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Remote Implementation of a Health Promotion Program in an Underserved High School during COVID-19: Lessons Learned

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Abstract

Background: This study examined the impact of remote implementation of a school-based health promotion program on health beliefs and behaviors of adolescent participants from an underserved high school during the COVID-19 pandemic.

Methods: As part of the program, Family Medicine residents trained healthy 10th grade high school students from a vulnerable community in California to become health coaches for family members with diabetes. Five of eight one-hour weekly sessions were delivered remotely after shelter in place was mandated. Students completed online pre and post-participation surveys including questions on health beliefs and behaviors and experience with remote learning. We explored factors associated with the likelihood of attending the remote classes, and we used paired T-tests to compare pre-and post-scores of health beliefs and behaviors, and qualitative analysis of open-ended questions to assess differences between those who completed in person sessions only and those who attended remote sessions.

Results: 45 participants completed pre-surveys and 26 of those completed postsurveys. 14 of those 26 attended remote program sessions. The 14 who attended the additional remote sessions demonstrated significant improvements in health mindsets (belief that body has self-healing properties p=.045; belief that illness is an opportunity p=.028); consumption of fruits and vegetables (p=.054); consumption of sugary drinks (p=.047); understanding of how to improve their health (p=.055); and frequency of talking about health with their families (p=.057). Participants who did not attend remote sessions did not show significant improvements in these areas. Non-attendees were more likely to be Hispanic and male.

Conclusions: These findings suggest that remote health promotion programs could support the health and well-being of adolescents in underserved communities. Yet, more research is essential to ensure all adolescents can participate.

Keywords: Child and adolescent health; Chronic diseases; Community health; Health communication; Health educators; Nutrition and diet; School health instruction; Remote implementation; School based health promotion

Introduction and Goals

The COVID-19 pandemic caused widespread cancellations of educational programs, and many adolescents in underserved communities were left with few opportunities for education [1]. Increased inequality in educational opportunities as a result of the pandemic has been well documented [2,3] and must be addressed to prevent a further widening of achievement gaps [4]. Additionally, closures of schools during COVID-19 threaten to further widen the gap in healthcare disparities as many children in poverty rely on school based services for physical and mental health [5]. The stay-at-home orders have also resulted in greater anxiety and loneliness in adolescents, highlighting an important role for continuing synchronous group education during this pandemic [6].

There is mounting evidence that online health education courses are favorably perceived by adolescents [7] and that online programs and mobile technology can have positive results on children's health [8-10]. Yet, we are just beginning to learn about the impact of adapting teaching and learning during the COVID-19 pandemic [11] particularly in economically disadvantaged communities.

The goal of this study was to examine the implementation of a school based, health promotion program adapted for synchronous remote learning and evaluate its impact on adolescent participants from an underserved community. The Stanford Youth Diabetes Coaches Program (SYDCP) is a "train the trainer program" that has been successfully implemented across 25 high schools, in 12 states in the US and in Canada [12]. In this program, health care professionals and trainees teach healthy high school students (grades 9-12) from

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underserved schools to coach family members with chronic health conditions over a period of 8 weeks through weekly hour-long sessions. The curriculum, based on Kate Lorig's Adult Chronic Disease Self-Management Model [13], Social Cognitive Theory [14], and peer health coaching [15], is designed to improve health knowledge, communication skills, goal setting, problem solving, and healthy behaviors.

In this study, we evaluated the program's impact on students who continued with synchronous remote SYDCP classes after in-person classes were cancelled and compared the impact to those who did not attend remote sessions. Here we: 1) analyze program impact on health related beliefs and behaviors between the group of students who completed initial in person SYDCP classes plus the remote classes, conducted over Zoom, versus those students who only attended the initial in person classes; 2) analyze possible factors associated with the likelihood of attending online classes; and 3) explore recommendations for improvement suggested by the students.

Methods

Participants

As part of an ongoing partnership between a San Jose, CA family medicine residency program and a local underserved mid-high poverty level high school (99% non-white, with 56.3% Hispanic or Latino, 35.4% Asian; 63% eligible for free or reduced price lunch), the SYDCP was implemented with 45 high school students as part of their mandatory school schedule starting in February 2020. When stay-at-home orders were enacted in March 2020, students at the local high school had received three in-person SYDCP classes. Our research team immediately adapted the SYDCP curriculum for synchronous remote implementation of the remaining 5 classes and invited all participants to join *via* Zoom.

Procedure

The SYDCP curriculum was adapted to maximize synchronous remote engagement of adolescent participants. These adaptations included adding more online chat opportunities, replacing in-class discussion with chat-based discussion; enabling role plays by asking volunteers to unmute; and asking participants to use objects at home to learn subjects like reading nutrition labels. Once schools were closed down, a member of the SYDCP research team sent emails to each of the students inviting them to join the SYDCP remote Zoom classes and sent them a link to the class each week. The classes were not mandatory as the school was unable to provide resources to all students for mandatory online teaching at the time. The remaining five classes were taught remotely by medical students with a family medicine faculty observer *via* Zoom, with student participants sheltering at home and accessing course materials on their personal devices.

Students were asked to complete online surveys before starting the program and again immediately after the last class. In addition to demographic characteristics, surveys included 10 questions from the validated Patient Activation Measure (PAM®10) licensed through Insignia Health 2020 [16]. The PAM measure consists of ten questions rated on a Likert scale of 1-5 that assess knowledge, skills and confidence for self-management of health and healthcare. Individuals with higher scores are at a higher level of activation and demonstrate better health outcomes and healthy experiences; they develop stronger self-management skill, are resilient in times of stress and are also more likely to engage in health behaviors [16]. Other measures include four questions on health mindsets developed in the Stanford Mind and Body Lab [17], four questions on health behaviors (on nutrition, and exercise) developed in the Stanford Mind and Body Lab [18]; and two questions about health empowerment developed by the SYDCP research team. Post intervention surveys also included open ended questions developed by the research team to assess lifestyle changes made as a result of program participation, participants' attitudes and perceptions about using Zoom to attend remote SYDCP classes, ease and satisfaction with these remote classes, reasons for attending and not attending remote classes, and preferences for delivery of future classes.

Data analysis

Pre-post intervention comparison: We compared changes in participants' pre and post survey scores for all questions including Patient Activation Measure (PAM®10), health mindsets, health behaviors, and health empowerment. PAM®10 pre and post test scores were calculated for each participant using the algorithm provided by the developer. PAM®10 respondents are given scores ranging from 0-100. Individuals with higher scores are at a higher level of activation and demonstrate better health outcomes and healthcare experiences. They also develop stronger self-management skills, are resilient in times of stress and are also more likely to engage in healthy behaviors [19].

We stratified the data into two groups; participants who attended remote SYDCP classes versus participants who did not, and we conducted T tests to compare means of pre and post-test responses among the two groups using SPSS version 26. We also used basic descriptive statistics to analyze whether participants made lifestyle changes as a result of program participation and what lifestyle changes they made.

Factors associated with attending remote SYDCP classes: We analyzed possible factors associated with the likelihood of attending online classes. We used basic descriptive statistics, and qualitative data analysis of open-ended questions using the same methodology described in the analysis of program satisfaction measures described in the next section.

Program satisfaction and suggestions for improvement: We explored recommendations for improvement suggested by the students by analyzing post survey responses regarding perceptions of Zoom technology/lessons, reasons for attending remote classes, challenges with this form of remote learning, and reasons for inability to attend remote classes. All quantitative data analysis was done using SPSS version 26. We employed an open and axial coding system to conduct qualitative analysis of open-ended questions. Two researchers independently read the responses to open ended questions and identified major themes and sub-themes based on frequency of repetition of key terms [20]. An independent reviewer then corroborated the results and resolved any conflicts in coding.

Results

Of the 45 adolescent participants who completed pre-surveys prior to initiating the SYDCP, 26 completed post surveys after the

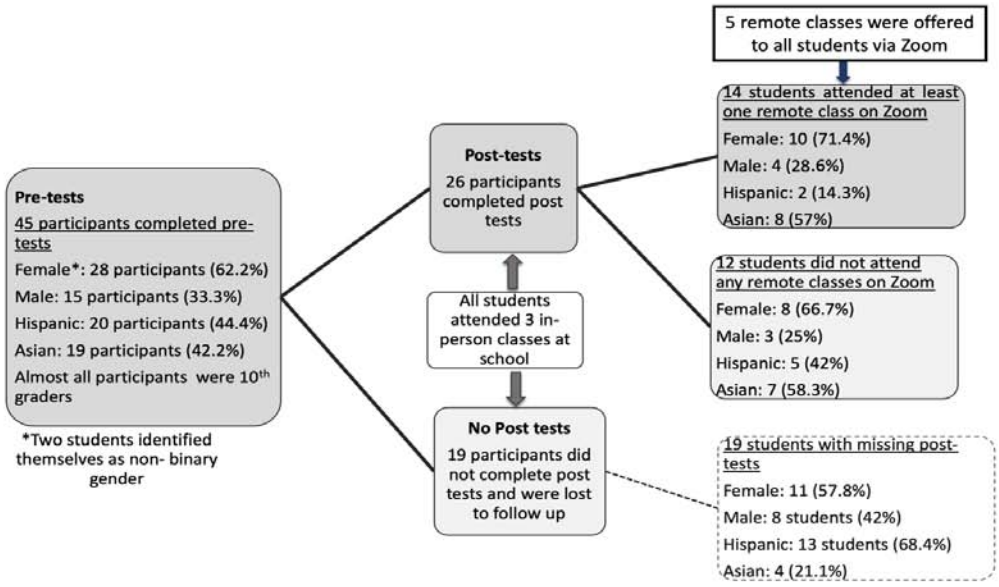

Figure 1: Participants' Characteristics and Demographics Based on Completion of Pre and Post Surveys.

completion of the SYDCP program. Of those 26, 14 participants attended synchronous remote SYDCP classes, while 12 did not attend any. All students attended the first three in-person classes while still at school. Figure 1 summarizes program participation and data collection.

Sample Characteristics (N=45)

All 45 participants attended three in-person classes held in their school in late February and early March 2020. Of those 45, almost all were 10th grade students; 62.2% were female; 44.4% were Hispanic, 42.2% Asian, 4.4% Native Hawaiian or Pacific Islander, 2.2% African American or Black and 2.2% non-Hispanic White; and mean age was 15.29 years.

Characteristics of participants who completed both pre and post surveys (N=26)

Of the 26 participants who completed pre and post surveys, 65% were female, 58% Asian, and 27% Hispanic; and mean age was 15.3 years. All 26 indicated that they could connect to Zoom from home. 68% participants coached a family member including a parent, grandparent, sibling, aunt or uncle and rest coached a friend.

When stratified by attendance in remote classes, 14 participants (53.8%) attended at least one remote class and 12 participants (46.2%) did not attend any remote classes. Within the group that attended at least one remote class, 50% (n=7) attended 1 or 2 classes and 50% (n=7) attended 3 or more classes.

Of those who completed pre and post surveys, characteristics of those who participated in remote classes compared to those who did not were similar except that a higher percentage of Hispanic students did not participate in remote classes. Of the 20 students (44.4%) in the initial cohort that identified themselves as Hispanic, 7 completed post surveys and 5 did not attend any remote classes.

Characteristics of participants who did not complete post surveys (N=19)

19 student participants completed pre surveys but not post surveys. Of these, 11 participants (57%) were female and 13 (68.4%) were Hispanic. None of the participants that identified themselves as non-Hispanic White or African American in the original group of 45 participants completed a post survey. The 19 students who did not complete post surveys were at a similar level of baseline patient activation scores (pre survey score= 57.44) as the students who completed both pre and post surveys (pre survey score= 55.13).

Pre-post intervention comparison (N=26)

Of the 26 student participants who completed both pre and post surveys, those who participated in remote classes were significantly more likely to report improved health beliefs and behaviors as compared to those who did not participate in any remote classes. Table 1 reports mean pre and post test scores for health beliefs and behaviors and p values based on paired T tests using SPSS 26.

Notable findings for health beliefs among participants who attended remote classes included being significantly more likely to show improvement in mindset regarding the body's capacity to self-heal (p=.045); mindset about considering illness as an opportunity (p=.028); and understanding of what it takes to be healthy (p=.05).

Significantly improved health behaviors for remote class participants included: decreased consumption of sugary drinks (p=.05); increased consumption of fruits and vegetables (p=.047); and increased talking about health with their family members (p=.05). Interestingly, while all student participants improved their sleep over the period of intervention, students who did not attend remote classes reported significantly improved sleep while sheltering in place (p=.046) compared to students who attended remote classes (p=.08).

While 96% of all 26 student participants who completed pre and post surveys reported making at least one lifestyle change as a result of program participation, the 14 participants who attended remote classes reported adopting multiple healthy behaviors. 36% of participants who attended remote classes made three or more lifestyle changes, (such as exercising more, eating healthier, and sleeping

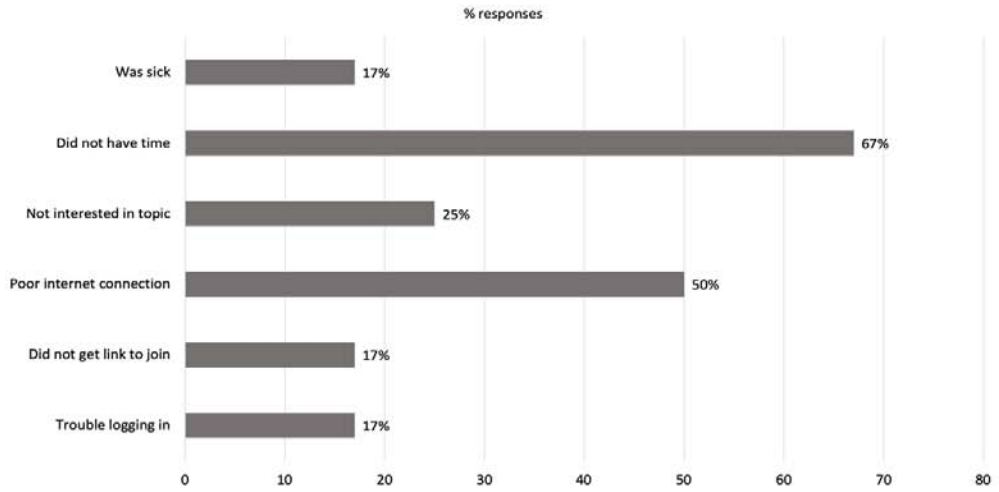

Figure 2: Participants' Reasons for Not Being Able to Join Zoom Class (N=12)*.
*Students could choose more than one reason.

Table 1: Comparison of Select Health Beliefs and Behaviors of Participants Based on Participation in Synchronous Remote Zoom Classes (Both Groups of Students Participated in 3 Initial In-Person Classes at School); N=26.

	Attended additional Zoom Classes N=14			Did not attend remote Zoom classes N=12		
Evaluation Measures	Pretest	Post-test	P value	Pretest	Post-test	P value
Patient Activation Measure						
[1]PAM ® 10 mean scores	57.84	60.47	0.526	52.2	57.6	0.186
Health Mindset						
[2]Body can self-heal	3.71	4.36	**.045***	3.75	4	0.389
[3]Illness is an opportunity	3.64	4.43	**.028***	4.5	4.67	0.586
Health Behaviors						
[4]Decrease in consumption of sugary drinks	1.07	0.57	**.047***	1.75	1.75	1
[5]Increase in consumption of fruits and vegetables	2.43	2.86	**.054***	2.33	2.42	0.795
[6]Increase in sleep	4.43	5	0.088	3.75	4.33	**.046***
[7]Understanding of ways to reduce stress	3.79	4.14	0.096	3.58	3.58	1
Health Empowerment						
[8]Understanding of how to improve health	3.71	4.07	**.055***	3.67	3.92	0.082
[9]Frequency of talking about health with family	2.86	3.5	**.057***	3.08	3.5	0.175

Score range: [1]0-100, [2]1-6, [3]1-6, [4]0-5, [5]0-5, [6]1-10, [7]1-5, [8]1-5, [9]1-5.

better) compared to 8.3% in the group who did not attend remote classes.

Qualitative analysis of open-ended questions about specific lifestyle changes made revealed that the majority of participants who completed pre and post-surveys (73%) reported making a lifestyle change to eat healthier. Within the category of healthy eating, we identified five sub-themes: decreased intake of sugary foods and drinks, increased consumption of fruits and vegetables, increased consumption of water, reduced intake of fatty foods and snacks, and reduction in portion sizes.

One participant said: "I started to reduce eating junk food and start trying fruits in healthy ways like not just eat it plain but create a healthy meal. Also, I get at least half the plate of veggies every day. Now I'm more cautious about what I eat." Another student noted: "I have changed on how I eat my meals. Most of the time my family would rely on eating processed foods and I wanted to change that. I decided to eat healthy foods like chicken breast or chicken tenders and salmon plus a side of veggies."

Factors associated with attending remote SYDCP classes using Zoom

We analyzed responses of 26 participants who completed pre and post surveys to get a better understanding of participants' experience with remote classes. Overall, 73% participants had not used Zoom before school closures due to the pandemic, but all could connect to Zoom from home and 88.5% understood how to use the platform. 58% participants said it was fun to use Zoom.

Of the 14 students who attended Zoom classes, seven attended 1 or 2 classes and seven attended 3 or more classes. Most students who

attended Zoom classes (64.3%) accessed them on their computer, and 28.6% accessed them on their cell phone. 12 participants (85.7%) had no problem using Zoom at home; two students reported initial problems (trouble finding link to class and trouble logging in) and experienced poor internet connectivity. 78.5% students who attended Zoom classes rated them as good to excellent, yet the feelings about attending future classes on Zoom were mixed. 64.3% students responded that they would not choose to take another class on Zoom and 50% liked SYDCP in person at school better than the remote program. Participants reported the following reasons for attending remote classes: 64% said they attended remote classes because information was useful; 57% wanted to complete the program; 43% because they liked that doctors came to teach; 43% because they thought it was required; and 36% because they found the topic interesting.

As indicated in Figure 2, participants who did not attend any Zoom classes reported their reasons for not attending as follows: 67% said they were not able to join due to lack of time; 50% were not able to join remote classes due to poor connection; 25% did not attend remote classes because they did not find topic interesting; 17% did not receive the link to class; and 17% had trouble logging in.

Qualitative Analysis of open-ended questions related to remote learning

For the 26 participants who completed the pre and post surveys, qualitative analysis of feedback about what would make it easier for them to join remote sessions was: to hold class at a different time (15%); to post the link to the class on a common platform (15%); or to contact them *via* an alternate email address (15%). When asked what would make it more interesting for them to join remote classes, 58% reported that they would not change anything because class is interesting as it is, and 27% suggested adding more fun and interactive activities such as role plays, "Kahoot" quizzes, activities to do at home, and utilizing interactive websites. Most students were satisfied with their Zoom experience at home and did not have too many suggestions for improvement.

Participants who attended remote sessions (N=14) reported that being more comfortable (36%), less distracted (36%), and finding communication easier (14%) made remote classes better. When asked what they liked best about the remote classes, 43% reported it was easier to participate (i.e., watch videos, see slides clearly, and play games) 29% liked that the program was beneficial for their and their team member's health, and 14% noted the interesting topic and useful information. When asked what could be improved, 21% of remote participants suggested no improvement was needed; 14% wanted more class time or better time management so they did not have to skip any material due to running out of time during class; 14% wanted videos to be checked before class to ensure that they could be played; and 14% wanted class to be held at a different time. These 14 participants felt that advantages of in-person classes were interpersonal interactions and participation (43%) and hands-on activities (21%).

Overall program satisfaction (N=26)

Of the 26 students who completed post-surveys, 96% students reported they liked that they learned something new about diabetes, 69% agreed this program helped them connect with the family member they coached, 92% reported the program helped them make a lifestyle change, 46% noted they think differently about health after doing this program, and 96% liked that doctors came to teach this program.

Discussion

This study evaluated the transition and adaptation of a health promotion program to online learning for high school students in an underserved high school. It provides evidence that programs can be successfully adapted for remote implementation and can significantly improve health beliefs and behaviors. Specifically, this study demonstrates that 1) high school students in an underserved community who participated in a remote adaptation of the SYDCP experienced significant improvements in key health beliefs and behaviors; 2) high school students from the same cohort who did not participate in the remote adaptation of the program did not demonstrate significant improvements in these health beliefs and behaviors; 3) the majority of high school student participants who completed post-surveys knew how to utilize Zoom and found it easy to use Zoom from home; 4) most of the participants who attended remote classes reported they did so because the classes have useful information while most of the participants who did not attend any remote classes reported they did not have time to attend the classes; 5) those who participated in the remote sessions liked that it was easier to answer questions, watch videos, see slides, share answers and play games on the Zoom platform versus in-person; and 6) almost every participant, regardless of attendance in the remote sessions, reported they liked that they learned something new about diabetes, the program helped them make a lifestyle change, and they liked that doctors came to teach this program.

The significant improvements reported in health mindsets, consumption of fruits and vegetables, consumption of sugary beverages, understanding of how to improve their health, and frequency of talking about health with their families are particularly encouraging given the small sample size in this study and indicates that the program's impact was substantial. Additionally, the fact that 96% of participants who completed the pre and post survey reported a positive lifestyle change as a result of program participation suggests that even a fraction of the program can be beneficial. The association between attending remote classes and making additional lifestyle changes also suggests that more participation in the program yields greater improvements in health behaviors and that remote participation has clear benefits. Because improvements in health behaviors and mindsets are correlated with improved health outcomes [21], these results suggest this program could play a role in improving health outcomes for youth in underserved communities.

While this study suggests that synchronous remote implementation of health promotion programs for adolescents in underserved communities can significantly benefit the adolescents who participate, some of the high school student participants who started the program in person were not able to continue engaging in the class after the transition to remote implementation. Students who did not participate in the remote sessions but did complete the post-test reported the two main reasons they did not participate were lack of time and poor internet connection. One possible reason for lack of time to attend remote classes could be that due to shelter in place,

many regular classes had been rescheduled and some students had to miss SYDCP class due to scheduling conflicts.

Another important consideration is that 19 of the 45 participants in this study did not participate in any remote sessions and did not complete a post survey. For these students, we have no way of knowing exactly why they did not participate, but lack of remote access may have been a barrier to participation. The teacher who coordinated this program at the high school reported that approximately the same percentage of students were not participating in any remote high school classes or programs. There exists a significant disparity in internet access with Black, Hispanic, and lower-income families much less likely to have adequate internet connectivity than White and higher-income families [22]. This "digital divide" not only affects students' ability to participate in remote educational experiences but also in their ability to stay connected with friends and family [23]. In order to best meet the needs of all students from underserved schools, it will be crucial to accumulate additional data on the barriers that exist to remote participation and what models are most successful to reach the most vulnerable students.

Limitations

This study had numerous limitations as it was planned and implemented with little notice when shelter-in-place orders were mandated. First, the small sample size limits the generalizability of this study. Another important limitation is the inability to follow and understand the experience of the 19 student participants who did not attend remote session and did not complete the post survey. Additionally, we must consider self-selection bias in this study with the possibility that participants who attended remote sessions were more motivated or interested in health improvement than their peers who did not attend the remote sessions. We also did not have a true control group because all participants attended three in-person sessions of the SYDCP program before the shelter-in-place orders.

Conclusions

Findings from this study indicate that a short, synchronous remote health promotion program is associated with healthy lifestyle changes and improved health mindsets, health behaviors, and health empowerment of adolescents from an underserved community who were able to attend the remote sessions. These findings suggest that remote health promotion programs could have value to support adolescents in underserved communities. Yet, many participants did not attend the remote sessions. To address the disparities that exist in remote access and prevent further academic and health disparities, it is essential to understand and address the barriers that exist to remote participation for many adolescents, especially those from underserved communities.

Implications for School Health

School districts and individual schools are facing unprecedented challenges as a result of COVID-19. To combat the loss in academic progress [24] as well as the declines in mental health well documented in adolescents during this time [25], finding methods to engage high school students remotely, provide academic content, and effect positive change in their lives is essential. Especially for students from underserved communities where the toll of the pandemic is heightened by increased rates of COVID-19 and hospitalization as well as economic hardship,[26] there is a pressing need for programs to support them through this time.

The successful SYDCP remote implementation described in this study indicates that it is possible to support high school students from underserved communities with synchronous remote programs. After only eight, one-hour sessions, the participants demonstrated significant improvements in health behaviors and health mindsets, and participants also reported increased understanding of how to improve their health and increased discussions about health at home. These results are especially relevant given the increase in obesity documented during this pandemic among youth [27] which substantially increases their risk of developing type 2 diabetes. This small study suggests that school health education remote learning programs can be implemented successfully with high school students from underserved communities, and that these students' health could benefit from such programs.

Qualitative feedback from participants also suggests that there were elements of the remote implementation that they found particularly engaging including the ability to answer questions in chat, watch videos, see slides clearly, and play games. These comments also suggest that the synchronous nature of the program was beneficial, and educators can capitalize on this feedback to maximize the engagement of their remote classes.

Yet, more than half of the participants who started this program in person were not able to attend any of the remote sessions which signals the critical need to identify and support students in underserved communities who are not able to access remote learning opportunities.

Human Subjects Approval Statement

The Institutional Review Board (IRB) of Stanford University approved our study and based on the type of human subjects' involvement in the study, granted it an exempt status as per regulations 45 CFR 46 or 21 CFR 56.

Acknowledgements

The authors do not have conflicts of interest. Subjects were recruited and treated in accordance with approved Stanford IRB guidelines for medical trainees.

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