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School-Based E-Cigarette Education Curriculum, "TEAM No Vaping": Impact on Knowledge of E-Cigarettes, Harm Perception, and Media Literacy Among Middle/High School Students

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Master of Public Health Capstone Project Report

School-based e-cigarette education curriculum, "TEAM No Vaping": Impact on knowledge of e-cigarettes, harm perception, and media literacy among middle/high school students.

by

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Abstract

E-cigarettes are the most used tobacco products among middle/high school students. Youth e-cigarette use is at an epidemic level. While school-based vaping prevention programs exist, there is limited evidence on the effectiveness of such programs. To address vaping prevention among this vulnerable population, University of Nebraska Medical Center (UNMC) in collaboration with the Tobacco Education & Advocacy of the Midlands (TEAM) developed and implemented a school-based e-cigarette education curriculum, "TEAM No Vaping." This study evaluated the impact of the "TEAM No Vaping" program on increasing the knowledge, harm perception, and susceptibility to e-cigarettes, and vaping media literacy for vaping prevention among middle and high school students. A pre- and post-test survey design was used to examine differences in students' a) knowledge of e-cigarettes, b) harm perception of e-cigarettes, c) susceptibility to e-cigarettes use, and d) vaping media literacy. Ten schools from Nebraska and Iowa participated in the study, with 590 middle- and high-school students completing surveys before and after the program. The curriculum was found to be associated with increase in Tobacco21 (T21) knowledge ($p<0.001$), increase in harm perception of e-cigarettes use ($p=0.001$) and increase in vaping media literacy ($p<0.001$). There was significant change in only one of three knowledge-based items (Most candy and fruit flavored e-cigarettes contain nicotine) ($p<0.001$). The study found no significant change in the susceptibility to e-cigarettes use ($p=0.36$) before and after participation in the program. TEAM No Vaping has a potential to be a useful educational tool in the prevention of youth e-cigarettes use. Future research is needed to determine its long-term impact in curbing youth vaping behavior.

Chapter 1 – Introduction

The purpose of this project was to evaluate the impact of a school-based vaping prevention curriculum developed at the University of Nebraska Medical Center (UNMC) and delivered to middle and high school students in the Midwest United States. We used pre- and post-test surveys to examine the differences in students' a) knowledge of e-cigarettes, b) harm perception of e-cigarettes, c) susceptibility to e-cigarettes use, and d) vaping media literacy. The analysis provides easily interpretable impact of curriculum on youth e-cigarette use and prevention.

We hypothesized that this curriculum would be associated with a) increase in students' knowledge about e-cigarettes, b) increase in the perceived harmfulness of e-cigarette use, c) decrease in susceptibility to e-cigarettes use, and d) increase in vaping medial literacy.

Chapter 2 – Background and Literature Review

Electronic Nicotine Delivery Systems (ENDS), also called e-cigarettes, vape pens, e-cigars, or e-hookah, among other names, are vaping devices that produce an aerosolized mixture containing flavored liquids and nicotine that is inhaled by the user.[1] While the cigarette smoking rate among youth has been declining over the last several decades, use of e-cigarettes among teens is gaining popularity.[2] E-cigarettes are the most used tobacco products among middle and high school students.[3] In September 2018, the United States Food and Drug Administration (FDA) identified youth e-cigarette use behavior as a health problem at epidemic level.[4] Despite this national attention, in 2019, more than 25% (1 in 4) students in the 12th grade and more than 20% (1 in 5) in the 10th grade reported using e-cigarettes in the past 30 days.[5] The youth vaping epidemic still persists. According to the 2021 National Youth Tobacco Survey, 11% of high school and 10% of middle school students reported current e-cigarette use (used e-cigarette in the last month).[6] Among current e-cigarette users, daily use was 27.6% among high school e-cigarette users and 8.3% among middle school e-cigarette users.[6] Overall, approximately 2.06 million youths were estimated to be current e-cigarette users in 2021.[6]

From a public health perspective there is growing concern about the rise in youth vaping.[7] Youth vaping behavior has several negative impacts. Vape users are exposed to aerosolized mixture containing toxic metal and carcinogenic substances thus putting them at risk of heart and lung diseases.[8] The recent e-cigarette use-associated lung injury (EVALI) epidemic among young people highlights the potential danger of using such products.[9] Vaping at an early age could lead to nicotine addiction and hinder brain development.[10] It can lead to mood disorders, negatively impact attention and learning, and lower impulse control.[11,12] Other effects may include depressed mood, irritability, aggression, frustration, impatience, anxiety, sleep disturbances, abnormal dreams, and dizziness.[11,12] Youth nicotine use is associated with later life behavioral disturbances, including substance abuse and mental health problems.[13,14] Vape products, with their high nicotine content, appealing flavors, low costs, wide availability, and attractive designs targeting youths endanger decades of progress in the fight against adolescent tobacco use.[15]

Factors that impact youth e-cigarette use include availability and marketing. E-cigarettes are sold at several convenient locations such as convenience stores, gas stations, pharmacies and tobacco shops.[16] In a study involving a national sample of tobacco retailors from 2014 to 2015, the proportion of retailors selling e-cigarettes increased from 72% to 79%, whereas price promotion for buyers at these locations increased from 11.9% to 22.2%.[16] Youths are exposed to e-cigarettes advertising through various sources. In 2016, young people saw vaping promotion advertisements at retail stores (68%), the internet (40.6%), movie/video streaming services (26.2%) and newspaper and magazines (23.9%).[17] Media through marking and promotion plays a significant role in shaping youth's tobacco use behavior.[18] The exposure to e-cigarette advertisements on social media was associated with positive expectation of e-cigarette use and lower risk perception.[19.] Therefore, increasing media literacy, defined as the ability to analyze and evaluate vaping related media messages,[20] might help youth avoid e-cigarette use and increase their skill to discern misinformation in media advertisements.[21]

While several studies on prevalence and impact of vaping among adolescents are available, a list of comprehensive programs targeted at reducing vaping behavior among this vulnerable population is limited.[8, 22] School is the ideal setting to implement such programs because a substantial part of adolescents' social life revolves around their peers in school.[23] Currently a few school-based programs such as "CATCH My Breath,"[24] the FDA's "The Real Cost" campaign,[25] and the Stanford Tobacco Prevention Toolkit[26] have been implemented in several schools with mixed success in curbing vaping behavior.[27-29] Most existing school-based programs are designed to teach youth about the dangers of vaping and to encourage them to refrain from initiating vaping or to stop vaping if they already used e-cigarettes.[28] Only a moderate amount of information is available on the robustness of these kinds of interventions. There is a lack of evidence on the impact of such programs on youth vaping prevention.[28, 29]

Given the high prevalence of e-cigarette use and high exposure to tobacco related media among youths, there is a need for programs to provide knowledge and awareness related to vaping, aid skill building and promote health media literacy among youth to prevent them from initiating vaping behavior. To address the issue of youth vaping, a school-based vaping prevention program, "TEAM No Vaping"

was developed by the College of Public Health at the University of Nebraska Medical Center (UNMC) in collaboration with the Tobacco Education & Advocacy of the Midlands (TEAM) and has been successfully implemented in several schools in Nebraska and Iowa. The TEAM No Vaping program focuses on changing knowledge, attitudes and beliefs related to e-cigarette use, as well as emphasizing vaping related media literacy. The program covers how advertising and media-messaging work. Students also learn to critically analyze messages by deconstructing ads and developing counter ads promoting healthy behavior using the same technique used for vaping promotion. The program is available at no cost to all schools that seek to help students make healthy choices regarding e-cigarette use behavior. Evaluating the effectiveness of such school-based vaping prevention programs is important, as it may help to address potential health problem. The objective of the study was to evaluate the impact of the TEAM No Vaping program on the change of knowledge, attitudes, beliefs, and media literacy related to e-cigarette use for youth vaping prevention. This study will inform literature about a school-based program in youth vaping prevention.

Chapter 3 – Data and Methods

This is a pre- post-test experimental study design to assess the impact of a school-based prevention curriculum. This capstone project focuses on the impact evaluation based on previously collected data.

Study setting and participants

A list of potential participating schools in Nebraska and Iowa was identified using an online database (https://nces.ed.gov/ccd/schoolsearch/). Then emails with program information and an invitation to attend informational meetings were sent to all the schools on the list. Schools were then invited to participate in the program. The curriculum was implemented in both public and private middle and high schools between October 2020 and March 2021. Ten middle and high schools implemented the program. Students from the 6th to 12th grades (age range: 11−18 years) participated in the program and completed the survey (Table 1). The program was implemented in classrooms by trained schoolteachers.

Intervention

TEAM No Vaping is a school-based vaping prevention curriculum targeting middle and high school students. The curriculum is grounded in key concepts from social cognitive theory (self-efficacy) and theory of planned behavior.[30, 31] Prior to the intervention development, two retreat meetings followed by focus group discussions with school representatives were conducted to identify key components and content for the curriculum. The draft curriculum was evaluated by stakeholders and experts before implementing the program. The curriculum includes built-in pre and post surveys which can be used to evaluate program effectiveness and make improvements, as necessary. The research team trained teachers to facilitate teaching the curriculum in their classes using either lecture or video.

The program implementation had three general steps: Participants were asked to a) complete a short, confidential survey before completing the curriculum, b) complete the three-lesson curriculum (30-60 minutes) designed to educate about risk of vaping, increase peer pressure refusal skills and build vaping related media literacy and awareness, and c) complete a short and confidential post survey. Each

lesson is accompanied with PowerPoint slides, video, reading assignments to increase student's health literacy and activity (Appendix A).

Data collection

Parents provided opt-out consent, and participating students provided assent at the beginning of the survey. A Research Electronic Data Capture (REDCap) online survey with a URL link was sent to teachers, who then emailed the link to their students. Students completed the online survey anonymously without parent or teacher oversight. The data was collected during the program implementation phase. The study has been approved by the UNMC IRB.

Measures

Knowledge about e-cigarettes was measured by three true/false questions and one multiple choice question. Questions asked about nicotine and e-cigarettes ingredients and recently enacted Tobacco 21 (T21) policy setting minimum age of legal access (MLA) for tobacco products to 21(Appendix B). T21 knowledge was analyzed separately to distinguish policy related knowledge from other e-cigarettes knowledge questions. A binary variable was created with respondent correctly answering questions as "having knowledge" and those answering incorrectly as "not having knowledge" for each item. We examined the change in proportion of students having knowledge in pre and post surveys.

Perceived harmfulness of e-cigarette use was assessed by a single question: "How much harm do you think e-cigarettes cause when they are used only some days but not every day?" with response options "No harm," "Little harm," "Some harm," and "A lot of harm." Based on the median of a 4-point Likert-type score, a binary variable was created, where "A lot of harm" was coded as 1, and other responses as 0. The difference in proportion between students who perceived e-cigarette use as harmful before and after the survey was evaluated to determine if the curriculum was associated with perceived harm.

Susceptibility to e-cigarette use was measured by two items: (1) "Do you think you will use an e-cigarette in the next year?" and (2) "If one of your best friends were to offer you an e-cigarette, would you use it?" Responses for these questions included "Definitely yes," "Probably yes," "Probably not," and

"Definitely not." The respondents who answered, "Definitely not" to both questions were classified into the group "no susceptibility to use e-cigarettes" and any combination of other responses is considered as lack of firm commitment to now use e-cigarettes in the future and hence classified as "susceptibility to use e-cigarettes." The change in proportion of students in "no susceptibility to use e-cigarettes" group between pre and post surveys was evaluated.

   Vaping media literacy (vML) was assessed by items from the vaping media literacy scale adapted from smoking media literacy scale[21]. The scale had three sub-scales: Authors and audience (vAA) Messages and meanings (vMM), and Representation and reality (vRR) with two items in each (Appendix B). Details of the adapted scale are published elsewhere.[21] In brief, based on 4-point Likert scale, each item of the vML was classified into two categories: 1 (strongly agree) and 0 (strongly disagree /disagree /agree). Separate scores for each subscale (vAA, vMM, and vRR) were created by summing the binary scores of both items in each subscale, which resulted in a range of 0–2 for each subscale. The composite vML scale was the combination of all three subscales for a range from 0 to 6. The difference between scores in each item and each subscale and overall difference in composite scores between pre and post survey was evaluated.

Statistical analysis

   A descriptive analysis was conducted to describe the characteristics of the sample in the study. Pre–post differences was calculated and displayed as the respective change in the corresponding variables. We used the general linear mixed model to measure the significance of the differences between pre and post survey. We examined the difference in proportion of respondents in specific categories for each variable as discussed in section 3.4. Statistical analyses were performed using Statistical Analysis System (SAS), and a two-tailed test with p-values <0.05 was considered statistically significant.

Chapter 4 – Results

Table 1 shows the participants' characteristics. A total of 590 students participated in the prevention program with 322 students completing pre-test survey and 268 students completing post-test survey. Most participants were male (61.8%), attended high school (66.8), and identified as Non-Hispanic (NH) whites (81.4%). Among those who participated in the program, 80.6% reported to have never used e-cigarettes, 80.6% reported no family members using e-cigarettes, and 56.1% have peers who have never used e-cigarettes. There was no statistically significant difference in participants' characteristic between those who completed pre and those who completed post-test surveys.

Students' T21 knowledge was significantly higher at post-test survey compared to pre-test (Table 2). The proportion of those who correctly answered T21 knowledge question at pre-test was 37.9%, whereas 41.9% incorrectly answered with 20.2% responding "I don't know". After participating in the program, the proportion of students who correctly answered increased to 79.7%, who incorrectly answered decreased to 13.2% and who responded "I don't know" decreased to 7.1%. There was significant difference in responses to only one of three knowledge about e-cigarettes questions between pre and post-test surveys (Most candy and fruit flavored e-cigarettes contain nicotine) (Table 2). The proportion of students who believed nicotine is addictive and harmful was 98.9% in pre-test survey, whereas 86.6% believed nicotine could cause them to lose control of themselves. The e-cigarette education program was significantly associated with an increase in students' perceived harmfulness of e-cigarettes use, from 36.3% to 49.8%. The proportion of students susceptible to e-cigarette use decreased from 44.9% to 41.1% after implementing the education curriculum, but this was not statistically significant (Table 3).

Table 4 summarizes vaping media literacy score in pre and post-test survey. The overall mean score at post-test increased to 3.8 (SD=2.3) from 2.7 (SD=2.3). This was statistically significant (p=<0.001). Mean scores for each subscale of the vaping media literacy were significantly higher at post-test compared to pre-test.

Chapter 5 – Discussions and Conclusions

TEAM No Vaping curriculum was found to increase the knowledge of T21 policy. Prior to participating in our e-cigarette education program, the majority of students (62.1%) were not aware of MLA to purchase tobacco products. Congress amended the Federal Food, Drug and Cosmetic Act in December 2019 to raise minimum legal age (MLA) from 18 to 21 years to delay youth tobacco initiation.[32] Knowledge of T21 policy was found to be inversely associated with intention to use tobacco products, including e-cigarette use and increased intention to quit.[33,34] The association was mediated by increased support for T21, perceived difficulty in accessing cigarettes, and reduced susceptibility to peer influence.[33] Several studies have demonstrated that the majority of middle and high school students support T21[33,35] T21 knowledge among adolescents could de-normalize use of tobacco products due to the fear of legal (e.g., monetary penalty) and social risks (e.g., parental punishment) as a result of violation of the law.[35] Increased knowledge could lead to higher compliance to the policy. Hence, a periodic assessment of T21 knowledge and attitude among adolescents might be beneficial in the area of e-cigarettes and emerging tobacco product use prevention by examining and understanding the association with change in intention, initiation and prevalence of e-cigarette use.

Only one out of three items related to knowledge about e-cigarettes ("Most candy and fruit flavored e-cigarettes contain nicotine) was found to be significantly associated with the program. Two questions where we saw no significant changes asked about the effect of nicotine in general without specifying the e-cigarette products. It seems most students are aware of potential effect of nicotine. There was significant increase in the proportion of students who believed flavored e-cigarettes contain nicotine after implementing the education curriculum. E-cigarette manufacturing companies have designed marketing gimmicks that appeal to young population by introducing multiple flavors making it look harmless.[36] Youth are either not aware that such flavored products contain nicotine or believe such products have low nicotine concentration.[37] Lack of awareness could be a risk factor for experimentation/initiation among students who have never used any tobacco products. The Federal Trade Commission (FTC) reported high nicotine concentration in e-cigarettes with the rise in average nicotine

concentrations in cartridges from 47.5 mg/ml in 2015 to 49.4 mg/ml in 2018, and in disposable e-cigarettes from 25mg/ml to 39.5 mg/ml during the same period.[38] Our current program not only covers contents about negative effects of nicotine, but also informs them that all e-cigarette products contain nicotine.

The proportion of students susceptible to e-cigarette use decreased but this was not statistically significant. Susceptibility to e-cigarette use, defined as lack of a firm commitment to not use e-cigarettes, has been found to predict the future e-cigarettes use among adolescent and is a potential risk factor for tobacco and other substance use behavior in the future. The non-significant impact on susceptibility in the study is likely due to how groups were categorized. For a participant to be non-susceptible, they need to answer "definitely not" to both questions. This likely made it difficult to classify participants as non-susceptible. A study on effectiveness of school-based vaping prevention program "CATCH My Breath" reported non-significant impact of the program on susceptibility from pre-intervention to follow-up.[39] The study also pointed out the potential influence of curiosity on susceptibility which might have increased simply due to introducing e-cigarettes as the topic for educational sessions. We didn't measure the impact of curiosity as the term is distinct from susceptibility and requires separate questionnaires to measure it. Nevertheless, understanding the association between susceptibility and future use of e-cigarettes and other tobacco products is a vital part of tobacco control strategy.

The proportion of students who considered e-cigarettes as harmful jumped significantly. This result supports the efficacy of the current education program in increasing awareness among youth that e-cigarettes use is not safe. Our program curriculum informs students about several risks associated with e-cigarettes use. Risk perception plays a vital role in individuals' substance use behavior.[40] The perception that e-cigarettes use is less harmful than traditional cigarettes is, in part, responsible for a rapid increase in youth vaping behavior.[41] Such perception has been found to be associated with increased e-cigarettes use.[41] E-cigarettes companies have been found to make unsubstantiated health related claims and often target adolescents.[42] Promoting e-cigarettes as a smoking cessation tool coupled with contradictory findings on harm and benefits of e-cigarettes use might have contributed to low harm perception of the

product.[41] Though long-term health effects of e-cigarettes are still unknown, the risk should not be underestimated as evidence from the recent epidemic of EVALI[43] and high nicotine content in e-cigarette products with potential for nicotine addiction.[43]

We found a significant increase in overall score in vML and in each sub-domain at the post-test surveys, which supports the effectiveness of TEAM No Vape intervention. Dai and colleagues have demonstrated the use of vML scale as a psychometric tool to evaluate effectiveness of such programs.[21] The same study found low vML among students. This is a great concern as exposure to mass media messages such as promotions and advertisements related to vaping significantly increases the risk of e-cigarette initiation by adolescents.[44] E-cigarette manufacturing companies spend heavily on marketing and promotions. Such expenditures tripled from $197.8 million in 2015 to $643.6 million in 2018.[38] Despite increasing awareness about e-cigarette use and its impact, it might be difficult to prevent youth from using e-cigarettes without providing them necessary skills to understand, decipher and process media messages. The current program focuses on three key domains of media messaging. It emphasizes understanding the target audiences, meaning of messages being conveyed and distinguishing the media representation from reality. Low vaping media literacy has been significantly associated with high susceptibility and low harm perception of the product, suggesting that increasing vML is an important intervention in youth e-cigarette use prevention and control.[21]

Limitations

The study has several limitations. First, the evaluation of the program was based on data collected from students from 10 middle/high schools at Midwest. We need to recruit more schools from other regions to assess the generalizability of the impact of the program or examine the geographical differences of knowledge, harm perception, susceptibility, and media literacy of e-cigarette. Second, the study used self-reported measures, hence subjected to social-desirability bias. However, several measures have been taken to address this limitation. The survey was confidential and anonymous. Surveys were sent to students via email so they could complete it in a private setting without any interference from parents and teachers. Third, this is the first attempt to evaluate the effectiveness of the program with a

pre-post study design. Therefore, further studies with a randomized control trial design are needed to validate the findings of the current study.

Conclusions

A critical component of tobacco prevention and control is to inhibit or delay initiation of use in any form. School-based educational programs should address impacts of using e-cigarettes. The school-based vaping prevention curriculum, "TEAM No Vaping" attempts to address this challenge by providing information to youths on the dangers associated with the use of e-cigarette products while educating them about marketing strategies used by e-cigarette manufacturing companies that primarily target young people.

This study evaluated the effectiveness of the "TEAM No Vaping" program targeting middle and high school students. The curriculum was found to be associated with increase in T21knowledge, increase in harm perception of e-cigarettes use and increase in vaping media literacy. Baseline knowledge about e-cigarettes was high, so we found a significant change in response to the knowledge question "Most candy and fruit flavored e-cigarettes contain nicotine." The study found no significant change in the susceptibility to e-cigarettes use before and after participation in the program. While several other educational programs aim to curb youth vaping, the current program focuses on increasing media literacy. Therefore, this program could be a useful resource in e-cigarette prevention among youths. Further research is required to determine the program's long-term impact on various aspects of youth vaping prevention.

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Tables

Table 1. Sample Characteristics of Student Participants

	n	%	Pre		Post		
	n	%	n	%	n	%	P-value
Overall	590	100	322	100	268	100	
Sex							0.61
Male	356	61.8	193	60.9	163	62.9	
Female	220	38.2	124	39.1	96	37.1	
Grade							0.27
Middle School	195	33.2	113	35.1	82	30.8	
High School	393	66.8	209	64.9	184	69.2	
Race / Ethnicity							0.43
NH-white	476	81.4	253	79.3	223	83.8	
NH-black	9	1.5	5	1.6	4	1.5	
Hispanic	49	8.4	32	10.0	17	6.4	
Others	51	8.7	29	9.1	22	8.3	
E-cigarette Use							0.16
Never	474	80.6	183	57.2	145	54.7	
Former	72	8.4	114	35.6	109	41.1	
Current	66	7.7	23	7.2	11	4.2	
Peer E-cigarette Use							0.85
None	328	56.1	225	69.9	186	70.5	
Some	223	38.1	45	14.0	33	12.5	
Most or All	34	5.8	52	16.1	45	17.0	
Family E-cigarette Use							0.24
None	474	80.6	258	80.1	216	81.2	
Smoking	63	10.7	31	9.6	32	12.0	
Vaping	51	8.7	33	10.2	18	6.8	

Table 2. Knowledge about e-cigarette

	Pre-intervention % (95% CI)	Post-intervention % (95% CI)	p-value	
T21 Knowledge*				
Incorrect	41.9 (36.5 to 47.3)	13.2 (9.1 to 17.2)	<.0001	
Correct	37.9 (32.6 to 43.2)	79.7 (74.9 to 84.5)		
I don't know	20.2 (15.8 to 24.6)	7.1 (4 to 10.2)		
Knowledge about E-cigarette				
Q1	98.1 (96.7 to 99.6)	98.9 (97.6 to 100)		0.4696
Q2	86.6 (82.9 to 90.3)	91.3 (87.9 to 94.7)		0.0748
Q3	86.6 (82.9 to 90.4)	96.6 (94.4 to 98.8)	<.0001	

*Refers to 21 years as a minimum legal access (MLA) for tobacco product.
Q1. Nicotine is addictive and harmful to the body (Survey Item 15)
Q2. When you are addicted to something, you lose control of yourself (Survey Item 16)
Q3. Most candy and fruit flavored e-cigarettes contain nicotine (Survey Item 17)

Table 3. Perceived harmfulness and Susceptibility to e-cigarettes

	Pre-intervention % (95% CI)	Post-intervention % (95% CI)	p-value
Perceived Harmfulness	36.3 (31.1 to 41.6)	49.8 (43.8 to 55.8)	0.001
Susceptibility to E-cigarette Use	44.9 (39.4 to 50.3)	41.1 (35.1 to 47)	0.3569

Table 4. Vaping Media Literacy Scores

Vaping Media Literacy Scale	Pre-intervention Mean (SD)	Post-intervention Mean (SD)	p-value	Adjusted p-value*
vAA+vMM+vRR (0-6)	2.7 (2.3)	3.8 (2.3)	<.0001	<.0001
vAA: Authors and Audiences				
vAA subscale (0-2)	0.9 (0.9)	1.3 (0.9)	<.0001	<.0001
vAA1: Target (0-1)	0.4 (0.5)	0.7 (0.5)	<.0001	<.0001
vAA2: Appeal (0-1)	0.4 (0.5)	0.6 (0.5)	<.0001	0.0002
vMM: Messages and Meanings				
vMM subscale (0-2)	0.8 (0.9)	1.2 (0.9)	<.0001	<.0001
vMM1: Desire (0-1)	0.3 (0.5)	0.6 (0.5)	<.0001	<.0001
vMM2: Influence (0-1)	0.4 (0.5)	0.6 (0.5)	<.0001	<.0001
vRR: Representation and Reality				
vRR subscale (0-2)	1.0 (0.9)	1.3 (0.9)	<.0001	0.0002
vRR1: Reframe (0-1)	0.4 (0.5)	0.6 (0.5)	<.0001	<.0001
vRR2: Mislead (0-1)	0.6 (0.5)	0.7 (0.5)	0.0382	0.07

vAA, vaping Authors and Audiences; vMM, vaping Messages and Meanings; vRR, vaping Representation and Reality.
*Adjustment by sex, grade, race/ethnicity, E-cigarette use status, family tobacco use, and peer vaping status.

Appendix A: Pre and Post Survey

Note: Same Pre- and Post-test survey

UNMC/TEAM Post-Survey for students

Student Assent

In this research survey, you are being asked to answer questions about your knowledge, attitudes, and experiences with e-cigarettes and other tobacco products. Even if you don't vape, use e-cigarettes, or other tobacco products, your responses are important. The information from this survey will be used to help young people all over the country in the development of healthy behaviors.

- This survey is completely voluntary and anonymous. **No one at school or at home will see your answers.**
- Taking part in this survey is up to you. Participating will not affect your grades in school or your ability to join any school activities.
- DO NOT write your name on this survey. The answers you give WILL NOT be connected to your name at any time.
- There are no known risks to participating in the education program and survey. The survey is designed to protect your privacy, and it does not include a physical test or exam.
- Please try to answer all the questions. If you do not want to answer a question, just leave it blank. You may stop taking part in this survey at any time.
- There are no wrong answers. Your answers are private.
- If you have any questions about this survey, please ask your teacher.
- By completing this survey, you agree to take part in this research.

Please complete the following:

What is the name of your school?

What is the name of the class where you were asked to complete this survey?

What is the name of your teacher who asked you to complete this survey?

What is today's date?

1. What is your date of birth?
Birthdate:___(M)/___(D)/___(Y)

2. What is your sex?
☐ Female
☐ Male
☐ Other

3. Are you Hispanic or Latino/a?
☐ Yes

☐ No

4. What race do you consider yourself to be?
☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Islander
☐ White
☐ More than one race

5. What grade are you in?
☐ 6th grade
☐ 7th grade
☐ 8th grade
☐ 9th grade
☐ 10th grade
☐ 11th grade
☐ 12th grade

The next few questions are about electronic cigarettes or e-cigarettes. These are battery-powered devices that usually contain a liquid that is vaporized and inhaled. You may know them as vape-pens, hookah-pens, e-hookahs, e-cigars, e-pipes, personal vaporizers, or mods. *Vaping includes JUULing, puffing, ripping, and any other form of using an e-cigarette.*

6. Have you ever used an e-cigarette such as JUUL, Puff Bar, NJOY, Blu, VUSE, MarkTen, Logic, Vapin Plus, eGo, or Halo, even once or twice? [Logic: If answer is "no", please go to Q10]

☐ Yes
☐ No

7. During the past 30 days, on how many days did you use e-cigarettes?
☐ 0 days
☐ 1 to 2 days
☐ 3 to 5 days
☐ 6 to 9 days
☐ 10 to 19 days
☐ 20 to 29 days
☐ all 30 days

8. What are the reasons you have used e-cigarettes? Please answer all items.		
Friend or family member used them	☐ Yes	☐ No
To try to quit using other tobacco products, such as cigarettes	☐ Yes	☐ No

They cost less than other tobacco products, such as cigarettes	☐ Yes	☐ No
They are easier to get than other tobacco products, such as cigarettes	☐ Yes	☐ No
I've seen people on TV, online, or in movies use them	☐ Yes	☐ No
They are less harmful than other forms of tobacco, such as cigarettes	☐ Yes	☐ No
They are available in flavors, such as mint, candy, fruit, or chocolate	☐ Yes	☐ No
I can use them unnoticed at home or at school	☐ Yes	☐ No
I was peer pressured into using them	☐ Yes	☐ No
I can use them to do tricks	☐ Yes	☐ No
I was curious about them	☐ Yes	☐ No

9. Are you seriously thinking about quitting e-cigarettes?☐ I have completely quitted e-cigarettes.
☐ Yes, I plan to quit e-cigarettes within the next 30 days;
☐ Yes, within the next 6 months;
☐ Yes, within the next year;
☐ Yes, but not within the next year;
☐ No, I do not plan to quit e-cigarettes.

	Definitely yes	Probably yes	Probably not	Definitely not
10. Do you think that you will try an e-cigarette soon?	☐	☐	☐	☐
11. Do you think that you will use an e-cigarette in the next year?	☐	☐	☐	☐
12. If one of your best friends were to offer you an e-cigarette, would you use it?	☐	☐	☐	☐

13. Do any of your closest friends use e-cigarettes?
☐ None of them
☐ Some of them
☐ Most of them
☐ All of them

14. Does anyone who lives with you now…?
☐ smoke cigarettes only
☐ vape e-cigarettes only
☐ use both cigarettes and e-cigarettes
☐ No one who lives with me now smokes or vapes.

.

The next few questions ask about what you know about e-cigarette use and vaping.

	True	False	I don't know
15. Nicotine is addictive and harmful to the body.	☐	☐	☐
16. When you are addicted to something, you lose control of yourself.	☐	☐	☐

17. Most candy and fruit flavored e-cigarettes contain nicotine.	☐	☐	☐

18. How much harm do you think e-cigarettes cause when they are used only some days but not every day?

☐ No harm

☐ Little harm

☐ Some harm

☐ A lot of harm

19. What is the legal age to purchase tobacco products including cigarettes, e-cigarettes, cigars, smokeless tobacco, etc. in your city/town?

☐ 16 years old

☐ 17 years old

☐ 18 years old

☐ 19 years old

☐ 20 years old

☐ 21 years old

☐ I don't know

The following questions ask you about what happens when you use e-cigarettes or vape.

How much do you agree with the following statements? Please remember you don't need to have any personal experience with e-cigarettes or vaping to respond to the following statements. We are most interested in how you feel about e-cigarettes and vaping.

	Strongly Agree	Agree	Disagree	Strongly Disagree
20. If I vape, I will enjoy it.	☐	☐	☐	☐
21. If I vape, it will help me to deal with my problems and stress.	☐	☐	☐	☐
22. If I vape, it will make me look cool among friends.	☐	☐	☐	☐
23. If I vape, it will make me alert and energized.	☒	☐	☐	☐
24. If I vape, it will increase my athletic performance.	☐	☐	☐	☐
25. If I vape, it will help me concentrate at school.	☐	☐	☐	☐

The following questions ask you about how marketing and social media can influence e-cigarette use.

26. Certain e-cigarette brands are specially designed to appeal to kids/teens.

☐ Strongly Agree

☐ Agree

☐ Disagree

☐ Strongly Disagree

27. When designing an advertising campaign, e-cigarette companies think very carefully about their target consumers like teenagers.
☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

28. E-cigarette advertisements link vaping to natural things that humans want, like love, good looks, and power.
☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

29. People are influenced by advertising whether they realize it or not.
☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

30. Most e-cigarette commercials and ads that show people vaping make vaping look more attractive than it really is.
☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

31. E-cigarette advertisements usually leave out a lot of important information (such as health risk).
☐ Strongly Agree
☐ Agree
☐ Disagree
☐ Strongly Disagree

The following questions evaluate your feedback regarding the "TEAM-No Vaping" Program (the e-cigarette lessons to prevent teen vaping).

32. Have you completed the "TEAM – No Vaping" Program with three lessons about e-cigarettes?
☐ Yes
☐ No (Logic: skip to Q40)

33. Please evaluate all of the "TEAM – No Vaping" lesson components.	Excellent	Very Good	Good	Fair	Poor	I don't know
34. Please evaluate each lesson and content.	☐	☐	☐	☐	☐	☐

Lesson 1: What are e-cigarettes?						
Lesson 2: Risks from Vaping	☐	☐	☐	☐	☐	☐
Lesson 3: E-cigarette Marketing and Ads.	☐	☐	☐	☐	☐	☐
Lecture contents and slides	☐	☐	☐	☐	☐	☐
Videos	☐	☐	☐	☐	☐	☐
Reading assignments	☐	☐	☐	☐	☐	☐
In-class discussions, activities, projects	☐	☐	☐	☐	☐	☐
Quizzes	☒	☐	☐	☐	☐	☐
What is the <u>overall</u> evaluation of all lessons?	☐	☐	☐	☐	☐	☐

Please respond to the following statements about learning outcomes:	Strongly agree	Agree	Disagree	Strongly disagree
34. I learned things I did not already know about e-cigarettes from the "TEAM-No Vaping" program.	☐	☐	☐	☐
35. Since I completed this program, I feel I would be more confident to say "No" if someone were to offer me an e-cigarette or invite me to vape.	☐	☐	☐	☐
36. I am less likely to vape now after I have participated in this program.	☐	☐	☐	☐
37. I can better understand hidden messages in vaping ads, especially those targeted at young people like me.	☐	☐	☐	☐

38. What did you like most about the "TEAM – No Vaping" program?

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39. How could the "TEAM – No Vaping" program be improved?

We would like to know your cultural background to improve our vaping education program in the future. Please respond to the following statements:

	Strongly agree	Agree	Disagree	Strongly disagree
40. If anyone in my family needs help, we would all be there to help them.	☐	☐	☐	☐
41. It is important to honor my parents.	☐	☐	☐	☐
42. It is important for me to be respectful of my parents.	☐	☐	☐	☐
43. I want to live according to the values and rules of my family.	☐	☐	☐	☐
44. When I make an important decision, I think about how my decision will affect my family.	☐	☐	☐	☐
45. I try to avoid doing dangerous things, because I don't want my parents to worry.	☐	☐	☐	☐
46. When I make an important decision, I think about how my decision will affect my friends.	☐	☐	☐	☐
47. My culture is an important part of my life.	☐	☐	☐	☐
48. I want to receive tobacco/vaping/substance prevention education that takes my cultural background into account.	☐	☐	☐	☐

Thank you for completing the survey!

Appendix B. Vaping Medial Literacy Constructs

Table. Adapted Vaping Media Literacy (vML) Scale.

Core Domains	Core Concepts	Survey Constructs[a]	Abbreviation
Vaping Authors and Audiences (vAA)	E-cigarette marketing targets consumers.	When designing an advertising campaign, e-cigarette companies think very carefully about their target consumers like teenagers.	vAA1 (Target)
	E-cigarette brands entice new generations of users.	Certain e-cigarette brands are specially designed to appeal to kids/teens.	vAA2 (Appeal)
Vaping Messages and Meanings (vMM)	E-cigarette marketing messages convey values and desirable features.	E-cigarette advertisements link vaping to natural things that humans want, like love, good looks, and power.	vMM1 (Desire)
	E-cigarette marketing messages are constructed around the product to influence behaviors.	People are influenced by advertising whether they realize it or not.	vMM2 (Influence)
Vaping Representation and Reality (RR)	Marketing messages are carefully reframed.	Most e-cigarette commercials and ads that show people vaping make vaping look more attractive than it really is.	vRR1 (Reframe)
	Marketing messages intentionally omit information/filter reality.	E-cigarette advertisements usually leave out a lot of important information (such as health risk).	vRR2 (Mislead)

[a]4-level Likert-scale from "strongly agree" to "strongly disagree."

Biography

Niran Tamrakar is an international student from Nepal. He is pursuing his Master's in Public Health (MPH) at University of Nebraska Medical Center (UNMC) with an emphasis on Epidemiology. His interest is on the prevention of noncommunicable and communicable diseases with a special interest in sexually transmitted infections/diseases. He received his bachelor's in science degree in Chemistry from Troy University, Alabama, and a Master of Art degree in Educational Psychology from University of Nebraska-Lincoln (UNL). During his first graduate program at UNL, he had opportunity to closely work closely with late Prof. Ian Newman on understanding alcohol use, assessing the potential dangers of indigenous alcohol production, particularly in Asia and developing and testing education/prevention programs. He has volunteered at Nebraska AIDS Project-Lincoln as HIV testing/Counselor. This experience combined with his academic research background motivated him to pursue his further education in public health. At UNMC, he closely worked with Dr. Daisy Dai in design, development, and implementation school-based vaping prevention program "TEAM No Vaping". Because of his job experience as a program assistant for Summer Health Professions Education Program (SHPEP) at UNMC, he is also interested in program management as potential future career.

Curriculum Vitae

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EDUCATION

Master's in public health (Epidemiology)   2019-Present

University of Nebraska Medical Center (UNMC), Omaha Nebraska

M.A., Educational Psychology (Cognition, Learning and Development)   December 2018

Cumulative GPA: 3.86

University of Nebraska, Lincoln Nebraska (UNL)

Bachelor of Science in Chemistry   December 2012

Cumulative GPA: 3.83; GPA in Major: 3.84

Troy University, Troy Alabama

Honor: Graduated with Summa cum Laude, Dean's List (7 times)

PROFESSIONAL EXPERIENCE

Program Assistant, Summer Health Professions Education Program (SHPEP) at UNMC   June-July 2021

- Provide technical and programmatic support   February-July 2022
- Setting up SHPEP at UNMC daily course modules
- Facilitate/Moderate virtual zoom sessions
- Program Manager: Dr. Sonja Tutsch

Student Worker, College of Public Health, UNMC   2019-2021

- Student Research Assistant (Supervisor: Dr. Daisy Dai)
- Design, develop and implement school-based vaping prevention program.
- Participants' recruitment/serve as a liaison
- Assist in literature review and manuscript preparation/publication

Graduate Teaching Assistant, Department of Epidemiology, UNMC   Spring 2020

- Course: Epidemiology in Public Health (Online)
- Supervisor: Dr. Christine Arcari

Graduate Research Assistant, Department of Education Psychology, UNL   2015-2017

- Research Focus: Traditional Chinese alcohol, Alcohol expectancies, Adolescent health.
- Supervisor: Dr. Ian Newman

Graduate Research Assistant, Department of Chemistry, UNL   June-July 2014

Graduate Teaching Assistant, Department of Chemistry, UNL   2013-2014

- Lab instructor for General Chemistry Class
- Tutor and exam proctor

Summer camp Counselor for Husker Summer Camp at UNL   Summer 2014

SKILLS AND COMPETENCES

Peer-Mentor training (Nebraska AIDS Project, Lincoln, Jan 2019).

Fluent in written and spoken English, Hindi and Nepali.

Proficient in using Microsoft office program, statistic software (SPSS and SAS).

Literature searches using multiple databases.

VOLUNTEER EXPERIENCE

Nebraska AIDS Project, Lincoln Nebraska   2017-2019

- HIV testing Counselor

Bridge to Care, UNMC   2020-2021

- College of Public Health Representative
- Bridge to Care health fair (Translator)

COVID-19 Vaccine Clinics, Douglas County Health Department   February, 2021

PUBLICATIONS AND PRESENTATIONS

Capstone Project (Fall Semester, 2022): "TEAM No Vaping": Impact on knowledge of e-cigarettes, harm perception, and media literacy among middle/high school students". Committee: Dr. Kendra L. Ratnapradipa (Chair), Dr. Hongying (Daisy) Dai, Dr. Tzeyu Michaud

Poster presentation at 2022 UNMC annual Midwest Public Health Innovation and Research Expo (PHIRE). Title "School-based e-cigarette education curriculum, "TEAM No Vaping": Impact on knowledge of e-cigarettes, harm perception, and media literacy among middle/high school students"

Dai, H. D., Ratnapradipa, K., Michaud, T. L., King, K. M., Guenzel, **N., Tamrakar**, N., ... & Sussman, S. (2022). Vaping media literacy, harm perception, and susceptibility of e-cigarette use among youth. *American Journal of Preventive Medicine*, *63*(5), 852-860.

Dai, H., **Tamrakar, N**., Rathnayake, N., & Kaeli Samson. (2021). Geographical distribution and social determinants of Tobacco 21 policy adoption and retail inspections in the United States: 2015-2019. *Tobacco Induced Diseases.*

Dai, H., Ramos, A., **Tamrakar, N**., Cheney, M., Samson, K., & Grimm, B. (2021). School Personnel's Responses to School-based Vaping Prevention Program: A Qualitative Study. *Health Behavior and Policy Review*, *8*(2), 130-147.

Thesis: "Alcohol Expectancies Among Students in the City of Pokhara, Nepal" (2018) under the supervision of Dr. Ian Newman and Dr. Eric Buhs, Department of Educational Psychology, UNL.

Newman, I., Qian, L., **Tamrakar, N**., Zhang, B. (2018). Chemical Composition and Safety of Unrecorded Grain Alcohol (Bai Jiu) Samples from Three Provinces in China. *International Journal of Environmental Research and Public Health*, 15, 2710.

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Newman, I. M., Qian, L., **Tamrakar, N**., Feng, Y., & Xu, G. (2016). Chemical content of unrecorded distilled alcohol (bai jiu) from rural central China: Analysis and public health risk. *The International Journal of Alcohol and Drug Research*, 6(1), 59-67.

Graduate Poster Session, Spring 2016. Title "Is Traditional Chinese Alcohol a Public Health Threat? An Analysis of sample from Rural China"