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Factors Affecting High School Teacher Adoption, Sustainability, and Fidelity to the "Youth@Work: Talking Safety" Curriculum

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Background *Our objective was to identify individual- and organizational-level factors that affect high school teacher adoption, sustainability, and fidelity to the occupational safety and health curriculum, "Youth@Work: Talking Safety."*

Methods *We analyzed survey data collected from 104 high school teachers across the US who were trained in the curriculum since 2004. Linear and Cox regression were used to examine bivariate associations between individual and organizational-level factors and the outcomes of interest.*

Results *Except for perceived complexity, all individual-level factors (acceptance, enthusiasm, teaching methods fit, and self-efficacy) were associated with one or more outcomes of interest (P-values ranged from <0.001 to 0.031). Priority for non-academic courses ($P = 0.035$) and supportive organizational climate ($P = 0.037$) were the organizational-level factors associated with sustainability and number of lessons delivered, respectively.*

Conclusions *Consistent with the literature, individual-level factors influenced teacher adoption and, to a lesser extent, sustainability, and fidelity to the Youth@Work: Talking Safety curriculum and should be considered in attempts to promote the curriculum's use in high schools.* Am. J. Ind. Med. 58:1288–1299, 2015. © 2015 Wiley Periodicals, Inc.

KEY WORDS: young workers; health and safety; curriculum; injury prevention; adoption; sustainability

INTRODUCTION

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 [National Institute for Occupational Safety and Health, 2003; National Institute for Occupational Safety and Health, 2006]. Improving access to workplace health and safety training is one way to help reduce these injuries [Colligan and Cohen, 2004; Burke et al., 2006]. However, studies consistently show that many young workers do not receive such training from their employers [National Institute of Medicine, 1998; Runyan and Zakocs, 2000; Delp et al., 2002; Zierold and Anderson, 2006; Runyan et al., 2007]. Recognizing this gap, and understanding that

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providing health and safety information to high school students will also provide a sustainable skill for youth, scholars from the National Institute for Occupational Safety and Health (NIOSH) have called for increased efforts at integrating occupational safety and health information into general high school curricula and vocational education programs [Schulte et al., 2003, 2005]. Doing so has been a cornerstone of NIOSH's recent "Safe, Skilled and Ready" initiative [National Institute for Occupational Safety and Health, 2015]

While the learning environment of the high school classroom presents an ideal setting in which to engage young people about workplace safety, and efforts to incorporate occupational safety and health topics into traditional and vocational high school curricula are ongoing [Linker et al., 2005; Young Worker Safety Resource Center, 2007; Bush and Andrews, 2013], there has been limited research on the success or sustainability of these efforts [Nester 1999; Schulte et al., 2005]. With ever increasing and often conflicting demands being placed on high school teachers [Greenberg 2004], the viability of their implementing an occupational health and safety curriculum into their classrooms in a sustainable way remains a question. The objective of the current study was to identify factors that affect high school teachers' adoption, sustainability, and fidelity to a NIOSH-sponsored curriculum called "Youth@Work: Talking Safety." This study will help increase the effectiveness of efforts aimed at integrating occupational safety and health curricula into high schools.

METHODS

The Youth@Work: Talking Safety Curriculum

The NIOSH-sponsored, evidence-based curriculum "Youth@Work: Talking Safety" (Talking Safety) was designed to provide youth with fundamental workplace safety and health skills and knowledge, using participatory, skill-building activities. The curriculum, which is customized for each state, includes six lessons with twenty-six activities and can be covered in 4–6 hr. The curriculum is free to the public and available online (http://www.cdc.gov/niosh/talkingsafety/). Talking Safety was evaluated in sixteen schools in ten states. Evaluations show students receiving the curriculum had measurable knowledge gains and behavior change compared to control groups [Bush et al., 2002; Stephenson 2005]. Specifically, Talking Safety has been shown to be effective in increasing knowledge of the child labor laws, health and safety concepts, worker rights, and students' ability to apply occupational safety and health information [Bush et al., 2002].

Data Collection

Data were collected via telephone survey with a sample of high school teachers from across the US who were trained in the Talking Safety curriculum between 2004 and 2012 by staff from the Young Worker Safety Resource Center (staffed by a partnership between the University of California Berkeley's Labor Occupational Health Program (LOHP) and the Education Development Center (EDC) in Newton, MA). Training workshops were offered at school sites and at education conferences and ranged from 2 to 5 hr in length, depending on the venue. All workshops included an overview of why health and safety training is important for teens, an overview of all the curriculum activities, and hands-on practice with two or more of the activities from the curriculum.

Consent procedures

Verbal consent was collected prior to conducting the survey and after interviewers read an informed consent script that described the purpose of the study, what participation entailed, the risks and benefits to participation, that they would receive a $15 gift card for their time, that participation was voluntary, and they could stop the survey at any time. Because we conducted the interviews over the phone and the study posed no more than minimal risk to participants, written consent was waived. All study protocols were reviewed and approved by the Institutional Review Boards of both West Virginia University and the University of North Carolina at Chapel Hill.

A database of trainees and their contact information, maintained by LOHP, was used to identify and recruit subjects into the study. We removed all trainees who had an administrative title (e.g., administrator, principal) listed in the database. This left 777 trainees in the contact database. Of these 777, we made contact with 331 (many had retired or their contact information was no longer current). Among the 331 trainees we spoke to, 230 met the eligibility criteria which included: 1) having taught high school students at any point since being trained in the Talking Safety curriculum–this included those whose formal job title may not have been "teacher" (e.g., program coordinator) but who had teaching responsibilities such as teaching a job-readiness class, for example; and 2) remembering being trained in the Talking Safety curriculum. We excluded those with no memory of the training because they would not be able to answer questions about the curriculum that would be asked of all subjects, regardless of curriculum use. Of the 230 eligible teachers, 104 participated in the study for a response rate of 45%.

Survey development

Our survey instrument included questions about teacher and school characteristics, the individual-level and

organizational-level factors known to affect teacher adoption, sustainability, and fidelity to school-based health curricula, and measures of these three outcomes (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. Minor changes were made to the instrument prior to full survey administration.

Variables and Measures

Outcomes

Adoption and usage levels. Using the Centers for Disease Control and Prevention definition of adoption, which is "the uptake of the desired intervention into the target population or uptake by the implementers" (Centers for Disease Control and Prevention 2007), we measured adoption as whether teachers had ever used the Talking Safety curriculum 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.

Sustainability. Among those who adopted the curriculum, we used two measures of sustainability. The first was whether or not the teachers taught the Talking Safety curriculum 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. 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), or all of the time (score value=3). Those who taught the curriculum only once and therefore only taught the lessons once, were given a score of zero, indicating no sustainability. For those who taught the curriculum more than once, we summed the frequency with which each of the six lessons were taught across all the times the teacher taught the curriculum. For example, teachers who taught all six lessons every time they taught the curriculum received a score of eighteen (6 lessons taught x 3 points for teaching each lesson "all of the time"). The range for the sustainability scale is 0 to 18.

Fidelity. Among those who adopted the curriculum, we measured fidelity to its 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 total lessons where the activities were delivered as designed. The scale range is 0 to 6, with zero indicating none of the lessons were taught as designed and six indicating all of the lessons were taught as designed.

Independent variables

Factors associated with adoption, sustainability, and fidelity. Independent variables were selected using concepts of Rogers' Diffusion of Innovations theory, which posits that an individual's decision to adopt an innovation is contingent upon attributes of the innovation itself (e.g., its complexity) [Rogers, 2003]. We also used evidence from prior studies that have identified individual- and organizational-level factors that influence adoption, sustainability, and fidelity to health related programs/curricula among high school teachers. Table I displays these factors along with their related Diffusion of Innovation concepts (when applicable).

The majority of factors examined in this study were measured using validated scales constructed by Rohrbach et al. [1993] and Steckler et al. [1992]. Where necessary, items in these scales were slightly reworded to properly reflect elements of the Talking Safety curriculum. Where a measure or scale was not available, we constructed one. Except where noted below, all scales captured teachers' perspectives after they completed the training session in the Talking Safety curriculum, and all were measured using a scale of 1 to 4 where 1 represented the lowest rating (e.g., *not at all* comfortable with the teaching methods required) and 4 represented the highest rating (e.g., *very* comfortable with the teaching methods required). Below we describe the scales used to measure each factor and provide their respective Chronbach's α coefficients in parentheses.

Individual-level Factors

Teacher's *Acceptance* ($\alpha = 0.54$) was measured using Rohrbach's "Program Acceptance" scale [Rohrbach et al., 1993] which consists of three items capturing the level of teachers' anticipated enjoyment in teaching the curriculum, their comfort with the activities of the curriculum, and their comfort with the teaching methods it requires. Teacher's *Enthusiasm* ($\alpha = 0.83$) was measured using Rohrbach's "Enthusiasm for Implementation" scale [Rohrbach et al., 1993] which consists of two items that captured how much teachers looked forward to teaching the curriculum and how much enthusiasm they had for teaching it.

Teacher's *Perceived Complexity* ($\alpha = 0.69$) was measured using Steckler's "Complexity" scale [Steckler et al.,

TABLE I. Literature Describing the Individual- and Organizational-level Factors Associated With High School Teacher Adoption, Sustainability, and Fidelity to Health-Related Curricula and Educational Programs

	Adoption	Sustainability	Fidelity
Individual-level Factors (*Rogers Diffusion of Innovations concepts are in parentheses*).			
Acceptance or favorable attitudes about the curriculum	Han and Weiss (2005), Parcel et al. (1995), Rohrbach et al. (1993)	Han and Weiss (2005)	Beets et al. (2008), Han and Weiss (2005), Rohrbach et al. (1993)
Enthusiasm toward or interest in the curriculum	Nester (1999, Rohrbach et al. (1993)		
Perceived complexity of the curriculum (complexity)	Rogers (2003, Thaker et al. (2008)		(Bauman et al. 1991)
Perceived benefit of the curriculum (relative advantage)	Nester (1999, Parcel et al. (1995) Rogers, (2003), Thaker et al. (2008)		
Self-efficacy/confidence in one's ability to teach the material	Han and Weiss (2005), Paulussen et al. (1994, Rohrbach et al. (1993)	Han and Weiss (2005)	Rohrbach et al. (1993)
Perceived fit between one's normal teaching methods and those required by the curriculum (compatibility)	Ennett et al. (2003), Rohrbach et al. (1993), Rogers (2003)		McCormick et al. (1995), Rohrbach et al. (1993), Taggart et al. (1990)
Organizational-level Factors			
Physical resources available to teach the curriculum (e.g., classroom space and equipment)	Smith et al. (1993), Thaker et al. (2008)	Smith et al. (1993)	Fagan and Mihalic (2003)
Administrator encouragement	Greenberg (2004), Han and Weiss (2005), Rohrbach et al. (1993), Smith et al. (1993), Thaker et al. (2008)	Rohrbach et al. (1993)	
Supportive organizational climate (teachers perceived support from school administrators)	McCormick et al. (1995), Nester (1999)		
Priority for non-academic courses	Thaker et al. (2008)		

1992] which consists of three items that capture teacher agreement on a scale of 1 to 4 (1 = strongly disagree to 4 = strongly agree) with a series of statements about: (1) how difficult they felt it would be to teach the curriculum, (2) how complex they thought the curriculum was in terms of the teaching methods it required, and 3) whether they had difficulty understanding the curriculum. *Perceived Benefit* ($\alpha = 0.84$) was measured using Steckler's "Relative Advantage" scale [Steckler et al., 1992] which consists of three items that captured teacher agreement on a scale of 1 to 4 (1 = strongly disagree to 4 = strongly agree) with statements about whether the Talking Safety curriculum was a better alternative than other approaches taken by their schools to teach students about workplace health and safety. Only those who said their school had used an alternative method were included when constructing this scale.

Teacher *Self-efficacy* ($\alpha = 0.80$) was measured using Rohrbach's "Implementation Self-Efficacy" scale [Rohrbach et al., 1993] which consists of six items capturing the level of teacher confidence and comfort with teaching the curriculum, leading the activities, and controlling the classroom and lesson flow while teaching the curriculum. *Teaching Methods Fit* ($\alpha = 0.76$) was measured using Rohrbach's "Compatibility of Teaching Methods" scale [Rohrbach et al., 1993] which consists of six items that capture how much the teachers normally use the types of 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.

Organizational-level factors

Physical resources were measured with two scales that we developed. The first, *Classroom Resources* ($\alpha = 0.90$), was constructed from two items that captured teacher agreement on a scale of 1 to 4 (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* ($\alpha = 0.89$), 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 Encouragement ($\alpha = 0.77$) was measured using Rohrbach's "Principal Encouragement" scale [Rohrbach

et al., 1993] which captured the level 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 ($\alpha = 0.90$) was based on Steckler's Organizational Climate scale which measures teachers' perceived support from school administrators [Steckler et al., 1992]. The original scale included 27-items, making it too long for our survey. Therefore, we selected 5 items from the scale which we felt best represented "support" and which had factor loadings of at least 0.70 in the original scale. Examples of items included the extent to which teachers felt they were included in decision making at their school; the extent to which upper-level administrators expressed an interest in the well-being and happiness of those who work at the school; and the extent to which administrators discussed teachers' career aspirations with them. All items were measured using a scale of 1 to 4 where 1 represented the lowest rating of support a teacher could give and 4 the highest; for example 1 = not at all included in decision making to 4 = always included in decision making. To ensure internal consistency of the new scale, we tested it with our present sample and achieved a Chronbach alpha of 0.90.

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 asked specifically about the priority given to workplace health and safety courses since this is the focus of the curriculum. *Priority for Work Safety Courses* 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 your school?" Both of these factors were measured using a scale of 1 = not at all a priority to 4 = very much a priority.

Other variables of interest

In addition to examining the factors above, we also investigated whether various school and teacher characteristics influenced teacher adoption, sustainability and fidelity.

School characteristics. Data on the characteristics of each teacher's school were drawn from the National Center for Education Statistics Common Core of Data (CCD) (http://nces.ed.gov/ccd/districtsearch/). The characteristics examined in this study and their CCD classifications are as follows: school type ("traditional," "special education," "vocational," and "other/alternative"); school size measured by student enrollment (<500, 500–1500, and >1500), pupil-teacher ratio, which we dichotomized at the mean (19:1), and school location ("rural," "suburban," and "urban").

No evidence exists that demonstrates adoption, sustainability and fidelity to a workplace health and safety curriculum would vary by school characteristics. However, we thought it important to explore the impact these characteristics might have on the outcomes of interest. We expected school type to be differentially associated with the outcomes investigated in this study given the different curriculum emphases in each type of school—academic college preparation for the majority of students in traditional high schools, trade skills in vocational/technical schools, and life skills in special education schools. The likelihood of teachers adopting a workplace health and safety curriculum can reasonably be expected to differ when comparing school types. School size, location, and pupil-teacher ratio are viewed as proxies for school resources, which we also expect would impact the likelihood of teachers using a curriculum that is outside the Common Core.

Teacher characteristics. Teacher characteristics included the following: job title (open ended responses were coded into: Community Technical Education Instructor; Transition/Special Education Coordinator or Instructor; Work Study/Community Technical Education Internship Coordinator; Academic Instructor [e.g., Math, English]; and Other); grade(s) taught (open ended responses were coded into: 9th grade only, 12th grade only, multiple grades); years of teaching experience (open ended responses were coded into: <10 years, 10–20 years, and >20 years), highest level of education achieved (response options included: Associate's degree; some 4-year college; Bachelor's degree; some grad school; Master's degree, Doctoral degree), whether they ever had a work injury in their lifetimes (yes/no); and gender.

Statistical Analysis

Univariate statistics were used to describe the school and teacher characteristics of the sample. Bivariate analyses were conducted to examine the frequency and mean scores of adoption, sustainability, and fidelity by school and teacher characteristics. Chi-square tests of significance (for proportions) and ANOVA and *t*-tests (for means) were used to examine associations. For these analyses, several variables were collapsed into fewer categories due to small cell sizes. For school type, we collapsed the original categories into either traditional or non-traditional (i.e., special education, vocational, and other/alternative). For teacher education, we collapsed the original categories into Bachelor's degree or less (i.e., Associate's degree, some 4-year college, Bachelor's degree) and some graduate school or more (i.e., some graduate school, Master's degree, Doctoral degree).

For ease of data presentation, Linear regression was used to examine bivariate associations between each of the individual-level and organizational-level factors and the continuous outcomes of interest (i.e., mean number of

lessons delivered, mean number of activities used, 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 (i.e., adopting the curriculum, teaching the curriculum multiple times), Cox regression was used to calculate prevalence ratios, in a manner described by Barros and Hirakata [2003]. This approach was used to account for the high prevalence of the two outcomes.

RESULTS

Sample Characteristics

The school and teacher characteristics of the study population are shown in Table II. The schools in which teachers worked were mostly traditional high schools (73%) and schools with enrollment of at least 500 students (75%). More than half (57%) of the schools had a student-teacher ratio below the mean of 19:1. Schools were about evenly distributed between rural, suburban, and urban locations.

Although the majority of teachers worked in traditional high schools, most (89.4%) worked as career/vocational or transition/special education teachers or coordinators who also have teaching responsibilities. Over 90% taught multiple grades. Just over half of the teachers had 10–20 years of teaching experience and more than half (55%) had a Master's degree. The majority of teachers were women (70%) and half of all teachers had experienced a work injury in their lifetimes.

Overall Adoption, Usage Levels, Sustainability, and Fidelity

Approximately two-thirds (69%) of teachers adopted the Talking Safety curriculum. Among those who did not adopt the curriculum, the two most common reasons for not doing so were time constraints (27%) and that they were already using other educational materials to teach their students about workplace health and safety (10%). The mean number of lessons teachers delivered was 5.1 (SD = 1.3) (possible range 1 to 6), and the mean number of activities they used was 14.9 (SD = 6.6) (possible range 1–26). Among those who did not teach all 6 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 the first few lessons were sufficient for teaching the topic and that it was hard to hold students' attention for more than a few lessons (15%).

Among those who did teach the curriculum, 81% taught it more than once with a mean sustainability score of 10.1 (SD = 6.6) (possible range 0–18). The mean fidelity score was 2.1 (SD = 2.2) (possible range 0–6). 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

TABLE II. School and Teacher Characteristics

School characteristics	Percent
Type (n = 101)	
Traditional	73.3
Vocational	9.9
Special education	8.9
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 or Instructor	32.7
Work Study/Community Technical Education Internship Coordinator	22.1
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
Ever had a work injury (n = 104)	
Yes	50.0

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 10% said they modified the activities to be more timely and reflect current or local events.

School and Teacher Characteristics Associated With Adoption, Usage Levels, Sustainability, and Fidelity

Table III displays the associations between each school and teacher characteristic and the outcomes of adoption, usage levels, sustainability, and fidelity. With regard to school characteristics, those working in traditional high schools ($P = 0.019$) and those teaching in rural schools ($P = 0.029$) taught more lessons on average than those teaching in non-traditional schools or in either urban or suburban schools, respectively.

In terms of teacher characteristics, those who had never experienced a work injury in their lifetimes were more likely to adopt the curriculum ($P = 0.034$) and to have higher fidelity scores ($P = 0.030$) than those who had experienced a work injury in the past. Teachers with at least some graduate education taught more lessons on average than those who held a bachelor's degree or less ($P = 0.019$), and female teachers had higher fidelity scores compared to their male counterparts ($P = 0.026$).

Individual-level Factors Associated With Adoption, Usage Levels, Sustainability, and Fidelity

Table IV shows the bivariate associations between each of the individual-level factors and the outcomes of adoption, curriculum use, sustainability and fidelity. Teacher's *acceptance* ($P = 0.001$), teacher's *enthusiasm* ($P < 0.001$), and teacher's *self-efficacy* ($P = 0.010$) were all positively associated with curriculum adoption. *Perceived complexity* was negatively associated with adoption ($P = 0.009$) and with the number of lessons delivered ($P = 0.009$). *Teaching methods fit* was positively associated with the number of activities used ($P = 0.012$). Teacher's *acceptance* ($P = 0.031$) and *teaching methods fit* ($P = 0.011$) were each positively associated with sustainability. Teacher's *enthusiasm* was positively associated with fidelity ($P = 0.012$).

Organizational-level Factors Associated With Adoption, Usage Levels, Sustainability, and Fidelity

Table V shows the bivariate associations between each of the organizational-level factors and the outcomes of adoption, curriculum use, sustainability and fidelity. *Supportive organizational climate* was negatively associated with the mean number of lessons delivered ($P = 0.037$) and *priority for non-academic courses* was negatively associated with sustainability ($P = 0.035$).

DISCUSSION

This study aimed to identify individual- and organizational-level factors associated with adoption, fidelity, and sustained use of the Youth@Work: Talking Safety curriculum by high school teachers from across the US. The findings suggest that individual-level factors, including teacher acceptance of and enthusiasm for the curriculum, their understanding of the curriculum, and their feelings of self-efficacy in being able to deliver the curriculum all play a role in whether and how much teachers use the curriculum. These results are consistent with the literature on the influence of individual-level factors on teacher adoption [Rohrbach et al., 1993; Paulussen et al., 1994; Parcel et al., 1995; Nester 1999; Ennett et al., 2003; Rogers, 2003; Han and Weiss, 2005; Thaker et al., 2008] and sustained use (Han and Weiss, 2005) of health-based curricula.

With regard to the organizational-level factors, we expected to see a positive association between curriculum adoption and each of the factors analyzed, based on the literature [Rohrbach et al., 1993; Smith et al., 1993; McCormick et al., 1995; Nester 1999; Greenberg, 2004; Han and Weiss, 2005; Thaker et al., 2008]. While all of our results were in the expected direction, none of the findings achieved statistical significance. Sustainability and fidelity were also expected to be positively associated with physical resources (i.e., equipment and classroom resources) (Smith et al., 1993; Fagan and Mihalic, 2003). Again, the results were in the expected direction yet not statistically significant.

We suspect that had our sample size been larger, these effects may have achieved statistical significance. In addition, we had several different types of schools in our sample (e.g. special education, traditional, vocational). This extra variance in the kinds of schools may weaken associations, unlike in other studies that may have had more uniformity among the schools in their samples.

Our analyses of supportive organizational climate and priority for non-academic courses and their relationships to outcomes other than adoption was exploratory. There is no evidence in the literature we reviewed that suggested these factors would be associated with any outcomes other than adoption (see Table I). However, we investigated whether either of these factors impacted curriculum usage levels, sustainability or fidelity, hypothesizing they both would be positively associated with each of these outcomes. We found only two significant associations and they were both in the opposite direction from that expected.

TABLE III. High School Teacher Adoption, Usage Levels, Sustainability, and Fidelity to the Youth@Work:Talking Safety Curriculum, by School and Teacher Characteristics

		Mean usage levels[a]		Sustainability[a]		
	% Adopted	Lessons delivered[b]	Activities used[c]	% Taught it multiple times	Sustainability score[d]	Fidelity (mean score[e])
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
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.

TABLE IV. Bivariate Regression Associations Between Individual-Level Factors and Measures of Adoption, Usage Levels, Sustainability, and Fidelity to the Youth@Work:Talking Safety Curriculum among High School Teachers

		Mean Usage Levels[a] Coef[d] (95% CI)		Sustainability[a]		
Individual-level factors	**Adoption PR[c] (95%CI)**	**Lessons delivered**	**Activities used**	**Taught it multiple times PR[c] (95%CI)**	**Sustainability score Coef[d] (95%CI)**	**Fidelity score[a] Coef[d] (95%CI)**
n	99	70	70	70	70	66
Acceptance	1.7*** (1.2, 2.3)	0.5 (−0.2, 1.2)	3.4+ (−0.3, 7.1)	1.1 (0.8, 1.5)	4.0** (0.4, 7.6)	0.6 (−0.8, 1.9)
n	101	72	72	72	72	68
Enthusiasm	1.8*** (1.4, 2.3)	0.4 (−0.2, 1.0)	2.5 (−0.8, 5.7)	1.1 (0.8, 1.5)	2.7+ (−0.5, 6.0)	1.4** (0.3, 2.6)
n	103	72	72	72	72	68
Perceived complexity	0.7*** (0.5, 0.9)	−0.8** (−1.4, −0.2)	−2.9+ (−6.0, 0.2)	1.1 (0.8, 1.3)	−1.1 (−4.2, 2.1)	−0.2 (−1.3, 0.9)
n	45	34	34	34	34	34
Perceived benefit[b]	1.1 (0.8, 1.5)	0.4 (−0.3, 1.0)	3.2+ (−0.3, 6.6)	1.0 (0.7, 1.5)	0.2 (−4.1, 4.4)	0.7 (−0.6, 2.0)
n	99	71	71	71	71	67
Self-efficacy	1.6*** (1.1, 2.4)	−0.03 (−0.9, 0.9)	1.3 (−3.4, 6.0)	1.0 (0.7, 1.3)	1.8 (−2.7, 6.4)	0.4 (−1.9, 1.2)
n	96	67	67	67	67	63
Teaching methods fit	0.8 (0.6, 1.1)	0.3 (−0.3, 0.9)	3.9** (0.9, 7.0)	1.2 (0.9, 1.5)	3.9** (0.9, 7.0)	1.0+ (0.03, 2.1)

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.
[c]Prevalence Ratio.
[d]Linear regression coefficient.

Supportive organizational climate was negatively associated with the mean number of lessons delivered ($P = 0.037$), and *priority for non-academic courses* was negatively associated with sustainability ($P = 0.035$).

There are no clear indications from our survey data, or from our understanding of curriculum adoption processes, as to why these findings were unexpectedly negative. Further research could be designed to gather information directly

TABLE V. Bivariate Regression Associations Between Organizational-Level Factors and Measures of Adoption, Usage Levels, Sustainability, and Fidelity to the Youth@Work:Talking Safety Curriculum among High School Teachers

		Mean usage levels[a] Coef[c] (95% CI)		Sustainability[a]		
Organizational-level factors	**Adoption PR[b] (95%CI)**	**Lessons delivered**	**Activities used**	**Taught it multiple times PR[b] (95%CI)**	**Sustainability score Coef[c] (95%CI)**	**Fidelity score[a] Coef[c] (95%CI)**
n	102	72	72	72	72	68
Equipment resources	1.0 (0.8, 1.3)	0.1 (−0.3, 0.6)	1.3 (−1.1, 3.6)	1.1 (0.9, 1.3)	1.1 (−1.3, 3.4)	0.6 (−0.4, 1.5)
n	100	71	71	71	71	68
Classroom resources	1.1 (0.9, 1.4)	0.3 (−0.2, 0.8)	1.2 (−1.3, 3.6)	1.0 (0.8, 1.2)	0.2 (−2.3, 2.7)	0.4 (−0.5, 1.2)
n	100	68	68	68	68	64
Administrator encouragement	1.0 (0.9, 1.1)	0.2 (−0.1, −0.4)	1.3+ (−0.1, 2.6)	1.0 (0.8, 1.1)	−0.1 (−1.4, 1.2)	0.2 (−0.2, 0.7)
n	97	68	68	68	68	65
Supportive organizational climate	1.2+ (1.0, 1.5)	−0.5** (−1.0, 0.03)	−1.6 (−4.1, 1.0)	1.0 (0.8, 1.2)	−1.3 (−3.8, 1.2)	0.1 (−0.8, 0.9)
n	92	61	61	61	61	57
Priority for non-academic courses	1.1 (1.0, 1.3)	−0.3 (−0.6, 0.1)	−0.7 (−2.4, 1.0)	0.9+ (0.8, 1.0)	−1.7** (−3.3, −0.1)	−0.2 (−.08, 0.4)
n	98	67	67	67	67	63
Priority for work safety courses	1.1 (0.9, 1.2)	0.0 (−0.3, 0.3)	0.5 (−0.9, 2.0)	0.9+ (0.8, 1.0)	−0.9 (−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]Prevalence Ratio.
[c]Linear regression coefficient.

from teachers about the perceived role of organizational climate on their use of the curriculum.

Our analyses of teacher characteristics yielded one particularly interesting finding that warrants mention given the topic of the curriculum under study. Teachers who had a prior work injury in their lifetimes were less likely to adopt the Talking Safety curriculum and to use the activities with fidelity. This is counter to what we expected. We hypothesized that teachers who had been injured at work would be more likely to educate their students on workplace safety so they do not suffer the same experiences. However, it is possible that some teachers who have been injured at work may view such injuries as normal or something that cannot be prevented so they were not willing to spend class time covering a topic they feel is of little use to their students. Not using the curriculum activities as designed may have to do with the work injured teacher thinking they know better from their own experience and therefore they chose to modify the materials in a way they felt better communicated the lessons of work safety. We did not collect detailed information about work injury experiences or attitudes related to work injury. Therefore, our interpretations are speculative.

Based on the totality of our results, we suggest that the successful integration of the Talking Safety curriculum into high school classrooms will require future 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 they feel capable of teaching the curriculum, and (4) help teachers understand the curriculum to ensure they do not feel it is too complex for them to use. Although the design of our training workshops already take most of these issues into consideration, it is clear that strengthening the approach in these areas is likely to be beneficial.

In addition, efforts may include developing marketing strategies that highlight positive teacher and student experience with the curriculum to help generate acceptance and enthusiasm for using it, as measures of teacher support for the curriculum showed the strongest effects on adoption, sustainability and fidelity. 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 are less likely. If teachers are not as comfortable with the teaching methods, such as role playing, games, and other participatory group activities, it will be important to provide skill-based training workshops for teachers where they can practice the activities to strengthen their feelings of competence and self-efficacy in teaching the curriculum (Rohrbach et al., 1993; Paulussen et al., 1994; Han and Weiss, 2005).

This study also explored the barriers faced by teachers in using the curriculum. We found that not having enough time was reported most often as a major barrier to delivering the curriculum. It also hampered teachers' ability to cover all of the lessons in the curriculum and led them to shorten some of the activities. These findings are consistent with other studies that report time constraints as a key barrier to integrating health and safety education into the high school classroom [Linker et al., 2005; Pisaniello et al., 2013]. Clear guidelines on how to streamline the curriculum activities to provide key content effectively in a shorter timeframe may increase adoption and sustained use of the curriculum.

Strengths and Limitations

Many of the trainees in our contact database were not reachable as they had retired or had out of date contact information, raising the possibility of a non-representative sample. However, many of the unreachable individuals (an estimated 30%) may not have met the eligibility criteria despite being listed as trainees in the LOHP database. Personal characteristics of teachers were not available for those who did not respond to our attempts to survey them and examination of potential differences in responders and non-responders by these characteristics was not possible. Since the schools of the non-responders were identifiable, chi-square analyses were performed to check for response bias with regard to school characteristics (size, type, location, and student/teacher ratio) and the time period during which they were trained in the curriculum. Proportions of all school features and time trained were statistically equal among responders and non-responders; therefore the schools in the sample appear to be representative with regard to these features. However, the modest response rate and the lack of information on the personal characteristics of the teachers who did not respond constrain our ability to generalize the findings.

Another limitation is the potential for recall bias. The individual- and organizational-level factors were measured by asking teachers about the opinions and feelings they held either in the period just after they were trained in the curriculum or when they last taught the curriculum. Just over 43% of surveyed teachers were trained in the curriculum between 2009 and 2012. Recall bias may be less of an issue for the variables measured at the time teachers last taught the curriculum as 47% of those who taught it last did so in 2012 and 25% last taught it in 2011.

One of the major strengths of this study is that it used strong measures of the factors being investigated. These included widely used, validated scales as well as several newly constructed scales with moderate to high Chronbach alpha coefficients. Additionally, this is the first study of its kind to investigate factors that affect high school teacher adoption, sustainability and fidelity to a workplace health and safety curriculum for young workers and provides a foundation on which to expand research in this area.

CONCLUSIONS

While the moderately low response rate of the study participants does limit our ability to generalize our findings, the positive results are consistent with the literature on the influence of individual-level factors in affecting high school teacher adoption, sustainability and fidelity to health-based curricula. We suggest that practitioners who wish to increase the use of the Youth@Work: Talking Safety curriculum by high school teachers should focus on addressing teacher attitudes about the curriculum and their perceived ability to understand and deliver the curriculum.

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