

Changes in Knowledge, Attitudes, and Perceptions About Substance Use Among Third Graders After Introduction of Substance Use Prevention Curriculum: A Pilot Study

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Abstract

Substance use remains a critical concern in youth, necessitating early educational interventions to encourage informed decision-making. This study aimed to evaluate the effectiveness of a pilot health promotion and substance use prevention curriculum introduced at the third-grade level. Third-grade students from nine schools in South Dakota and Minnesota participated, with the curriculum's efficacy assessed via pre- and post-curriculum surveys evaluating students' knowledge of content included in the curriculum. Mean student age was 8.5 years old and average class size was 20 students. Results showed an increased understanding of basic substance use disorder concepts, an improved ability to identify different parts of the brain and identify harmful effects of substance use on the brain and body, and increased awareness of fentanyl as a dangerous substance. The differences between the pre-curriculum and post-curriculum were statistically significant, indicating learned concepts from the provided course content. This study highlights that a well-structured curriculum can bolster third graders' understanding about personal health, brain functions, safe medication use, and the potential harms from substance use.

Introduction

Over the past two decades, drug overdose has become a national crisis with deaths surging from approximately 70,630 in 2019 to 106,699 in 2021, and annual rates continue to increase year-over-year.^{1,2} This alarming trend impacts adults and adolescents alike, with overdose-related deaths among 14 to 18-year-olds nearly doubling between 2019 and 2020.³ Recent data further suggests that up to 10% of 12- and 13-year-olds have tried tobacco, alcohol, or another substance.⁴ This rise in substance use among younger adolescents is especially concerning, as substance use before the age of 13 has been correlated with a 70% likelihood of developing a substance abuse disorder within seven years.⁵

Effective substance use prevention programs require proactive intervention before first use occurs.^{6,7} While familiar programs such as Project DARE have been widely implemented and federally funded since the early 1980s,⁸ relatively recent data have shown that less than one-third of all schools implementing a substance use prevention curriculum utilize evidence-based methods of instruction.^{9,10} Very few programs have been rigorously studied, and analysis that has been done has generally shown limited efficacy of programs such as DARE. Nonetheless, many states have

mandated the provision of these drug prevention curricula at the elementary level.¹¹

Nearly 30 years ago, Dusenbury and Falco outlined the foundational elements that they believed underlie an effective substance use prevention curriculum.¹² They argued that these curricula must:

1. Be grounded in research.
2. Deliver developmentally appropriate information.
3. Offer training in social resistance skills.
4. Provide normative education emphasizing that most individuals do not use illicit substances.
5. Foster the development of decision-making, assertiveness, and broader social skills.
6. Utilize interactive engagement over traditional didactic lecturing.
7. Be facilitated by trained providers.
8. Be taught longitudinally over an extended period.
9. Exhibit cultural sensitivity, ensuring relevance across diverse student populations.
10. Undergo rigorous and periodic evaluations to confirm effectiveness.

Contemporary substance use prevention programs

such as Raising Healthy Children, Positive Action, and LifeSkills Training have incorporated these principles to a greater degree than previous programs and have likewise demonstrated greater efficacy at achieving their outlined goals. Raising Healthy Children focuses on comprehensive student, teacher, and parent training but faces ambiguous impact results; Positive Action uses structured sessions to teach personal health and competence, showcasing multiple positive outcomes; LifeSkills Training stands out as a flagship program, incorporating a blend of personal management and drug resistance skills and consistently demonstrating efficacy. Despite these advancements, a critical need persists for curriculum that is both robust and consistently effective.^{13,14,15}

To address this continued need, we assembled an education committee which included addiction medicine specialists, a child psychiatrist, and elementary school teachers with the goal of developing an evidence-based third grade substance use prevention curriculum that might be used by schools locally and beyond. A pilot version of the program was administered to third graders in nine different school districts over the 2022-2023 school year, and students completed baseline knowledge surveys prior to receiving the curriculum. After a year of instruction, the baseline survey was once again completed, and students demonstrated significant improvements regarding knowledge of personal health, safe medication use, and the potential consequences of substance use.

Methods

Curriculum Development and Design

A multidisciplinary educational planning committee was organized, including experts from the fields of child and adolescent psychiatry, addiction, psychology, education, and school administration. Together, the committee developed a third-grade health promotion and substance use prevention curriculum structured into eight lessons to be delivered sequentially throughout the year. The eight lessons are as follows:

1. My Body
2. My Brain
3. My Brain on Substances
4. Your Health/My Health
5. Medication Safety
 1. Substance Use Disorder
7. Emotions
8. Pressures

Each lesson represents a general theme to be taught

longitudinally as a student progresses from elementary to high school. Although students will work through many of the same lessons each year, the content within each lesson evolves to suit the students' advancing age and understanding. For example, the "My Body" kindergarten lesson is quite basic, but its content deepens and broadens at each subsequent grade level. Additionally, the eight lessons are designed to be gradually introduced from kindergarten to third grade, at which point a student will be receiving all eight lessons for the first time.

Materials and Engagement Tools

Lesson books tailor-made for each grade level were developed to present educational content in an age-appropriate manner. Each lesson incorporates interactive elements such as group activities, discussions, and student-driven interactions to ensure active engagement. To further augment learning, animated videos and narrated stories are also incorporated. Brief quizzes conclude each lesson to assess student comprehension of lesson content.

Schools and Curriculum Implementation

The education committee contacted school superintendents and principals across South Dakota and Minnesota to recruit pilot schools. Nine school districts representing a mix of rural and small urban towns consented to participate. Third-grade classes were chosen to receive the pilot as this is the first grade level at which all lessons are designed to be taught, and also due to the curriculum's alignment with the National Health Education Standards, which outline goals for curricula taught from third to fifth grade. Average class size was 20 students. School administrators gathered written consent from parents at the beginning of the school year to allow the administration of our third-grade curriculum in the classroom. The committee then conducted orientation sessions for educators and counselors involved in the pilot. Schools were finally equipped with the necessary teaching aids, including lesson books, lesson plans, models, and video animations. This study was approved by the institutional review board at the University of South Dakota.

Survey Design and Implementation

A 10-question multiple-choice survey was designed by the education committee, focusing on basic concepts from the eight lessons. This instrument was administered via Google Forms at the start of the academic year, capturing baseline data from 324 third grade students across the participating schools. All 343 students in attendance on the day of baseline survey collection attempted the survey, but 19 surveys were

excluded from baseline analysis due to missing answers on one or more questions. To the committee's knowledge, no students refused the survey and there were no significant technical difficulties. All surveys were completed voluntarily and no identifying information was collected.

Curriculum Delivery and Oversight

The curriculum was delivered over the course of the 2022-2023 academic year, with educators given the flexibility to pace lessons according to their classroom dynamics. Each lesson took roughly 30 minutes to complete. While educators had the autonomy in pacing the lessons, the committee maintained oversight through periodic check-ins, ensuring curriculum fidelity and addressing any concerns. All school districts reported completion of all eight lessons.

Post-curriculum Survey and Data Analysis

The initial survey was re-administered at the conclusion of the academic year and completed by 309 students. In total, all 323 students in attendance on the day of post-curriculum survey administration attempted the survey, but 14 were excluded due to one or more missing answers. All surveys were again completed voluntarily and were without significant technical complications. The pre- and post-curriculum survey data were analyzed with an independent samples t-test on SPSS.

Results

Overall Performance

The post-curriculum survey indicated an overarching improvement in the percentage of correct answers on all questions when compared to baseline results. The mean survey score of all students at baseline was 55.7% correct, and mean scores post-curriculum increased significantly to 76.7% correct ($p < .001$).

Individual Question Analysis

While improvements were observed across all questions, the extent of change varied. Some questions which had a higher initial correct response rate showed marginal improvements. For instance, nearly 80% of students correctly answered "Yes or No: Alcohol and drugs change the way my brain works" at baseline, and nearly 90% correctly answered this at the end of the year. Greater improvements were seen on other questions such as one stating "Tolerance impedes brain function and could cause me to lose interest in things I like," which increased from 51.0% to 75.2% correct. Table 1 displays the percentage of correct answers for each survey question at baseline and post-curriculum.

Discussion

Summary of Main Results

Our post-curriculum survey indicated an overall enhancement in the percentage of correct answers for all questions when compared to the pre-curriculum baseline. This improvement suggests that the curriculum effectively conveyed the information that the educational committee intended. These findings are consistent with other studies that show that targeted and age-appropriate educational interventions can positively impact students' knowledge on the consequences of substance use.

Strengths

Broad Implementation: With the curriculum being adopted in various settings ranging from rural school districts to small urban towns, our study showcases the curriculum's low cost, ease of implementation, and adaptability to various classroom environments.

Large sample size: The participation of 324 students in the pre-curriculum survey and 309 students in the post-curriculum survey ensures a fair representation of many schools in the midwest, enhancing the generalizability of our results.

High fidelity: The reported completion of all lessons by all curriculum providers underscores the program's feasibility and ease of implementation in school settings.

Limitations

Grade-specific implementation: Our study focused solely on third graders, which limits generalizability to other grades.

Anonymous data: As no identifying data was collected, we cannot pair baseline and post-curriculum survey results for individual students and cannot identify students that moved into or out of a school district mid-year. However, communication with school district leaders indicated minimal student dropout and minimal addition of new students.

Potential confounding factors: While our curriculum was intensive, students may have garnered knowledge from other subjects or external influences, potentially contributing to increased post-curriculum scores.

Implications and Future Directions

Given the promising results, we have expanded the availability of our curriculum to 50 schools across five states. The curriculum has been broadened from kindergarten through fifth grade and the educational committee continues

Table 1. Comparison of students' percentage of correct answers on the baseline and post-curriculum surveys for each question.

Question No.	Question (Answer)	Baseline correct N = 324	Post- curriculum correct N = 309	Difference
1 Baseline N = 343 Post-curriculum N = 322	My brain controls my entire body. (Yes)	77.8%	95.3%	+ 17.5%
2 Baseline N = 340 Post-curriculum N = 320	Name the three parts of the brain. (Cerebrum, brain stem, cerebellum)	39.2%	69.6%	+ 30.4%
3 Baseline N = 341 Post-curriculum N = 322	What "feel good" chemical does the brain release? (Dopamine)	23.8%	67.6%	+ 43.8%
4 Baseline N = 342 Post-curriculum N = 320	What does "PTA" stand for? (Pause, think, act)	46.6%	88.5%	+ 41.9%
5 Baseline N = 339 Post-curriculum N = 321	Who should I take medication from? (A trusted adult)	78.4%	89.4%	+ 11.0%
6 Baseline N = 340 Post-curriculum N = 319	Tolerance impedes brain function and could cause me to ____. (Lose interest in things I like)	51.0%	75.2%	+ 24.2%
7 Baseline N = 338 Post-curriculum N = 319	Alcohol and drugs change the way my brain works. (Yes)	79.8%	89.3%	+ 9.5%
8 Baseline N = 341 Post-curriculum N = 319	What would happen if I start using drugs before my brain is done growing? (High chance of developing substance use disorder)	61.5%	71.4%	+ 9.9%
9 Baseline N = 342 Post-curriculum N = 321	What area of the brain controls my emotions? (Limbic system)	20.2%	33.1%	+ 12.9%
10 Baseline N = 343 Post-curriculum N = 319	Fentanyl is ____. (Dangerous)	77.5%	87.1%	+ 9.6%
Mean totals		55.7%	76.7%	+ 21.0% (p < .001)

to develop lesson plans for middle school and high school, creating a comprehensive program that follows students from the beginning of elementary school to high school graduation.

Conclusion

This pilot study reaffirms that a well-designed curriculum can significantly enhance knowledge about personal health, brain functions, safe medication use, and the potential harms of substance use among third graders. Given the increasing challenges posed by substance use and its repercussions, early educational interventions are pivotal.

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