Final Report: Program Evaluation

Ask, Listen, Learn: *Alcohol and Your Developing Brain*

Outcomes of a Digital Curriculum Designed for Youth as Implemented in Classrooms across the U.S.A.

Submitted to

Foundation for Advancing Alcohol Responsibility

By

The Insight Consulting Group

Allan Y. Cohen, Ph.D. & Chris Ringwalt DrPH

May 15, 2018

CONTENTS

Page

4 **EXECUTIVE SUMMARY**

5 **INTRODUCTION and OVERVIEW**
Alcohol Use Prevention in Education
Brain Science in Education

6 **PROGRAM HISTORY AND DEVELOPMENT**
Program Goals
Commissioning of Independent Evaluation

8 **METHODS**
Evaluation Design
Design Elements
Design Testing: The Pilot Study
10 Measurement Techniques
Instrument Development: Student Outcomes
Instrument Development: Teacher Interviews and Fidelity Check List
13 Recruitment and Data Collection

13 **RESULTS and FINDINGS**
Characteristics: The National Study Sample
15 Study Findings: Student Outcomes
Analytic Strategy
A Baseline Assessment: School Bonding
Acquisition of Specific Knowledge about Brain Anatomy and Function
Acquisition of Understanding about the Effects of Alcohol on Brain Function
Confidence in Communication about Alcohol's Effects on the Brain
Stimulation of Interaction about Alcohol with Teachers and
Attitudes and Intentions about Alcohol and Healthy Decisions
28 Students' Feedback on Their Class Experience
Intellectual Interest
Student Affective Experience
Student Comments: Positive Reactions and Suggestions for Improvement
33 Study Findings: Teacher Response and Participation
Teacher Feedback from the Pilot Test
Teacher Implementation and Fidelity: The National Study

39 **DISCUSSION**
The Issue of Effectiveness
Issues involving Implementation
41 Recommendations
Appropriate Grade Levels
Further Research & Development
43 Concluding Statement

44 A**PPENDICES**
45 Appendix A. Pretest Instrument
46 Appendix B. Posttest Instrument
48 Appendix C. Fact Sheet on the Protection of Human Subjects
50 Author Information and Acknowledgements

Executive Summary

Introduction and Overview. This report describes findings related to the evaluation of the national deployment of the Ask, Listen, Learn "*Alcohol and Your Developing Brain*" curriculum. Our first discussion reviews the conceptual context of the program in the domain of substance abuse and health education, with a particular focus on alcohol abuse education. We also place the curriculum within the context of science education. We then link the theoretical background with the explicit goals and objectives of the program and closely examine the rationale behind our approach to evaluation design and outcome measurement.

Evaluation Design and Sample Characteristics. We describe the processes of instrument development, the recruitment of participating classrooms, the operational elements of data collection, and our strategies for statistical analysis. After an explanation of a pilot test (conducted in eight classrooms), we detail the characteristics of the final national sample of 72 classrooms and some 1,770 students. Roughly comprising equal numbers of boys and girls, the grade levels included mostly 5^{th} -7^{th} grade students, along with fewer classrooms of 4^{th} and 8^{th} graders.

Student Outcomes. We then examine student responses to an anonymous paper and pencil survey given before the seven lessons that constitute the curriculum, and another survey survey conducted after all lessons were completed. Some items in the survey appear both on the pretest and the posttest, while others appeared singly on one or the other. With very few exceptions, the pre-post and posttest only outcomes demonstrated statistically strong confirmations of the intended programmatic objectives. Summary highlights include findings that:

1. *Students successfully acquired specific knowledge about brain anatomy and function;*
2. *Students successfully demonstrated an understanding of the effects of alcohol on the function of the developing brain and reported confidence in sharing that understanding with their peers;*
3. *Students reported significantly increased communication with adults (teachers, parents, and caregivers) about underage drinking;*
4. *Students developed a greater perception of the harmful effects of underage drinking, reporting attitudes and values consistent with making better decisions in the future; and*
5. *Students reacted positively to the program, reporting that it engaged them intellectually and that they enjoyed their class experience.*

Teacher Participation and Feedback. Participating teachers also responded enthusiastically to the impact of the class and their teaching experience, reporting a high degree of student engagement. They also collaborated relatively fully in online reporting of their implementation of the class activities that accompanied the animated videos. We found that meaningful student outcomes were generated even in classrooms where all the activities were not implemented.

Conclusions and Recommendations. The report concludes with the implications of our overall findings, including the strengths and replicability of the program. We offer recommendations regarding optimal grade levels, further research, and possible future versions of the programmatic digital suite.

INTRODUCTION and CONTEXT

Alcohol Use Prevention and Education. There are now decades of funding from the National Institutes of Health that have supported evaluations of generic substance use prevention programs for students of all ages. While the great majority of these have targeted middle school students – a developmental stage at which many children initiate alcohol and other substance use – a few were developed for elementary school students.[1] Of these, only four have been specified as either "model" or "promising" by the nation's preeminent compendium of evidence-based practice in the human services ("Blueprints for Healthy Youth Development"[2]). The one program designated as a model is "Positive Action";[3] the remaining promising programs include "Coping Power",[4] "Raising Healthy Children," and "the Good Behavior Game".[5] All of these may be characterized as psychosocial prevention curricula, and none approaches prevention from the perspective of brain science and the effects of alcohol on the developing brain. In this regard, the *Ask, Listen, Learn: Alcohol and Your Developing Brain* (*ALL*) curriculum makes a unique contribution to a very limited field of effective alcohol use prevention efforts that target students aged 9-12 years.

Brain Science in Education. Policy and practice related to addictions and substance abuse have moved recently toward a model of addictive problems as "brain disease." We find increasing emphasis from federal agencies, such as the National Institute on Alcohol Abuse and Alcoholism (NIAAA) (e.g.,[6]) on neuroscience, neurotransmitters and the behavioural effects of anomalies in the nervous system that are attributable to psychoactive substances. However, this trend has not yet translated into the development of school-based curricula for alcohol education.

On a parallel track, despite widespread interest in promoting middle school students' interest in pursuing careers in science, technology, engineering, and mathematics (STEM), there is remarkably little documentation in the scientific literature of examples of curricula designed to accomplish this goal. A review of the literature yielded only one, which is based primarily on videos of scientists in these various fields.[6] Specific curricula that focus on stimulating students' interest in brain science and functioning are also scant. More generally available on the Web are

[1] Ringwalt, C., Vincus, A. A., Hanley, S., Ennett, S. T., Bowling, J. M., & Haws, S. (2011). The prevalence of evidence-based drug use prevention curricula in US middle schools in 2008. *Prevention Science*, *12*(1), 63-69.

[2] http://www.blueprintsprograms.com

[3] http://www.blueprintsprograms.com/factsheet/positive-action

[4] http://www.blueprintsprograms.com/factsheet/coping-power

[5] http://www.blueprintsprograms.com/factsheet/good-behavior-game

[6] Wyss, V. L., Heulskamp, D., & Siebert, C. J. (2012). Increasing middle school student interest in STEM careers with videos of scientists. *International Journal of Environmental and Science Education*, *7*(4), 501-522.

sites that provide advice, guidelines, and student activities for teachers who might want to integrate instruction on brain science into their existing lesson plans (e.g.,[7,8]).

One curriculum,[7] which does offer teachers specific lessons and associated plans, includes topics such as the anatomy of the brain, protecting the brain from impact, the nervous system, and neurons and their functions. However, except for Ask, Listen, Learn (*ALL*), the only Web-based material that focuses specifically on the effects of substances on the developing brain is sponsored by the National Institute on Drug Abuse (NIDA),[8] but it is designed to be read directly by adolescents and is not presented in a curricular format. *ALL* thus appears to be unique in presenting a fully articulated curriculum that was developed to enhance late elementary and middle school students' interest in the science of the brain, to increase awareness of the effects of alcohol on the brain, and potentially to promote interest in careers such as neuroscience. It is reasonable to expect that *ALL*- exposed students will more easily integrate the new science around psychoactive substances as they progress to higher grade levels.

Program History and Development

Launched in 2003 by the Foundation for Advancing Alcohol Responsibility (Responsibility.org), *Ask, Listen, Learn: Kids and Alcohol Don't Mix* (*ALL*) was developed with an overarching goal in mind: to prevent underage drinking by encouraging parents to have conversations with their kids about alcohol. The program has constantly evolved to meet the current needs of three primary audiences: parents, educators, and youth ages 9-12.

Since its inception, shaped by expert input, including from the U.S. Department of Education, the American Academy of Family Physicians, and the CDC, the program has taken on many forms. Initiatives have included television advertising campaigns with Nickelodeon, in-school events with elected officials, partnerships with Olympic athlete role models like Apollo Ohno, Ashley Wagner, and Simone Biles, and distribution of resource material through the publisher Scholastic.

After nearly a decade of programming, Responsibility.org took a fresh look at the program. They saw that the landscape of education was changing; technology was becoming more present in the classroom, and late elementary and middle school-aged students were growing up as digital natives. To continue to provide quality, creative, and relevant content, *ALL* set out to develop a fully digital suite of resources focused on alcohol and the developing brain.

Teacher experience and focus groups had demonstrated kids' fascination with how their brains and bodies work. With the importance of digital format in mind, staff and expert consultants narrowed the program's focus to the brain, how alcohol affects it, and how that, in turn, affects behavior and health. All material went through a series of review with teachers, counselors, and students. Program content regarding alcohol's effect on the developing brain was reviewed by experts at the National Institute on Alcohol Abuse and Alcoholism and is consistent with

[7] https://faculty.washington.edu/chudler/baw1.html
[8] https://teens.drugabuse.gov/drug-facts/brain-and-addiction

currently available science. Each iteration incorporated suggestions on content, with a particular concentration on student engagement and ease of implementation for teachers.

The final product (*Ask, Listen, Learn: Alcohol and Your Developing Brain)* is a fully digital suite of curricular content accessible online free of charge. It features seven vibrant animated videos, as well as lesson plans, resources for parents, games, and activities, and more. All content has been aligned to Common Core, Next Generation Science, and National Health Education Standards to facilitate its adoption and justify the time spent on the curriculum. With the support of partners like the American School Counselor Association and the National Association of School Nurses, the new content was released in November 2016. Since that launch, Responsibility.org has built an *ALL* community of over 7,000 educators and parents, and has distributed the program to 210,000 classrooms, reaching perhaps millions of parents.

Program Goals

The *ALL* curriculum was hypothesized to assist in reducing the probability of future underage drinking among students aged 9-12, with a particular focus on the 5th and 6th grades. *ALL's* primary program goals prioritize: (1) student learning about brain anatomy, physiology, and function, (2) student understanding of how alcohol affects the developing brain, and (3) comprehension concerning the physiological processes by which alcohol affects behavior and health. Further below, we discuss briefly the conceptual background of how knowledge, attitudes, and intentions about alcohol may affect later behavior. By implication, an indirect goal of the curriculum is to enhance students' willingness to talk about alcohol misuse with parents and other adults.

Commissioning an Independent Evaluation. Responsibility.org has a longstanding tradition of researching and evaluating their programs and initiatives, from development through implementation. The earliest evaluation of the program was conducted by Teenage Research Unlimited (TRU) in 2005, assessing the impact on parents and kids from the brochure in *Nick* magazine. An evaluation conducted in 2010, by what was then the Century Council, involved the *ALL* video game, a progenitor of the curriculum evaluated here. The program included six games, four of which included specified questions and probes designed to assess players' understanding about healthy lifestyle choices and the dangers and consequences of underage drinking. The results of a pre- and post-test survey of about 1,300 5th through 7th graders revealed that these games appeared to raise students' awareness and knowledge concerning the dangers of drinking alcohol. Results also showed that students mostly found the games to be an enjoyable means by which to learn about the dangers of underage drinking [9].

A third evaluation in 2014, conducted by Scholastic, in partnership with Responsibility.org, of an earlier iteration of the Ask, Listen, Learn curriculum (*Reach for Success*), featured pretest surveys of about 2,200 5th through 7th grade students and posttest surveys of 1,900 students. The results of this evaluation demonstrated increases in students' discussions about alcohol awareness, both at school and at home. The data also show an increased awareness of the health

[9] https://asklistenlearn.org/materials/game-evaluation-research-report/

effects of alcohol use related to underage consumption[10]. A companion survey of 320 teachers suggested that over 90% had used, or planned to use, *Reach for Success* materials with their students and to distribute the program's family-oriented information to students' families. Again, over 90% found *Reach for Success* to be either *extremely* or *very* useful[11].

In 2017, a science-based assessment of the new curriculum was the natural next step. To that end, Responsibility.org commissioned an independent, external study of program effects, selecting a team of researchers with substantial experience in substance abuse education. Potential contractors were tasked with executing a rigorous large-scale study, primarily of 5th – 7th graders from schools across the nation. The evaluation strategy focused on measuring the effectiveness of the program's impact, both on its intended objectives, as well as on variables known to decrease the risk of later underage drinking.

Our research team (as The Insight Consulting Group), was intrigued by the innovative nature of the program and the sincere resolve of the Responsibility.org to support an external, fully independent, and science-based evaluation. The study we conducted served one major and one secondary purpose: (1) to assess the immediate effect of students' exposure to the *ALL* program, and (2) to inform program developers of any findings that might suggest helpful refinements in further replication.

METHODS

Evaluation Design

We created a systematic research design that included a pilot study and a subsequent evaluation of the curriculum with a large national cohort of classes. The evaluation design began with an analysis of results from focus groups conducted by an independent researcher and overseen by Responsibility.org staff in 2016. The series of focus groups involved 5th and 6th grade students and 4th through 6th grade health and science teachers, testing the utility of the animation and the materials. Results from each series of focus groups and classroom demonstrations helped refine the final digital suite and materials. Upon examining the material and clarifying the program's prime objectives, the next step was to construct an evaluation approach that applied the best science consistent with the current stage of program development.

Design Elements. At the program's stage of development, the critical research questions involved whether *ALL*, administered with reasonable fidelity, would meet its objectives and could demonstrate its effectiveness. On one dimension, the program objectives mirrored ordinary educational testing of new content, e.g., "Did students learn and retain the intended information?" On another dimension, the program objectives hypothesized change in an intended direction, e.g.,: "Did the curriculum change existing knowledge and attitudes about alcohol's effects on the nervous system and behavior?" Another interesting program

[10] https://asklistenlearn.org/materials/scholastic-student-assessment-report/
[11] https://asklistenlearn.org/materials/scholastic-teacher-evaluation/

characteristic affecting research design involved the absence of any reasonably similar school-based program for the intended age group. No comparable curricula appeared to exist for 5th to 7th graders, and none that was available online and that featured alcohol abuse education focusing on brain function.

We considered all practical options for an optimal design. Our focus was on the effectiveness of the program under conditions that would be encountered in an eventual national rollout. For obvious reasons, with no relevant comparison curriculum or group and at this stage of program development, a randomized control trial would not have been appropriate. Also, artificially stratifying a purposive sample to resemble arbitrarily selected population characteristics also appeared inappropriate. The ultimate target populations for the program were schools and teachers interested in this free, readily available, and innovative approach. Thus, a rational research sampling should reflect that target population. We determined that the optimal design that yielded adequate statistical power for assessing student outcomes would involve a reasonably large national study of at least 50 classrooms in schools and with teachers who were interested in trying out the curriculum. Measurement would include carefully crafted student surveys administered at the beginning of the program lessons and after its last lesson. The pre-post design would include items measuring both progress in achieving instructional objectives and change in other key variables intended by the program.

Simultaneously, we developed a rigorous online procedure for teachers to measure the degree to which they used the animation videos and the panoply of materials and resources intended to enrich classes. To approach a true efficacy trial, we did impose conditions to ensure that a minimum set of some 49 activities of the seven lessons were implemented. Also, with the assistance of program staff, we developed strategies to recruit cohorts of collaborating teachers.

Design Testing: The Pilot Study. Before mounting a full national evaluation, we asked program staff to recruit teachers from six states and the District of Columbia to assist us with a pilot study. The curriculum, accompanied by draft questionnaires, was implemented in six schools with 5th and 6th graders and in two schools with 7th and 8th graders.

On a qualitative level, both teachers and students were enthusiastic about the course (see page 33). Curriculum developer-observers were also pleased with the experiment. Looking at the quantitative results of pretests and posttests by classroom (a total of 330 survey forms), results were encouraging, both in the acquisition of knowledge and intended changes in attitudes and implied values. Several of the survey items not involving specific knowledge about brain function showed "ceiling effects" on the pretest, which attenuated our ability to look to for changes on the posttest. As a result, several of the items were refined, some re-worded, some deleted, and some added. Overall, the quality of implementation, data collection, and program results strongly warranted deploying the national study.

Measurement Techniques

Instrument Development: Student Outcomes. The final measurement instruments for student outcomes were developed carefully over three months, integrating preliminary results from the pilot test. The survey items had to meet at least the following criteria:

1. Consistent as possible with contemporary wording from similar studies;
2. Possessing "construct validity" – that is, they measured the construct that we desired them to measure - and clarity of meaning;
3. Efficient enough to take no more than ten minutes for students to complete;
4. Wording of items that would help prevent response biases (e.g., automatically agreeing with a series of statements), as well as minimizing ceiling and floor effects;
5. Offering a range of flexible responses;
6. Avoiding any attribution of sensitive personal behavior (such as personal drinking behaviors or parental abuse);
7. In the posttest, where possible, allowing students to attribute changes in their knowledge or attitudes directly to the curriculum;
8. Compatibility with the likelihood of honest answers, to avoid social desirability bias; and
9. Tracking closely the stated goals and objectives of the program.

Keeping in mind the above criteria, we chose to construct categorical (or "nominal") response options, instead of scaled (or Likert type) responses. Categorical options are easier for students to respond to, while allowing statistical techniques that require fewer mathematical assumptions. To enhance the variance of responses, many of the items included a "not sure" or "maybe" option to amplify their reactions to items.

The posttest questions to which students responded were more extensive than those asked on the pretest. Fewer items about brain anatomy and physiology appear on the pretests, since fewer students would have had a sufficient introduction to brain science before their exposure to the program to respond meaningfully on the pretest. Also, several posttest items unique to the posttest included attributional elements, i.e., allowing students to tie outcomes specifically to the classes. Students who finished the posttest early could write in comments about what they especially liked about the classes and how they might be improved. Appendices A & B include contents of the actual pretest and posttest forms.

The table on the following page lists all the survey items and in which survey(s) they appear. We have numbered them sequentially for easy reference. We use the same item numbers in the Results section further below.

NUMERICAL KEY TO ITEMS ON PRE AND POST INSTRUMENTS

{Numbers are assigned to each item, in order of their appearance on each survey. Note that Pre-Post items are identical.}

Pretest Only

7. Most of the time, I really enjoy coming to school.

Both Pretest and Posttest

1. Grade
2. Gender
3. Have you ever talked about underage drinking with your teacher as part of a classroom discussion in school?
4. In the last year, how often have you talked with your parents, grandparents, or another adult caregivers about the dangers of underage drinking?
5. Have you ever been taught about the brain and how it works as part of a classroom lesson in school?
6. Have you ever been taught about the effects of alcohol on the brain as part of a classroom lesson in school?
8. Alcohol affects only certain parts of the brain.
9. Alcohol acts as a stimulant to the nervous system.
10. Some people can drink alcohol and still drive well.
11. What are neurotransmitters?
12. I could explain to friends how alcohol affects the brain.
13. The brain has many parts. Which parts of the brain can be affected by drinking alcohol?
14. I could explain to friends why drinking alcohol is more harmful for young people than for adults.
15. I have enough information to help me make good decisions in high school about drinking alcohol.

Posttest Only

16. Excitatory neurotransmitters slow the brain down.
17. The cerebellum controls coordination.
18. The hippocampus makes and stores memories.
19. The medulla helps with making smart decisions.
20. The cerebral cortex is divided into three lobes.
21. Knowing about the effects of alcohol on the brain will help young people make better decisions about drinking.
22. How much did you enjoy the classes you've had on alcohol and the brain?
23. This class made me want to learn more about the effects of alcohol.
24. This class made me interested in neuroscience.
25. What are three things you especially liked about the "Ask, Listen, Learn: Alcohol and Your Developing Brain" classes?
26. What could we do to make the classes better?

Instrument Development: Teacher Interviews and Fidelity Check List. In recent years, there has been considerable interest in the development of effective strategies designed to determine how prevention curricula are implemented in the classroom. These strategies include training teachers in curriculum administration and then hoping, and trusting, that they would then administer the curriculum as intended, as well as to placing video cameras in their classrooms to record their lessons. Particularly well-resourced studies have then utilized pairs of impartial observers to document the degree of concordance of the content of the teachers' guide and what teachers said and did (and how they said and did it), relative to each activity in each lesson.[12] Particular interest has focused on whether teachers abbreviated particular activities (or perhaps failed to administer them altogether), and which activities tended to be given short shrift. Often these have been the ones that the developers consider key to the success of their curricula – particularly carefully guided discussions, small group work, and student role plays. Indeed, program implementation failure has been given a name – Type III error – all its own. The term is used to describe a situation in which an evaluator reports that a particular program has failed to reach its objectives, when in fact the "failure" was not due to the program itself but to how it was administered.

Teachers participating in the national study were invited to implement the *ALL* curriculum in their classroom and also to complete a "fidelity checklist" shortly following their completion of each lesson (to prevent recall bias). The Fidelity Checklist was tailored closely to the activities that constituted each lesson. While some response options were dichotomous – e.g., "did you show a particular video or not," most comprised the following alternatives:

- *I used this activity as described in the lesson plan*
- *I used part, but not all, of this activity*
- *I made some modifications to this activity*
- *I did not use this activity*

We knew there would be variation in the number of activities teachers would complete. Again, we would not consider this a failure in design or implementation, but rather a pragmatic result of the range of activities that may be expected to be administered in future iterations of the program. Further in this report, we describe the variations in implementation across lessons and among teachers. Whatever the nature of the results, they would be useful for program staff, both for curriculum refinement and enhanced preparedness for later technical assistance.

[12] Ringwalt, C.L., Clark, H.K., Hanley, S., Shamblen, S.R., & Flewelling, R.L. (2010). The effects of Project ALERT one year past curriculum completion. *Prevention Science*, *11*(2), 172-184.

Recruitment and Data Collection.

Program staff sent descriptions to their large network of educators, inviting participation by school personnel in the age group targeted. Potential teachers were informed that they or their school would receive a small incentive if they completed regular online reports of their activities and if they administered both pre- and posttest paper surveys to their students.

Teachers were encouraged to administer all activities in all lessons, but were offered flexibility in timing. Most were given at least eight weeks to complete the process. Once the list of interested teachers was compiled, program staff (and a data collection contractor) sent them a complete set of instructions for program implementation. Our research staff provided teachers with a fact sheet on confidentiality and human subjects protection to help assure that school administrators were comfortable about student surveys (cf. Appendix C). Teachers also received instructions about the online software for inputting teacher activities. As noted, teachers' online reports included which lessons they had administered, and which specific activities they used in each lesson.

Teachers received paper student pretest surveys, along with a Federal Express package for survey return. After receipt of the pretests and completion of four fidelity checklists, the data collection contractor sent a new package with the posttests and another FedEx return envelope. The contractor collected the responses and entered scores into a statistical database (SPSS) for the use of the evaluation team and its statistical analysis. Likewise, data from teacher activity input were also aggregated and forwarded to our evaluation staff.

RESULTS and FINDINGS

Characteristics: The National Study Sample.

From 70 unique schools and 72 classrooms, program staff received a total of 1,836 pretests and 1,652 posttests. We examined the resulting database to look for anomalies, such as out-of-range values and also to settle on the appropriate statistical tests for our analyses. For pre-post comparisons in studies such as this, we expect some attrition from the students who took the pretest. For example, we would lose any pretest students who were absent at the posttest. To a lesser extent, the students who were absent at the pretest might not have completed the posttest. In a few cases, such as some 6^{th} grade classrooms where two teachers who sent in pretests either did not administer the posttests or did not send them in to us, we eliminated some surveys from the pre-post analyses.

To ensure necessary confidentiality, students completed the surveys anonymously. We were unable to identify them or match them up from pretest to posttest. Therefore we used the students' class as the primary unit of measure and calculated averages of all students for each item by classroom and grade level. For the pre-post items, we matched classrooms that

completed both pretest and posttests, excluding those classrooms with missing data. For the items included on the posttest only, we were able to use more of the posttest surveys.

Regarding overall demographics, the table below shows the total responses broken down by grade level, both for the pretest and posttest. On the pretest sample, 71.8% were 5th and 6th graders, with 7th graders totaling 32.6%. A smaller group of 8th graders (9.3%) and two classes of 4th graders (2.4%) completed the total. We can see that the percentages of participation from by each grade remained relatively constant from pretest to posttest despite the overall attrition.

Demographics: Grade Level

Item 1. ***Grade:***

Pretest N	***Pretest %***	***Posttest N***	***Posttest %***
4th: 44	2.4%	4th: 33	2.0%
5th: 720	39.2%	5th: 701	42.4%
6th: 598	32.6%	6th: 465	28.1%
7th: 304	16.6%	7th: 301	18.2%
8th: 170	9.3%	8th: 152	9.2%
TOTAL: 1,836		**TOTAL: 1,652**	

Regarding gender, the table below displays self-identified gender in pre and posttests from the entire original sample. The distribution in both cases was quite even, with a very slightly greater representation of female students. None took advantage of checking a preference for not answering the question. An inspection of the raw data showed this close equivalence across all grade levels, except for a higher percentage of girls in the small 4th grade sample.

Demographics: Gender

Item 2. ***Do you consider yourself to be:***

Pretest N	***Pretest %***	***Posttest N***	***Posttest %t***
Male: 909	**49.5%**	Male: 812	**49.2**%
Female: 927	**50.5%**	Female: 840	**50.8%**
TOTAL: 1,836		**TOTAL: 1,652**	

Study Findings: Student Outcomes

To best understand these results, we discuss single items and clusters of items in terms both of their placement (pretest only; pre-post; and posttest only) and their content.

Analytic Strategy. Before performing statistical tabulations and analyses of the student outcome results, a final sample was selected for pretest-posttest comparison. The selection corrected for anomalous attrition and maximized the likely match between pretests and posttests for the classrooms under study. Ultimately, we analyzed 3,482 surveys, including 1,772 pretests and 1,710 posttests. For each item, we took averages from each classroom and aggregated them for the 72 classes studied. Examining our complete database, we found that attrition was minor. Consistent with the original sample, 88% of the students were 6^{th}, 7^{th} or 8^{th} graders, and the remaining students were in 4^{th} or 8^{th} grade. The total sample was comprised nearly equally of boys and girls.

For pre-post items, we were able to apply reliable and conservative statistical procedures to assess the meaningfulness of differences in responses. Our preferred statistical tests (the Fisher's Exact Test and the Pearson version of the Chi-Square Test) both generate the probabilities that our quantitative findings could have occurred by chance. Also called "statistical significance levels" or "confidence levels," according to the convention, we express the probability levels as "p**,**" which equals a number reflecting the probability that each numeric distribution may have occurred by chance. Thus, a "*p*" of .05 reflects a five percent (one in 20) probability that the result occurred by chance (or a 95% probability that the difference was real). In the social sciences, the .05 level is considered statistically significant. In a further example, a "*p*" of .0001 suggests that the difference only occurs by chance one in 10,000 times. Thus, the lower the value of "*p*," the stronger is the result.

When items appeared *only once* as an item in the pretest or the posttest, we can easily examine findings of response percentages at face value. With "face validity," our interpretation of the strength of the results is somewhat subjective, but transparent. [To test findings that look obvious, we did perform the chi-square protocol using the item data ("observed") vs. the numbers that might occur totally by chance ("expected"). In no cases would our interpretation have changed.]

Our analysis of outcomes followed the intended objectives of the program, as well as tracking with the logic models of prevention science. In this section, we examine the data to discover whether results confirm the key objectives of the program.

A Baseline Assessment: School Bonding. For the one item on the pretest that did not appear on the posttest, we included a statement that has frequently been used in previous studies of elementary and middle schools. The research literature has pointed to "school bonding" or "school engagement by students" as key protective factors in later substance use experimentation. To the extent that any sample of students reflects either very high or very low school bonding, we might have needed to alter our interpretation of the findings of the present

study. A key measure related to the school bonding factor is reflected by whether students enjoy coming to school or not.

Item 7. [Pretest] *I really enjoy coming to school.*

	Frequency	**Percent**
True	1,051	**59.6%**
Not Sure	421	**23.8%**
False	294	**16.6%**
Total	1,766	100.0%

Thus, in our overall national sample, we see a general trend toward enjoyment (59.6%), with the rest either not sure or registering non-enjoyment. We compared these results with a ten- year evaluation of some 4,000 New Jersey late elementary students, as well as other studies. We observed that the *ALL* sample fits reasonably within the range of responses historically seen. So, to interpret the present data, we are not required to consider this dimension further as a potential biasing factor.

Acquisition of Specific Knowledge about Brain Anatomy and Function. The posttest asked several sophisticated questions (in a *true/not sure/false* format*)* about the function of different parts of the brain, reflecting specific aspects of the seven parts of the brain in the seven lessons in the classes. [As noted above, these items did *not* appear on the pretest because there was no reasonable expectation that more than a few students would have known the answers.] The test questions were judged to be extremely difficult since they combined brain anatomy with physiological function. Also, we constructed questions that included items where correct responses were "false" to mediate possible response bias. Key results are displayed below. [Correct responses are starred--**.]

Item 16 - Excitatory neurotransmitters slow the brain down.

	Frequency	**Percent**
True	542	**31.1%**
Not Sure	278	**16.0%**
False**	921	**52.9%**
Total	1741	100.0%

Item 17 - The cerebellum controls coordination.

	Frequency	**Percent**
True**	1285	**74.0%**
Not Sure	347	**20.0%**
False	105	**6.0%**
Total	1737	100.0%

Item 18. The hippocampus makes and stores memories.

	Frequency	**Percent**
True**	1377	**79.1%**
Not Sure	249	**14.3%**
False	114	**6.6%**
Total	1740	100.0%

Item 19. The medulla helps with making smart decisions.

	Frequency	**Percent**
True	850	**49.1%**
Not Sure	365	**21.1%**
False**	517	**29.8%**
Total	1732	100.0%

Item 20. The cerebral cortex is divided into three lobes.

	Frequency	**Percent**
True	550	**31.8%**
Not Sure	406	**23.5%**
False**	772	**44.7%**
Total	1728	100.0%

We see the most impressive results for Items 16 (neurotransmitters), 17 (cerebellum), 18 (hippocampus), and 20 (cerebral cortex) with a correct vs. incorrect ratio of 76.9% vs.23.1%. Students were less successful with Item19 (medulla). In looking back at the animation, we found that the word "decisions" appeared frequently. The frequency of those instances may have caused many students to recall them and thus respond "true" to the statement that "The medulla helps with making smart decisions." Still, overall, students performed very well. Only one fourth of the sample gave incorrect responses to statements that most adults could not answer confidently. Below, we see more examples of impressive learning in some of the knowledge-based pre-post items.

Acquisition of Understanding about the Effects of Alcohol on Brain Function.

Prevention scientists understand the modest potential of knowledge-based curricula to change future alcohol use behavior. The link between knowledge and behavior is particularly difficult to track in elementary school students. Most researchers studying planned behavior conclude that knowledge is just one, if a necessary, component of personal attitudes towards a specific behavior. Knowledge, in conjunction with perceptions of social and family norms concerning the appropriateness of the behavior, more accurately predicts future intentions to behave. Research suggests that future intentions, in the absence of environmental constraints, constitute the proximal determinant of behavior. However, an accurate understanding of the effects of alcohol and the developing brain undoubtedly is a foundational, if modest, element in a child's ultimate decision as to whether and when to begin to use alcohol. The pre-post items following and the findings below tap this kind of understanding.

Because students who are beginning the class, especially those in later grades, would be familiar with alcoholic beverages as well as the brain, these next items seemed appropriate to include as indicators of change from the pre to posttest.

ITEM 9. - Alcohol acts as a stimulant to the nervous system.

		Pre-test	Post-test	Total
True	Count	645	743	1388
	%	**36%**	**43.6%**	**40.1%**
Not sure	Count	971	351	1322
	%	**55.4%**	**20.6%**	**38.2%**
False**	Count	138	611	749
	%	**7.9%**	**35.8%**	**21.7%**
Total N		1754	1705	3459

Significance Test (Chi-Square) Result: p <.00001

Item 9 is something of a trick question because the "false" response is the correct one. We see a five-fold increase in correct answers in the posttest responses. Exposure to the classes markedly reduced the "not sure" responses, with most changes in the direction of the correct response.

Because of its importance in the instructional objectives of *ALL*, we included two different ways of tapping student learning about alcohol's effect on the different parts of the brain.

ITEM 8. – Alcohol affects only certain parts of the brain.

		Pre-test	Post-test	Total
True	Count	464	320	784
	%	**26.4%**	**18.7%**	22.6%
Not sure	Count	891	187	1078
	%	**50.7%**	**11.0%**	31.1%
False**	Count	404	1200	1604
	%	**23.0%**	**70.3%**	46.3%
Total N		1759	1707	3466

Significance Test (Chi-Square) Result: p <.00001

ITEM 13. The brain has many parts.
Which parts of the brain can be affected by drinking alcohol?

		Pre-test	Post-test	Total
All of them	Count	462	1260	1722
	%	**26.2%**	**74.5%**	49.8%
Some of them	Count	644	352	996
	%	**36.5%**	**20.8%**	28.8%
None of them	Count	20	13	33
	%	**1.1%**	**0.8%**	1.0%
I don't know*	Count	640	66	706
	%	**36.2%**	**3.9%**	20.4%
Total N		1766	1691	3457

Significance Test (Chi-Square) Result: p < .00001

For both items, we note a fairly even pretest distribution around the "Not sure" response. The correct responses from the pretest varied from 23% (Item 8) to 26% (Item 13). Posttest

improvement was equally consistent and statistically dramatic, insofar as correct responses rose 47.3% for Item 8 and 48.3% for Item 13. Aside from the obvious interpretation of the results, the similarities strengthen the case for item reliability and validity.

ITEM 10. - Some people can drink alcohol and still drive well.

		Pre-test	Post-test	Total
True	Count	388	378	766
	%	**22.1%**	**22.2%**	22.2%
Not sure	Count	404	235	639
	%	**23.0%**	**13.8%**	18.5%
False**	Count	961	1086	2047
	%	**54.8%**	**63.9%**	59.3%
Total N		1753	1699	3452

Significance Test (Chi-Square) ***Result: p < .001***

This item has been used in previous research on elementary drug education as an indicator of anti-alcohol attitudes. In one sense the best response may be "not sure," because adults who drink alcohol may not drink enough to affect driving. However, the item serves as a kind of projective test to see how perceptions might have changed during the classes. There was virtually no change for the 22% of pretest respondents who thought the statement was true. However, half of the pretest students were sensitive to the possible adverse effects of drinking and driving. The curriculum experience appeared to intensify this attitude. We observe a 10% decrease in the number of those *not sure*, reflected in the 10% increase in "false" responses. Results showed both a lack of social desirability bias, as well as a modest if significant change in attitude toward any drinking and driving.

Recall that it seemed wasteful to us to have pretest questions about complex aspects of the brain, such as the functions of particular brain structures. We tested that knowledge only in the posttest. However, we did want to include one term (neurotransmitters) in the pretest as well as the posttest, a term that some students may have been exposed to previously. The role of neurotransmitters is critical to understand how alcohol affects the developing brain. The table on the following page reflects results from Item 11.

ITEM 11. What are neurotransmitters?

		Pre-test	Post-test	Total
Cells	Count	225	329	554
	%	**12.8%**	**19.4%**	16.0%
Chemical messengers**	Count	371	1304	1675
	%	**21.0%**	**77.0%**	48.5%
Synapses	Count	63	61	124
	%	**3.6%**	**3.6%**	3.6%
I don't know	Count	1104	0	1104
	%	**62.6%**	**0.0%**	31.9%
Total N		1763	1694	3457

Significance Test (Chi-Square) Result: p < .00001

At pretest, only 21% of students knew or guessed the correct answer, while 62.6% responded that they did not know, and 16.4% guessed incorrectly at the fairly reasonable alternatives we provided. There was a dramatic change at posttest, where 77% answered correctly, a difference of 56%. Remarkably, on the posttest, *no students whatsoever responded that they didn't know the answer,* a change from nearly 63% to zero percent. Of the 23% that guessed incorrectly, the majority selected the next most likely description ("cells") as the best characterization of neurotransmitters. Arguably, the statistical strength of these data constitutes an important confirmation of one of the program's prime objectives – learning about the brain.

Confidence in Communication about Alcohol's Effects on the Brain. Two pre-post items expanded the implications of student understanding of alcohol's effects on brain function and resulting behavior, projecting the ability to integrate and communicate that knowledge. The first item (12) reflects differences in students' perceived abilities to communicate their understanding with peers.

ITEM 12. I could explain to friends how drinking alcohol affects the brain.

		Pre-test	Post-test	Total
Agree	Count	682	1248	1930
	%	**38.6%**	**73.9%**	55.9%
Not sure	Count	707	357	1064
	%	**40.0%**	**21.1%**	30.8%
Disagree	Count	377	84	461
	%	**21.3%**	**5.0%**	13.3%
Total N		1766	1689	3455

Significance Test (Chi-Square) Result: p < .00001

Note the dramatic increase following program exposure in the percentage of students affirming the statement—from 38% to 74%. Posttest results show that only 5% of students felt they could not explain the concept to their friends. Also, the percentage of students who were unsure about their capability shrunk by half. This finding is a very important finding from a substance abuse prevention point of view--with overwhelming statistical confidence. The very positive response seems to indicate that students are not only learning the material shared with them but integrating it as well – which is required if they are to share it with their peers. Also, because peer influence is an important driver of substance misuse experimentation, the secondary prevention effects of this finding are additionally meaningful. Confidence in sharing knowledge increases that probability that sharing will occur, enhancing the preventive influence on students' peer groups.

We included a second item measuring confidence in sharing knowledge. Particularly relevant to one of the clear objectives of *ALL*, it concerns the significantly greater harmfulness of alcohol's effect on the developing brain in childhood and adolescence in contrast with the adult brain. Because beverage alcohol is a legal product and its use is so prevalent among adults in North America, it is often difficult for school-based health educators to justify abstention until the legal age of 21. Many teachers and parents have heard arguments from adolescents that they could legally buy and use tobacco or a firearm or obtain a pilot's license or get married before 21, all perceived as riskier than experimental underage drinking. In fact, research has demonstrated both the evolutionary development of the brain through early young adulthood and verified its vulnerability to a range of biochemical influences. This concept, if accepted by younger students, reinforces a rational "perception of harm," a variable highly predictive of misuse of psychoactive substances. The table below displays the likely effect of *ALL* on such student perception.

ITEM 14. I could explain to friends why drinking alcohol is more harmful for young people than for adults.

		Pre-test	Post-test	Total
Yes	Count	788	1278	2066
	%	**44.6%**	**75.7%**	59.8%
Maybe	Count	665	329	994
	%	**37.7%**	**19.5%**	28.8%
I don't think so	Count	313	82	395
	%	**17.7%**	**4.9%**	11.4%
Total N		1766	1689	3455

Significance Test (Chi-Square) Result: p < .00001

These are dramatic results. The pretest distribution is nicely diversified. The 44.6% at pretest saying "Yes" moved substantially to 75.7% at posttest. The "Maybe" responses dropped in half, with a massive drop to 4.9% in those who still "don't think so." Again, the results show a

possible dual impact: (1) *ALL*'s ability to generate confidence in regards to this particular knowledge, and (2) students' confidence in convincing their peers of its truth.

Stimulation of Interaction about Alcohol with Teachers and Parents. Based on considerable research and clinical observation, Responsibility.org constructed the Ask, Listen, Learn initiative as a foundation for efforts to prevent underage drinking. Previous iterations of the program focused on increasing adult/parent/teacher awareness of underage drinking by encouraging dialogue and communication between caregiving adults and children. The series of previous evaluations sponsored by Responsibility.org, described above, tapped the outcomes of the various initiatives by measuring such communication.

Two of the pre-post items established a baseline regarding student classroom experience in learning about the brain and alcohol's effects on it. Item 5 asks about previous classroom experience learning about brain function. Item 6 extends that inquiry to the existence of previous classroom instruction regarding alcohol's effects on the brain. The tables below display an important dynamic of the program's impact.

ITEM 5. Have you ever been taught about the brain and how it works as part of a classroom lesson in school?

		Pre-test	Post-test	Total
Yes	Count	1074	1616	2690
	%	**61.1%**	**95.0%**	77.8%
No	Count	683	85	768
	%	**38.9%**	**5.0%**	22.2%
Total N	Count	1757	1701	3458

Significance Test (Chi-Square) Result: p < .00001

Regarding the results displayed above, we found that nearly three-fifths of the total sample reported at pretest that they had been taught in school about the brain and how it works, presumably through previous biology or science classes. As intended and expected by program developers, the posttest percentage increased dramatically to 95%. We suspect that most of the residual 5% in the posttest may have assumed that the statement still referred to their experiences *before* the *ALL* class.

ITEM 6. Have you ever been taught about the effects of alcohol on the brain as part of a classroom lesson in school?

		Pre-test	Post-test	Total
Yes	Count	782	1637	2419
	%	**44.2%**	**96.0%**	69.7%
No	Count	986	68	1054
	%	**55.8%**	**4.0%**	30.3%
Total N	Count	1768	1705	3473

Significance Test (Chi-Square) Result: p < .00001

For Item 6, less than half of students on the pretest reported any previous classroom experience that included discussion of alcohol and the brain, although again that was somewhat higher than might be expected. However, as expected, for both items 5 and 6, as grade levels increased, the proportion of students previously exposed to teaching about the brain or alcohol's effects also increased. The posttest percentage for the total sample moved to 96%, confirming that teachers did indeed implement lessons featuring the linkage between alcohol use and the effects on the brain.

Whereas the two items above measured classroom baseline and post-class exposure to knowledge about the brain and alcohol, the next two items measure critical elements of the historic Ask, Listen, Learn campaign goals. The items specifically ask for reports of dialogue, i.e., person-to-person communication about underage drinking. First, students were asked if they had ever talked with teachers about the subject.

ITEM 3. Have you ever talked about underage drinking with your teacher as part of a classroom discussion in school?

		Pre-test	Post-test	Total
Yes	Count	778	1618	2396
	%	**44.1%**	**94.7%**	69.0%
No	Count	987	91	1078
	%	**55.9%**	**5.3%**	31.0%
Total N	Count	1765	1709	3474

Significance Test (Chi-Square) Result: p < .000001

Data indicate strongly that students communicated more with teachers regarding underage drinking following exposure to the program. A striking finding here is the movement of "no" in the pretest (55.9%) to a scant 5.3% in the posttest. The strength of the change is meaningful in demonstrating the degree of student involvement in the classes, as well as suggesting that the classes generated a novel, personal, interpersonal dialogue with the teacher for half of the

students (a change of 50.6%). We emphasize that the "yes" posttest response reflected not only a dialogue with a teacher but communication specifically about underage drinking. We return to the implications of this data further below.

Given the priority of *ALL*'s history and long-term goals, Item 4 (talking with parents about underage drinking), presented in the table immediately below, has been asked in the same language to subjects in *ALL's* previous evaluations.

ITEM 4. In the last year, how often have you talked with your parents, grandparents, or another adult caregiver about the dangers of underage drinking?

		Pre-test	Post-test	Total
Never	Count	668	493	1161
	%	**37.7%**	**28.8%**	33.3%
1 time	Count	379	360	739
	%	**21.4%**	**21.1%**	21.2%
2 or 3 times	Count	429	522	951
	%	**24.2%**	**30.5%**	27.3%
4 or more times	Count	298	335	633
	%	**16.8%**	**19.6%**	18.2%
Total N	Count	1774	1710	3484

Significance Test (Chi-Square) Result: p < .00001

It should be noted that the curriculum and its suggested activities did not necessarily prioritize or demand that students try to initiate dialogues on underage drinking with parents/caregivers. We also note that the structure of the responses creates a certain degree of complexity in the analysis, since we cannot tell whether individual students in the pre-test category stayed in the same category or moved to one of three other categories at the posttest. There are various ways to configure the data; we touch on the most important.

Overall, the results show a strong, consistent, and statistically powerful increase in communication with adult family members ("parents"). Presumably, changes were the result of the *ALL* classes, since such conversations must have occurred in the period between the start of the curriculum and the time of the posttest. Because these findings are so unexpected and intriguing, the data deserve more discussion. Of particular importance is the change in the "never" responses. Examined as a single category, of the 668 students who reported never having had such a conversation, 175 had at least one conversation with adults during the curricular period, a change of 26.2%. During the same period, the proportion of students who reported that they had talked with their parents/caregivers at least once in the previous year increased from 62.4% to 71.2%.

The strength of these results is mitigated somewhat by a progressive "ceiling effect." For example, pretest students who marked "4 times or more," even if they had talked with parents during the class, could not show an increase in the posttest. Another example is the apparent anomaly showing a slight decrease in the "1- time" category from pre- to posttest can be explained if more pretest students who marked "1-time" had additional conversations.

Of further interest are the progressive differences across grade levels. The table below shows the percentage of responses in each of the five grades. The progression is logical. The 4th graders show the highest percentage of "Never" responses and the lowest percentage of "4 times or more" responses. The converse is true for 8th graders.

Progression of Percentage Pretest Responses on Item 4 by Grade Level

	4th	**5th**	**6th**	**7th**	**8th**
Never	47.8%	40.5%	37.8%	33.3%	30.1%
One time	30.4%	23.4%	19.6%	17.9%	21.6%
2 or 3 times	15.2%	21.2%	24.4%	30.1%	27.8%
4 times	6.5%	14.9%	18.2%	18.6%	20.5%

Given the underlying principle of both Items 3 and 4 (having conversations about underage drinking), it seemed reasonable to combine the data from both response sets. The pre-post table below includes those students who said "no" to the question, "Have you ever talked about underage drinking with your teacher as part of a classroom discussion in school? We added the pre and post "Never" responses to the question: "In the last year, how often have you talked with your parents, grandparents, or another adult caregiver about the dangers of underage drinking?"

Initiation of First Conversations about Underage Drinking:
Teachers & Parents Combined

	Pre	**Post**	**Total**
Never Talked: Parents/Caregivers	668	493	1161
Item 4 %	**57.5%**	**42.5%**	
Never Talked: Teachers	987	81	1,068
Item 3 %	**91.6%**	**7.5%**	
Total %	1,655 **74.2%**	574 **25.8%**	**2,229**

The combined totals show a communication increase of nearly 50%. Expressed in another way, nearly three-fourths of students who reported never talking with adults or teachers about underage drinking confirmed at least a first dialogue on the topic by the end of the *ALL* classes. Further evidence for the strength of the finding comes from the Chi-square test result of 352.1, and a probability level of *3.666e-77* (3.6 preceded by 76 zeros)--reflecting effectively zero probability that the result could have occurred by chance.

We analyzed these items more intensely because the findings suggest that the program generates conversations with adults around alcohol-related issues, such contact being linked by research to the prevention of underage drinking. Thus, it is possible that the program generates not only perception of harm of alcohol but also helps reinforce constructive norms mediated by the influence of teachers and parents.

Attitudes and Intentions about Alcohol and Healthy Decisions. As we mentioned above, there are several vectors or forces that may affect the future likelihood of substance misuse. In this study, we are particularly interested in certain important potential protective factors, such as basic knowledge of alcohol's effect on brain function, an increased perception of harm from underage drinking, and increased communication with teachers and adults about underage drinking. One other important protective factor involves expressed intentions toward healthy behavior. At these age levels, prevention scientists are wary about asking students to predict their specific behavior in the future. However, given such limitations, we added an item in the posttest that could hint at students' perception of the impact of relevant knowledge on attitudes toward healthy behavior.

Item 21 – Knowing about the effects of alcohol on the brain will help young people make better decisions about drinking.

	Frequency	**Percent**
Agree	1441	**83.2%**
I'm Not Sure	199	**11.5%**
Disagree	92	**5.3%**
Total	1732	100.0%

The table reveals an extremely strong result; students were 16 times more like to agree than disagree (83.2% vs. 5.3%). These results are consistent with validating the role of brain-relevant information on perceptions of peer behavior. The findings confirm the possible influence of "perception of harm," mentioned above as a strong correlate of substance abuse among older youth. Additionally, we might be justified in inferring that students responding to the question may be including themselves in their expectations of future decision-making.

We tested out that inference of personalization with another set of statements, sufficiently similarly worded that they may qualify as pre-post items. About Item 15a (make good decisions in high school about drinking alcohol), the pilot test suggested we might come across a ceiling effect that would offer little room for improvement. Thus, to enhance a possible causal relationship between the program and future intentions, we added some attributional language and slightly different response options in the posttest as Item 15b. In this case, Item 15b in the posttest attempts to infer whether the information gained specifically in the *ALL* classes were perceived as relevant to projected later decisions about underage drinking. Response data can be examined either independently or as a pre-post variable.

ITEM 15a. I have enough information to help me make good decisions in high school about drinking alcohol.

ITEM 15b. This class has helped me have enough information to help me make good decisions in high school about drinking alcohol.

Response	Count/Percent Response	Pretest	Posttest
15a (Yes) or 15b (Agree)	Count	1246	1449
	%	**70.4%**	**85.8%**
15a (Maybe) or 15b (I'm not sure)	Count	338	196
	%	**19.1%**	**11.6%**
15a (I don't think so) or 15b (Disagree)	Count	185	44
	%	**10.5%**	**2.6%**
	Total N	1769	1689
	Total %	100.0%	100.0%

Chi-Square 132.9 p=2.171e-29 (2.17 preceded by 28 zeros)

As expected, we see a high percentage of pretest respondents (70.4%) responding "yes" to the statement. With specific attribution to the class, the posttest response of "agree" moves up to 85.8%. The 19.1% responding "maybe" in the pretest dropped to 11.6% in the posttest. There is a meaningful drop from pretest responses of "I don't think so" to the posttest response of "disagree" (from 10.5% to 2.6%). The results were highly statistically significant and, even allowing for all possible future intervening variables, imply a promising effect on later underage alcohol consumption.

Students' Feedback on Their Class Experience.

In part, the ultimate acceptance of non-mandatory curricula is affected by the interest and enjoyment of students. Enthusiasm from students affects teachers' attitudes, as well as the converse. Although we could not study the linkage between individual student reaction and individual outcomes, we know that programs popular with students and teachers are more likely to survive and be replicated. Our measures provide some evidence regarding students' intellectual and affective reactions to the class.

Student Intellectual Interest. For the 9-12 age group, where the social use of alcohol is infrequent, one might wonder how interesting the subject of alcohol and the brain would be. To explore students' intellectual interest, we included two salient posttest items.

Item 23. This class made me want to learn more about the effects of alcohol.

	Frequency	Percent
Yes	801	**46.0%**
Maybe	650	**37.4%**
No	285	**16.4%**
Total	1736	100%

In this positive response (46.1 % *yes*), students attribute to the classes a continuing interest in learning about the effects of alcohol. We observe very little evidence of lack of curiosity, boredom or disinterest (16.4%). We could expect that, for the "maybe" response, there may have some satiation of relevant knowledge, but the door is kept open for more learning.

Switching attention to Item 24 (interest in neuroscience), it may seem a bit premature to ask 5th and 6th graders about their possible future studies in neuroscience. However, even a modicum of interest bodes well for exposure to further substance abuse education involving subjects such as addiction, brain dysfunction, and the chemistry of psychoactive substances. A positive response even with such a small sample might be encouraging to the staff at the National Institutes of Health (e.g., NIAAA and NIDA), given the anticipated need for researchers and clinicians interested in neuroscience and psychoactive substances.

Item 24. This class made me interested in neuroscience.

	Frequency	Percent
Yes	549	**31.7%**
Maybe	680	**39.3%**
No	502	**29.0%**
Total	1731	100.0

These results are quite impressive considering the probable absence of previous exposure to this field of study. Almost one-third (31.7%) answered affirmatively that the class stimulated their interest in neuroscience, and 71% expressed at least a potential interest in the field. Here, we must factor in the possibility that teachers' enthusiasm for the topics may have contributed to the results. However, teacher enthusiasm will always play a role in the impact of any curriculum.

Student Affective Experience. Intellectual interest in the content is one aspect of students' experience of a series of lessons. As discussed above, the viability of a non-mandatory curriculum is partially dependent on the affective response or level of enjoyment of students and teachers. The following item taps such feelings.

Item 22. How much did you enjoy the classes you've had on alcohol and the brain?

	Frequency	Percent
A lot	775	**44.7%**
Some	749	**43.2%**
Not very much	139	**8.0%**
Not at all	72	**4.1%**
Total	1735	100.0%

Results suggest that the curriculum was very well received by students. Nearly 88% enjoyed classes either "a lot" or "some," with only 12.1% expressing negativity (i.e., "not very much" or "not at all"). One hypothesis to consider is that older students (e.g., as did 8th graders in our study) will have responded less enthusiastically toward the curriculum because they considered it more appropriate for their younger peers. Overall, these findings compare very favorably with surveys of 5th graders' enjoyment of traditional substance abuse education curricula.

Student Comments: Positive Reactions and Suggestions for Improvement

Positive Responses. In addition to the scorable responses on the posttest, students were able to write in specific comments about the class. We asked students "*What are three things you especially liked about the "Ask, Listen, Learn: Alcohol and Your Developing Brain" classes?* Responses from the pilot test highlighted student appreciation for the video animations, the songs and jingles, and the informative nature of the classes. The table on the next page summarizes categories of response from students in the national study.

Most of the students who responded to the posttest provided a written response. As can be observed, all but 2.9% of students were able to identify especially likeable elements of the *ALL* experience. Looking at the categories displayed, most of the elements cited revolved around two aspects of the curriculum: its presentation and the content. Regarding the presentation elements, we note that 50.1% of students mentioned visual animation and characters along with their "fun and entertaining" quality.

Item 25. What are 3 things you especially liked about the Ask Listen Learn classes?

	Frequency	Percent
Like the songs, jingles, videos/visuals/characters…	748	**46.4%**
Teaches negative effects of alcohol—coordination, reflexes/cognitive thinking	257	**16.0%**
Liked it-Very informative and educational.	227	**14.1%**
Like the activities and team builder	157	**9.7%**
Fun and entertaining.	74	**4.6%**
Liked the lessons and papers	65	**4.0%**
Nothing/None	15	**.9%**
Other	35	**2.2%**
Don't know	33	**2.0%**
Total	1611	100.0%

On the content side, we see mention of the teaching of harmful effects and the activities, lessons and papers, plus its "educational and informative" qualities by 43.8% of responders. Taken together, 93.1% of responding students articulated positive responses, which is closely congruent with the 87.9% of students answering Item 23 above who professed that they enjoyed the classes.

Suggestions for Improvements. Instructive also are student suggestions for improvements in the classes. We were interested in any elements that they would like to see more, as well as those they disliked. As can be observed in the table on the page following, we were able to aggregate fifteen categories that captured the vast majority of comments. The themes mentioned were consistent with comments made by students in the Pilot Test. While the responses speak for themselves, it might be useful to organize them into four major categories.

1. *More of the Same* Here suggestions involve students either expanding elements that already exist, or reporting that they liked or accepted the program as is. Such elements (e.g., "more lessons") are mentioned by 56.0% of respondents.

2. Add Elements. This category includes suggestions that new elements might be added (e.g., "add more characters, get guest speakers[13]). Such elements comprised 26.3% of the responses.

3. Changes Needed. In this category, students suggested changes or refinements, primarily in the video (e.g., "change the introduction"); 8.4% of the comments were of this type.

4. No Particular Comment. Two types of comments ("other" or "don't know") constitute this category, reflecting 9.4% of total responses.

Item 26. What could we do to make the classes better?

	Frequency	Percent
More activities, videos	237	**16.2%**
More lessons, more educational and informative	260	**17.8%**
Make more enjoyable and entertaining	114	**7.8%**
Change the intro, no repeating	45	**3.1%**
Make video longer	189	**13.0%**
Add more characters	19	**1.3%**
Shorter lessons……	27	**1.9%**
Make more grown up…..	45	**3.1%**
More games/Online games	125	**8.6%**
Slow down the video/speaking….	50	**3.4%**
Don't drink/Live healthy…..	59	**4.0%**
Have a guest speaker come	4	**.3%**
Add snacks/Food	12	**.8%**
Nothing/None.	136	**9.3%**
Other……	68	**4.7%**
Don't know……	69	**4.7%**
Total	1,459	**100.0%**

Overall, we were impressed by helpful nature and detail of many of the comments, potentially relevant to program developers who might later wish to refine or expand the program.

Study Findings: Teacher Response and Participation

In both the Pilot Test and national study, we found that teachers (occasionally counselors or other instructors) were the driving forces in gaining cooperation with our research. Relatively few needed much review or approval from principals or other authorities. Because we now expect teachers to drive much of the use of the program, we took their comments seriously as an important part of our overall assessment of the program's future viability.

Teacher Feedback from the Pilot Test. We encouraged Responsibility.org to arrange open-ended interviews with seven teachers as part of their participation in the pilot test classes, to learn more about their response to the curriculum. Their frank responses were transcribed, and we summarize some key interactions below. In some text teachers' responses have been slightly modified for ease of reading.

Question*: **Please describe your experience with the ALL program website. Was it easy or difficult to navigate? Were you able to find the program content and materials?***

Teacher Responses: Teachers were generally very pleased with the website. One reported that it had "a lot of information and resources, which I really liked". Another appreciated that "all the program materials were together on one main screen," and that it was easy to then click on a particular lesson outline and related materials: "Especially when I was putting it up on my Smart TV for my students to see." That just made it flow a lot quicker as well for my students." One teacher did ask for a single point-and-click for all the lesson materials so that she could print them all off at once. She also expressed concern about the sheer number of cards she had to print off to teach 160 students (in various classes) during the course of the school day. Another asked if it would be possible to be able to preview materials before downloading them. Still another expressed her appreciation for the prompt technical assistance she received from *ALL* in regards to downloading materials. Moreover, one mentioned how much her students liked the videos.

Question: ***How did the ALL program compare with your thoughts and feelings about any other science and health curricula you have taught?***

Teacher Responses: One teacher responded that her students really enjoyed the videos, and the songs "stuck in their heads." She used the videos twice: the first time to introduce the topic and then, after the students had answered the questions associated with it, she showed it again and allowed them to change their answers as needed. [*Note: She was not referring to survey questions,*] Another teacher reported that the curriculum was much more detailed than anything she had ever presented, and that increased not only her students' knowledge but her own as well. She continued, "I strongly feel like this has made an impact on them." Still another reported that the curriculum was "a perfect fit for the makeup of my class." She printed off the article that went with the lesson, which generated "great conversations," and also volunteered that the curriculum paired well with State standards.

Question: ***Is there additional content or instruction you would have found useful or helpful in teaching this lesson?***

Teacher Responses: Respondents struggled to suggest improvements to the curriculum. One teacher reported that her students would like to have longer videos. A second used the captions to help students answer specific content questions, and suggested that changes in some of the captions might be helpful to make them better [more informative].

Question: ***Did the content match the grade level you taught it to?***

Teacher Responses: One teacher reported that she thought it did. She was particularly impressed with the candor in students' answers to the question of whether they and their friends would drink when they were in high school; many answered "maybe." She continued that "we talked a lot about peer pressure." A second teacher said that there were a couple of lessons that she thought were more appropriate for middle school students. A third and fourth taught it to their 5th and 6th graders, who "really liked it." Another originally thought that the videos would "be a little low" for her students, but the content "was so much more mature" than she realized that the videos did an excellent job conveying it. "I think the simplicity of the videos and the lessons helped them understand the content a lot better."

Question: What type of classroom or homework activities would you like to see more of in the future?

Teacher Responses: One teacher requested a "family activity…A lot of them were not sure how to bring it up because their dad drinks a lot of beer or their older brother is always drunk….so they were not sure how they would be able to talk to them." This teacher did review some "conversation starters", and told her students to take their material home, share it with their parents, and tell them what you are doing in class. "We have a big alcohol problem in this community so it would be really helpful." Another teacher requested "more writing assignments and anything that keeps them engaged." Still another teacher changed some activities to role plays, and asked for lessons to include them and "active drama". One teacher requested "related articles or pull up magazines, more relatable to the kids."

Teacher Implementation and Fidelity: The National Study. The demonstrable enthusiasm of teachers in the pilot test, as well as their detailed comments about program implementation, helped program staff refine elements of the program. For the national study conducted in the fall of 2017, the 72 teachers completed the fidelity checklists online, specifying which lesson-specific activities they had implemented and providing useful information about what was presented in the classroom. Aside from the animated videos, the numbers of possible activities for implementation vary by lesson, from nine to eleven, comprising nearly 70 activities in all. Teachers could select the activities they wished to use. A list of the major activities and their patterns and frequency of use is recorded in the table below.

Utilization of Discrete Activities by Teachers

Activity	Used as described	Used part but not all	Made some modifications	Did not use
Pre-lesson division into A, I, & E Team	32	17	21	31
Students discussed and answered the comprehensive questions	67	14	19	NA
Students read "Brain Drain" and completed the Venn Diagram worksheet	49	22	11	18
Students discussed neurotransmission with students and how alcohol affects it	76	111	17	6
Students played the Neuron Bobsled game	29	6	11	54
Students used the vocabulary card as a homework assignment	15	7	18	60
Students discussed and answered the comprehensive questions	72	15	13	na
Students created their own metaphor and skit to explain what happens when alcohol meets the central nervous system	33	17	17	33
Students played the Neurotransmission matching game	40	11	7	42
Students discussed how alcohol affects people differently and might slow down the central nervous system	86	10	3	1
Shared and reviewed with your student the "Start a Conversation" reading	39	15	15	31
Students used the vocabulary cards as a homework assignment	17	6	19	58
Students discussed and answered the comprehensive questions	75	15	10	na
Students completed the Verbal Coordination Activity	47	11	22	19
Students discussed what happens when the cerebellum is impaired by alcohol and how it is important to be able to communicate clearly	83	10	3	4
Students defined what peer pressure means to them and discussed the different influences kids may face	67	13	17	4
Students completed the Practice Saying No activity	56	10	21	14
Students used the vocabulary cards as a homework assignment	15	3	21	61
Students discussed and answered the comprehensive questions	74	11	14	1

Students discussed the Lobes Diagram and the different names and functions of each lobe	60	21	15	4
Students completed the Fill-In the Blank diagram of the brain lobes	50	14	15	21
Students completed the Decision Making activity	54	17	18	11
Students played the Cerebral Cortex Ball Game	17	7	11	65
Students discussed the dangers of drunk driving and viewed the "End Impaired Driving" videos	58	7	11	24
Students read "Crash" and answered the questions at the end of the article	38	11	15	36
Students used the vocabulary cards as a homework assignment	13	8	17	63
Students discussed and answered the comprehension questions	75	7	18	na
Students discussed the dangers of not being able to create new memories because of underage drinking	71	14	13	3
Students completed the Memory Storage activity	42	10	17	32
Students explored kidshealth.org and discussed the importance of avoiding drinking to protect physical and emotional health	25	14	21	40
Students completed the Fill-In the Blank diagram on the functions of the brain	56	6	21	18
Students completed the Brain Scramble activity	32	11	10	47
Students read "Focus: How the Brain Works" and answered the corresponding questions	42	18	8	32
Students used the vocabulary cards as a homework assignment	14	1	21	64
Students discussed and answered the comprehensive questions	72	8	18	1
Students read about the endocrine system on kidshealth.org and discussed the endocrine system and hormones	24	18	17	42
Teacher wrote the five body parts on the board and their students explained how each part is impacted by alcohol	40	13	31	17
Students completed the Design Your Own Infographic activity	24	10	15	51
Students discussed the importance of making healthy decisions and setting goals	71	10	10	10
Students completed the Goal Setting activity	42	14	21	24
Students used the vocabulary cards as a homework assignment	14	3	17	67
Students discussed and answered the comprehension questions	75	10	13	3
Students completed the Too Much activity	36	14	19	31

Students wrote down facts and myths about alcohol	39	17	21	24
Students completed the Appropriate Resources activity	24	13	17	42
Students wrote an essay answering the question "Why drinking alcohol is harmful for growing kids and adolescents."	25	7	31	38
Did you have your students use the vocabulary cards as a homework assignment?	11	3	17	69

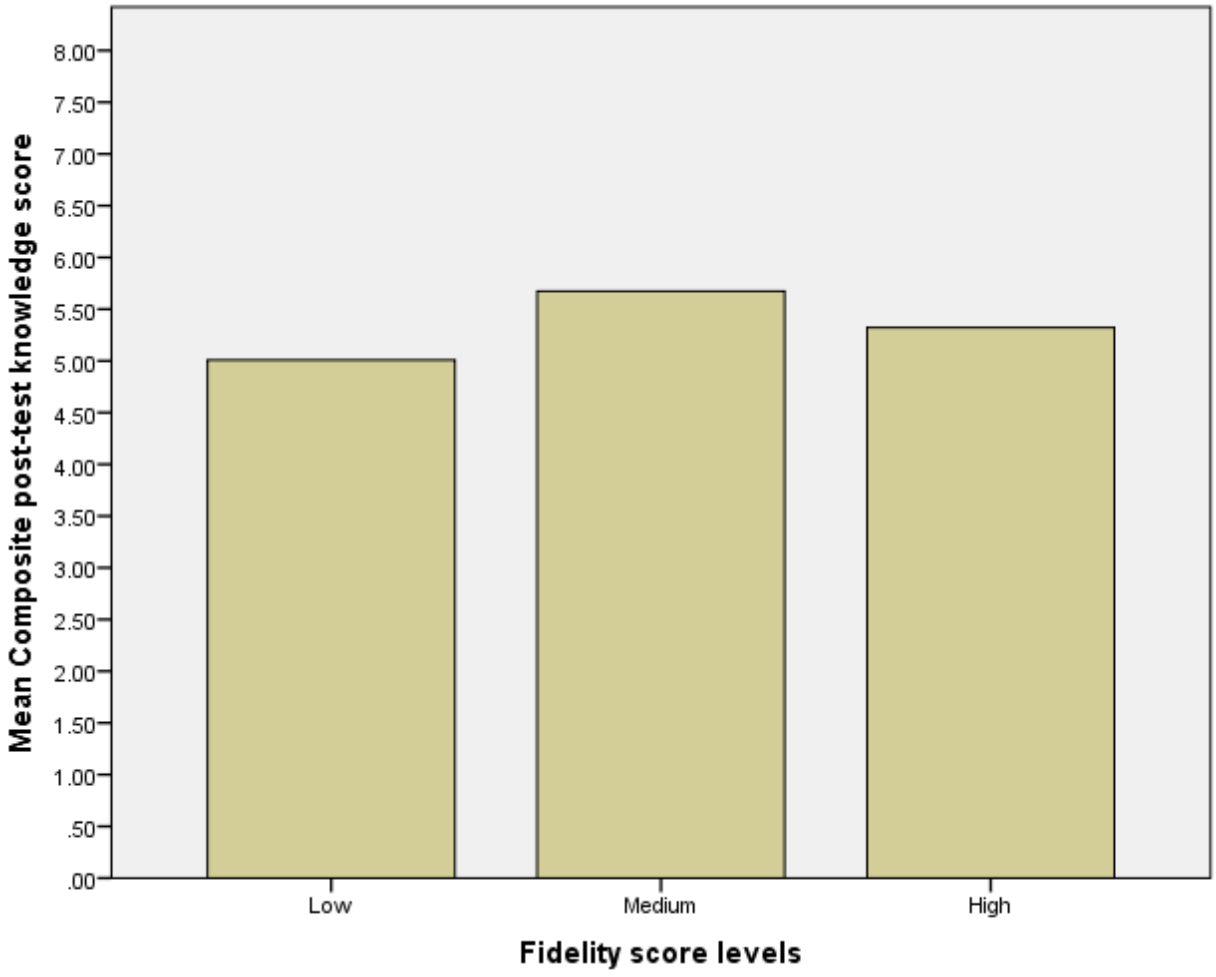
As noted, teachers were invited to utilize as many of the activities and resources available; ultimately, they selected the activities they wished to use. As can be seen, there is considerable variability in how teachers implemented each activity, that is, whether the activity was used as described, in whole or in part, whether the teachers modified it, or whether they did not use it at all. In interpreting the results, it is important to understand that, statistically, we treated all activities as equally important, which is not necessarily accurate. As illustrated in the table below, averaged across all seven lessons the 72 classrooms, teachers implemented 57% of the possible activities provided, with the range across the seven lessons varying between 48% and 68%. The table shows the variation in the number of activities implemented per lesson. It also displays the minimum number and maximum number of parallel activities that could be implemented, the mean (average) of the scores across all teachers and the standard deviation for each.

Average Teacher Fidelity Responses per Lesson

	N	Minimum	Maximum	Mean	Std. Deviation
Lesson 1 (Brain) fidelity score	72	1.00	9.00	5.1111	1.77268
Lesson 2 (CNS) fidelity score	72	3.00	9.00	5.5417	1.52849
Lesson 3 (Cerebellum) fidelity score	72	2.00	9.00	6.0972	1.76156
Lesson 4 (Cerebral Cortex) fidelity score	72	.00	9.00	4.3472	2.25900
Lesson 5 (Hippocampus) fidelity score	72	2.00	10.00	5.2361	2.21705
Lesson 6 (Hypothalamus) fidelity score	72	.00	11.00	5.6806	2.39616
Lesson 7 (Medulla) fidelity score	72	.00	9.00	4.6806	1.77483

To assess the possible influence of fidelity, we looked at the association between overall teacher fidelity scores and a composite student score of knowledge acquisition. As displayed in the graph on the next page, three equal teacher fidelity groups were created (Low, Medium, and High),

based on the average number of total activities that they implemented during the classes. Student knowledge acquisition scores were based on a composite of correct responses on posttest items relating to brain anatomy and function. The lowest third of fidelity scores reflects teachers who implemented from 15- 34 of the 69 possible activities. The Medium group implemented from 35-45 of the 69 possible activities, and the High group implemented 46-69 activities. In comparing fidelity scores with student knowledge scores, testing found that the composite student score differences between the Low, Medium, and High fidelity groups are *not* statistically significant. (The statistical testing featured Hierarchical Linear Modeling, adjusting for nested observations within schools.) Beyond the knowledge acquisition items, we tested the fidelity groups against other major student items and found the same lack of statistical significance. *Importantly, these findings suggest that a wide range of significant student outcomes can be expected if at least the animated videos and 15 or more key activities are implemented, with confidence in effectiveness increasing if at least half of the activities are implemented.*



***Fidelity Score Levels: Number of Activities Implemented (minimum 15, maximum 69)**

Low (15-34 Fidelity Score, 5.00 Knowledge Score)

Medium (35-45 Fidelity Score, 5.67 Knowledge Score)

High (46-69 Fidelity Score, 5.32 Knowledge Score)

Certainly, we would not recommend minimizing the resources available for implementation. However, the data imply that the basic facilitation of discussion around the animations, along with a modicum of key activities, may be sufficient to generate significant effects.

DISCUSSION

This study allowed a rich and interesting assessment of a unique curriculum. It may be helpful to offer some general perspectives on the findings and the possible futures of the program. In this section, we examine a range of issues of ultimate importance to the sponsors and users of *ALL*. While we will focus on student and teacher outcomes, we also consider issues of replicability, utility, implementation and further research and development.

The Issue of Effectiveness

When attention turns to the evaluation of a new program, the first question commonly asked is "Does it work?" Of course, there are many elements involved in answering that question beyond mere short-term impact. Re-examining the totality of data collected for this *ALL* study, we determined that the evaluation design was scientifically rigorous, the national sample was sufficiently robust, and that the measurement instruments were reliable and valid. In a careful review of the results, including the inherent methodological limitations and possibilities of error, we found that statistical analyses offered strong evidence for the following intended outcomes:

1. *Students successfully acquired specific knowledge about brain anatomy and function;*
2. *Students successfully acquired an understanding about the effects of alcohol on the functions of the developing brain and reported confidence in sharing that understanding with their peers;*
3. *Students reported significantly increased communication with adults (teachers, parents, caregivers) about underage drinking;*
4. *Students developed a greater perception of the harmful effects of underage drinking, and reported attitudes and values consistent with making better decisions in the future; and*
5. *Students reacted positively to the program, expressing both intellectual interest and that they enjoyed their class experience.*

Comments on the Outcomes. We believe that the *ALL* program generated outcomes that are consistent with individual factors that are associated with a lower probability of substance abuse, including underage drinking. Specifically, we see evidence of enhanced knowledge about bodily systems affected by psychoactive substances, specific knowledge about the harmful effects of alcohol on the developing brain, an increased perception of harm, increased conversations with adults about underage drinking, and the formation of attitudes and intentions consistent with maintaining informed and healthy decisions about the consumption of alcoholic beverages. The strength of the outcomes for students is enhanced by data confirming teachers' substantial enthusiasm for the curriculum.

Despite the evidence of meaningful impact, we doubt that a causal link can be easily proven between a single exposure to this series of lessons and reductions in alcohol intake, especially in

later adolescence. Research is relatively clear that a multi-faceted approach to prevention—through continual education, appropriate media, community action and parental involvement—is necessary to make measureable population differences in adolescent and young adult behavior. Still, every piece of the overall prevention strategy must undergo rigorous evaluation to take its place in the overall mosaic of effective public health strategies. More so, when the age of first onset (usage) is highly related to later problems and, as that age is still quite low, evidence-based education programs at early grades are a critical part of a comprehensive national strategy.

Limitations of the Student Outcome Study. Evaluations of prevention strategies can rarely utilize the so-called "gold standard" of research, where (a) one program is matched against another or none at all, (b) schools or classrooms can be selected at random, (c) all agree that no other prevention strategies will be administered during the experiment, (d) individuals enrolled in the experimental and control or comparison groups can be followed for years, and (e) where the external social and cultural environments are under the control of the researchers.

This study, conducted under real-world conditions, includes none of those elements. We did not choose schools randomly – instead, we relied on schools and teachers who wished to participate. There were no alternate programs with similar content with which *ALL* could be compared. The proper implementation of every activity of every lesson could not be guaranteed, and we know that many activities were not implemented, either in whole or part, by many teachers. Nor could we follow up any individual student past the curriculum's completion. Moreover, of course, we were in no position to guarantee that environmental conditions would not change in any of the communities of the schools surveyed; indeed we lacked the resources even to assess those conditions.

As for technical limitations, it would be fair to argue that the teachers who agreed to participate in the study might be more enthusiastic than those who declined to participate. One could also argue that the existence of an incentive may have biased teachers to do a better job than they might have otherwise, or that parents in our experimental schools might have been more engaged than schools that turned down the option to try the program.

Given these limitations, it would be premature to generalize our findings to the entire population of English-speaking teachers and their late elementary school or early middle school students. Nonetheless, our purposive sample of schools will likely be similar to other venues using the program. Even considering the study's limitations, our findings are extremely promising and are certainly sufficient to encourage further development of the program and justify its wide distribution.

Issues involving Implementation

Prevention scientists and public health policy experts understand that even the most impressive programmatic outcomes, conducted using rigorous methodologies and under close supervision to ensure high fidelity, do not guarantee that a program will be widely useful. Under the historic criteria utilized by NREPP (the HHS National Registry of Evidence-based Programs and Practices, now no longer supported by SAMHSA)**,** issues surrounding access, implementation, and replicability were all critically relevant to decisions to recommend programs to communities, schools, and service organizations.

Even for effective curricula, there are major barriers to dissemination that involve practicality. One such barrier involves the transferability of evidence-based programs. In most rigorous and successful efficacy tests of a curriculum, specially trained and classroom-savvy teachers deliver the program under strict guidelines to ensure fidelity. Many promising programs that are studied in such an artificial environment may require extensive training for instructors in real-world school systems, especially where programmatic fidelity and the time committed cannot be guaranteed. Cost is the second barrier, even to programs that are accepted as evidence-based. Suppose a program and its related training and materials cost $500 per class. Few schools could afford to offer it as a comprehensive part of their instructional protocols. A third barrier involves the pressure on schools to be aligned with pedagogical standards – from their school district or State and Federal curricular standards (e.g., Common Core, Next Generation Science, and National Health Education Standards). Many states require that their students be exposed to some substance abuse education, but only accept curricula that are well-integrated with other published standards.

In the case of the *ALL* curriculum, most or all of these barriers have been eliminated. Access is virtually universal, no extra teacher training is required, all materials are available free of charge, and considerable care has been taken to satisfy the curricular standards of individual State Departments of Education. Thus, no matter the methodological limitation of the present study and no matter how cautious the interpretation of its positive findings, the promise of optimal replication possibilities amplifies the program's value.

Recommendations

Since programmatic improvement, both for process and content, is a subsidiary goal of program evaluation, we offer a few recommendations to Responsibility.org management and directors.

Appropriate Grade Levels. Given the grade diversity of our sample (4^{th} – 8^{th} grades), we have been cognizant of potential variances in outcomes and responses to the program. In general, with rare exceptions, outcomes for each of the major item areas reach and often greatly exceed statistical significance across every grade level – so we know there is only a small possibility that they occurred by chance. Deeper data analysis suggests that the "sweet spot" for

the program is the 5th and 6th grades. However, the data suggest also that the program will be effective for 7th graders. We do see significant drop-offs in the response of 8th graders, most probably because the video animation and its voices target a younger audience. This phenomenon is somewhat moderated by the fact that the actual content of the material---brain function and alcohol's effects—is extremely sophisticated, probably at a high school level. Still, it seems appropriate to warn teachers that 8th graders could find some of the animation and materials "not very grown up." Given our very small sample of 4th graders, we do not have enough data to comment on the program's appropriateness. However, we cannot easily exclude them. Our two classrooms of 4th graders were among the highest performers and provided the most enthusiastic responses to the program.

Further Research and Development. From a purely scientific point of view, the findings of this study would justify an expansion of further research and evaluation, as well as developing extensions and expansions of the program itself. Further work might include:

1. ***Ongoing pre-post evaluation of "real-world" users***. This strategy is a logical follow-up to the current evaluation effort. It would involve using the same or slightly modified pre-post instruments to be administered by collaborating teachers as a continual process. We could recommend a minimum and maximum limitation of the number of classrooms surveyed---sufficient enough to have statistical power, few enough to protect limited resources. Teachers would only complete one easy online sheet to give an idea of the fidelity of their implementation. Incentives would be modest and entirely optional.

2. ***A Study of 4th Grade Classrooms.*** Although we have enough evidence to be skeptical about recommending 8th graders for the program, it may be useful to study a reasonable cohort of 4th graders. If findings were equivalent to our small 2017 sample, the program could be helpful to fill a very large void of alcohol-related education for this age group. On the other hand, it may be worthwhile considering a slightly modified version of the videos and teachers' guides to limit the technical information imparted.

3. ***Development and Evaluation of a Modified Program for later Middle School Students.*** Responsibility.org might also consider modifying the animation of the videos to appeal more directly to 7th through 9th grade students. Voices could be altered; some of the animated characters could be changed, and a modest adjustment to content and resource materials could be executed. Although *ALL for Middle School* would be competing with other curricula at that level, student interest and the curriculum's ease of availability and implementation might appeal to many school districts, especially those that are struggling to find engaging and readily available science curricula.

4. ***Development and Evaluation of ALL including other substances.*** Still considering students ages 9 through 12, the apparent effectiveness of this innovative approach and the ease of availability and advantage of cost might well justify the modification and expansion of the program to add additional content on cannabis (marijuana) and perhaps even opioids. The effect

of marijuana's active ingredient (THC) on the brain is now well known and might be easily congruent with the present animations and content. Interactions between alcohol and THC would be of interest in the domain of early education about impaired driving. Curricular content pertinent to opioids might focus on safety – in particular, the dangers associated with use and medication sharing. The harmful interactions between alcohol and street/prescription drugs could also be featured. A curriculum of this nature would be unique and likely would be in great demand.

5. ***Integration into Existing Prevention-Education Networks.*** As noted earlier, many States mandate substance abuse education, even in elementary schools. As the nation becomes increasingly aware of the effects of psychoactive drugs on the population, more attention will be given to evidence-based curricula or units that can be readily inserted into broader curricula that target students at the late elementary and early middle school levels. Several external curricula have been accepted statewide, featuring networks of trained instructors, many delighted to introduce new and appealing materials, especially to younger students. For example, some 800 instructors, mostly law enforcement officers, collaborate with teachers involving an evidence-based curriculum in New Jersey schools, under the sponsorship of L.E.A.D. (Law Enforcement Against Drugs). It is possible that such organizations might wish to include *ALL* as part of schools' mandate to expand evidence-based programming. This type of recruitment might be helpful in disseminating and institutionalizing *ALL*. As an additional advantage, mandatory ongoing evaluation in those venues might well enhance the body of knowledge regarding program outcomes.

Concluding Statement

Given the stated limitations of this project, we believe that the objective findings of our evaluation clearly support the continued deployment of this promising and innovative program. We find the program consistent with good science, current prevention practice, and with demonstrable appeal to both students and teachers. Combined with the program's access, availability, and dissemination capability, the possibilities for expansion, wider adoption, and further research all appear to augur a valuable addition to the portfolio of programmatic options enhancing the effort of schools, parents, and communities to prevent underage drinking.

APPENDICES

A. Pretest Survey

B. Posttest Survey

C. Fact Sheet on the Protection of Human Subjects

D. Author Information and Acknowledgements

A. ASK, LISTEN, LEARN: BRAIN PRE-ASSESSMENT

Student Information

Grade: ***4th 5th 6th 7th 8th***
Do you consider yourself to be: ***Male Female Prefer not to answer***

Have you ever talked about underage drinking with your teacher as part of a classroom discussion in school? ***Yes No***

In the last year, how often have you talked with your parents, grandparents, or another adult caregiver about the dangers of underage drinking?
Never 1 time 2 or 3 times 4 or more times

Have you ever been taught about the brain and how it works as a part of a classroom lesson in school? ***Yes No***

Have you ever been taught about the effects of alcohol on the brain as part of a classroom lesson in school? ***Yes No***

Assessment Questions **True or False**

Select the best possible answer

Most of the time, I really enjoy coming to school.	***True***	***Not sure***	***False***
Alcohol affects only certain parts of the brain.	***True***	***Not sure***	***False***
Alcohol acts as a stimulant to the nervous system.	***True***	***Not sure***	***False***
Some people can drink alcohol and still drive well.	***True***	***Not sure***	***False***

What are neurotransmitters?
Cells Chemical Messengers Synapses I don't know

I could explain to friends how drinking alcohol affects the brain.
Agree I'm not sure Disagree

The brain has many parts. Which parts of the brain can be affected by drinking alcohol?
All of them Some of them None of them I don't know

I could explain to friends why drinking alcohol is more harmful for young people than for adults.
Yes Maybe I don't think so
I have enough information to help me make good decisions in high school about drinking alcohol.
Yes Maybe I don't think so

B. ASK, LISTEN, LEARN: BRAIN POST-ASSESSMENT

Student Information

Grade: ***4th*** ***5th*** ***6th*** ***7th*** ***8th***

Do you consider yourself to be:
Male ***Female*** ***Prefer not to answer***

Have you ever talked about underage drinking with your teacher as part of a classroom discussion in school?
Yes ***No***

In the last year, how often have you talked with your parents, grandparents, or another adult caregiver about the dangers of underage drinking?
Never ***1 time*** ***2 or 3 times*** ***4 or more times***

Have you ever been taught about the brain and how it works as a part of a classroom lesson in school? ***Yes*** ***No***

Have you ever been taught about the effects of alcohol on the brain as part of a classroom lesson in school? ***Yes*** ***No***

True or False

Alcohol acts as a stimulant to the nervous system.	***True***	***Not sure***	***False***
Alcohol affects only certain parts of the brain.	***True***	***Not sure***	***False***
Excitatory neurotransmitters slow the brain down.	***True***	***Not sure***	***False***
The cerebellum controls coordination.	***True***	***Not sure***	***False***
The hippocampus makes and stores memories.	***True***	***Not sure***	***False***
The cerebral cortex is divided into three lobes.	***True***	***Not sure***	***False***
Some people can drink alcohol and still drive well.	***True***	***Not sure***	***False***

Assessment Questions

POST TEST, page 2

Select the best possible answer

What are neurotransmitters?

Cells ***Chemical Messengers*** ***Synapses*** ***I don't know***

I could explain to friends how drinking alcohol affects the brain.

Agree ***I'm not sure*** ***Disagree***

The brain has many parts. Which parts of the brain can be affected by drinking alcohol?

All of them ***Some of them*** ***None of them*** ***I don't know***

I could explain to friends why drinking alcohol is more harmful for young people than for adults. ***Yes*** ***Maybe*** ***I don't think so***

Knowing about the effects of alcohol on the brain will help young people make better decisions about drinking.

Yes ***I'm not sure*** ***Disagree***

This class has helped me to have enough information to help me make good decisions in high school about drinking alcohol.

Yes ***Maybe*** ***I don't think so***

Student Feedback

How much did you enjoy the classes you've had on alcohol and the brain?

A lot ***Some*** ***Not very much*** ***Not at All***

This class made me want to learn more about the effects of alcohol?

Yes **Maybe** **No**

This class made me interested in neuroscience.

Yes **Maybe** **No**

What are three things you especially liked about the "Ask, Listen, Learn: Alcohol and Your Developing Brain" classes?

1._____

2._____

3._____

What could we do to make the classes better?

1._____

2._____

3._____

C. Fact Sheet on the Protection of Human Subjects

ALCOHOL AND YOUR DEVELOPING BRAIN
APPROPRIATENESS OF STUDENT ASSESSMENT QUESTIONNAIRES

Overview. In testing new curricula, it is often extremely helpful for developers to know how students are responding to the experience. Often sought are markers for gains in knowledge of curricular content, reactions to the experience, and possible intended changes in student attitudes. In curricula such as this one, which involves behavioral health education, such responses are particularly valuable. To refine new curricula, developers often use ungraded, voluntary and anonymous student questionnaires to obtain honest student feedback on the impact of the classes, often with an assessment questionnaire at the beginning of the curriculum and another after all the classes have been completed.

Although rare, some schools are extremely sensitive about *any* ungraded testing, the results of which are made available to outside curriculum developers. In the case that your school administrators or parent groups are sensitive about this particular assessment procedure, we wish to present some ethical assurances that you can share with them.

Guarantees of Confidentiality & Other Safeguards. It is important for us that students offer their most relevant and honest feedback on the questionnaires and that there are no adverse consequences of their responses on the questionnaires. Thus, the questionnaires are anonymous. We do not ask for their names or any information that could identify them as individuals. We do not try to match the early questionnaires with the final questionnaires by the individual. We also hold confidential the identity of the classroom, teachers and school districts. [We are happy to provide local class results to teachers or administrators on request.] Also, to avoid any discomfort to students, we ask that they be told that their participation is voluntary, although we encourage them to participate. In this spirit, students are able, without penalty to cease responding to questions if they do feel uncomfortable.

Compliance with Regulations. Because our questionnaires are designed to give feedback on the classes, we do not consider them "surveys" or "research" in the ordinary sense. We do not consider the students as "human subjects." However, even if school personnel or parent groups see this process as "survey research," official regulations of the U.S. Department of Education specifically exempt our assessment procedures from having to undergo any formal institutional human subjects review. These regulations are usually mirrored by policies of State departments of education. And especially when using anonymous techniques that do not put students at risk, assessment techniques are usually interpreted as requiring neither active nor passive parental consent.

Excerpts from the Electronic Code of Federal Regulations

Title 34: Education

{*Note to readers: See bolded section on exemptions.*}

PART 97—PROTECTION OF HUMAN SUBJECTS

Relevant parts of the regulatory codes follow immediately below:

§97.101 To what does this policy apply?

(a) Except as provided in paragraph (b) of this section, this policy applies to all research involving human subjects conducted, supported or otherwise subject to regulation by any federal department or agency which takes appropriate administrative action to make the policy applicable to such research. This includes research conducted by federal civilian employees or military personnel, except that each department or agency head may adopt such procedural modifications as may be appropriate from an administrative standpoint. It also includes research conducted, supported, or otherwise subject to regulation by the federal government outside the United States.

(1) Research that is conducted or supported by a federal department or agency, whether or not it is regulated as defined in §97.102(e), must comply with all sections of this policy.

(2) Research that is neither conducted nor supported by a federal department or agency but is subject to regulation as defined in §97.102(e) must be reviewed and approved, in compliance with §§97.101, 97.102, and §§97.107 through 97.117 of this policy, by an institutional review board (IRB) that operates in accordance with the pertinent requirements of this policy.

(b) Unless otherwise required by department or agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:

(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

A Note. In case any of these issues appear to be a problem in your locale, please let us know so that we might provide more information.

D. Author Information and Acknowledgements

Allan Y. Cohen earned his M.A.in Social Relations and Ph.D. in Clinical Psychology at Harvard University. He currently serves as a Senior Project Manager at the Pacific Institute for Research and Evaluation (PIRE) and Executive Director of the Insight Consulting Group. Dr. Cohen has 30 years of experience in evaluation research and program management, primarily in the field of substance abuse prevention. A licensed clinical psychologist, he has held academic positions at Harvard, the University of California (Berkeley and San Francisco), and John F. Kennedy University. Co-founder of PIRE and Executive Director for more than two decades, he has been Principal Investigator or Project Director of more than 150 evaluation and action projects, including some of the largest alcohol and drug prevention projects ever sponsored by the HHS Center for Substance Abuse Prevention. Dr. Cohen has served as a policy and evaluation consultant to the White House, U.S. State Department, and the U.S. Armed Forces. He received a Lifetime Achievement Award from the National Association of State Alcohol and Drug Directors, holds a lifetime California teaching credential, and was an early Associate Editor of the *Journal of Primary Prevention*, where he continues as a peer reviewer.

Christopher L. Ringwalt earned his MSW at the University of Tennessee and his doctorate of Public Health at the University of North Carolina (Chapel Hill). He currently serves as a Senior Evaluator at the University of North Carolina's Injury Prevention Research Center (IPRC), a Senior Scientist at the Pacific Institute for Research Evaluation, and as Scientific Director of the Insight Consulting Group. Dr. Ringwalt has 25 years of experience in the design, development, analysis, and reporting of epidemiological, etiological, and evaluation studies relating to public health issues. His research has focused primarily on the prevention of adolescent and adult risk behaviors, particularly alcohol, tobacco, and other drug (ATOD) use. He has served as Chair of the Alcohol, Tobacco, and Other Drug Section of the American Public Health Association (APHA), and as Secretary to the Board of the Society of Prevention Research. Dr. Ringwalt has published over100 journal articles, book chapters, and other publications, and is now serving as the editor of the *Journal of Primary Prevention.*

Acknowledgements. We wish to acknowledge the generous assistance in statistical analysis from our colleague, Dr. Mallie Paschall, Senior Scientist at the California Prevention Research Center. We also wish to thank Maureen Dalbec, Responsibility.org. Vice President, our Evaluation Project Officer, for her continual cooperation as well as superb management of the recruitment and data collection process. Thanks are also offered to Ralph Blackman, Responsibility.org President and CEO, for his wise oversight and clear articulation of the Foundation's goals, and to Helen Gaynor, Responsibility.org *ALL* program manager, who carefully educated us on project history and content.