



Health Literacy Instruction and Evaluation among Secondary School Students

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ABSTRACT

Background: Tobacco use, poor eating habits, and physical inactivity are the modifiable risk behaviors most associated with the leading causes of morbidity and mortality in the United States. Because these risk behaviors are established during adolescence, the nation's schools are uniquely positioned to develop health literacy in students. **Purpose:** The purposes of this study were (1) to evaluate textbook-based health literacy instruction on the acquisition of health concepts and skills, and (2) to use the Health Education Assessment Project (HEAP) database items to assess changes in the concepts and skills associated with risk behaviors. **Methods:** The study participants consisted of 669 secondary students. Items were selected from the database to measure students' achievement in concepts and skills related to tobacco, nutrition, and physical activity. **Results:** Results indicated significant improvements in concepts and skills scores from pretest to post-test in the treatment group when compared to the control group. **Discussion:** Exposure to health literacy instruction through a comprehensive, health education textbook has a positive influence on the development of concepts and skills that contribute to health literacy. **Translation to Health Education Practice:** Teachers should provide instruction from curricula that focus on health concepts and skills. Additionally, HEAP database items should be used for evaluative purposes.

BACKGROUND

Health education is recognized as an essential component of health promotion and a key to the reduction of risk behaviors associated with chronic diseases.¹ Health education is defined as "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and the skills needed to make quality health decisions."^{2(p99)} Determining the influence of health education on the acquisition of this information (concepts) and these skills allows researchers to evaluate the efficacy of school-based instruction as a tool for the achievement of health literacy and, therefore, as a component of

chronic disease prevention.

The nation's schools are uniquely positioned to educate children and youths about risk behaviors by making health education available to their students. The primary goal of school health education is to develop health literacy in the school-aged child. Health literacy is defined by the Joint Committee on Health Education Standards as "the capacity of individuals to obtain, interpret, and understand basic health information and services and the competence to use such information and services in ways which enhance health."^{3(p5)} In 2005, a report by the National Academy of Sciences' Institute of Medicine stated, "[T]he most effective means to improve

health literacy is to ensure that education about health is a part of the curriculum at all levels of education."^{4(p149)}

If the goal of school health education is to improve students' health literacy, it is vital to have a framework to guide the achievement of this goal. In 1995, such a framework was developed and disseminated to states, school districts, administrators, and teachers across

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the nation. Titled “National Health Education Standards: Achieving Health Literacy” (NHES), the framework was developed by a coalition of health education organizations and professionals. The standards provided in this framework were designed to support schools in meeting the essential goal of enabling students to acquire the concepts and skills necessary to achieve health literacy. Of the seven standards delineated in the framework, one (standard 1) addressed concepts and six (standards 2-7) addressed skills.³

Over the next decade, most states and many school districts across the country adopted these standards. Textbooks and other curricular materials were developed based on them, and the Health Education Assessment Project (HEAP) provided assessment items to evaluate the effectiveness of the curricular materials.⁵ Due to research-based advances related to health education, the national standards were revised in 2006. The revised document, “National Health Education Standards: Achieving Excellence,” includes eight standards. Of these standards, one delineates concepts (standard 1) and seven (standards 2-8) delineate skills.⁶ (Note: The revised standards were not available at the time this study was conducted. The 1995 standards served as the foundation for the textbook series and the HEAP assessment items used in this study.)

The emphasis on skills in the standards documents underscores the paradigm shift from merely informing youths about health concepts to also providing them with the skills that can enable them to make healthier decisions regarding their behaviors.^{2,3,6,7} Current state-of-the-art health education curricula provide sequenced instruction that is consistent with state and/or national health education standards.³ These curricula are more likely to positively affect the health behaviors of students when they teach the skills needed to engage in health-enhancing behaviors.^{8,9}

The shift from a cognitive-based to a skill-based philosophy has resulted in effective programs in the areas of substance abuse prevention as well as sexually transmitted infections and pregnancy prevention among

teens. Although research since the mid 1980s has demonstrated the effectiveness of skill-based programs, these programs have overwhelmingly addressed a single issue (i.e., teen sexuality, violence, or tobacco/substance use) and/or targeted specific populations (i.e., high-risk youth or minority populations).¹⁰⁻¹⁶ A few programs—Growing Healthy (for grades K through 6), The Great Body Shop (for grades K through middle school), the Michigan Model (for grades K through 12), and the Teenage Health Teaching Modules (for grades 6 through 12)—are comprehensive curricula that have demonstrated positive effects on students’ concepts and skills. However, these curricula are limited in their dissemination due to various factors such as the cost of the curricula, the inability of the developers to market widely,¹⁷⁻²⁰ or exclusion from the state textbook adoption lists.

PURPOSE

Most health education in the United States is taught based on textbooks selected from state textbook adoption lists. To date, no comprehensive “state approved” textbook series has been researched to determine its efficacy in improving the health-related concepts and skills described in the NHES. Thus, the primary purpose of this study was to evaluate the effects of textbook-based health literacy instruction on students’ health-related concepts and skills. A secondary purpose was to use HEAP assessment items to assess changes in concepts and skills related to the risk behaviors of tobacco use, poor nutrition, and physical inactivity.

The resultant findings are important in determining whether health education, as it is most commonly delivered, influences the health literacy of children and youths. That is, does it develop the concepts and skills necessary for students to choose health-enhancing behaviors that may prevent chronic diseases? The answer to this question can inform persons who make decisions related to (1) requiring health education in the nation’s schools, (2) determining the importance of this subject area, and (3) using HEAP assessment items to monitor the effectiveness of

health education curricula.

METHODS

Design

A quasi-experimental design was selected to control for the potential threats of maturation and history to the validity of the evaluation results. Intact classrooms were used to provide as natural a setting as possible for the instruction to occur. The goal was to test the efficacy of the instruction as it would occur in the regular classroom without experimental manipulation that was not replicable in the “real” school setting.

Subjects

Three schools from the Little Rock Public School District in Arkansas were selected for participation in the study. Two of the institutions are middle schools and one is a high school. These schools were selected based on adequate numbers of students in each health class and teacher access to a classroom. (Some health classes in Arkansas and elsewhere are taught in the gymnasium while several physical education classes are in progress.) An additional consideration was the availability of a control group. In Arkansas, students are required to take at least nine weeks of health and nine weeks of physical education during middle school. High school students must take one semester of health and one semester of physical education. It is common practice to rotate classes of students from health to physical education and vice versa in order to fulfill the health and physical education requirements during the school year. Students are randomly assigned to either health or physical education class via computer at the beginning of the school year. The control group consisted of students who were assigned to participate in physical education classes during the nine weeks or semester the study was conducted, rotating to health during the following nine weeks or semester. Students in the control group were not exposed to textbook-based health literacy instruction.

All pretests for the health and control group classes were administered the first



week of school during the fall semester of 2005. Post-tests were administered to both groups prior to the end of the fall semester. Before data collection, a university Institutional Review Board (IRB) approved the study.

Instruments

An instrument consisting of 30 selected response items was developed for pre- and post-test assessment of health-related concepts and skills. The items were selected from the Council of Chief State School Officers (CCSSO) State Collaborative on Assessment and Student Standards (SCASS) HEAP database. The purpose of HEAP is to develop valid health education evaluation resources and to increase “capacity to align curriculum, instruction, and assessment to improve student health literacy through improved health instruction.”²¹ The HEAP database was selected because the items have been rigorously developed, pilot tested, and determined to meet the requirements of content validity and reliability.²²

Of the 30 items that were selected from the database, 15 assessed health concepts and 15 assessed health skills. Five health concept items queried students about tobacco, physical activity, and nutrition. The 15 selected skill items assessed students’ ability to demonstrate processes associated with accessing information, interpersonal communication, decision-making, goal setting, and self-management within the context of the topic areas (tobacco, nutrition, and physical activity). (Note: Because the assessment database is proprietary, the actual items are not included in this article.)

The selected items were based on the lessons that were used in both the middle and high school textbooks. The reliability coefficient of the data was $\alpha=.75$ and $.77$ for the middle school and high school skills scale, respectively, and $.76$ and $.72$ for the concepts scales, indicating an acceptable level of internal consistency.

PROCEDURES

A partnership was formed between the Arkansas Department of Education (Office of Comprehensive School Health), the

University of Central Arkansas (Department of Health Sciences), and the Little Rock Public School District. The latter was recruited as a partner because it had adopted a comprehensive textbook series for secondary students during the previous academic year. *Teen Health* is the title of the middle school text and *Glencoe Health* is the high school text. This textbook series is published by Glencoe/McGraw-Hill and is listed on the Arkansas State Recommended List of Instructional Materials. The concepts and skills delineated in the NHES serve as the foundation for this series.^{23,24}

Prior to pretest administration in the treatment and control group classes, a passive consent form was distributed to each student. All persons who administered pretests and post-tests followed a written protocol to ensure conformity in administration of pre- and post-tests.

Data Analysis

Data was analyzed using SPSS 13 with a two-way ANOVA with repeated measures on the last factor. Reported p-values are based on two-sided tests with a p-value less than .01 considered significant due to multiple analyses. For the purposes of this study, the three topic areas (tobacco, nutrition, and physical activity) were combined into concept scores and skill scores.

RESULTS

Participants in pretesting included 377 middle school students. Of these, 188 were in the treatment group, and 189 were in the control group. The high school pretest groups included 554 students. The treatment group consisted of 272 students, the control group 282. In the post-testing phase, 208 middle school students participated (100 treatment, 108 control), along with 461 high school students (230 treatment, 231 control). Pre- and post-test scores were matched for each student. Demographics of the participants are presented in Table 1

Differences in the Middle School Group

Four mixed between-within subjects analysis of variances were conducted on the middle school and the high school scores of concepts and skills. The between subjects

factor was group (treatment vs. control), and the within subject factor was time (pretest vs. post-test). Results are presented for the middle school students and then the high school students. There was a significant interaction effect on the concepts scores for treatment group by time [$F(1,206)=120$, $p<.001$]. As can be seen in Table 2, the concepts scores improved in both the treatment and control groups, but the treatment group’s scores improved significantly more than the control group’s. The magnitude of the differences in the means was large (eta squared=.37). This result indicates that the amount the treatment group improved their scores from pre- to post-test (almost 5 points) was significantly larger than the improvement in the control group (less than 1 point). Overall, 37% of the variability in the improvement from pre- to post-test scores can be attributed to the group the student was in, treatment versus control.

Like the concepts scores, there was a significant interaction in the skills scores by treatment group and time [$F(1,206)=123$, $p<.001$, eta squared=.37]. This result indicates that the treatment group students significantly improved their skills scores (by almost 5 points) compared to the control group (less than 1 point). The magnitude of this difference was considered large (eta squared=.37). Thirty-seven percent of the variability in the change in skills scores can be attributed to the treatment (Table 2).

Differences in the High School Group

Among the high school group, there was a significant interaction effect on the concepts scores for treatment group by time [$F(1,459)=63$, $p<.001$]. As can be seen in Table 2, the concepts scores improved in the treatment but not the control group. The magnitude of the differences in the means was between moderate and large (eta squared=.12). This result indicates that the amount the treatment group students improved their scores from pre- to post-test (almost 2 points) was significantly better than the slight decline in the control group’s scores. Overall, 12% of the variability in the change from pre- to post-test scores can be attributed to the health instruction.


Table 1. Participant Demographics by Group and Grade (n=669)

	Treatment				Control			
	Middle School		High School		Middle School		High School	
	n	%	n	%	n	%	n	%
Sex								
Missing	1	1.0%	1	.4%	1	.9%	0	.0%
Female	55	55.0%	115	50.0%	50	46.3%	113	48.9%
Male	44	44.0%	114	49.6%	57	52.8%	118	51.1%
Total	100		230		108		231	
Race								
White	14	14.4%	77	35.3%	19	19.0%	88	39.8%
Black	75	77.3%	120	55.0%	73	73.0%	113	51.1%
Hispanic	2	2.1%	6	2.8%	3	3.0%	6	2.7%
Asian	1	1.0%	6	2.8%	0	.0%	10	4.5%
Biracial	5	5.2%	9	4.1%	4	4.0%	0	.0%
Native American	0	.0%	0	.0%	1	1.0%	4	1.8%
Total	97		218		100		221	

There was a significant interaction in the skills scores by treatment group and time [$F(1,459)=123, p<.001, \eta^2=.21$]. This finding indicates that the treatment group students significantly improved their skills scores (by more than 2.6 points) compared to the control group (less than one-fourth of a point). Twenty-one percent of the variability in the change in skills scores can be attributed to the treatment (Table 2).

DISCUSSION

The primary purpose of this study was to evaluate the influence of comprehensive textbook-based instruction on students' acquisition of health-related concepts and skills leading to health literacy. Data from this study suggests that exposure to such instruction resulted in a significant improvement in the concepts and skills described in the NHES. A secondary purpose of the study was to use HEAP assessment items to evaluate changes in concepts and skills associated with tobacco, nutrition, and physical activity, leading risk factors in chronic diseases. The HEAP assessment items proved to be a valid and reliable form of evaluating concept and skill acquisition. Study results indicate that students who were exposed to

the textbook-based instruction achieved significant increases in their scores on the HEAP assessment items.

These findings are consistent with previous research that indicates the effectiveness of health education aligned with the NHES. That is, although state-of-the-art health education instructs students about essential concepts, it focuses on teaching the skills needed to adopt healthy behaviors. Previous research has shown that curricula that transmit accurate information without incorporating skill development are less likely to influence health behavior.^{8,9}

If exposure to comprehensive textbook-based instruction improves the health literacy of adolescents, the inclusion of such instruction is to be encouraged in all schools. Unfortunately, national data indicates that students receive little and inconsistent health education instruction. The Schools Health Policy and Promotion Study (SHPPS) conducted in 2000 demonstrated that the percentage of elementary schools requiring health education in grades K–5 ranged from 33 to 45%. Only 27% of schools require health education in grade 6, 20% in grade 8, 10% in grade 9, and 2% in grade 12.²⁵ Given the potential for health education to impact

health literacy, it appears that the nation's schools are missing a prime opportunity to influence the health of its citizens.

Ideally, health education would be incorporated as a part of a coordinated school health program within each school. This program would consist of eight interactive components that work together to enhance the health status of students, staff, and communities. In addition to health education, these components would include physical education; health services; counseling, psychological, and social services; nutrition services; healthy school environment; parent, family, and community involvement; and health promotion for school faculty and staff. The effectiveness of health education is increased when its outcomes are reinforced by the other seven components.²⁶ It should be noted that three of the components—health education, physical education, and nutrition services—are directly related to the behaviors associated with increased risk of chronic diseases.

The coordinated school health program may be viewed as an essential part of health promotion within each community. Health-enhancing policies such as smoking bans would reinforce the no-smoking messages

**Table 2. Concepts and Skills Pretest and Post-test Scores by Group and Grade**

	Treatment			Control		
	Mean	Standard Deviation	n	Mean	Standard Deviation	n
Middle School						
Concepts pretest	6.47	2.44	100	5.89	2.43	108
Concepts post-test	11.19	2.63	100	6.77	2.50	108
Skills pretest	6.74	2.22	100	5.69	2.25	108
Skills post-test	11.72	2.61	100	6.64	2.08	108
High School						
Concepts pretest	8.42	2.87	230	8.20	2.75	231
Concepts post-test	10.12	2.91	230	8.16	3.05	231
Skills pretest	8.38	2.70	230	7.89	2.82	231
Skills post-test	11.04	2.94	230	8.12	3.08	231

Note: The possible range of test scores was 0–15.

received at school. These policies and messages would, in turn, be reinforced by anti-smoking messages in the media and the high tax rates placed on tobacco products.

In conclusion, the results of this study demonstrate that comprehensive health education instruction using standards-based texts plays an important role in the development of health literacy and possible reduction of risk factors that contribute to chronic diseases. Therefore, the potential power of health education to influence health behaviors and, ultimately health status and health care spending cannot be ignored.

Strengths and Limitations

The strength of this study was the authentic setting in which the research was conducted. Participating teachers received no in-depth, in-service training prior to teaching health education. They were instructed to teach the content areas related to tobacco, nutrition, and physical activity. However, consistent with the setting, teachers made their own decisions about how to present the chapters in the text as well as how to use the ancillary materials provided as part of the textbook series. The texts were selected by teachers in the school district using the State Recommended List of Instructional

Materials, the most common method of curriculum selection across the nation.

The primary limitation of the study was the number of students who participated in pretesting but were unavailable for post-testing. Only those participants with a matching pretest and post-test were used in the analyses. Therefore, two hundred sixty-two students (28%) who completed pretests were lost from the sample. Many factors such as relocation, absence at the time of the post-test, and incomplete data contributed to the reduction in sample size. However, the study attrition rate is consistent with district-wide attrition rates. Second, because this study was conducted with a sample of urban students in a public school district, results may not be generalized nationally or within different school environments. Third, the majority of the sample consisted of White and Black students. A small percentage of the participants identified themselves as Hispanic, Asian, Native American, and biracial. A final limitation was the lack of a double blind research design. Instructors and students in both the experimental and control groups were aware that they were participating in a research study.

TRANSLATION TO HEALTH EDUCATION PRACTICE

This study explored the effect of comprehensive textbook-based instruction on students' health concepts and skills. Based on the findings, a few recommendations can be made:

- Providing time in the curriculum for health education should be a primary focus in order to increase the health literacy of children and youths.
- Teachers and other personnel should select curricular materials that emphasize the concepts and skills delineated in the NHES.
- Increased effort should be made to research the effects of comprehensive curricula. Curricula that are proven effective should be widely disseminated.
- Future research should include adolescents of other racial/ethnic groups.
- The HEAP database provides concept and skill items that can be used by educators for process and impact evaluation efforts. Educators should use these items for curricular assessment and support the development of additional database items.

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