Evaluation Report of NIH K-12 Program

Title: Evaluation Report for the NIH3 Module, *Understanding Alcohol*

Date: 2001

Description:
This report evaluates one component within the NIH K-12 program, the NIH Curriculum Supplements. The NIH Curriculum Supplements are K-12 teacher's guides to two weeks' of lessons that explore the science behind current health topics. The modules are sent free of charge upon request to educators across the United States. Over 50,000 educators have one or more curriculum supplement.

This study specifically examines the results of the field tests conducted during the development of:

Understanding Alcohol: Investigations into Biology and Behavior (Grades 7 – 8)

This study was designed to determine the effectiveness of the module as a supplementary addition in the K-12 science curriculum. The field test sites were selected from volunteers who were chosen to maximize inclusion of various races, ethnicities, and geographic regions. The evaluation consisted of a field test with close-to-complete instructional materials. The surveys measured student knowledge using a pre/post test. The teachers also commented on the effectiveness of the lessons and their implementation. These resulted were used to identify strengths that were highlighted and weaknesses that were corrected in the final draft. The teachers' comments were included in the final draft as "tips from teachers" on specific lessons.

BSCS NIH3 Module: Understanding Alcohol
Final Evaluation Report
May 2001

INTRODUCTION

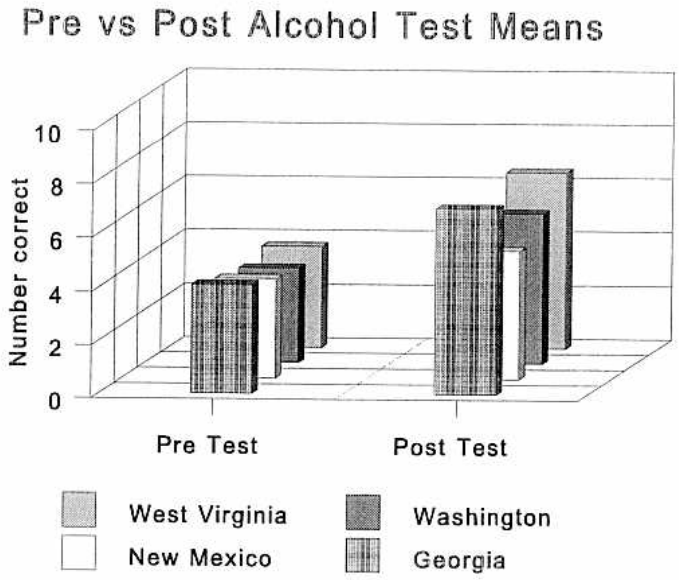
This final evaluation report analyzes current field test evaluation data on the NIH3 sponsored *Understanding Alcohol* module developed and implemented by BSCS in Colorado Springs. This module, *Understanding Alcohol: Investigations into Biology and Behavior*, was developed under a contract from the National Institutes of Health National Institute on Alcohol Abuse and Alcoholism. It was nationally field tested in Georgia, New Mexico, Washington and West Virginia from February 2001 through May 2001. The data for this final report was generated from all four sites. There were four types of data collected: 1) pre-post module tests; 2) student surveys; 3) teacher surveys; 4) classroom observations.

The first data item consisted of two 10 item multiple choice and short answer test items (i.e., pre- and post-tests) keyed to information distributed across the six classroom lessons (see Appendix A). After the module was completed, students were asked to fill out a two page opinion survey about the overall module and specific lessons (see Appendix B for this form). The teacher surveys provided an opportunity for feedback on specific activities (see Appendix C for this form). Teachers were also encouraged to write their observations directly in the margins of the Field Test Notebook. Classroom observations were made by the evaluator while visiting the classrooms (see Appendix F). For the *Understanding Alcohol* module the project evaluator, Dr. Coulson, was able to attend five classes at the West Virginia field test site (i.e., Moundsville, WV). In addition to classroom visits by the project evaluator, BSCS staff also visited sites participating in the *Understanding Alcohol* module. Appendix D contains the verbatim comments of the students from the two page opinion survey and Appendix E contains the teacher narrative comments from the field test sites.

RESULTS

In Figure 1 the pre-post test averages are plotted for each of the four field test locations.

Figure 1



Each state pre-post test difference was tested using a paired t-test procedure and all mean comparisons were statistically significant at the .01 alpha level. Table 1 below gives the actual means.

Table 1
Understanding Alcohol Pre-Post Test Means

		Pre Test Means	Post Test Means
West Virginia*	(N=77)	3.77	6.56
Washington*	(N=43)	3.54	5.60
New Mexico*	(N=40)	3.73	4.80
Georgia*	(N=271)	4.10	6.95

*Statistically significant; $p < .01$

The Student Survey form (Appendix B) contained three objective questions and two open ended questions about the module. Surveys were completed anonymously with 77 surveys from West Virginia, 45 from Washington, 41 from New Mexico and 325 from Georgia. Overall, eighty three percent of the students indicated that the *Understanding Alcohol* unit was *"just right"*. Table 2 below shows the percentage distribution for the first survey question by state.

Table 2
Understanding Alcohol Overall Perception

	Too Easy	Just Right	Too Difficult
West Virginia	10.4%	80.5%	9.1%
Washington	13.6%	79.5%	6.8%
New Mexico	2.5%	87.5%	10%
Georgia	12.8%	84.9%	2.3%

The second question on the student survey was an adjective check list, where the students could select one or more adjectives to apply overall to the *Understanding Alcohol* unit. Table 3 summarizes the percentages of students that applied each adjective; the sum of the percentages for each field test site exceed hundred percent because students may select more than one adjective.

Table 3
Adjective Check List by State

	Fun	Confusing	Active	Stimulating	Challenging
WV	66%	13%	53%	45%	58%
WA	39%	30%	43%	34%	25%
NM	71%	39%	51%	27%	51%
GA	69%	13%	59%	33%	24%

The final part of the quantitative student survey questions focused on the rated *clarity* and *engagement* of the six lessons in the *Understanding Alcohol* module. Tables 4 and 5 present the overall percentage distributions for these six lessons. Figures 2 and 3 show the site-by-site means on a four-point scale, where 4 indicates high clarity or engagement, and 1 indicates low clarity or engagement.

Table 4
Clarity Distribution for Six Chapters

	High	Medium High	Medium Low	Low
1. Alcohol: Separating Fact From Fiction	36.5%	46.4%	12.7%	4.4%
WV	45.3%	42.7%	8%	4%
WA	37.2%	44.2%	14%	4.7%
NM	27.8%	33.3%	11.1%	27.8%
GA	34.7%	48.5%	13.8%	3%
2. What is a drink?	58%	29.2%	9.2%	3.6%
WV	47.2%	30.6%	18.1%	4.2%
WA	41.5%	41.5%	7.3%	9.8%
NM	41%	43.6%	10.3%	5.1%
GA	65.2%	25.3%	7.2%	2.4%
3. Responding to Alcohol: What's Important?	43.1%	38.2%	15.6%	3.1%
WV	49.3%	34.2%	13.7%	2.7%
WA	34.9%	39.5%	23.3%	2.3%
NM	39.5%	34.2%	21.1%	5.3%
GA	43.2%	39.5%	14.2%	3%
4. Alcohol Use, Abuse, and Alcoholism	53.2%	29.4%	13.1%	4.2%
WV	54.2%	31.9%	12.5%	1.4%
WA	42.2%	42.2%	13.3%	2.2%
NM	43.6%	33.3%	12.8%	10.3%
GA	56%	26.3%	13.3%	4.4%
5. Alcohol and Driving: When to Say No	57.6%	25.1%	12%	5.4%
WV	54.8%	34.2%	9.6%	1.4%
WA	42.2%	26.7%	24.4%	6.7%
NM	25%	30.6%	22.2%	22.2%
GA	64.7%	21.8%	9.3%	4.2%
6. Establishing Rules for Alcohol Use	47.5%	32%	13.1%	7.4%
WV	34.7%	36.1%	18.1%	11.1%
WA	45.2%	42.9%	4.8%	7.1%
NM	42.1%	21.1%	23.7%	13.2%
GA	51.7%	30.8%	11.6%	5.8%

Table 5
Engagement Distribution for Six Chapters

	High	Medium High	Medium Low	Low
1. Alcohol: Separating Fact From Fiction	21%	40.9%	26%	12.1%
WV	22.2%	41.7%	26.4%	9.7%
WA	14%	44.2%	27.9%	14%
NM	15.8%	42.1%	15.8%	26.3%
GA	22.1%	40.1%	26.3%	11.4%
2. What is a drink?	37.5%	33.4%	20.7%	8.43%
WV	27.1%	41.4%	21.4%	10%
WA	14.6%	46.3%	29.3%	9.8%
NM	48.6%	17.1%	22.9%	11.4%
GA	41.8%	31.6%	19%	7.5%
3. Responding to Alcohol: What's Important?	34.6%	39.6%	18.6%	7.2%
WV	44.1%	35.3%	14.7%	5.9%
WA	22.7%	40.9%	22.7%	22.7%
NM	33.3%	41.7%	13.9%	11.1%
GA	34.4%	40.1%	19.4%	6.1%
4. Alcohol Use, Abuse, and Alcoholism	43%	32.4%	16%	8.6%
WV	42.9%	22.9%	24.3%	10%
WA	33.3%	31.1%	24.4%	11.1%
NM	42.9%	28.6%	14.3%	14.3%
GA	44.6%	35.4%	12.9%	7.1%
5. Alcohol and Driving: When to Say No	43.1%	30.1%	17.3%	9.6%
WV	38.9%	31.9%	18.1%	11.1%
WA	28.9%	31.1%	20%	20%
NM	34.4%	15.6%	31.3%	18.8%
GA	47.2%	31%	15.2%	6.6%
6. Establishing Rules for Alcohol Use	38.4%	31.9%	17.4%	12.3%
WV	22.5%	39.4%	18.3%	19.7%
WA	27.9%	48.8%	16.3%	7%
NM	34.3%	20%	17.1%	28.6%
GA	44.1%	29.1%	17.4%	9.4%

The student survey defined clarity as: *"If you felt the content and information in a lesson was 'easy to understand' give it a high clarity rating, and if you felt that the lesson was*

'confusing' and 'unclear' give it a low clarity rating". Engagement was defined on the survey as: *"Engagement is simple. In your opinion did the lesson get you doing interesting things. If it did, give the lesson a high engagement rating, if it did not, give it a low rating"*. Figures 2 and 3 below show the site-by-site means on a four-point scale, where 4 indicates high clarity or engagement, and 1 indicates low clarity or engagement.

Figure 2

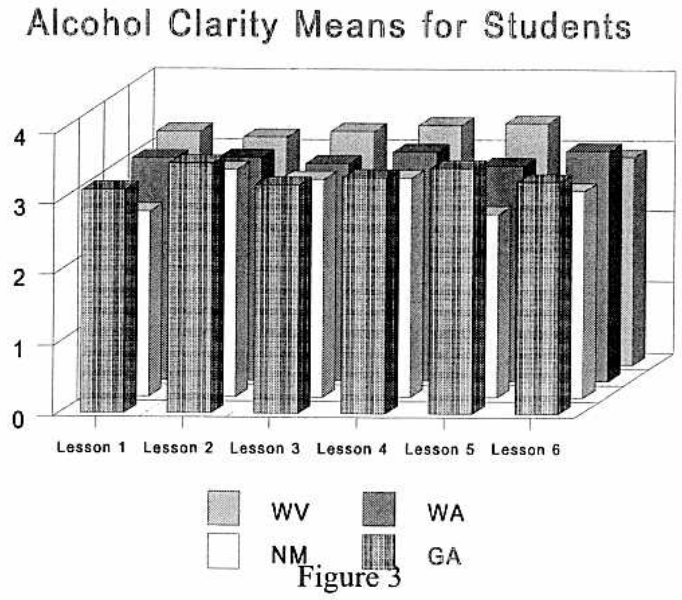
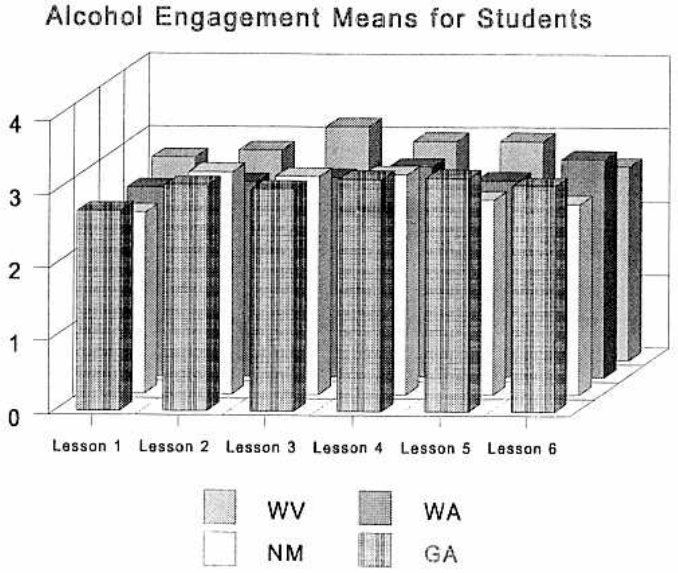


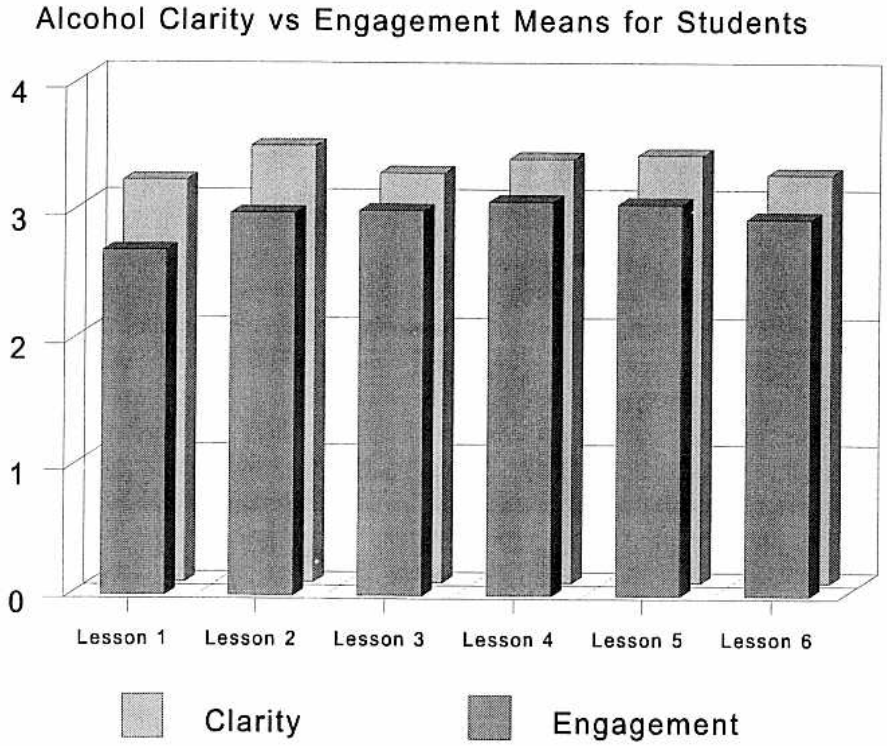
Figure 3



The final figure in this series provides a comparison of the clarity ratings and engagement ratings

for each of the six lessons collapsing over the four field test sites.

Figure 4



The last part of the student survey are the written responses to two questions about what the students ***liked most*** and ***liked least*** about the Understanding Alcohol lessons. These responses will be discussed later.

The objective teacher activity rating data from West Virginia show Lesson 4 to be the weakest from a "teacher materials" perspective, and Lesson 6 to be the weakest from a "student materials" perspective. Tables 6 and 7 below show the averages by lesson on a 6 point Likert scale, where the higher value indicates a stronger positive opinion.

Table 6
West Virginia Teacher Lesson Ratings of Teacher Materials

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Introductory sections were helpful	5.5	4.5	6	5.6	6	6
Presentation strategies were helpful	5.5	5	6	5.3	5	5
Procedures for students were clear	6	6	6	4.7	5	6

Table 7
West Virginia Teacher Lesson Ratings of Student Materials

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Reading level appropriate for students	4	6	6	6	6	4
Conceptual level appropriate for students	5	5	6	5.3	6	4
Material engaged and motivated students	4.5	5.5	6	5.6	6	2
Material helped students construct understanding	4	4.5	6	5	5	2
Materials for activities were worthwhile	5	5.5	6	5	6	3

The objective teacher activity rating data from Washington state shows Lesson 6 to be the weakest from a "teacher materials" perspective, and Lessons 1 and 6 to be the weakest from a "student materials" perspective. Tables 8 and 9 below show the averages by lesson on a 6 point Likert scale, where the higher value indicates a stronger positive opinion.

Table 8
Washington Teacher Lesson Ratings of Teacher Materials

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Introductory sections were helpful	5	5	5	5	5	4
Presentation strategies were helpful	5	4	5	4.7	5	3
Procedures for students were clear	5	5	5	4.7	5	3

Table 9
Washington Teacher Lesson Ratings of Student Materials

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Reading level appropriate for students	4	4.5	4	4.3	5	3
Conceptual level appropriate for students	4.5	5	4	4.3	5	4
Material engaged and motivated students	4.5	5	3.7	4	4	5
Material helped students construct understanding	3.5	4.5	5	4.7	4	4
Materials for activities were worthwhile	5	5.5	5	5	5	5

Table 10
Alcohol Aggregated Teacher Lesson Ratings of Teacher Materials

	L1A1 Up w mouse n=5	L1A2 Fact Fictn n=6	L2A1 What is a drink n=6	L2A2 Rspnd to alchl n=6	L3A1 What is up alchl n=5	L3A2 Dose, gntcs time n=5	L3A3 Effect gntcs n=6	L3A4 Effect time n=3	L4A1 Use & non use n=6	L4A2 Use abuse n=6	L4A3 Abuse alchls n=6	L5A1 Say no n=6	L6A1 Rules for use n=6
Introductory sections were helpful	5.4	4.7	5	5	4.8	5.2	5.3	4.7	5	4.5	3.9	5.3	4.8
Presentation strategies were helpful	4.8	4.8	5	4.8	5	5	5	3.7	5	4	4.2	5.2	4.7
Procedures for students were clear	5.4	5.5	5.5	5.5	5.6	5.4	4	4	4.7	3.8	4	5.5	5.5

Table 11
Alcohol Aggregated Teacher Lesson Ratings of Student Materials

	L1A1 Up w mouse n=5	L1A2 Fact Fictn n=6	L2A1 What is a drink n=6	L2A2 Rspnd to alchl n=6	L3A1 What is up alchl n=5	L3A2 Dose, gntcs time n=5	L3A3 Effect gntcs n=6	L3A4 Effect time n=3	L4A1 Use & non use n=6	L4A2 Use abuse n=6	L4A3 Abuse alchls n=6	L5A1 Say no n=6	L6A1 Rules for use n=6
Reading level appropriate for students	6	4.2	5.8	5.2	5.3	5	5.2	5	5.2	5	5.4	5.6	4
Conceptual level appropriate for students	4.6	4.8	5.5	5.2	5.2	5	5.2	5	4.8	4.2	4.8	5.3	4.2

	L1A1 Up w mouse n=5	L1A2 Fact Fictn n=6	L2A1 What is a drink n=6	L2A2 Rspnd to alchl n=6	L3A1 What is up alchl n=5	L3A2 Dose, gntcs time n=5	L3A3 Effect gntcs n=6	L3A4 Effect time n=3	L4A1 Use & non use n=6	L4A2 Use abuse n=6	L4A3 Abuse alchls n=6	L5A1 Say no n=6	L6A1 Rules for use n=6
Material engaged and motivated students	4.4	4.8	5.8	5.3	5	4.8	4.7	4.7	4.7	4.5	4.4	5.3	4.2
Material helped students construct understanding	2.7	5	5.3	4.7	5.5	5	5.2	4.3	4.8	4.4	3.7	5.2	3.8
Materials for activities were worthwhile	4.2	5.3	5.8	5.2	5.4	5	5	4.7	5	4.3	4.2	5.3	4.3

Tables 6 through 9 provide generalized "lesson-level" data from West Virginia and Washington, whereas Tables 10 and 11 provide means disaggregated to the specific "activity-level" across all field test sites. In this regard there is a slight redundancy when examining Tables 6 through 9 versus Tables 10 and 11.

Table 12, which starts on the next page, is designed for use by the BSCS writing team. This table organizes teacher narrative information found in Appendix E on a Lesson and Activity basis. In this way the cumulated teacher comments for a particular *Understanding Alcohol* lesson and activity may be easily found and thereby applied to the revision process. The **Discussion** section and **Recommendations** follow Table 12.

Table 12 (Writer's Table)

	Alcohol Lesson 1 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
1	None.	Had problem playing the video. The kids do not know how a normal mouse acts. As day moved on, kids come into class asking "Do we get to see the drunk mouse?" so it was already in their head.
1	Good way to introduce the lesson on how alcohol affects the body.	Children had no prior knowledge of normal mouse behavior, so it made this activity difficult for them to understand. I was surprised that the mouse falling off the table was NOT a good enough indicator of a drunk mouse; thought it was an escape attempt.
1	Reinforced the idea that although alcohol is a depressant, it can also stimulate behavior.	Students knew we were studying alcohol, so came to class assuming the mice were drunk. Had no clue as to what normal mouse behavior might be. Had to have a brief review of differences between observation and inference before we could continue.
1	Able to use laptops.	Maybe discuss with the class "regular" behavior of mouse.
2	This was a good measure for the teacher. I could determine what they knew about alcohol & did not know. This activity led into great class discussions.	It is best to get 2 or 3 views about each statement. Four or 5 views make the activity too long and lose the focus of the students. The statement alcohol is a disease is not covered very well in the teacher refer. section. Statements 13 & 14 not clear.
2	Put forth important discussion points. Gave students an opportunity to argue their points. Promoted good discussion period.	Some points were NOT fully discussed during unit. Example: Alcoholism is a Disease (need an activity for this.)
3	Statements really got the kids talking about alcohol. Stimulated wonderful conversations. They were amazed that I never told them if what they said was true or not true--led directly to next activities where these issues were addressed	Some vocabulary was unknown to my students, i.e. sober, intoxicated, moral, binge.
1	It's always good to have that visual.	I wonder if it might help the students if they were told and could see a little more of how it happened showing the person putting the mouse down. Give them an idea of the procedure that they went through.
1	By using this film as an opener, the students become interested in finding out about alcohol. It really captivated the students!	Remember to put the URL number in the directions.

	Alcohol Lesson 1 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
2		This activity was too similar to the pretest. The order that I was instructed to go through included film, pretest, this activity. The students could not understand why they had to go through this sheet (because it was too similar to the pretest.) You might want to place this somewhere else in the lessons. Also, the students did not know what stimulant and "Binge" drinking meant. I was not sure if I should explain to them. You might address this issue in the teacher directions. And I think you should have a key to this page for the teacher. I realize that page 8 explained eight of the statements, but I wanted to be sure that I was explaining all of the statements correctly. This took a lot of the time to locate the answers throughout the reading..

	Alcohol Lesson 2 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
1	This really engages the students into thinking about size and percent. Both of these are factors.	None.
1	Great visual tool. Very helpful start to the unit, with this activity. Short activity.	None.
1	Visual of the diff. drinks really impressed on the kids the differences in alcohol concentrations. Adding these to gallon containers really reinforced the concept that all drinks have the same total alcohol content.	Would be better for kids to come to conclusion about concentration of alcohol in diff. drinks on their own. Have a totally Metric classroom--had nothing with which to measure ounces.
1	Strengths were the way the demonstration visually showed the amount of alcohol. The students were very engaged.	Would be easier if measure amounts in ml; most science classes use metrics.
2	This activity really showed how alcohol dissolves in water. The kids understood this concept more effectively because there was a visual.	I had a hard time explaining to the kids about Response to alcohol in an obese person vs. non-obese.
2	Great visual tool. It goes well with "What is a Drink?" Helped students to understand the concepts.	Need some questions or perhaps hypothetical situations (individuals) for students to examine and predict how alcohol will affect them.
2	An excellent visual on how alcohol can affect 2 people with diff. percent body fat. I kept the 2 bottles on the front table all week and the idea was reinforced each time they saw the bottles.	Metric measurements, please!

	Alcohol Lesson 2 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
2	Always good to do demos; visualization always good; good background info.	
1	Great visual!! Kids got it.	Wording on Master 2.1 not too clear. Like the % of Alcohol (as a fraction). Some students were not sure what this meant.
2	Another great visual. I had to do it up front just because I wasn't sure about exposing them to the rubbing alcohol (district restrictions?).	It really took a lot of leading to get the kids to understand the idea of fat content. I tried giving them two people one muscle man one couch potato that went with each bottle. It seemed to help.
2	Nice tool for getting an idea of what the students know and don't know.	Do you want them to learn the vocabulary later or are you expecting them to know it? Otherwise you may want to define some of the words.
1	This activity was very effective for the students to understand alcohol content. It was a good visual for them to see. The equation paper was well done. All students seemed to understand this concept.	My problem was gathering the materials. I believe it would have been much easier if you would simply stated a shot glass rather than a 1.5 ounce cup, etc. I had problems determining the ounces because I was gathering my materials at home. I did not have a graduated cylinder at home. I also found that 2-liter bottles worked better that plastic milk bottles because they were clear and easier to obtain. Many of the questions at the end had to be reworded for my students to understand. I would ask them as stated and they would reply "What does it mean?"
2	It was easily seen that the alcohol combined with the water by using food coloring. This was a good visual to teach the concept as to why the brain is sensitive to alcohol. (The brain being composed of a significant amount of water.	The only confusion was when talking about the obese person versus the lean person, the students couldn't get the concept that the obese person becomes more affected by the alcohol because it appeared that the mineral oil was the person's fat and the alcohol did not mix with the fat.

	Alcohol Lesson 3 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on yourr experience with this module, what aspects would you change?*
1	The kids loved watching the mice. It really showed the effect of alcohol from being a stimulant to a depressant.	Ask the students to make predictions after each mouse.
1	Format of questions, ending with "Why should they care?" This is a good intro. It really gets the students to start thinking about alcohol.	None.
1	Thought-provoking. Good discussion started, should have been at beginning of unit (rather than What's up with this mouse?)	

	Alcohol Lesson 3 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on yourr experience with this module, what aspects would you change?*
1	Related alcohol use to personal experiences. Got students to think about the topic in general.	Need more information about diff types of alcohol (other than ethanol) as students had questions like "Can you drink rubbing alcohol?" "Sterno?" etc. Students definitely struggled with a definition of alcohol.
2	The students enjoyed watching the mice. They found it very entertaining.	It would be good for the kids to predict.
2	Ability to display on website.	Thought more info should be provided. Biologically how does dose effect brain?
2	Good visual representation of the effects of alcohol on mice. Effectively showed that alcohol both increases and decreases behavior and that this effect is dose dependent.	Students had a difficult time again making conclusions based only on specific observations. A lesson was required in scientific method.
2	Able to use laptops.	
3		Students had a hard time understanding the time. 0-1 was really 11 minutes after mouse ingested alcohol. 5-6 was 15-16 15-16 was 25-26 20-21 was 30-31 We use the printed version. The web site probably would have been more engaging.
3	Computer illustration capability.	Difficult to provoke conversation and discussion relating to this.
3	Good visual representation of the effects of alcohol on genetically different mice.	Although the activity clearly showed that there was a difference in behavior for the 2 different genetic strains of mice, it was still unclear to students HOW genetics actually makes a difference in this behavior. Wanted to know specifics.
3	Good way to compare the 2 strains of mice.	
4	Presented an integral part of alcohol use & its effects over time.	Could NOT display it from website like the previous two.
4	Good visual representation of the effects of alcohol over time.	If the point of the exercise is to show that alcohol decreases behavior over time and then that behavior will increase again as alcohol is metabolized than I think the actual experiment should demonstrate this.
4		Need to have on web site; not as much fun for students to count on paper.
1	Great for them to see it happen and to be recorders of data.	Master 3.3 doesn't go up to 20 so it was difficult to record on graph. (See notes on Study 1 Master 3.3.) I had students using bar graphs even after reading the directions. How could I help this not happen again?
2	Great for them to see it happen and to be recorders of data.	Using different colored pens might help with the difference in Study 2a & 2b. I study 2a, mouse with 2.0 dose ...the instruction box covers part of the path of the mouse.

	Alcohol Lesson 3 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on yourr experience with this module, what aspects would you change?*
3	Not as visually stimulating as it was on the web.	Could not find it on the web site. Had to use handouts. On Master 3.11 the Graph is not labeled correctly.
1	I liked this activity the most. The students got very involved in the activity and it could be easily done by my special-Ed students, as well as keeping the interest of the gifted students. It was a nice way to incorporate the use of the computer for learning activity and a good way to teach them to use of different colors for lines on the graphs.	Activity 1: The blue instruction boxes that came up after the mouse had completed its path, need to be moved off of the mouse path. It was hard for the students to see the path. Activity 3: The graph selected has the wrong bottom label. It should be time in minutes. I hope you put study three only computer. Remember to put the URL numbers in the lessons.

	Alcohol Lesson 4 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
1	Factors that might influence them to drink or not was great. It really lead to a good discussion.	Four or 5 students working together will not work; 2 or 3 is better. When 4 or 5 work together, it ends up that 2 or 3 aren't doing anything.
1	Presented hypothetical results what were almost identical to real life U.S.	Dice rolling was very tedious.
1	The dice rolling made relatively nice bell-curve graph of use and non-use. In the end, students could easily identify who drinks and who doesn't and some of the reasons why.	Students seemed caught up in the dice rolling without thinking about what the dice rolls were actually indicating about the people they were modeling.
1	Nice idea w/ dice. I have small classes so made them do 4 individuals each.	
2	Students enjoyed rolling the dice and determining the outcome of their fictitious individual.	The students did not know what is considered alcohol abuse. They have a hard time answering why someone would abuse alcohol.
2		Dice rolling is tedious.
2	Again, the dice rolling made a relatively nice bell-curve graph of use and abuse. In the end, students could easily identify who drinks and who abuses alcohol and some of the reasons why.	Students had a really hard time coming up with the factors that lead from use to abuse. It was unclear to them about the effects of genetics on individuals as well as why one person would react positively to the alcohol and another negatively.
2	Good idea.	Change the handout and make sure you put that you are pulling over the "final score" from activity one.

	Alcohol Lesson 4 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
3	None.	The students did not know the difference between alcoholism and abuse. They could not come up with any factors why someone would become an alcoholic. I had to guide or tell them.
3	The dice rolling gave an accurate depiction of the 50% of abusers who go on to become alcoholics.	Students had a really hard time coming up with the factors that led from abuse to alcoholism. Genetic effects were a problem. There is more needed on why alcoholism is considered a disease and which elements involve choice and which do not.
1	Nice hands-on activity. It really got them thinking about pressures.	Master 4.3 needs to be bigger in size. Smaller group sizes might help it run smoother. I had the kids give a fictitious name to the person so there wasn't a problem with associating it with other students.
2	Some were really able to visualize it.	Lost some kids because they were not actively participating.
3	Nice hands-on activity.	Turn Master 4.6 so it is landscape and make it larger.
1	The students were very active and involved when doing this activity. They really seemed to like seeing the histogram made of their results.	I would like to see the Master 4.3 Template (Pg. 73) made as overhead for the teacher when the final unit is done. I drew my own overhead because we do not have access to making them. (The one's that are to be used for copy machines are not allowed at our school because it caused a machine to burn up.)
2	Activity really kept students on task.	On Master 4.4. (Pg. 74), I believe that it would better understood by the teacher if you would place in the parentheses (Final score from Activity 1) beside Environmental Factors. At first, I thought you were wanting us to place the score of the family environment factor only. This did not allow for any of the individuals to become alcoholics. (I finally realized my mistake.) Again, in the final unit you should have an already made transparency of Master 4.6 for the teachers.
3	I think this activity kept the students busy and was a good way to show how histograms work, but I'm not sure if they related to concepts to what we were doing.	In the directions (on Pg. 67), the Master should be 4.7 on #5 and 4.8 on #7. Also, when looking at the numbers for the final scores (on #3) you should have it be for the scores of 61 or higher. This would coordinate with the histogram graph.

	Alcohol Lesson 5 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*

	Alcohol Lesson 5 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
1	The kids loved this activity. They found the charts very interesting. They now understand blood alcohol level.	None.
1	Great demo (this was my favorite activity). Students really enjoyed the party scenario and like to see who could drive.	None.
1	An effective way of showing how alcohol is metabolized over time. An effective way of showing the various effects different doses of alcohol has on people. An effective way to start dialog on laws--most students favored zero tolerance level in the end.	It was very difficult to get students to come up with drinking pattern as a factor. We only got there after repeated and relatively direct prompting from the teacher.
1	I like the 6 party guests and the different weights and the different number of drinks--to see how all those things can affect the BAL.	
1	I was pleasantly surprised how easily my students picked up on this activity. I would go over the 1st guest with them, and then they were able to understand what to do. the chart on Pg. 86 (Master 5.3) made this much easier to follow than when it was first introduced to us in January.	

	Alcohol Lesson 6 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
1	It made the students aware of the economic, social, and medical problems resulting from alcohol. They were blown away with the stats. on murders, rapes.	The story was too young for these kids. Some thought it was too childish.
1	Volstead is a good concept. A make-believe planet makes it helpful for students to break away from the laws they already know.	None.
1	Kids were relatively bored by the exercise on listing the pros and cons of alcohol use but seemed enthusiastic about making the rules on the Planet. Using the original statement list was good to review all the material in the unit	"Pulling it all together" scientific review was difficult to understand. It was unclear to me what students were supposed to produce as the points in the "critique" as listed did not seem to be aspects either supporting or not the decisions kids had made.
1	Cute idea--students seemed to like it.	
1	Nice way to see if they are getting the info and how they use it to support themselves.	

	Alcohol Lesson 6 Activity Table	
Activity	*Based on your experience with this module, what aspects did you particularly like?*	*Based on your experience with this module, what aspects would you change?*
1	The idea is good, but it needs to be an opening activity.	This was the least effective of all of the activities. All of the lessons that we conducted before this one had visuals and hands-on activities. I think this was kind of a let down to the students because all they got to do was discussion groups. If you placed this lesson at the beginning of the unit, I think the students would be more receptive to doing this lesson. It would get the students to start thinking about the rules of alcohol. It would be a good "ice breaker."

DISCUSSION

This section discusses patterns in the narrative data (especially from student comments) which are corroborated by the statistical patterns.

The *Understanding Alcohol* module showed statistically significant gains from pre-test to post-test across all four sites. In addition, student narrative comments were generally positive (i.e., 63% positive vs 37% about problems). Furthermore, as can be seen in Table 2, eighty percent or more of the students across the four field test sites rated the module as *just right* (neither too easy, nor too difficult). Relatively speaking the students from New Mexico saw the module as *more difficult*, whereas the students from Georgia and Washington saw the module as relatively *easier*. When Table 3 is examined, the students from Georgia and West Virginia saw the module as the least confusing (i.e., 13%), while the students from New Mexico saw the module as the most confusing (i.e., 39%).

Figure 4 on page 7 shows that the overall student rates for each of the six lessons were higher for clarity than engagement. These statistics indicate that "What Is a Drink?"had the highest clarity level, and "Separating Fact from Fiction" had the lowest engagement level. This finding is supported from the student narrative record which is summarized in Table 13 below. Specifically, less than one percent of the positive comments (i.e., *what you liked most about the lessons*) dealt with "Separating Fact From Fiction", while 21% of the positive remarks dealt with "What is a Drink?".

For "Separating Fact From Fiction", students did not like to answer read-aloud or work from questions distributed on a hand-out. This was not sufficiently hands-on for most of the students. In contrast, "What is a Drink?" was visually very stimulating, and connected in an easily understood way to thin/fat body types. In this regard, the material in lesson 2 was intrinsically interesting.

> *"I thought that the experiment with beer, wine and vodka was interesting. I thought it was cool to find out that all three drinks have the same amount of alcohol." [page D-4]*
>
> *"I really liked the What is a Drink with red dye. I liked it because you could see how much alcohol was in each drink and it was easy to understand." [page D-4]*
>
> *"I liked seeing how what alcohol does to your body. I liked this because it was cool to watch it mix in." [page D-46]*

Overall the visual impact of "What is a Drink" was strong and effective.

The set of activities which received the most frequent "positive" comment from students concerned the mouse. While 29% of the positive comments dealt with mouse related activity (i.e., observing the mouse, computer tests of mouse) only 10% of the negative comments (i.e., *liked least*) related to mouse activities. The active, experimental nature of lesson 3 combined

with computer use was very popular with the students:

> *"The mouse experiment. It was very intellectual. The more alcohol, the harder it was for the mouse to understand the maze."*

> *"When we went down to the computer lab and tested the mouse's blood level it was fun."*

A few students expressed a prurient interest in the drunk mouse, while others expressed concerns for the welfare of the mouse. In a small percentage of responses students articulated that they did not like the ambiguity of some of the tasks:

> *"I did not like writing the surveys; they were weird and I had no clue what the answers were. ... "*

Students dealing with "ambiguity" relates to the expressed concern about some of the confusion experienced with generating a five paragraph letter for lesson six. Ambiguity is a two edged issue: on the one side it may be that the students are "confused" and on the other side it may be that the "inquiry-nature" of the materials is less familiar to the students. To the extent that "hands-on" is derivative of "inquiry", students were very satisfied with this aspect of the materials:

> *"I want more hands-on assignments."*

> *"I liked all the lessons - they were fun and active. We didn't just take notes and not talk - we talked, used the computer and other stuff."*

The lessons "Modeling Alcohol" (i.e., dice) and "When to Say No" (i.e., hosting a party) drew approximately equal percentages of positive and negative comments: 19%/15% and 12%/13%, respectively (see Table 13 below). The strength of "Modeling Alcohol" was the active nature of throwing the dice. Some students did not make a close link of the outcome of the dice experiment to the frequency distribution of alcohol use and abuse in the population. Others did not like the attendant graphing activity, possibly because of the lack of connection between the graph itself, and the number of alcohol abusers in the general population.

The "When to Say No" lesson (#5) experienced a related problem. Some students liked the comfort and specificity of body/weight calculations, while others did not care for the amount of calculation required by lesson 5.

> *"I liked when we did the project about how drunk you were at the end of four hours because I really like math and it was like a game not an assignment."*

On balance, students who were positive about lesson #5 expressed a stronger opinion that those

who were negative (mostly complaining about the calculations required).

Table 13
Distribution of Student Narrative Comments

	Percent of Total Positive Comments	**Percent of Total Negative Comments**
1. Mouse activities	29%	10%
2. Separating Fact from Fiction	<1%	11%
3. What is a Drink?	21%	7%
4. Modeling Alcohol	19%	15%
5. When to Say No	12%	13%
6. Establishing Rules	18%	43%

Finally Table 13 shows that the largest discrepancy between positive and negative remarks is for the final lesson, "Establishing Rules", with the balance toward the negative remarks. However the percentages do not tell the complete story. Specifically, if one simply compares the percentages for "Establishing Rules", they differ by a factor of 2.4. However, in terms of frequency, the discrepancy factor diminishes to 1.4. That is, the student narrative record contained 68 positive references to "Establishing Rules" and 95 negative references to this lesson (i.e., 95/68=1.4). Furthermore, there is an interesting pattern to *why* the students liked or did not like "Establishing Rules".

The predominant reason for not liking "Establishing Rules" had to do with the combination of lack of "objects to manipulate" and its relatively heavy reading and writing requirement. That is, some students found it confusing. They were simply not sure what to write in the letter. Other students simply did not like the act of writing, and a couple of students said that they did not like lesson 6 because they did not like to read. For example:

> *"I did not like lesson 6 because we had to write a whole page report."*
>
> *"I didn't like lesson six because I don't like to write."*

Although some of the student remarks were very clear that it was the act of writing that they did not like in lesson 6, others seemed to link their difficulty with the writing tasks to the ambiguity of instructions or the confusing nature of lesson 6.

On the other hand a smaller number of students liked writing and therefore enjoyed lesson 6:

"Well, for me, I like writing so I enjoyed the 'Establishing Rules' thing" (i.e., lesson 6).

However, the real value to lesson 6 for a number of the students derived from the class interactions. Specifically, students liked hearing the opinions of their classmates. It is interesting to note that some of the students interpreted *disagreements* as negative, something to be avoided, whereas others found diverse opinions interesting.

> *"What I liked the most about the alcohol use lessons was that it made you think, especially the one when we had to establish rules for alcohol use." [page D-13]*
>
> *"I really liked the Volstead project because: 1) it was new and creative; 2) it got the whole class involved; 3) we got to learn how hard decisions are made."*
>
> *"I also like the Volsteadian experiment and how our class debated on the rules for the plan. We talked about the effects of too much alcohol and how it could lead to 'death' or a 'coma', which made me think really hard on knowing when to say 'no'. This unit was a whole bunch of fun." [page D-29]*

Each of these quotes above reflect the interactivity of lesson 6, and the benefit of focusing on interactions whether it is to build consensus or appreciate diversity. While a noticeable percentage of students objected to the amount of writing in lesson 6, clearly a number of the students in particular classes benefitted from hearing the opinions of others and embracing the different points of view.

Although the Georgia and West Virginia field test site showed the strongest gains from pre-test to post-test, all four sites showed a statistically significant gain in average post-test scores. The paired t-tests were all highly significant at the .01 alpha level. On the ten item test, the students from Georgia and West Virginia averaged 6.95 and 6.56 correct answers on the post-test, up from a pre-test average of 4.1 and 3.77, respectively. While New Mexico only increased 1 additional question correct (rather than 2 [Washington] or 3 [Georgia and West Virginia]), this increase was sufficiently consistent across all students so as to be statistically significant. The paired t-test is a more powerful statistical test because the error term is reduced by taking out shared variance from pre and post test scores via a correlation function.

Student reaction to content was mixed. The main "negative" reaction was to the writing requirements in lesson six. Many, though not all, did not want to write a five paragraph letter. To some extent, this was partly due to what the students felt were "ambiguous" instructions on what to do for this exercise. There were a noticeable but small percentage of students that liked the writing requirements because they liked to type and/or liked to write. Student objections to the writing required in lesson six, was largely offset by other student comments about the advantages of group interactions during lesson six. The dice estimation tasks in lesson four

(*Alcohol Use, Abuse, and Alcoholism*) were liked, particularly because they were active, although some students did not like the associated graphing activity. Mouse related activity, including the associated computer activity in lesson 3 was the most popular among the students.

The objective student ratings on the *clarity* and *engagement* of the materials were generally very high. In this regard, the strongest lesson was 4 (*Alcohol Use, Abuse, and Alcoholism*) with nearly half of the student responses giving it high clarity (48%), and 40% rating it high on engagement. As it might be expected, lesson 6 received the greatest percentage of low ratings for clarity and engagement at 10.5% and 18.1% respectively. In general, the students rated clarity higher than engagement across all six lessons (see Figure 4). Finally a large percentage of the students (i.e., ~83%) rated the *Understanding Alcohol* unit as *"just right"* in level of difficulty.

Appendix E contains a series of teacher comments on specific activities. These comments are very specific as they apply to particular activities throughout the six lessons. Although they will not be summarized here, such comments provide useful suggestions for the writing team at BSCS. Table 12 presents a "writer's table" of teacher comments for each lesson and activity. The aggregated objective ratings on these lessons in Tables 6 through 9 reinforce the earlier findings that lesson 6 was weakest and lesson 3 the strongest, with the qualifications discussed above.

The project evaluator observed five classes in West Virginia engaged in the dice activity associated with lesson 4 (*Alcohol Use, Abuse, and Alcoholism*). While the activity was well managed by the teacher and very engaging for the students, the general impression was that the connection between the outcomes of the dice rolls and resulting distributions of alcohol use and abuse needed to be more actively reinforced. This reinforcement might be achieved with more "introductory remarks" from the teacher, particularly at the moment of initial engagement with the glass of "alcohol". When the teacher held up this glass of "alcohol" (actually colored water) the students appear quite engaged. A more "embellished" story about who will drink this, and who will drink too much of this might be appropriate at this time to "foreshadow" the distribution estimation activity using the dice.

Another point to emphasize is that some of the activities appear the same to the students, and thereby repetitious. For example, giving out 10 "true/false" questions right after completing a 10 item multiple choice pre-test can appear to be repetitive. Estimating percentage of "abusers" in the general population can appear to be repeating the estimation of the percentage of "users" in the population, unless the activities are more "dramatically" delineated from each other. Also, generating a list of the "abuses" of alcohol may be seen as repeating the generation of a list of the "uses" of alcohol. Eliminating this kind of duplication can also provide additional time for some of the other activities.

Students at this age level are very interested in concrete and "real" things: real mice, real alcohol, real people. Throughout the student narrative, phrases like *"unrealistic", "not real", "too fictionistic"* came up. When such matters are overly fictionalized it drains some of the educational liveliness from the material, and consequently lowers attention and interest. While it is important not to imply that a real person is an alcoholic, or that a particular glass is really

alcohol about to be ingested by a mouse, or a student, it is equally important to devise strategies that create materials that are "alive" and "real". Several times during the site visit the evaluator observed the students asking *who* these fictitious people were. Some students even asked why they could not be "real" people.

There were a few technical details about the "interval limits" for the graphed distributions. Specifically in a couple of instances the interval limits were not mutually exclusive relative to the level of integer measurement being used in the dice examples.

Overall, the *Understanding Alcohol* module had a strong positive impact on the students. The consistent pre-post test findings were consistently statistically significant across all four field test sites. Throughout the student narrative, there were indications of the module impact:

> *"My favorite part about the 'Understanding Alcohol' lesson is that you learn that it is not 'cool' to drink. I learned about the hazards of drinking and the effects they have on your body." [page D-22]*

> *"I really enjoyed studying this alcohol unit. I now know when to say no, when to drink, and how much to drink." [page D-29]*

While the recommendations which follow provide suggestions for revisions, it is important that important features are not "tossed-out" based on particular criticisms, particularly from students. Lesson six would be one illustration where students complained about the heavy writing requirements, yet the interactivity engendered by this lesson showed itself to be very valuable.

RECOMMENDATIONS

The following recommendations are based on the results and discussion of the data in this report.

1. The first general recommendation is that the revision process ensure that the distribution of "activity" is even throughout the week-long module. That is, the more passive requirements such as reading and writing, and the more active requirements such as the experimentes are "distributed" rather than "massed";

2. The second general recommendation is that the revision process, wherever possible, "unfictionalize" elements of the modules.

In view of the two general recommendations above several specific suggestions are made:

3. Add visual elements into lesson 6 (*Establishing Rules*). Visual elements would add "reality" to aspects of the activity as well as provide a compensatory balance to the amount of reading and writing required by this lesson;

4. Brainstorm ways of changing "fictionalized" aspects to "more real" aspects. For example, in lesson 5 instead of using "fictional party guests", consider designing a role play activity in which students are the guests, colored water is served in known amounts and then actual weight-by-consumption calculations are made. Another example might be to change the Volstead planet to an isolated community in Nevada where the water supply has caused communal amnesia (i.e., necessitating local "rules" to be rewritten). This would also permit rendering economic figures in terms of the population of a small town, rather than the $148 billion 1992 figure which when disaggregated into matters like healthcare and crime may be difficult to grasp;

5. Retain the interactive discussion inherent in lesson 6, with perhaps some teacher guidance for managing consensus and normalizing disagreements;

6. Include more "paragraph" writing activities earlier in the module. It may be possible to involve computers with these writing activities, as well as a journaling activity that is creatively linked to lesson 6, the Volstead letter (e.g., "foreshadowing an alien alcohol policy");

7. Distribute more "activities" toward the end of the module. Students like activity, including something as simple as leaving the room to go down the hall to the computer room. Additional activities could include role playing "party goers" in lesson 5;

8. Reduce perceived redundancies (e.g., 10 pre-test items then 10 T/F statements; percent of abusers in population then percent of alcoholics in population) through redesigned sequences;

9. Lesson 1 (*Alcohol: Separating Fact from Fiction*) seemed to be the "lowest"in terms of salience. This may indicate a need to examine and increase the intensity of the activities contained therein;

10. Align graphing requirements in lesson 4 (*Modeling Alcohol*) closer and in a more explicit fashion to the purpose of the dice activity which is to actively show the distribution of alcohol use and abuse in the general population;

11. Link calculations in lesson 5 to "real" guests (i.e., students in the class). This recommendation relates to #4 above;

12. The pre-post comparisons were statistically very strong indicating a strong impact on learning about alcohol from this module, therefore adjustments to modules should seek to retain the "educational content" therein.