could investigate these associations and utilize a multi-level approach to better investigate how the individual- and organizational-level factors affect the outcomes of interest.

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Factors Affecting Teachers Adoption of Youth at Work Talking Safety Curriculum

Total Enrollment: 104   **Protocol Number:**

Grant Number: 5-R03-OH009736-02

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race				
Ethnic Category	**Females**	**Males**	**Sex/Gender Unknown or Not Reported**	**Total**
Hispanic or Latino				**
Not Hispanic or Latino				
Unknown (individuals not reporting ethnicity)	73	31		104
Ethnic Category: Total of All Subjects*	73	31		104 *
Racial Categories				
American Indian/Alaska Native				
Asian				
Native Hawaiian or Other Pacific Islander				
Black or African American				
White				
More Than One Race				
Unknown or Not Reported	73	31		104
Racial Categories: Total of All Subjects*	73	31		104 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)				
Racial Categories	**Females**	**Males**	**Sex/Gender Unknown or Not Reported**	**Total**
American Indian or Alaska Native				
Asian				
Native Hawaiian or Other Pacific Islander				
Black or African American				
White				
More Than One Race				
Unknown or Not Reported	73	31		104
Racial Categories: Total of Hispanics or Latinos*	73	31		104 **

* These totals must agree.
** These totals must agree.

Publications

In preparation: Rauscher, KJ, Casteel, C, and Bush, D. Factors Affecting Teacher Adoption Sustainability and Fidelity to the Youth@Work: Talking Safety Curriculum. To be submitted to the *American Journal of Industrial Medicine.*

The findings of this study were presented at the Annual Meeting of the American Public Health Association, November 2014, New Orleans, LA.

Inclusion of Children

No children were included in this study. This study has implications for children's safety at work as the results can inform attempts to integrate OSH education into high school settings, which will allow teachers the opportunity to educate high school aged students about workplace safety. Ultimately, it is hoped that by having this education youth can be better protected from injury at work.

Materials

No data or research materials are available for sharing with other investigators.

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TANGIBLE PERSONAL PROPERTY REPORT
Final Report SF-428- B

Federal Grant or Other Identifying Number Assigned by Federal Agency (Block 2 on SF-428).

`5 R03 OH009736`

`K. Rauscher, PI`

1. Report (Select all that apply)

a. ___ Federally-owned Property   (List on Supplemental Sheet SF-428S or recipient equivalent and complete Section 2a below.)

b. ___ Acquired Equipment with acquisition cost of $5,000 or more for which the awarding agency has reserved the right to transfer title (List on Supplemental Sheet SF-428S or recipient equivalent and complete Section 2b below.)

c. ___ Residual Unused Supplies with total aggregate fair market value exceeding $5,000 not needed for any other Federally sponsored programs or projects. *(Complete Section 2c below)*

d. ___ None of the above

2. Complete relevant section(s)	For Agency Use Only
2a. Federally-owned Property *(Select one or more.)* (i) ___ Request transfer to Award _____ (ii) ___ Request Federal Agency disposition instructions (iii) ___ Other *(Provide detail in Block 3 or attach request)*	Agency response to requested disposition of Federally owned property: (i) Recipient request approved ___ denied ___ (ii) Dispose in accordance with attached instructions ___
2b. Acquired Equipment *(Select one or more.)* (i) ___ Request unconditional transfer of title with no further obligation to the Federal Government. (ii) ___ Request Federal Agency disposition instructions Note: If the awarding agency does not provide disposition instructions within 120 days the recipient may continue to use the equipment for Federally supported projects or dispose in accordance with the applicable property standards.	Agency response to requested disposition of acquired equipment: (i) Recipient request approved ___ denied ___ (ii) Dispose in accordance with attached instructions. ___ Authorized Awarding Agency Official Signature: | Date: Name: | Phone: Title: | Email:

2c. Reportable Residual Unused Supplies

(i) ___ Sale proceeds or ___ Estimate of current fair market value .... $_____

(ii) Percentage of Federal participation .... _____%

(iii) Federal share .... $_____

(iv) Selling and handling allowance .... $_____

(v) **Amount remitted to the Federal Government**................................... $_____

3. Comments

`NULL`

FINAL REPORT ATTACHMENT TO SF-428

Agency use only

Department of Health and Human Services
Final Invention Statement and Certification
(For Grant or Award)

DHHS Grant or Award No.

5 R03 OH009736

A. We hereby certify that, to the best of our knowledge and belief, all inventions are listed below which were conceived and/or first actually reduced to practice during the course of work under the above-referenced DHHS grant or award for the period
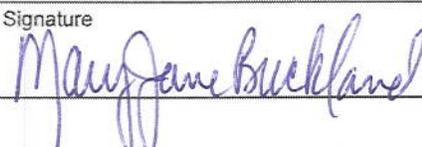
through

_____   _____
original effective date   *date of termination*

B. Inventions (Note: If no inventions have been made under the grant or award, insert the word *"NONE"* under Title below.)

NAME OF INVENTOR	TITLE OF INVENTION	DATE REPORTED TO DHHS
NULL		

(Use continuation sheet if necessary)

C. Signature — This block *must* be signed by an official authorized to sign on behalf of the institution.

Title	Name and Mailing Address of Institution
Assistant Secretary	West Virginia University Research Corporation
Typed Name	886 Chestnut Ridge Road
Mary Jane Buckland	P.O. Box 6845
	Morgantown, WV 26506-6845

Signature: *Mary Jane Buckland*   Date: 11/17/14

HHS 568 (Rev. 08/12)

November 28, 2014

Mary Pat Shanahan
Grants Management Specialist
Centers for Disease Control and Prevention
Procurement and Grants Office
OD, Environmental, Occupational Health and Injury
Prevention Services Branch/Team 2
P.O. Box 18070
626 Cochrans Mill Road
Pittsburgh, PA 15236-0070

RE: Close out Documents for Grant #5-R03-OH009736-02

Dear Ms. Shanahan:

Enclosed please find the Final Progress Report, Tangible Personal Property form, and the Final Invention Statement relative to the above referenced grant. The Federal Financial Report has been submitted by our business office via eraCommons.

If you have any questions, please do not hesitate to contact me at 304-293-0254.

Sincerely,

Kimberly Rauscher, MA, ScD
(Principal Investigator)
Assistant Professor
Department of Occupational and Environmental Health Sciences
West Virginia University