

SCHOOL BASED INTERVENTIONS TO INCREASE ELECTRONIC CIGARETTE  
AWARENESS AMONG ADOLESCENTS

A Field Study submitted to the faculty of  
San Francisco State University  
In partial fulfillment of  
the requirements for  
the Degree

Master of Science

In

Nursing: Clinical Nurse Specialist

by

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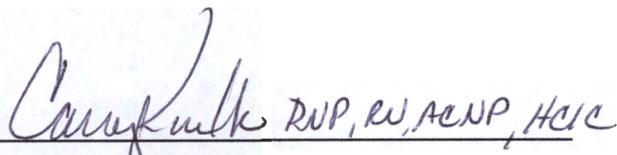
San Francisco, California

May 2019

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# SCHOOL BASED INTERVENTIONS TO INCREASE ELECTRONIC CIGARETTE AWARENESS AMONG ADOLESCENTS

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San Francisco, California  
2019

Use of electronic cigarettes (e-cigarettes) are increasingly popular among the adolescent population. Since e-cigarettes have only been available starting in 2007, long term health risks associated with its use is unknown. The American Academy of Pediatrics recommends increasing regulation of e-cigarettes as the chemicals it contains is not safe for adolescent use. From an educational perspective, the purpose of this field study is to propose a multi-modal comprehensive educational intervention based in the high school setting. The goal of this educational intervention is to increase adolescent awareness of the health risks associated with e-cigarettes with the hopes of decreasing its use among this population. This educational intervention is supported by an evidence based comprehensive literature review and utilizes the underlying framework of Bloom's taxonomy of educational objectives. The resulting recommendations for this educational intervention include use of both traditional lecture style approaches and use of peer discussions and demonstrations throughout the year long teaching curriculum. Preventive educational measures should also start at an earlier age such as during middle school. Conclusions from this field study identified a gap in knowledge among adolescents' awareness of e-cigarettes. Lastly, more research is needed to not only

examine the long term health effects of e-cigarette use on adolescent development but also the outcomes of educational interventions on reducing rates of e-cigarette use.

I certify that the Abstract is a correct representation of the content of this Field Study

Campbell DNP, RN, ACNP, HCIC  
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05/14/2019  
Date

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## **Introduction**

Cigarette smoking is a leading cause of morbidity and mortality worldwide. The Centers of Disease Control and Prevention (CDC) reports in the United States alone, one in five deaths are attributed to smoking and smoking related illnesses (CDC, 2017). With increasing research highlighting detrimental health effects associated with cigarette smoking, public health campaigns actively advocate for smoking cessation. One such tool made to resemble the feeling of smoking cigarettes is the electronic cigarette (e-cigarette). First introduced in 2007, e-cigarettes do not burn tobacco and are advertised as a safe alternative to cigarettes. Users can choose varying concentrations of nicotine and a flavor profile. As e-cigarettes still contain nicotine and harmful substances that are inhaled by the user, the Federal Drug Administration (FDA) does not support the use of e-cigarettes as a smoking cessation aid (CDC, 2018). Despite the FDA's stance on e-cigarettes, e-cigarettes have rose in popularity since its introduction. Furthermore, the introduction of e-cigarettes has heralded a new public health concern; increasing rates of e-cigarette use among the adolescent population.

## **Assessment and Significance**

Adolescence is a critical period of development in which both healthy and harmful behavioral habits are created. Nearly all cigarette and tobacco use is initiated during adolescence and young adulthood (U.S. Department of Health and Human

Services, 2016). With this knowledge, extensive strides have been taken to inform youth of the dangers of cigarette smoking and tobacco products. Successfully, with the use of health screenings, social media campaigns, educational interventions, and law revisions raising the legal age of purchasing tobacco products, a decreasing trend in the use of cigarettes and related tobacco products among adolescents was observed from 2011-2014 (Barrington-Trimis et al., 2016). Conversely, the rates of e-cigarette use among adolescents in the United States increased exponentially. In the 2016 National Youth Tobacco Survey, e-cigarettes were the most commonly used product among adolescents within the past 30 days, accounting for 4.3% of use among middle schoolers and 11.3% of use among high schoolers (Jamal et al., 2017).

While the detrimental long term health risks associated with cigarette smoking is widely known, it is still unknown for e-cigarettes due to its relatively new availability on the market. What is known is: 1) electronic cigarettes contain nicotine and other harmful substances to an adolescent's developing brain and 2) use of e-cigarettes is rising in popularity among adolescents, even among those who have never smoked a cigarette. In the Monitoring the Future Survey administered in 2015 to students in the 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> grade, use of e-cigarette surpassed the use of all other tobacco related products, with 16.3% of 12<sup>th</sup> graders reporting use of e-cigarettes within the last 30 days (Giovacchini, Pacek, McClernon, & Que, 2017). Furthermore, use of e-cigarettes among adolescents increases the risk of using cigarettes and other tobacco products in subsequent years (Leventhal et al., 2015). These findings suggest that tobacco-related illnesses may be

prolonged despite significant gains in public health initiatives surrounding smoking cessation.

The rise in popularity of e-cigarettes has largely been attributed to the wide range of appealing flavors, perceptions that e-cigarettes pose less health risk compared to cigarettes, and the acceptability of its use in public settings. It was not until August 2016, nine years after the introduction of e-cigarettes, when the FDA officially enforced regulations classifying e-cigarettes as a tobacco product. This regulation limited the sale of e-cigarettes to only those above 18 years, required health labels to be added to the packaging, and required manufacturing establishments to be registered with the FDA (Morrill, Abel, Januszewski, & Chamberlin, 2017). Since that time, public health initiatives such as school-based interventions and media campaigns have been aimed towards increasing adolescent knowledge and awareness about the health risks of e-cigarettes. However, educational interventions can always be improved.

If past data reveal health initiatives are effective in decreasing user rates of cigarette and tobacco products among the adolescent population, similar interventions must be taken with e-cigarettes. Within the San Francisco Unified School District, the Tobacco Use Prevention Education (TUPE) Program implements a tobacco use prevention curriculum and cessation programs from sixth to twelfth grade. With support and cooperation from school personnel, community members, and student peer leaders, grant funding for this program was renewed for three years from 2013 to 2016 (TUPE, 2016). Although TUPE's spring 2016 data show effectiveness in decrease rates of cigarette use from 2013-2015, the website does not list educational or support services

specific to e-cigarettes despite highlighting it as a new problem among the high school population. Additionally, there is no mention whether the TUPE program grant was renewed and is currently being implemented in school settings.

Teachers and nurses in the school setting are in a unique position to raise awareness of the detrimental health effects of e-cigarettes. Building upon the foundation of the TUPE program, a standardized educational curriculum for e-cigarettes among the high school population is needed. This program will address not only the health risk of e-cigarettes but also takes into account the social and familial settings in which an adolescent may encounter e-cigarettes. Through participation in this standardized curriculum, adolescents will be provided with the confidence they need to make informed health decisions in regards to e-cigarettes.

### **Purpose**

Currently, San Francisco Unified School District's Tobacco Use Prevention Education tackles tobacco use prevention but does not focus specifically on e-cigarettes (TUPE, 2016). Thus, there is still a lack of a standardized school curriculum addressing e-cigarettes. Acknowledging the gravity of addressing adolescent health and the increasing trend of e-cigarette use among this vulnerable population, this author proposes piloting a multi-modal comprehensive academic year-long educational intervention about electronic cigarettes to all incoming ninth grade adolescent students in one public high school in the San Francisco Unified School District (SFUSD).

In 2000, SFUSD developed the Wellness Initiative to improve the health, well-being, and educational outcomes of SFUSD high school students by establishing school-based wellness centers within the high schools themselves (SFUSD, n.d.). Today, 18 high schools within the SFUSD has a wellness center. The wellness centers offer physical health, mental health, and substance abuse services. Building on the resources and mission of the Wellness Initiative and TUPE program, this pilot educational intervention will equip a multidisciplinary team, including: school nurse, teachers, counselors, social workers, administrative staff, and security personnel, with the knowledge, resources, and teaching strategies to inform high school adolescents of the risks associated with e-cigarette use. Although counselors, social workers, administrative staff, and security personnel will not be directly teaching the curriculum throughout the school year, they are included in this training as students may interact with them throughout the school year. Furthermore, it is hoped the successful implementation of this pilot program among one grade level (ninth grade) will eventually be extended to all grade levels and ultimately, to all SFUSD high schools with a Wellness Center.

### **Assumptions**

Numerous assumptions must be addressed before piloting this educational intervention. Assumptions that should be considered are listed as follows:

1. The school's perception of whether or not their students are, or at risk for, smoking can play a large role in the time and effort put into developing and refining a year-long educational curriculum.

2. School personnel may not view e-cigarettes as a detrimental and risky health behavior. As such, they may not deem it a vital topic in need of its own curriculum and may be hesitant to support the curriculum if it is contradictory to their personal beliefs.
3. A pre-set school curriculum set forth by the school district may not allow enough time or resources to engender the success of this year-round curriculum.
4. Whether schools have the funding and/or resources to support this curriculum.
5. Staffing availability. Schools are often overloaded with various obligations and as a result, conflicting demands of staff members may pose a challenge as time is needed to create and implement the curriculum during school hours.
6. Lastly, surveys completed as part of the evaluation process may not accurately reflect the knowledge acquired as a result of the curriculum intervention.

### **Program Goals, Objectives, and Desire Outcomes**

The overall goal of this pilot educational program is to provide ninth grade adolescents with factual knowledge and personal skills to make informed decisions about e-cigarette use. The desired outcome objectives for this program are threefold.

The first objective is to prepare a multidisciplinary team to initiate this pilot program of increasing e-cigarette awareness among ninth grade adolescents. The school nurse, or other willing school staff member, will become the program champion. The program champion is responsible for creating both the educational curriculum to be

taught to the students and the training course to present to the multidisciplinary team. Additionally, a survey will be administered to all multidisciplinary staff to evaluate personal perceptions of e-cigarettes and whether e-cigarette education should be addressed in the high school setting.

The second objective is to present the educational curriculum to every ninth grade student throughout the academic school year. Three, thirty minute teaching lessons will be held throughout the year before each school break in the winter (December), spring (March or April) and summer (May or June). These lessons will be taught by teachers with support from the school nurse as needed.

The third and final objective is to evaluate whether or not this educational intervention is sustainable in the school setting. All teachers and nurses who conducted the teaching session will meet twice a year to review overall survey data responses, to discuss successful strategies of teaching the material, and/or to report any barriers to implementing the curriculum.

This proposed plan strives to increase adolescents' knowledge and awareness about e-cigarettes. This will help adolescents make informed decisions about using e-cigarettes as well as provide benefits to their peer groups. Short, intermediate, and longer term outcomes begotten from these objectives, as well as inputs and activities necessary to the success of this plan can be found in Appendix A, the "Logic Model".

### **Methods, Interventions, and Evaluation Criteria**

Various activities and interventions must be employed to meet the objectives of this program leading to the goal of increased adolescent awareness about e-cigarettes. (See details in Appendix B, “Work Plan” and Appendix C, “Outcomes Framework”).

### **Staff Preparation**

The program champion (e.g., school nurse) is tasked with the responsibility of creating both the educational curriculum to be taught to the students and the training course to present to the multidisciplinary team. With help from other school nurses, teachers, the Wellness Initiative partners and the TUPE program, the final product will include one, eight hour training module to train the multidisciplinary team, and three, thirty minute educational lessons to teach the students. The school nurse will then arrange with school personnel to present the training curriculum to the multidisciplinary team the week before the start of the new school year in August. Before starting the training topics for the multidisciplinary team, a survey will be administered to evaluate personal perceptions of e-cigarettes and whether e-cigarette education should be addressed in the high school setting (See Appendix G, “Staff Perception Evaluation”). Afterwards, the training will continue with topics such as risks associated with e-cigarette use and teaching adolescents how to confront peer pressure if presented with e-cigarettes. A survey will be administered before and at the end of the workday to assess knowledge of the skills taught. A score of at least 25% higher on the post-survey will indicate a successful training.

In addition to educating teachers and students, the school nurse will also create a flier for all parents/guardians of incoming ninth grade adolescents regarding the purpose and goals of this pilot program. This flier will be given as part of the incoming student welcome packet. This flier will also include community resources parents/guardians and students can access for support. A portion of the multidisciplinary team training will be dedicated to teaching how to engage parents to discuss the health risks of e-cigarettes with their child. It is also recommended teachers address the topic of e-cigarettes during annual parent/guardian teacher conference week.

### **Increase in Knowledge**

The desired outcome of this pilot educational program is for 100% of ninth grade adolescents who complete three, thirty minute educational lessons to demonstrate increased knowledge regarding e-cigarettes. The administration of the three lessons purposely coincide with each school break in the winter (December), spring (March or April) and summer (May or June). It is hoped an educational lesson prior to break will prepare students with what she/he may encounter during their time away from protected school grounds.

Before the first lesson in December, a survey questionnaire will be administered to all ninth grade students to assess baseline knowledge of e-cigarettes (See details in Appendix E, "E-cigarettes Baseline Knowledge Evaluation"). The three lessons will then be taught as designed with the last lesson in the summer (May or June) ending with another survey questionnaire to assess knowledge gained from the lesson. This questionnaire will also include open answer responses for the perception of the lesson

applicability to real world settings (See details in Appendix F, “Post-Educational Lessons Questionnaire”). All survey responses are anonymous and will be collected by a designated student in the classroom. This student will collect all survey responses faced down (answers hidden) and will then put all the surveys in a sealed manila envelope. The student will lastly bring the manila envelope to the school’s nursing office where there will be a labeled box for collection. The school nurse will work with the administrative team to analyze the survey responses. Success of this objective would be (1) completion of all three teaching sessions with the appropriate survey responses, (2) a 25% increase in knowledge gained by students in the post-survey, and (3) a 50% positive response in real-world applicability of the curriculum in the post survey.

In regards to the content of the educational lessons, Anderson et al. (2014) reported school based interventions utilizing only information-giving curriculum has not successfully shown beneficial long term results in rates of cigarette smoking among adolescents. Consequentially, each lesson will contain a component of information-giving curriculum related to e-cigarettes as well as interactive teaching demonstrations including, but not limited to, role playing on refusing peer influence, use of social media, and incorporating the online game, Playforward: Smokescreen. Furthermore, a general recommendation is for educators to utilize peer leaders within the classroom and school setting. The perception of friends’ viewing the use of e-cigarettes as “wrong” has been correlated with lower use of e-cigarettes among adolescents (Giovacchini et al., 2017). Peers leaders should be chosen at the discretion of the teacher and can include criteria such as student volunteers, leadership potential, and motivation to teach peers. E-

cigarettes are likely to be presented in social contexts and with the support and exchange of knowledge through peers, adolescents may be more willing to consider the information presented.

The overarching goal of these multi-modal comprehensive educational lessons is to provide adolescents with the knowledge to make informed health decisions in the various situations where they may encounter e-cigarettes.

### **Program Sustainability**

To support the third objective of program sustainability, teachers and nurses will meet for two, one hour long post intervention meetings in December (before the start of the spring semester) and June (after the end of the school year). The purpose of these post intervention meetings will be to discuss how this additional curriculum affected their teaching agenda and whether or not they feel their students gained knowledge that they would not have gain elsewhere. A post-meeting survey regarding the instructor's thoughts on the sustainability of the curriculum during the school year will be administered in June on a proposed day arranged by the school nurse and staff personnel. The success of this objective would be achieved if 60% of instructors agree to continue this educational program the following school year.

## **Literature Review**

### **Search Strategies and Organization of Literature**

From February 2018 through March 2019, a literature review search was conducted using San Francisco State University's J. Paul Leonard Library journal database. Full text primary source research articles were retrieved from CINAHL, PubMed, and EBSCO Host. Keywords used to conduct the search included: electronic cigarettes, smoking rates, adolescents, high school, school interventions, and educational plans. The search was customized to include only peer-reviewed journals published from 2014-2019. Use of these keywords provided numerous articles including randomized control trials, cross-sectional studies, and prospective longitudinal cohort studies.

The literature analysis begins by examining current trends among adolescent use of and exposure to cigarettes and e-cigarettes. Additionally, these trends are explored through the lens of the adolescent's perceived risks and social influences. The analysis then takes a problem-solution pattern, comparing the current trends and exploring whether the implementation of school-based interventions can play a role in increasing awareness and ultimately influencing decreasing use of e-cigarette products.

### **Analysis of Literature Presenting the Need for E-cigarette Education**

Since the introduction of e-cigarettes in 2007, use of e-cigarettes have increased in popularity among the adolescent population. Furthermore, more adolescents are trying e-cigarettes without ever trying traditional cigarettes (Barrington-Trimis et al., 2016). To determine whether e-cigarette use among adolescents is substituting for using traditional tobacco cigarettes and/or to assess whether e-cigarettes are enticing new adolescent users who would not otherwise start using cigarettes, Barrington-Trimis et al. (2016) conducted

a study among high schoolers in Southern California. They found cigarette use decreased among 11<sup>th</sup> and 12<sup>th</sup> grade students from 1994-2014 but the combined prevalence for using cigarettes and/or e-cigarettes increased. In 2014, the combined prevalence among 12<sup>th</sup> graders was 13.7%, a percentage comparable to the 14.7% adjusted prevalence of cigarette use alone in 2001, before e-cigarettes became available. With this data, the authors suggest e-cigarette use among adolescents is not merely a substitute for using cigarettes and that e-cigarettes are recruiting new adolescent users who have never smoked cigarettes (Barrington-Trimis et al., 2016).

An adolescent's risk perception of e-cigarettes can greatly influence the decision to start using. Giovacchini et al. (2017) utilized a cross-sectional design to examine middle and high-school students' risk perception towards cigarettes and e-cigarettes in relation to use of either product. This study also examined the influence of a friend's perceived risk of either product and parental influences and attitudes on adolescent smoking behaviors. Among middle schoolers, 4% of students reported using e-cigarettes and/or cigarettes, 73.7% perceived a great risk with using cigarettes, and 33.6% perceived a great risk with using e-cigarettes. Most middle school students also indicated that using e-cigarettes would be perceived as either wrong or very wrong by their friends (95.4%) and parents (95.3%). Among high schoolers, use of e-cigarettes (37.2%) was higher than use of cigarettes (21.7%) and among both students who use e-cigarettes and non-users, only 11.3% of students perceived a great risk associated with e-cigarette use. Furthermore, a student's perception of great risk associated with e-cigarettes decreased with higher grade levels. High schoolers also reported using e-cigarettes would be

perceived as either wrong or very wrong by their friends (37.4%) and parents (79.0%) (Giovacchini et al., 2017). Considering both peer and parental perceptions of e-cigarette may impact an adolescent's decision to use, it is very important to address social factors and situations in any educational initiative.

Additionally, the rise of new types of e-cigarettes and an increase in advertisements marketing e-cigarettes as safe and appealing are persuasive to the vulnerable adolescent population. A new type of e-cigarette, a Pod Mod, which is sold by the company JUUL, is a small, rechargeable device with the size and look of a traditional USB drive. These characteristics make it very easy to conceal its use, even within the classroom. School districts such as the Upper Dublin School District in Pennsylvania have even banned students from bringing USB drives for this reason (Heyman, 2018). Although small, Pod Mod cartridge contains a higher concentrations of nicotine and fewer of the nicotine related adverse side effects compared with a traditional e-cigarette. In a study conducted by Barrington-Trimis and Leventhal (2018), they found 63% of 15- 24 year olds surveyed were unaware nicotine was present in all JUUL products, including Pod Mods. JUUL packaging does containing warning labels indicating the product contains nicotine but it was only in October 2018 when JUUL redesigned their warning labels to be larger and in bold, block letters at the request of the FDA to deter use by underage individuals (Godwin, 2018). Regardless of the labeling of health hazards on e-cigarette packaging, the health ramifications of higher doses of nicotine in these Pod Mods need to be acknowledged and addressed.

To promote new types of e-cigarettes, advertisements have also increased. Trends in e-cigarette marketing towards middle and high school students were analyzed by Marynak, Gentzke, Wang, Neff, and King (2018) using data from the 2014 through 2016 National Youth Tobacco Surveys (NYTS). The NYTS asked students which source they saw advertisements, options being the internet, reading material (i.e newspapers, magazines), media outlets (i.e televisions, movies) and/or convenience stores, including gas stations. In 2016, 28% of students stated they were exposed to e-cigarette advertisements from one source, 21.2% from two sources, 16.7% from three sources and 12% from four sources, with the most common sources being from retail stores followed by the internet (Marynak et al., 2018). Although these numbers seem small, during 2014-2016, exposure to e-cigarette advertisements among middle and high school students from any source increased from 68.9% (18.3million) to 78.2% (20.5million) in the United States. To make matters worse, advertising and marketing for e-cigarettes do not follow the same rules and restrictions for conventional cigarettes. As a result, e-cigarette advertisements can be seen everywhere, including television, sports and music events, and even in-store displays.

Lastly, use of e-cigarettes has been associated with using traditional tobacco products. Leventhal et al. (2015) conducted a longitudinal, school-based cohort study in ten public high schools in Los Angeles, California to assess whether e-cigarette use among 14-year olds who had never used cigarettes, is correlated with initiating use of cigarettes and other tobacco products the following year. From self-reported survey analysis, baseline e-cigarette ever smokers (N=222) showed a positive association with

using cigarettes at the six-month follow up compared to never smokers (9.7% vs. 3.0% respectively). The twelve-month follow up showed comparable results (7.9% vs. 3.3%) (Leventhal et al., 2015).

### **Analysis of Literature Presenting Effective Educational Strategies**

Various teaching methods are available but educational approaches need to be tailored to the target population. Anderson et al. (2014) reported school based interventions utilizing only information-giving curriculum has not successfully shown beneficial long term results in rates of cigarette smoking among adolescents. In an effort to incorporate interactive and collaborative teaching approaches, Morrill et al. (2017) developed and delivered a pilot interactive educational presentation about e-cigarettes to high school students (N=357) aged 14 -18 years old. The presentation included a slide presentation with video clips on information about the risks of tobacco products and e-cigarettes. The presentation was followed with an interactive Jeopardy-style game where students were divided into teams and answered questions related to the information. At the end of this didactic educational session, students completed an anonymous survey and 98% of respondents stated they heard of e-cigarettes before the presentation, 31% had tried e-cigarettes in their lifetime, and 84% responded that “neither” e-cigarettes or tobacco cigarettes are safer when compared to one another. Additionally, 97% of students reported learning something new from the presentation (Morrill et al., 2017). This study demonstrates the beneficial effects of incorporating an interactive component in a lesson plan.

Another study demonstrated the positive results of incorporating interactive activities that are completed by students prior to attending class. In a study conducted by Chao, Chen, and Chuang (2015), they aimed to show whether a flipped learning style approach was more beneficial to student learning than a traditional teacher-centered lecture approach (control classroom). The flipped classroom incorporated use of videos or quizzes completed prior to class time, in class lectures with the teacher highlighting important takeaways, and time for discussion and collaboration with peers. Pre- and post-tests were administered to the students at week one and week eight. At the end of the eight week study, students in the flipped classroom reported feeling more interested in the learning process, had a more positive learning attitude, and felt this approach allowed more time for discussion and learning which connected them to their peers (Chao, Chen, & Chuang, 2015). Utilizing a similar flipped classroom approach in this educational plan can result in increased student motivation for learning about e-cigarettes and in their ability to apply it in their life.

With the advent of new technology and younger generations growing up in a digital and highly interactive society, educational approaches need to change to match how adolescents learn and interact with information today. Wedlock and Growe (2017) propose technology are educational tools for teachers, as a result, they propose any educational plan aimed at teaching adolescents should include use of technology. One such technological concept that is often proven to engage students is the use of videogames. In a study by Pentz et al. (2019), adolescents aged 11-14 years (N=80) played a free, online videogame PlayForward: smokescreen for one hour each week for

four weeks, a total of four hours of gameplay. In the videogame, the student navigate their player throughout the school by choosing decisions that may place them in situations where use of tobacco products may be encountered. Specific skills gained from the game include refusing peer offers to use tobacco and e-cigarette products. After playing the game, adolescents completed a survey with results showing increased knowledge and risk perceptions about e-cigarettes and other tobacco products (not including traditional cigarettes), and increased negative health beliefs regarding these products. Furthermore, students enjoyed playing the videogame and took it seriously, 92.4% stating they took personal responsibility for the decisions they made in the game (Pentz et al., 2019). Prior to this videogame, fewer than half of the adolescents reported ever having tobacco product education at school or at home. After playing, 87.3% reported they would likely make life decisions based on the knowledge and experienced gained from playing the game. This study shows how educational interactive games can influence decisions made in the real world setting.

Lastly, the value of peer teaching should be prioritized. In a Turkish study conducted by Ayaz and Acil (2015), they analyzed survey results regarding knowledge levels acquired about smoking from two methods of teaching, peer education (n=253) and classic training model (n=101). Peers were defined as those similar in age, interest, and background and peer education was defined as peers undertaking either informal or organized educational activities with peers. At the beginning of the study, 4.7% of students in the peer education group and 9.9% of students in the classical training school were smoking. After the program, smoking decreased to 4.3% in the peer education

group but remained unchanged in the classical training group (Ayaz & Acil, 2015).

Although this study did not specify the age of the youth, this study still underscores the impact peers have as an opinion leader and educator among fellow peers.

### **Summary of Literature Review**

The findings from this literature review confirm e-cigarette use among adolescents needs to be a public health priority that requires interventions from various angles if the long term goal is to decrease adolescent use of e-cigarettes and other tobacco products. Leventhal et al. (2015) showed a positive correlation between adolescents who currently smoke e-cigarettes and their rates of smoking traditional cigarettes at both six and twelve-month follow ups. Furthermore, Barington-Trimis et al. (2016) showed that although the overall trend for only using cigarettes is decreasing, e-cigarette use is not substituting for using cigarettes and e-cigarettes are recruiting new adolescent smokers. Furthermore, with the advent and popularity of Pod Mods which contain higher concentrations of nicotine compared to traditional cigarettes, use of these Pod Mods in addition to regular e-cigarettes pose a great health risk. Taking these study findings into consideration, it can be inferred that if the current trend follows an increase in e-cigarette use among adolescents, these adolescents are more likely to become regular users of tobacco products and be at risk for its associated detrimental long-term health consequences.

Social factors influencing an individual's decision to use or not use e-cigarettes and/or other tobacco-related products needs to be addressed. Social factors involve many

levels including individual perceptions, interpersonal relationships among family and peers, the community and the society at large. Marynak et al., (2018) found marketing and advertising for e-cigarettes increased by 9.3% from 2014 to 2016. Although this seems like a small percentage, this is only the exposure amount reported by adolescents in the National Youth Tobacco Surveys, and this percentage itself includes an increase of 2.2million individual exposures. Additionally, current e-cigarette marketing and advertising strategies is not subjected to the same rules and regulations as traditional tobacco products. This needs to be addressed through regulation from policymakers at the community and societal level.

Fortunately, there may be a shift in viewpoint among adolescents and the use of e-cigarettes. Giovacchini et al. (2017) found that among middle school students, 33.6% reported a great risk with using e-cigarettes compared to only 11.3% of high schoolers. This is in line with the study's finding that older adolescents in increasing grade levels are less likely to view e-cigarettes as having a great risk. This suggest that targeted interventions at a younger age may be contributing to middle schoolers awareness of the hazards associated with e-cigarettes.

School-based interventions are effective in increasing knowledge about e-cigarettes. Morril, Abel, Januszewski and Chamberlin (2017) implemented a onetime didactic presentation to high school students with a portion of the presentation composed the traditional presentation with some video clips and another portion with an interactive Jeopardy game. Through that teaching method, 97% of high school students reported learning something new about e-cigarettes. This is the effect of one single presentation.

Chao et al. (2015) eight week study about the flipped learning style approach showed it was more beneficial to student learning than a traditional teacher-centered lecture approach. Flipped learning style includes collaboration with peers and the value of peer teaching cannot be overlooked as demonstrated from Ayaz and Acil (2015). Ayaz and Acil (2015) also stressed peer education does not need to occur in a structured and formal presentation to reap the benefits. Lastly, Wedlock and Growe (2017) urged the use of technology as educational tools for teaching a technology driven adolescent population. Pentz et al. (2019) demonstrated the use of an online video game, PlayForward: smokescreen, has the ability to influence real life decisions based on the knowledge and experienced gained from playing the game. These studies demonstrate a single educational presentation including various interactive components has the ability to produce positive outcomes in increasing awareness about e-cigarettes. Imagined the additional impact a year-long smoking curriculum can have on the impact of an adolescent's decision to use e-cigarettes.

With the information gained from the literature review, this author highly recommends implementing a year-long, school-based smoking curriculum taught by both school nurses and teachers to all incoming ninth grade students. This curriculum should not only encompass informative educational sessions but also interactive lessons such as practicing refusal skills which students can utilize in real world settings. With the proper training, the presentation of this curriculum will ensure that adolescents are informed of the detrimental effects of using e-cigarettes. This knowledge has the potential to create a lifelong, positive health impact in a young adult's life.

## Conceptual Framework

### Bloom's Taxonomy of Educational Objectives

The conceptual framework underlying this educational plan is based on the educational classification system developed by American psychologist Benjamin Bloom and his collaborators in 1956. Commonly known as Bloom's Taxonomy, this educational classification aims to help educators create specific learning objectives capable of evaluation (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). Bloom identified three domains of learning: cognitive, affective, and psychomotor. Bloom's taxonomy focuses on the cognitive domain which includes knowledge acquisition and the development of intellectual abilities and skills. Within the cognitive domain, Bloom identified six classifications arranged in a hierarchal pattern with each classification relying upon the skills learned from the previous (Bloom et al., 1956). In 2001, Bloom's taxonomy was revised by Anderson et al., former colleagues of Bloom. The revised version of Bloom's taxonomy will be used in this educational intervention and the six classifications within the domain of cognitive learning are described below.

1. Remembering: The learner retrieves knowledge information previously learned from memory. Knowledge information includes ideas, behaviors, and phenomena. The act of remembering includes recognition and recall (Anderson et al., 2001).
2. Understanding: The learner is cognizant of the intent and meaning behind the material being taught, regardless of whether it was taught in oral, written, or

graphic communication. Understanding includes terms such as interpreting, summarizing, inferring, explaining, and comparing (Anderson et al., 2001).

3. **Applying:** The learner remembers what was learned and appropriately performs functions or procedures in a given situation. This classification is vital in real life situations as most educational objectives intend to be applicable to real life problem situations. Applying includes terms such as executing and implementing (Anderson et al., 2001).
4. **Analyzing:** The learner is able to break learned material into its constituent parts and comprehend the relationship and organization of those parts as a whole. Analyzing includes differentiating, attributing, and organizing (Anderson et al., 2001).
5. **Evaluating:** The learner critically judges and critiques information based on standards and criteria. Evaluating includes checking and critiquing (Anderson et al., 2001).
6. **Creating:** The learner is able to draw upon previous knowledge and synthesize parts together to form a new, or different, product and experience. Creating includes generating, producing, and planning (Anderson et al., 2001).

### **Definition of Variables**

The main variables in this educational intervention include the school nurses and ninth grade teachers who will be directly teaching this educational curriculum, the ninth grade adolescent students who will participate in this intervention, and the educational curriculum itself. The educational intervention includes an e-cigarette curriculum

implemented in three, thirty minute lessons throughout the school year. Each session comprises of information-giving curriculum and interactive teaching demonstrations including role playing on refusing peer influence and use of technology. The measurable knowledge outcomes will be determined by pre and post tests given to students.

Evaluation surveys will also be given to school nurses and teachers at the end of the year to determine the sustainability of this educational intervention.

### **Relationship among Variables**

The revised Bloom taxonomy for cognitive learning identifies six classifications, each classification relying upon skills previously learned. The variables identified in this educational plan adhere to the classifications of Bloom's taxonomy as follows.

1. Remembering: School nurses and teachers implementing this educational plan will participate in a comprehensive training workshop prior to the beginning of the school year. It is expected they will retain that information and will be able to pass that knowledge onto their students in the teaching sessions. The students will then be able to show knowledge attainment through the pre and post surveys administered after the educational lessons.
2. Understanding: From the informative and demonstrative teaching sessions, students will grasp the importance for education surrounding use of e-cigarettes and related tobacco products, especially in context of social settings where they will likely encounter them.

3. **Applying:** With the knowledge gained about e-cigarettes and through demonstrative teaching and practice of peer refusal skills, students may be more comfortable refusing e-cigarettes and related tobacco products when they are presented with it in a real world context.
4. **Analyzing:** Through the informative sessions, students will be able to look at e-cigarettes and all its component parts to determine why its use can be detrimental to their health.
5. **Evaluating:** Participation in this educational plan will allow students to critically assess information about e-cigarettes, whether it is told to them by school nurses and teachers during the teaching session, or if they are presented with it in social settings such as through peers and advertisements. Additionally, surveys administered will provide insight on whether this year-long educational plan was effective in increasing knowledge e-cigarette.
6. **Creating:** From the informative and demonstrative teaching sessions, the student's increased awareness about e-cigarettes could later be extended to other tobacco related products and/or other risky situations adolescents may be presented with. This educational plan is only a small portion of the overall educational system whose aim is to guide adolescents in making informed decisions.

### **Application of Bloom's Taxonomy to Educational Plan**

The overarching goal of this educational plan is to increase adolescent awareness of e-cigarettes in the hopes of decreasing e-cigarette use among this population. Bloom's

Taxonomy has been implemented in multiple school settings as an effective strategy to gauge and evaluate student achievement of learning objectives. Christy Howard (2016) conducted a literature review to demonstrate how teachers can utilize Bloom's taxonomy to ensure middle school and high school students are engaged in the learning process while meeting Common Core State Standards (CCSS) of education. Howard advocates that Bloom's taxonomy is a framework allowing teachers to prepare questions and activities that build upon one another, a term called scaffolding activities. During a lesson, initial questions rely on the lower levels of Bloom's taxonomy, remembering and understanding. When students become more comfortable with the knowledge, they are able to scaffold their thinking process to analyze, evaluate, and even create new ideas. Additionally, Howard suggests Bloom's taxonomy also applies to non-traditional lecture style lessons, allowing for more interactive learning styles such as the incorporation of media and technology to engage and help students meet CCSS (Howard, 2016). With a similar approach, this educational intervention will be structured using Bloom's taxonomy to guide the various lecture material, peer discussions and teaching, and interactive activities.

### **Budget**

As this pilot program will be implemented in a school setting during a regular academic year, the majority of the staff and resources needed to successfully implement this program are already in place. For example, this pilot program will occur in a SFUSD high school that is part of the Wellness Initiative which places a Wellness Center within

the school. Health promotion programs, including the Wellness Center and Tobacco Use Prevention Education, have various sources of funding. All Californian school districts use the General Fund as the primary operating fund (SF County Office of Education, 2017). More specifically, San Francisco voters also approved a proposition for the Public Education Enrichment Fund (PEEF), a major source of funding for school sports, libraries, arts, music, and the Wellness Centers. School nurses will work with Wellness Center staff and school personnel (e.g., teachers) to create an educational program using readily available and free online resources from reputable sources including the Centers of Disease Control and Prevention and the World Health Organization. Additionally, there are other avenues of funding sources such as local community partnerships if needed. At this time, no extra funds will be requested to create this new pilot educational curriculum about e-cigarettes.

In terms of staff and support for this pilot program, all SFUSD high schools have a school nurse that is on campus either full time or part time. Additionally, the school already ensures there are enough teachers prior to the start of the academic year. No additional staff is necessary for the implementation of this program and resultingly, no extra funds will be needed to hire additional staff solely for this program.

A foreseeable cost is a possible rise in the materials budget. The extra material stems from the need to print paper surveys to administer to the multidisciplinary team during the initial training, to the adolescent students in evaluating their baseline knowledge and knowledge gained after the educational intervention, and to the teachers at the conclusion of the school year. Additionally, paper will be needed to print pilot

program fliers that will be given to parents/guardians of all incoming ninth grade students. Other costs such as pens and pencils are added in the event it is needed but it is expected both staff members and students will provide his/her own writing utensils. In total, the material budget is estimated to be \$146.99 for the cost of implementing this pilot program to all incoming ninth grade students in a high school setting (See Appendix F, “Budget”).

### **Economic Evaluation**

What is the cost effectiveness of introducing a standardized educational curriculum about e-cigarettes in the high school setting? Stakeholders, including nurses, teachers, parents and the larger community are concerned with favorable outcomes for adolescents, whether it is related to adolescent health or general educational attainment. Adolescents’ as stakeholders are concerned whether the subject matter taught in school will be applicable and helpful in the real world. Cost is often an obstacle to the implementation of new programs however this proposed pilot program has marginal costs associated with its creation and implementation.

From a public health perspective, it is unethical to forgo an inexpensive health program focused on prevention. The CDC estimates smoking-related illnesses in the United States cost greater than \$300 billion per year, including \$170 billion for direct health care given to adults as a result of their smoking-related illnesses (CDC, 2018a). Although this is an estimate for tobacco smoking related illnesses, it has been shown use of e-cigarettes among adolescents increases the risk of using cigarettes and other tobacco

products in subsequent years (Leventhal et al., 2015). A prevention program given to the entire ninth grade class in a high school setting that costs an estimated \$146.99 for an entire year pales in comparison to the billions of yearly costs associated with smoking-related illnesses. Furthermore, if this program was expanded to all grade levels in the entire school, the estimated cost of \$587.96 ( $\$146.99 \times 4$ ) is still miniscule in comparison to billions. Nonetheless, all programs come with a cost and must be evaluated prior to implementation.

### **Sustainability and Continuity Plan**

With the implementation of any new program, the driving force behind the program is the hope for positive change. While the direct goal of this pilot program is to increase adolescent awareness about e-cigarettes, it is hoped that adolescents will take this knowledge and either choose not to use or decrease their use of e-cigarettes. Consequently, the ability to educate an entire grade level can cause a ripple effect towards educating a large portion of an entire generation as students engage and interact with peers through various social outlets outside the school setting.

Internally, the school's multidisciplinary team, especially the teachers and school nurse, must support this program to effectively teach and engage students in the educational lessons. The teachers and nurses involved directly with teaching the material will be invited to provide honest and experienced feedback regarding the curriculum itself, the feasibility of incorporating the program throughout the year, and whether the program is beneficial for the students. As this pilot program will be implemented in a

high school with a wellness center, wellness center staff must also be willing to play a supportive role. The underlying support from the internal environment must include a sense of the ethical and social value in improving the lives of their students.

The social responsibility and sense of value in advocating for preventive education for adolescents also extends into the external environment. To reinforce the topics discussed in the school program, it will be necessary to engage the community, especially government officials and lawmakers, to exemplify the need for education and the potential positive health effects this program can have on the adolescent, the family, and the community as a whole. Already, government officials and lawmakers are realizing the impact e-cigarettes have on the adolescent populations. Public health campaigns against e-cigarettes are beginning to appear in advertisements on the streets of San Francisco. It is imperative to tackle the issue surrounding e-cigarettes on all fronts.

Evaluation is a major part of assessing whether the continuation of a program is possible and/or if changes and improvements can be made. This process analysis, as detailed earlier in this proposal, requires a source of data which the program has incorporated into its activities in the form of surveys. Again, focusing on the desired outcome among the adolescents, the direct goal of this pilot program is to increase adolescent awareness about e-cigarettes through education, not the direct effect this education will have on either the use or decrease use of e-cigarettes. Through the documentation in the survey data given to students, baseline knowledge prior to the start of the program compared to the knowledge gained after the program completion will be used to determine the program's effectiveness of attaining its goal. Additionally, the

survey given to teachers and the nurse directly involved the teaching will help determine whether the program should be changed in any way to further benefit the students.

Hopefully, with a positive survey response from both students and teachers, this pilot program can be expanded to include all grade levels throughout the school.

A major part of a program's sustainability is its cost-effectiveness. As detailed in the economic evaluation of this program, this program does not require a lot of additional support from staff or resources that have not already been allocated to the school through the general education budget. The additional funds requested are for materials, including paper and writing utensils that would be found in a school setting normally. The overall estimated financial cost to initiate this pilot program pales in comparison to the potential financial burdens that may be faced by the adolescents, their families, and the overall community at large due to smoking-related illnesses. Therefore, this pilot preventive education program is a cost effective and sustainable program to incorporate into a high school setting.

Lastly, the school board is one of the largest stakeholders in an educational plan's sustainability and continuity. Even if the planned intervention is cost effective and sustainable as evidenced by the minimal budget and positive responses from staff members implementing the curriculum, the school board has oversight regarding which programs are permitted to continue. Luckily, since this educational plan parallels SFUSD's mission of quality instruction and support enabling students to thrive in the 21<sup>st</sup> century, this pilot educational curriculum that builds upon the social responsibility and

sense of value in advocating for preventive education for adolescents will surely be supported (SFUSD, n.d).

### **Conclusion**

Electronic cigarettes are popular among the adolescent population. As of February 2019, the CDC reports 3.6 million middle and high school students used e-cigarettes in 2018, compared to 2.1 million in 2017 (CDC, 2019). With its ease of use and appealing flavors, it is not surprising e-cigarette use among the adolescent population has been increasing since its introduction in 2007. Adolescent use of e-cigarettes is not safe as the long term health consequences is unknown. Adolescents who use e-cigarettes are also more likely to use other tobacco related products in later years, adding on to the already known health risks associated with tobacco use.

Government policies such as public health campaigns, restrictions on advertising strategies, and age limits on purchasing traditional tobacco products have proven effective at decreasing use of tobacco products overtime. However, these same rules and regulations for e-cigarettes are lagging behind. Adolescents are often exposed to advertisements and marketing for e-cigarettes due to the lack of regulation for promoting these products. Additionally, e-cigarette use is present in the social context adolescents find themselves in. Adolescents may have already formed their own perceptions about e-cigarettes from interactions with peers or material on the internet but additional knowledge can always be gained.

Adolescents do not receive any formal education regarding e-cigarettes and from the review of literature, there is a definite need for an intervention. School nurses and teachers are in a unique position to provide that intervention. This pilot program proposal encompassing a year-long school-based educational curriculum utilizing Bloom's taxonomy of educational objectives and incorporating interactive lesson components such as peer instruction and technology in the form of an online game will be able to touch upon all the different learning strategies of various adolescents. The implementation of this multi-modal educational intervention about e-cigarettes to high-school adolescents has the potential to foster positive life-long health behaviors.

### **Definitions**

1. Adolescence: A period of rapid growth and development from ages 10-19 years in which an individual transitions from childhood into adulthood (World Health Organization, 2018).
2. Electronic cigarettes (e-cigarettes): A hand-held electronic device used to resemble the feeling of smoking tobacco cigarettes. E-cigarettes contain a battery, a heating element, and a compartment to hold liquid that often contains nicotine, flavorings, and other hazardous chemicals. By heating the liquid, an aerosol is produced and inhaled by the user (CDC, 2018).
3. Multi-modal Approach: In the context of educational interventions, a multi-modal program includes initiatives within and beyond the school to enhance the learning environment. Examples include providing information-giving curriculum,

enhancing lessons using visual or audio learning tools, and incorporating community interventions such as interacting with parents. This approach is aimed at strengthening and enforcing the curriculum (Anderson et al., 2014).

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## Appendices

### Appendix A Logic Model

Inputs	<ul style="list-style-type: none"> <li>• San Francisco Unified School District (SFUSD) High Schools participating in the San Francisco Wellness Initiative which brings wellness centers into the school site (John O’Connell High School)</li> <li>• Program funding obtained from general SFUSD budget and SF Wellness Initiative partnerships including SFUSD Health Programs, San Francisco Department of Children, Youth and Their Families, and the San Francisco Department of Public Health</li> <li>• Multidisciplinary team including: school nurse, teachers, counselors, social workers, administrative staff, security personnel</li> <li>• One program champion (i.e school nurse) to oversee training of team members and to aid in the development and implementation of the pilot program</li> <li>• All incoming first year adolescent students one SFUSD public high school, roughly 600 students ages 14-15 years old (or age starting first year of high school)</li> <li>• Peer volunteers, either of same grade level or upper classmen, to assist with program activities</li> <li>• Conference room or meeting space for initial training of multidisciplinary team and for follow up post intervention meetings</li> <li>• Projector for presentations in staff training/follow up post intervention and during educational instruction to students</li> <li>• Paper, pens, and pencil packs</li> </ul>
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Activities	<ul style="list-style-type: none"> <li>• Program champion will create an educational curriculum to be implemented throughout the year to all incoming first year high schoolers</li> <li>• One, eight hour work day for initial training of entire multidisciplinary team prior to the start of the new school year (August) to introduce proposed pilot program, focusing</li> </ul>
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	<p>on program purpose, goals, individual roles, and providing resources to enhance knowledge of team members. (This training and all other post intervention meetings will be led by the program champion).</p> <ul style="list-style-type: none"> <li>• Two, one hour long post intervention meetings (in December and June, before winter and summer recess, respectively) with team members directly involved in leading educational lessons with the students (school nurses and ninth grade teachers). Post intervention meetings will focus on strategies, both successful and unsuccessful, of teaching the material and/or any barriers to implementing the curriculum.</li> <li>• Three, thirty minute educational lessons given to all ninth grade adolescents throughout the year (one before each school break in the winter (December), spring (March or April), and summer (May or June).</li> <li>• These thirty minute educational lessons will include: powerpoint presentations, videos, peer-to-peer teaching, interactive games including Jeopardy (question and answer based game) and the online videogame PlayForward: Smokescreen</li> <li>• Surveys given to participating students assessing knowledge gained and real world applicability of curriculum</li> <li>• Surveys given to team members, especially school nurse and teachers, assessing quality of curriculum content and sustainability of program</li> <li>• Meet with peer volunteers to train them on leading discussions among their peers</li> <li>• Creation of educational flier by program coordinator to be given to parents/guardians of all incoming nine grade students to inform them of this pilot program and any community resources available about e-cigarettes (or other substances)</li> </ul>
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Outputs	<ul style="list-style-type: none"> <li>• One comprehensive educational curriculum about e-cigarettes</li> <li>• One, eight hour work day for initial training of entire multidisciplinary team, resulting in one team of competently trained staff (including school nurse, teachers, counselors, social workers, administrative staff, security personnel)</li> <li>• Two, one hour long post intervention meetings with school nurse and teachers (and others if willing)</li> </ul>
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	<ul style="list-style-type: none"> <li>• Three, thirty minute educational lessons given to all ninth grade adolescents throughout the year (one before each school break in the winter (December), spring (March or April), and summer (May or June).</li> <li>• 100% participation of all nine graders in this pilot program</li> <li>• Peer volunteers competently trained to assist and lead instructional material</li> </ul>
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Initial Outcomes	<ul style="list-style-type: none"> <li>• Entire multidisciplinary team will become aware of the need for this pilot program and the challenges faced by adolescents when encountering substances (both legal and illegal) during this vulnerable age</li> <li>• Entire multidisciplinary team will verbalize desire to participate in proposed pilot program and will complete initial, eight hour training</li> <li>• Nurses and teachers (and others if willing) will participate in two, one hour long post intervention meetings</li> <li>• Ninth grade adolescents will actively participate in educational lessons</li> <li>• Ninth grade adolescents will gain knowledge about e-cigarettes, acknowledge social situations where they may encounter these products, and become aware of resources available to them.</li> <li>• Parents will be informed of pilot program and resources available to use throughout the year to engage their child in talking about e-cigarettes</li> </ul>
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Intermediate Outcomes	<ul style="list-style-type: none"> <li>• School nurse and teachers will engage all students in dialogue regarding e-cigarettes</li> <li>• Ninth grade adolescents will actively participate in educational lessons</li> <li>• Ninth grade adolescents will be able to differentiate facts versus myths surrounding e-cigarettes</li> <li>• Ninth grade adolescents will participate in role playing behavior such as refusing to use e-cigarettes when presented by peers</li> <li>• Ninth grade adolescents will recognize the various situations where they may be presented with e-cigarettes (i.e through</li> </ul>
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	peers, social media, movies, advertisements) and how it influences his/her perception of e-cigarettes in both a positive and negative manner
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Longer Term Outcomes	<ul style="list-style-type: none"><li>• Ninth grade adolescents will acknowledge personal changes in attitudes and perceptions about e-cigarettes due to enhanced knowledge gained from educational lessons</li><li>• Ninth grade adolescents will be confident with their personal decision to not use e-cigarettes (or to use when he/she becomes of legal age if that is their informed choice)</li><li>• Ninth grade adolescents will be comfortable talking about e-cigarettes to peers, adults, and their parents/guardian</li><li>• Ninth grade adolescents will demonstrate their refusal skills when presented with e-cigarettes</li><li>• Ninth grade adolescents will know the resources available for additional support</li><li>• Successful pilot program will be incorporated into all SFUSD high schools and potentially to all grade levels.</li></ul>
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### Appendix B Work Plan

Objective 1: Within one, eight hour training session, the school nurse will establish and prepare a multidisciplinary team ready to initiate this pilot program of increasing e-cigarettes awareness among ninth grade adolescent students throughout the entire school year.

Activity #	Description	Responsible Staff	Timetable	Milestone or Product	Partners
1.0	Create a multi-modal comprehensive educational curriculum about e-cigarettes	School Nurse	One to two months prior to beginning of training in August	Three, thirty minute educational lessons	Wellness Center partners, other school nurses, teachers
1.1	Create a training course for the multidisciplinary team comprised of teachers, counselors, social workers, administrative staff, security personnel, etc.	School Nurse	One to two months prior to beginning of training in August	One, eight hour training module	Wellness Center partners, other school nurses, teachers
1.2	Arrange date/time/location with school personnel to present training course to multidisciplinary team members	School Nurse	One week prior to start of school year (August)	A survey will be administered before and at the end of the training to assess knowledge of the skills taught. A score of at least 25% higher on the post-survey will indicate a successful teaching	All school personnel

1.3	Create a one page flier focusing on program purpose and goals to be given to parents/guardians of all incoming ninth grade adolescents	School Nurse	One week prior to start of school year (August)	One page informational flier about program purpose, goals and community resources available	Wellness Center partners, all school personnel
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Objective 2: By the end of the school year, 100% of ninth grade adolescents will have completed three, thirty minute educational lessons about e-cigarettes throughout the academic year.

Activity #	Description	Responsible Staff	Timetable	Milestone or Product	Partners
1.0	Survey of adolescents' baseline knowledge of e-cigarettes.	School nurse and teachers	Prior to first lesson in December	Completed survey and documentation of baseline knowledge.	Teachers and school nurse
1.1	Adolescents will participate in educational lessons which will include information giving curriculum, videos, and role-playing scenarios	School nurse and teachers	During all three, thirty minute educational lessons	Increase knowledge about e-cigarettes and its relation to health, acknowledging self-attitudes and perceptions towards, and learning about available resources.	Teachers and school nurse
1.2	Adolescents will participate in the online game, PlayForward: Smokescreen	School nurse and teachers, adolescent	Will be assigned as homework after first lesson in December	Assigned as homework after educational lessons. Completion of online game for 1-2 hours after each of the educational lessons for a total of four hours of gameplay.	Teachers and school nurse, PlayForward: Smokescreen video game (a collaboration between the play2PREVENT Lab, Yale, USC Tobacco Centers

					of Regulatory Science, and Schell Games)
1.3	Survey of participating adolescents' knowledge after learning the curriculum. To include an open ended question regarding the quality of the curriculum and whether the material will help the adolescent in the real world settings	School nurse and teachers	At end of final lesson in April/May	Completed survey. Analysis of knowledge gained and the curriculums applicability to the real world	Teachers and school nurse

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Objective 3: By the end of the school year, the multidisciplinary team will be able to attest to the quality and sustainability of this year long educational curriculum about e-cigarettes.

Activity #	Description	Responsible Staff	Timetable	Milestone or Product	Partners
1.0	Two, one hour long post intervention meetings with team members directly involved in leading educational lessons (school nurses and teachers, other staff members if willing).	School nurse and teachers	After first lesson (Dec) and before last lesson (April/May)	Discuss strategies, both successful and unsuccessful, of teaching the material and/or any barriers to implementing the curriculum.	Teachers and school nurse, other school personnel if applicable
1.1	Analysis of adolescents' survey responses.	School nurse and teachers, administrative team	After each lesson	Analysis compilation of survey responses to assess student's perception of material presented	Teachers and school nurse, administrative support team

1.2	Survey for team members directly involved in leading educational lessons (school nurses and teachers)	School nurse and teachers, administrative team	After last lesson (April/May)	Analysis compilation of survey responses regarding program sustainability	Teachers and school nurse, administrative support team
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### Appendix C Outcomes Framework

Outcome	Indicators	Relevant Clients	Performance Target	Data Source	Data Collection Methods
<p>Ninth grade adolescent students will gain factual knowledge about e-cigarettes, learn how to interact with e-cigarettes in the real life setting, and learn about various resources available.</p>	<p>Of participating adolescents, the percentage (%) who provide successful verbalization of knowledge gained from educational lessons at baseline vs. year end.</p>	<p>All ninth grade adolescent students ages 14-15 years (or age of first year in high school) who have attended all three educational lessons throughout the school year.</p>	<p>95-100% of participating adolescents can verbalize learned knowledge.</p>	<p>Survey questionnaire response at baseline vs. post educational lessons.</p>	<p>Teachers and school nurse will administer survey questionnaire response to participating ninth graders prior to the first lesson (December). At the end of the school year, another survey will be administered prior to the last lesson (April/May). The program coordinator (i.e school nurse) will work with the administrative team to gather all the survey responses, analyze the data and present trends associated with the educational curriculum.</p>

### Appendix D Materials Budget

Total Materials Budget: \$146.99

Item	Cost per Item	Number of Items Needed	Notes	Amount Requested
Pens and pencils packs	\$5	5 pens packs 5 pencils packs	Staff and students are expected to bring his/her own writing utensils. Extras will be purchased for use during multidisciplinary team training session as needed.	\$50
Conference room or large meeting room (already part of school building)	\$0	1	Utilize school's current conference room/large space meeting room for multidisciplinary team training	\$0
Conference room supplies including projector, computer, whiteboard, table, and chairs (already part of school building)	\$0	1 of each	Utilize school's current supplies	\$0
Copy and print paper	\$16.99	1	Paper for survey questionnaires and fliers with information about new pilot program about e-cigarettes to be given to parents as part of welcome packet for new incoming ninth grade students  (Cost per item approx. for 1500 sheets at Office Depot)	\$16.99
Ink and Toner	\$80	1	To print survey questionnaires and informational fliers	\$80

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### **Appendix E E-cigarettes Baseline Knowledge Evaluation**

1. True or False, using e-cigarettes or “vaping” is safe for teenagers?
2. True or False, the long term health effects of e-cigarette use among teenagers is not known?
3. True or False, E-cigarettes contain harmful substances such as nicotine, metals (nickel, tin, lead), and chemical flavorings.
4. What is the legal age you can purchase e-cigarettes?
  - a) 13 years old
  - b) 16 years old
  - c) 18 years old
  - d) 21 years old
5. True or False, research shows using e-cigarettes can increase your risk of starting to use other tobacco products including traditional tobacco cigarettes?
6. List 2 resources you can use to learn more about e-cigarettes.

**Appendix F Post-Educational Lessons Knowledge Evaluation Questionnaire**

1. Did you participate in all three educational lessons about e-cigarettes throughout the school year? YES or NO
2. True or False, using e-cigarettes or “vaping” is safe for teenagers?
3. True or False, the long term health effects of e-cigarette use among teenagers is not known?
4. True or False, E-cigarettes contain harmful substances such as nicotine, metals (nickel, tin, lead), and chemical flavorings.
5. What is the legal age you can purchase e-cigarettes?
  - e) 13 years old
  - f) 16 years old
  - g) 18 years old
  - h) 21 years old
6. True or False, research shows using e-cigarettes can increase your risk of starting to use other tobacco products including traditional tobacco cigarettes?
7. List 2 facts you learned about e-cigarettes:
8. List 2 resources you can use to learn more about e-cigarettes:
9. Reflecting on all your lessons about e-cigarettes, what are the strengths and weaknesses on how the curriculum was presented to you?
10. Are there any other comments, concerns, or feedback you would like to include regarding the overall e-cigarette educational lessons?

**Appendix G Staff Perception Evaluation**

1. Circle one: Do you know what electronic cigarettes (e-cigarettes) are? Yes or No
2. Circle one: Do you feel that e-cigarettes cause harmful health effects? Yes or No
3. Circle one: Do you believe it is important to talk about e-cigarette use among our high school students? Yes or No
4. Circle one: Do you support incorporating an educational curriculum addressing e-cigarettes throughout the school year? Yes or No

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**Figure 1 Bloom's Revised Taxonomy**

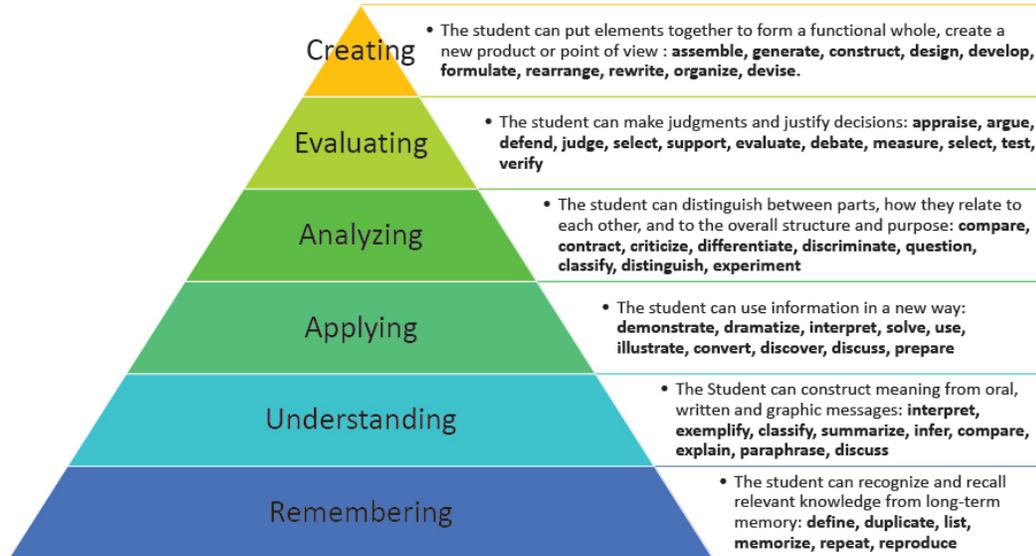


Figure 1. Bloom's revised taxonomy. This figure illustrates the six classifications of the revised Bloom's Taxonomy as created by Anderson et al. (2001) in relation to the expected educational outcomes the student (variable) should achieve at each level.