

# Oral Health Knowledge, Reading Comprehension, and Behavior Change After Implementing the eBook for Oral Health Literacy© Curriculum with 3rd Graders During COVID-19: Implication for School Health Education

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## Abstract

One year after the COVID-19 quarantine, we conducted an eight-week pilot study with third graders ( $n = 246$ ), who took a repeating knowledge, attitude, and behavior pretest and a reading comprehension posttest from the eBook for Oral Health Literacy© curriculum.

Our research questions were: 1) Will the knowledge, attitude, and behaviors of third graders change over time after reading eight chapters of the curriculum? 2) Is there a relationship between the knowledge, attitude, and behavior pretest scores and the reading comprehension and written spelling posttest scores of the oral health literacy curriculum? and 3) Is there a relationship between the class attendance of students and their pretest scores on eight chapters of the eBook for Oral Health Literacy© curriculum?

Mixed-effects logistic regression models were employed. Pretest responses of oral health knowledge, attitudes, and behaviors were the dependent variables, and the eBook chapter numbers ( $n=8$ ) were the independent variables to see if there were changes in students' pretest responses over time. The model accounted for the age and gender of each student as fixed effects; a random effect was used to account for student variability.

First, chapters of the curriculum were significant predictors of knowledge (Chapters 2, 4, 5, 6, 7, & 14/15) and behavior (Chapters 3, 4, 5, 6, 7 & 14/15), but not attitudes. Chapter 5 was a significant predictor of knowledge, attitude, and behavior pretest scores. Second, third graders significantly enhanced their oral health knowledge and behaviors as indicated by their posttest scores for reading comprehension and written spelling. Third, to determine the impact of pretest scores on student attendance during COVID-19, a generalized linear mixed model employed student attendance as the



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dependent variable and student pretest scores as the independent variables. Significant relationships resulted between student attendance and pretest answers on Behavior Question 1 for brushing teeth ( $p = 0.004$ ); on Knowledge Question 2 for having a toothbrush ( $p = 0.001$ ); and on Knowledge Question 8 for having any cavities ( $p = 0.020$ ). Posttest scores for reading comprehension and spelling were significantly associated with student attendance ( $p = 0.009$ ).

A digital curriculum called the eBook for Oral Health Literacy© shows promise in changing oral health knowledge and behaviors among third graders after an eight-week intervention. Limitations include the lack of a control group and lack of curriculum time for health education instruction during COVID-19.

#### Keywords:

Oral Health Literacy, Oral Health Knowledge, Oral Health Behaviors, Reading Comprehension, Mixed-Effects Logistic Regression Model, Ebook Curriculum, Teeth Brushing, COVID-19

## Introduction

### Background

Health literacy means “being able to apply basic skills of reading, writing, and numeracy to health-related materials and activities within a health care setting and medical context” (Speros, 2005, p. 635). Within a school context, health literacy has also been defined with a focus on basic literacy skills. For example, functional health literacy, defined as the ability to read, write, and speak about health (Ubbes & Whitesel, 2022), is encompassed in one of the eight curriculum standards released by the National Consensus for School Health Education in the United States. The third curriculum standard outlines performance expectations for preK-12 students to demonstrate health literacy when accessing valid and reliable health information, products, and services (National Consensus for School Health Education, 2022).

Zullig et al (2013) found that middle school students who liked to read and go to libraries and bookstores were also more likely to do preventive health behaviors for oral health. Prior to 2016, only 58 percent of American schools indicated plans to teach oral health to elementary children (CDC, 2019b). With the 2021 release of “Oral Health in America” by the National Institutes of Dental and Craniofacial Research, one section in their report highlighted “Oral Health Across the Lifespan” with a specific focus on children below the age of eleven. Even though the report emphasized that good oral health is vitally important to the overall health and wellbeing of everyone, schools were not explicitly named to do

more in oral health education. However, the Whole School, Whole Community, and Whole Child (WSCC) promotes health and academic success using a ten-component model (Birch et al, 2025) from which oral health initiatives can be advanced. For example, two of the WSCC model components, namely health education and health services, have the potential to support children in academic classrooms and school-based health clinics, respectively, while promoting oral health education and oral health literacy.

Setbacks on child health and oral health emerged during and after the COVID-19 pandemic (Rajmil et al, 2021; Viner et al, 2022). When schools closed from the pandemic in May 2022, psychosocial and emotional strain increased for all school children and their families during the quarantine period (Eigl et al, 2022). Anxiety rates also increased among children (Madigan et al, 2023) due to the necessary increase in screen time during remote schooling (Griffith et al, 2023). Shoshani (2023) found that students with more daily health routines experienced less decline in their subjective well-being and life satisfaction during the pandemic lockdown with lengthy school closures. Physical health routines were also dysregulated during the pandemic. Medical studies showed that inflammatory cytokines contributed to gray matter loss in the brains of people with mild COVID-19 symptoms (Abbasi, 2022). Vascular injuries and the dysregulation of brain neurotransmitters also contributed a wide range of cognitive, emotional, and behavioral burdens (Boldrini et al, 2021).

For decades, tooth pain and dental disease were two of the main reasons that children missed school which affected their academic learning time and school attendance rates (Jackson et al, 2011). Today, post pandemic, school absenteeism has become a national crisis with chronic rates increasing from 11% to 39% (U.S. Department of Education, 2024), and one in four students missing at least 18 days of school a year (Barshay, 2024). Data collected during the pandemic found that children were 16% less likely to have excellent dental health as perceived by their parents, and children were 27% less likely to have a dental visit in the past 12 months (Lyu & Wehby, 2022). Eigl and colleagues (2022) found that 37% of 5483 children and youth reported poorer sleep quality during the pandemic with many of those challenged by difficulty falling asleep and staying asleep. Remarkably, 94% of young people in the study went to bed later in the night, hence demonstrating a dysregulation of health-related routines (Eigl et al., 2022). Dysregulated lifestyle schedules potentially affect many health-related routines like teeth brushing, book sharing, and functional language development (Tamis-LeMonda et al, 2018), including the effects of sleep on oral health and wellbeing (Shah et al, 2024).

Unmet dental needs disproportionately affect children

from low-income households (Ruff et al, 2024), which included a lower number of preventive dental checkups for children during and after the COVID-19 pandemic (Lyu et al, 2022). Three years prior to the coronavirus pandemic, national results from the 2016 School Health Policies and Practices Study (Centers for Disease Control and Prevention, 2019b) reported that only 41.4% of U.S. school districts had a policy requiring children to have an oral health examination before entering kindergarten or first grade. Other national results showed that only 27.7% and 36.5% of U.S. school districts, respectively, had a policy that schools would provide health services to students who had oral health problems or had a policy to provide students with an oral healthcare referral. Unfortunately, oral health continues to be unsupported in school health education. Data show that only 25.2% of school health services staff in the U.S. were provided professional development opportunities to learn about ways to support the oral health of students in school districts, and only 23.6% of U.S. school districts actually provided a healthcare professional to support student oral health care. These data are challenging because there are multiple systemic diseases that begin in the mouth (NIDCR, 2021), and good oral health is a prerequisite to general overall health (USDHC, 2022).

The current study sought to improve the data described above by implementing an oral health literacy curriculum in an elementary school as a pilot program. Based on the vital need for oral health education to be part of an overall general health campaign in the United States (USDHC, 2022), we looked for examples of skill-based school curricula in oral health that could be implemented online with children. Two online curricula were found for oral health. Mesbahi and colleagues (2023) employed a cooperative learning pedagogy by implementing an online dental education curriculum with the goal to improve oral health knowledge and self-care skills of adolescents (ages 10 to 13) from two schools in British Columbia, Canada. Results showed that significant improvements from baseline to follow-up occurred in toothbrushing scores, tooth brushing time, and dietary knowledge related to oral health. These improvements were maintained for six weeks after curriculum implementation. The second skill-based curriculum was the eBook for Oral Health Literacy© for third grade children, which is the subject of the current research. The unique contribution of this childcentric curriculum includes its multimodal digital format (e.g., visual, textual, gestural, lexical, and aural) to use in school classrooms, in dental clinics, and/or at home, owing to its free accessibility via an academic website and/or on digital devices (e.g., iPhone and iPad). Another curriculum benefit for students is the emphasis on language associated with cognitive behavioral skills (e.g., decision making, goal setting, and communicating) as an impetus for developing oral health knowledge, attitudes, and behaviors via

health literacy.

### **Purpose**

Oral health literacy has been defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate oral health decisions" (Institute of Medicine, 2013). For the purposes of this study, oral health literacy was reconceptualized developmentally as the ability to read, write, and speak about oral health while interacting with the eBook for Oral Health Literacy© curriculum and its accompanying workbook. For this study, conceptualizations of oral health literacy were based on an understanding of functional health literacy as the ability of students to read, write, and speak about their health (Ubbes & Whitesel, 2022), flanked by the importance of building background knowledge and word knowledge (or subject-based vocabulary) about oral health. In the design of the eBook for Oral Health Literacy© curriculum, oral health was described and explained in the form of behavioral actions (Ubbes et al, 2023) aligned to the Integrated Theory of Behavioral Prediction (Yzer, 2012) with three salient beliefs. Some examples of "behavioral actions for oral health" were characterized as the children's ability to brush their teeth every day and preferably twice a day, their ability to floss their teeth every day, and their ability to have a dental checkup every six months. Health-related language in the form of action verbs (e.g., decision making, goal setting, brushing, flossing) were repeated on each of the ten slides of an eBook chapter. This repetition encouraged the learning of lexical word patterns for health education supported by visual photographs of children demonstrating "behavioral actions for oral health". The third grade students were not explicitly aware of the three salient beliefs that formed the declarative sentences of each chapter, but each storyline consisted of a patterned script for consistency: one self-efficacy belief statement, three health outcome beliefs, three normative beliefs, followed by another self-efficacy belief then a concluding statement and question to the reader. We hypothesized that the eBook for Oral Health Literacy© curriculum would improve third graders' oral health knowledge, attitudes, and behaviors after reading eight chapters of the curriculum over eight weeks. The posttests, located in the eBook for Oral Health Literacy© Workbook, required students to answer a reading comprehension and written spelling assessment after each chapter.

There were three research questions for the study: 1) Will the knowledge, attitude, and behaviors of third graders change over time after reading eight chapters of the eBook for Oral Health Literacy© curriculum? 2) Is there a relationship between the knowledge, attitude, and behavior pretest scores and the reading comprehension and written spelling posttest scores of

the oral health literacy curriculum? and 3) Is there a relationship between the class attendance of students and their pretest scores on eight chapters of the eBook for Oral Health Literacy© curriculum one year after the COVID-19 quarantine?

## Method

### Subjects

The subjects (N = 246) were boys and girls, aged 8 to 10 years old, who attended an elementary school in southwest Ohio. The school district ranked fifth out of ten schools in their county on state literacy scores (Children's Defense Ohio, 2022). The study took place in the media center classroom of the elementary school, led by a teacher who was certified as a media specialist. Third graders came to their required media class once a week for eight weeks, which included approximately 25 minutes of the oral health literacy intervention during each class. All third graders in the elementary school had the opportunity to participate in the study. Researchers could not get a control school approved by the administration due to the perceived constraints imposed upon the school district by the COVID-19 pandemic.

### Procedures

Parental consent was sought and obtained prior to students receiving their own personal curriculum workbooks at school where they participated in the study. Each week, prior to reading one chapter of the eBook for Oral Health Literacy© curriculum, students took a pretest consisting of 12 questions. Completing the pretest constituted student assent to participate in the lesson each time. No student assessments were recorded by the teacher for a grade, so some students opted not to take the pretest at different times.

The pretest remained the same over the eight-week intervention and was categorized into Knowledge (K), Attitude (A), and Behavior (B) questions (See Appendix A for the questions) while chapter topics varied each week. Oral health knowledge was assessed through questions 2, 3, 5, 7, 8; oral health attitudes were assessed through questions 6, 9, 12; and oral health behaviors were assessed through questions 1, 4, 10, 11. A response of "yes" was recorded as a "1" and a response of "no" was recorded as a "0". Questions 8 and 9 were reverse coded with a "yes" recorded as "0" and "no" recorded as "1", because answers represented dental conditions that children should not have for good overall health.

Students were also asked to complete a posttest after reading one chapter per week of the eBook for Oral Health Literacy©. The posttest required students to write a one-word response by recalling the missing word that they had previously read in the eBook

chapter. Students were not provided a word list to complete this task because they had to remember the word in the context of the sentence and spell the word as best as they knew how. Thus, this rebus-type sentence completion helped to measure the reading comprehension of students' learning about their oral health and to measure whether students were able to make inferences from the valid and reliable curriculum information needed for oral health literacy. The fact that students had to spell and write the correct word for each of the posttest sentences for a chapter meant that students were actively practicing their word knowledge of oral health while in the process of completing the posttest as a form of expressive language development. Appendix B contains a sample posttest from one of the eBook chapters.

### Instrument

The eBook for Oral Health Literacy© curriculum, previously evaluated and reported elsewhere (Ubbes & Whitesel, 2022; Ubbes & Witter, 2021; Ubbes, et al 2020; Ubbes, Coyle, & Tzoc, 2018), was made available to students and their teacher in the media classroom. The curriculum was implemented by the teacher who used an in-person delivery while accessing the eBook chapters on one main computer connected to the school portal. Even though the eBook curriculum and workbook were available free from an academic website at <https://dlp.lib.miamioh.edu/ebook/index.php> and from a downloadable application on iPhones and iPads from the same location, the school did not opt to build this feature into the elementary curriculum during the school year following the COVID-19 quarantine. Students participated in the study while attending class in the media classroom, and all third grade students in the school (n=246) rotated through the media classroom weekly for a 35 minute class. On the days of curriculum implementation, the eBook chapter story and workbook were completed within the first 20 minutes of the class.

The pretests and posttests for each chapter were bound in sequential order into a colorful eBook for Oral Health Literacy© Workbook and distributed to each third grader. Each week, children took the Pretest (Appendix A) in their workbook before the teacher displayed and read each chapter aloud to assess the oral health knowledge, attitudes, and behaviors of third graders. The Posttest (Appendix B) was given from the workbook after each chapter was read in order to assess the reading comprehension and written spelling of third graders.

The grading of each posttest question was based on two factors: the correctness of the answer and the spelling of the students' written answers. The scores that students received were ranked from 0 to 4. A missing answer was given a "0", a correct answer

with correct written spelling was given a "1"; a correct answer with incorrect written spelling was a "2"; an incorrect answer with correct written spelling was assigned "3"; and an incorrect answer with incorrect written spelling was assigned "4".

### Data Analysis

The pretest responses for knowledge, attitudes, and behaviors were analyzed using a type of generalized linear mixed model (GLMM) called a mixed-effects logistic regression model. Logistic regression models are used for studying the relationship between one or more independent variables and a binary dependent variable (Vetter & Schober, 2018). Compared to other models with a binary response variable, logistic regression has the advantage because exponentiated coefficients can be interpreted as odds ratios in health research (Schober & Vetter, 2021). Generalized linear mixed models can be used to incorporate random effects into a logistic regression model, which is useful for modeling subject-level variability in a longitudinal study (Dean & Nielsen, 2007). In this study, the pretest responses (e.g., oral health knowledge, attitudes, and behaviors) were treated as the dependent variables, and the chapter numbers were the independent variable of interest to see if there were changes in the students' pretest responses over time. The models also accounted for the age and gender of each student as fixed effects, and a random effect was used to account for the variability among different students.

The posttest scores were analyzed using a mixed-effects multinomial logistic regression model. Mixed-effects multinomial logistic regression models allow the use of a nominal dependent variable (Hedeker, 2003). In this case, the posttest responses were nominal scores of 0 to 4 based on whether the posttest answers for reading comprehension and written spelling were correct. The nominal posttest responses served as the dependent variable for the posttest models, and the independent variables were question type, chapter number, and student attendance (i.e., measured by how many chapters a student was in attendance during curriculum implementation).

For research question 2, a mixed-effects logistic regression model was used to compare pretest and posttest performance. Comprehension of the previous chapter (e.g., posttest score) was used as the independent variable to predict the pretest knowledge, attitudes, and behaviors for the next chapter. These models were also adjusted for the age and gender of each student.

For research question 3, a mixed-effects logistic regression model was used to determine whether there was a relationship between any of the pretest questions and student attendance. For the posttest

scores, a linear model was used to determine whether there was a relationship between attendance and the percentage of correct answers on the posttest questions.

### Results

The first research question was "Did the knowledge, attitude, and behaviors of third graders change over time after reading a chapter of the eBook for Oral Health Literacy© curriculum?" Running the data through the mixed-effects logistic regression model showed that attitude questions (Appendix A) did not have as much of an impact on pretest responses as the knowledge and behavior questions did. The mixed-effects logistic regression model was used to determine whether there was a significant relationship between the eight eBook chapters and the pretest responses categorized by knowledge, attitudes, and behaviors (KAB). For the eight chapters, random errors were used as the predictors, and KAB were used as the response variables. Chapter 1 was considered the reference variable. Chapters 2, 4, 5, 6, 7, and 14/15 were significant predictors for the student responses on pretest knowledge questions, and Chapters 3, 4, 5, 6, 7, and 14/15 were significant predictors for the student responses on pretest behavioral questions. Chapter 5 was the only significant predictor for student responses on the pretest attitude questions. In fact, Chapter 5 (Appendix B) was the only chapter that predicted knowledge, attitude, and behavior pretest scores.

Specifically, the pretest knowledge questions showed a significant improvement from Chapter 1 to the following chapters: Chapter 2 ( $p = 0.003$ ), Chapter 4 ( $p = 0.002$ ), Chapter 5 ( $p = 0.004$ ), Chapter 6 ( $p = 0.002$ ), Chapter 7 ( $p = 0.002$ ), and Chapter 14/15 ( $p = 0.009$ ). The only chapter that was not significantly different from Chapter 1 was Chapter 3 ( $p = 0.095$ ). The only significant change in the pretest attitude questions was between Chapter 1 and Chapter 5 ( $p = 0.027$ ). The pretest behavior questions showed significant improvement from Chapter 1 to the following chapters: Chapter 3 ( $p = 0.038$ ), Chapter 4 ( $p = 0.017$ ), Chapter 5 ( $p = 0.006$ ), Chapter 6 ( $p = 0.008$ ), Chapter 7 ( $p = 0.014$ ), and Chapter 14/15 ( $p = 0.005$ ). There was no significant difference in behavior responses between Chapters 1 and 2 ( $p = 0.186$ ).

In Table 1 below, the average pretest responses are shown for knowledge, attitudes, and behaviors in columns 2, 3, and 4, respectively. Favorable responses (e.g., brushing teeth) were coded as 1, while unfavorable responses (e.g., having cavities) were coded as 0. An asterisk indicates a significant difference in the average response for that chapter compared to Chapter 1. As such, Chapter 1 served as the reference variable.

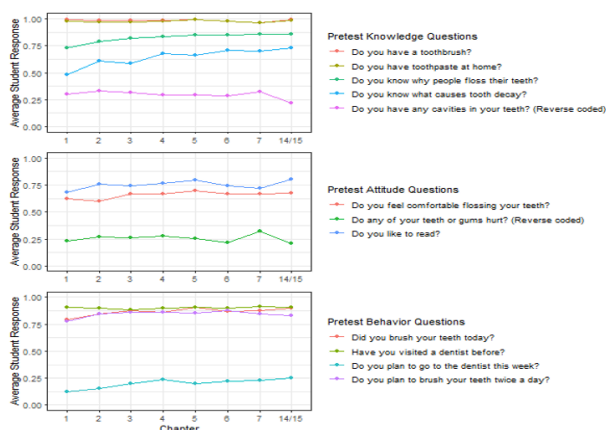
**Table 1.**  
*Changes in Knowledge, Attitude, and Behavioral Pretest Responses*

Variable	Knowledge	Attitude	Behavior
Chapter 1	0.700	0.515	0.654
Chapter 2	0.743*	0.542	0.687
Chapter 3	0.745	0.560	0.715*
Chapter 4	0.763*	0.565	0.722*
Chapter 5	0.764*	0.587*	0.729*
Chapter 6	0.765*	0.542	0.730*
Chapter 7	0.778*	0.568	0.733*
Chapter 14/15	0.766*	0.563	0.731*

\*p <= 0.05

Figure 1 (below) shows the average student responses for the five pretest knowledge questions, three pretest attitude questions, and four pretest behavior questions over the eight weeks. Baseline measurements on the X axis show the progression of chapters 1 through chapters 14/15 for a total of eight chapters that students read from the eBook for Oral Health Literacy© curriculum. The average student responses showed that most students knew they had a toothbrush and toothpaste at home with only minor changes at the end of the eight weeks. However, many did not know “why people floss their teeth” or “what causes tooth decay” until they had read later chapters of the curriculum. As students progressed from reading eight eBook chapters over eight weeks, their knowledge increased for Pretest Knowledge Question 3 (“Do you know why people floss their teeth?”) and Pretest Knowledge Question 4 (“Do you know what causes tooth decay?”). For the posttest answers, there was a significant improvement in the number of correct responses for Chapter 3 compared to Chapter 1 ( $p < 0.001$ ). All subsequent chapters showed significant improvement compared to Chapter 1 ( $p < 0.001$ ), but there was no significant change in correct responses from Chapter 1 to Chapter 2 ( $p = 0.739$ ).

**Figure 1.**  
*Pretest Scores*



The second research question was “Is there a relationship between the knowledge, attitude, and behavior pretest scores and the reading comprehension and written spelling posttest scores of the oral health literacy curriculum? Data were run through another mixed-effects logistic regression model, or a generalized linear mixed model (GLMM). There was no significant association between the pretest and posttest scores as shown in Tables 2, 3, and 4.

Table 2 (below) shows the results of the GLMM which investigated the relationship between chapters 1, 2, and 3 to determine if there was any relationship among them. In these models, posttest scores were predictors of pretest responses. The Chapter 1 posttest question scores were compared to the Chapter 2 pretest responses, the Chapter 1 posttest question scores were compared to the Chapter 3 pretest responses, and the Chapter 2 posttest scores were compared to Chapter 3 pretest responses. Each of these chapters was not significantly different.

**Table 2.**  
*Comparisons Between Chapters 1, 2, and 3*

Covariates	Chapter 1 Posttest, Chapter 2 Pretest	Chapter 1 Posttest, Chapter 3 Pretest	Chapter 2 Posttest, Chapter 3 Pretest
Score of 1	0.312	0.904	0.617
Score of 2	0.497	0.943	0.693
Score of 3	0.979	0.884	0.818
Score of 4	0.694	0.961	0.705
Student Age	0.862	0.656	0.748
Gender: Girls	0.898	0.410	0.912

\*p <= 0.05

In Table 3 below, the GLMM investigated the relationship between chapters 4, 5, and 6 to determine if there was any relationship among them. In these models, posttest scores are predictors of pretest responses. The Chapter 3 posttest question scores were compared to Chapter 4 pretest responses, the Chapter 4 posttest question scores were compared to Chapter 5 pretest responses, and the Chapter 5 posttest scores were compared to Chapter 6 pretest responses. Each of these chapters was not significantly different.

**Table 3.**  
*Comparisons Between Chapters 4, 5, 6*

Covariates	Chapter 3 Posttest, Chapter 4 Pretest	Chapter 4 Posttest, Chapter 5 Pretest	Chapter 5 Posttest, Chapter 6 Pretest
Score of 1	0.488	0.312	0.926
Score of 2	0.490	0.497	0.977
Score of 3	0.539	0.979	0.733
Score of 4	0.631	0.694	0.666
Student Age	0.845	0.861	0.347
Gender: Girls	0.305	0.898	0.520

\*p <= 0.05

In Table 4 below, the GLMM investigated the relationship between chapters 7, 14, and 15 to determine if there was any relationship among them. In these models, posttest scores are predictors of pretest responses. The Chapter 6 posttest question scores were compared to Chapter 7 pretest responses, the Chapter 7 posttest question scores were compared to Chapter 14 pretest responses, and the Chapter 7 posttest scores were compared to Chapter 15 pretest responses. Each of these chapters was not significantly different. (Note: Chapters 8, 9, 10, 11, 12, and 13 were not included in this study due to the time constraints imposed by the COVID-19 pandemic).

**Table 4.**  
*Comparisons Between Chapters 7, 14, and 15*

Covariates	Chapter 6 Posttest, Chapter 7 Pretest	Chapter 7 Posttest, Chapter 14 Pretest	Chapter 7 Posttest, Chapter 15 Pretest
Score of 1	0.823	0.998	0.569
Score of 2	0.800	0.911	0.490
Score of 3	0.902	0.952	0.959
Score of 4	0.793	0.313	0.882
Student Age	0.766	N/A	0.118
Gender: Girls	0.663	N/A	N/A

\*p <= 0.05, N/A: Not Applicable

The third research question was “Is there a relationship between the class attendance of students and their pretest scores on eight chapters of the eBook for Oral Health Literacy® curriculum?” To determine the impact of pretest scores on student attendance, a GLMM was constructed using student attendance as the dependent variable and student pretest scores as the independent variables. Results showed that there was a significant relationship between the students’ school attendance and their pretest answers on Behavior Question 1 ( $p = 0.004$ ) for brushing teeth today, Knowledge Question 2 ( $p = 0.001$ ) for having a toothbrush, and Knowledge Question 8 ( $p = 0.020$ ) for having any cavities. Figure 2A below shows the distribution of students in attendance from a low 48% presence for chapter 7 and a high of 88% presence for chapter 1. Class attendance was high for the first six chapters, but attendance was lower than 50% for the last two chapters. Figure 2B below shows a

histogram with a distribution of absences during the curriculum implementation. Most students had two or fewer absences with a median of 2 absences, but 35 of the 248 students (14%) were absent for four of the eight chapters. Only 14% of students ( $n = 35$ ) had perfect attendance, and no students are listed with 8 absences because they would not have been included in the study.

**Figure 2.**  
*Attendance for Each Chapter and Distribution of Absences*

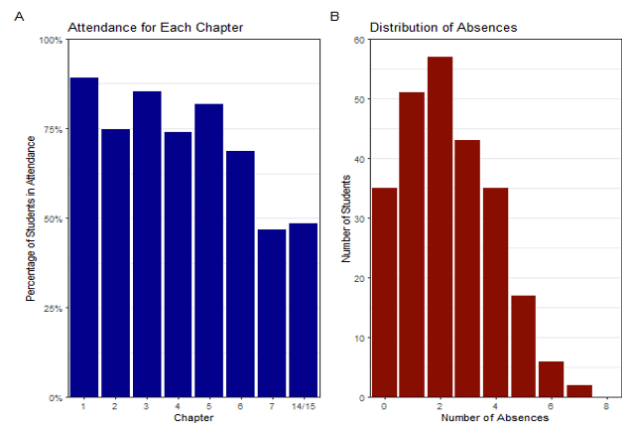


Figure 3 (below) shows that posttest comprehension scores were significantly associated with attendance ( $p = 0.009$ ). Attendance records were used to calculate the ratio of the absences that students had compared to the number of times they were supposed to attend classes during the study period. This created an attendance variable called presence.

**Figure 3.**  
*Attendance vs. Posttest*

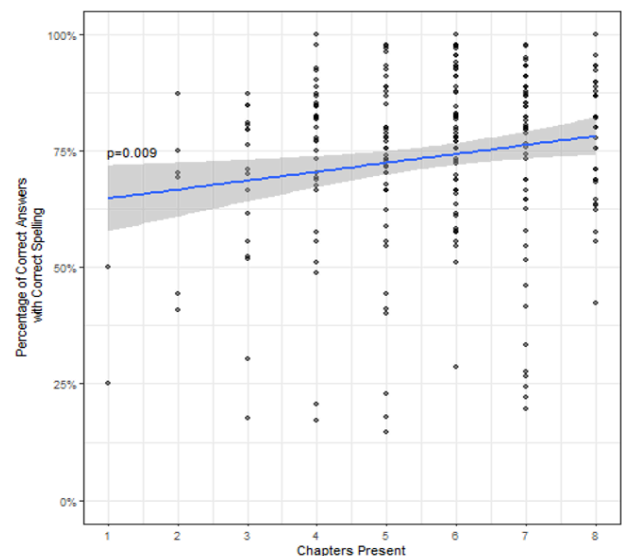
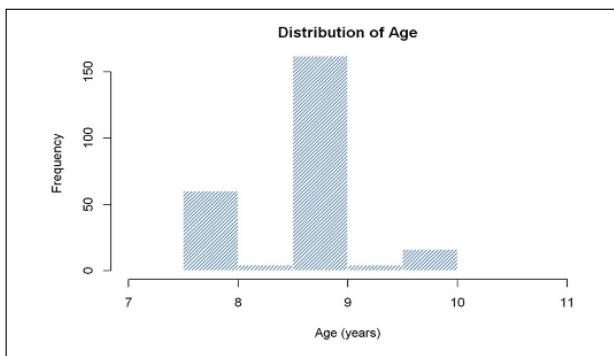


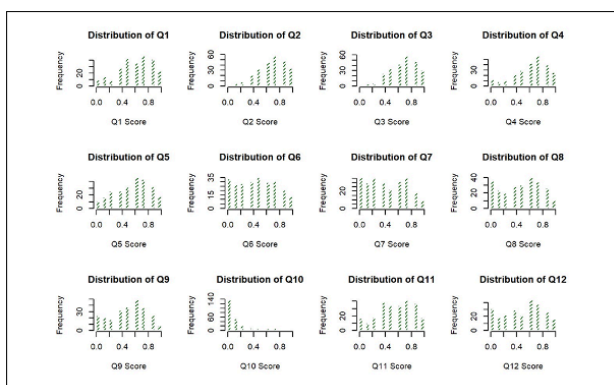
Figure 4 (below) shows the frequency and distribution of students by age, followed by Figure 5 showing the frequency and distribution of pretest questions by

student scores. Both were normally distributed.

**Figure 4.**  
*Frequency and Distribution of Students by Age*



**Figure 5.**  
*Frequency and Distribution of Pretest Questions by Student Scores (n =234)*



**Discussion**

According to the CDC (2019a), a short-term curriculum, “delivered for a few hours at one grade level, is generally insufficient to support the adoption and maintenance of healthy behaviors”. However, Brown and colleagues (2007) found that a single-lesson tobacco prevention curriculum was useful in changing the knowledge and smoking intentions of students exposed to their program. As such, we wanted to test the capabilities of an oral health literacy curriculum that was taught only one day per week over eight weeks for a total curriculum time of two hours. Third graders significantly enhanced their oral health knowledge and behaviors as measured by reading comprehension scores and written spelling scores. Results indicated a significant relationship between student attendance and their pretest answers on Behavior Question 1 for brushing teeth ( $p=0.004$ ); Knowledge Question 2 for having a toothbrush ( $p=0.001$ ); and Knowledge Question 8 for having any cavities ( $p=0.020$ ). In addition, posttest reading comprehension and written spelling scores were significantly associated with attendance ( $p =$

0.009).

Despite the fact that our study did not have a control school during the COVID-19 pandemic, these are important findings because knowledge and behaviors about oral health can influence the daily oral health practices of the children. Six of the eight chapters of the eBook for Oral Health Literacy® curriculum significantly predicted student responses for oral health knowledge and oral health behavior on the pretests. This was not the case for oral health attitudes because only chapter 5 showed significant results. However, Chapter 5 was able to predict knowledge, attitude, and behavioral changes of the students from the pretests to the posttests. More specifically, the knowledge and behaviors of third grade students changed over time after reading seven of the eight chapters of the eBook curriculum at the rate of one chapter per week. This is notable, because students took only one minute to read (and/or read along silently with the digital narrator) the 10 pages of the chapter, and then students took on average ten minutes to write and spell the missing words in the comprehension posttest for that chapter. In the current study, the reading of each chapter out loud for one minute by the eBook narrator helped the third graders to listen, view, and interpret the visual, textual, and gestural content. A multimodal experience of listening, viewing, and thinking about the visual and textual content can boost learning (Forzani & Ly, 2022). Results showed that students were able to complete the written comprehension questions after each chapter with favorable results thus demonstrating that they retained their learning about oral health during the course of the curriculum implementation. As expected, students with poorer school attendance did not fare as well.

The posttest comprehension questions in the accompanying eBook for Oral Health Literacy® Workbook aimed to assess third graders on their functional health content knowledge and functional health literacy skills (e.g., reading and writing about health) as aligned with curriculum standards 1 and 3 respectively of the National Health Education Standards (National Consensus for School Health Education, 2022). Hale et al (2007) found that students in fourth grade were better able to answer comprehension questions after oral reading than after reading silently. Thus, future studies with the eBook for Oral Health Literacy® should explore the role of interactive health literacy whereby the oral conversations that children have with their literacy influencers (e.g., peers, professionals, and parents) can be quantified in dosage minutes when interacting with the eBook narratives. Other reading comprehension research with the curriculum might investigate four

different conditions comparing children: 1) reading silently; 2) reading out loud in tandem with the narrator's voice; 3) reading out loud without the narrator's voice; and 4) reading out loud while being supported by a literacy influencer who is present with the child in real time discussing and interacting with the digital content.

In the current study, only two hours were needed for implementing eight chapters of the eBook for Oral Health Literacy® at the rate of one chapter per week for eight weeks. Health education instruction remains woefully inadequate for certain health topics based on data showing a low percentage of districts with school policies indicating what health topics will be taught (CDC, 2019b). Studies have also shown that most students in public schools often receive only a middle school or high school health class for a total one-year health curriculum when adolescents are often more curious and anxious about their health with Canadian guidelines even more progressive than the U.S. (Robinson, et al, 2019). Whereas more progressive schools would support the teaching of health education regardless of low priorities made by educational decision makers (Dabravolskaj et al., 2020; Herlitz et al, 2020; Tancred, 2018), the recent coronavirus pandemic revealed that school classes that were conducted online lacked educational resources, namely digital resources, in all subject areas (Gopika & Rekha, 2023). In the U.S., comprehensive and categorical health curricula are available for school districts to adopt (Herbert & Lohrmann, 2011), but fewer digital health curricula are available for students online.

There are two national documents that supported the design of the eBook curriculum. The first document that supported the design of the eBook curriculum was the Characteristics of an Effective Health Education Curriculum (CDC, 2019a). The CDC document suggests that one of the 13 characteristics of an effective health education curriculum should focus on clear health goals and behavioral outcomes. The eBook curriculum focuses on clear health goals and behavioral outcomes using a narrative of action verbs such as decision making, goal setting, and interpersonal communication skills to improve oral health behaviors (e.g., brushing, flossing, rinsing), including the importance of setting a goal to have a dental checkup every six months. A second guideline for an effective health curriculum (CDC, 2019a) includes opportunities to reinforce health-related skills and positive health behaviors. As such, the eBook curriculum is designed with health-related skills that reinforce how children can make daily decisions for healthy teeth, set nutrition and hygiene goals for healthy teeth, and visit and interact with a dentist during a dental checkup every six months. A third guideline for an effective health curriculum (CDC,

2019a) should provide functional health knowledge that is basic, accurate, and directly contributes to health-promoting decisions and behaviors. As such, the eBook curriculum uses visual, textual, and gestural narratives to communicate valid and reliable oral health information through lexical scripts that demonstrate social-behavioral role models for children. Whereas the CDC curriculum guidelines (2019a) indicate that "A curriculum that provides information for the sole purpose of improving knowledge of factual information will not change behavior", the eBook uses a theoretical framework to establish the reasons for doing oral health hygiene behaviors and not just reading about it. The narrative scripts of the first three slides in each eBook chapter promote health outcome beliefs; the middle three slides promote social normative beliefs; and three additional slides promote self efficacy beliefs. These three types of salient beliefs (Bandura, 1986) were included in the narrative scripts to help children to improve their functional health knowledge and oral health behaviors. The current study sought to determine if the curriculum actually improved their functional health knowledge and oral health behaviors.

The second document that supported the design of the eBook curriculum was the National Health Education Standards which serves as a model for curriculum, instruction, and assessment in preK-12 schools (National Consensus for School Health Education, 2022). Teachers of preK-12 health education are encouraged to support students to meet performance expectations that are aligned to eight National Health Education Standards. Even though performance expectations are not specifically found for oral health in the standards, oral health skills can be introduced and taught as topics within health promotion, disease prevention, health behaviors, health literacy, and nutrition - as the eBook design has indicated. The National Consensus for School Health Education (2022) states that students should be able to demonstrate observable health and safety practices and demonstrate health literacy, interpersonal communication skills, decision making skills, and goal setting skills. The national standards also expect students "to demonstrate health literacy by accessing valid and reliable health information, products, and services to enhance health" and "comprehend functional health knowledge to enhance health". Hence, the eBook for Oral Health Literacy® has met these two standards since knowledge and behaviors have improved with second and third graders in this study.

Future research should further investigate the effects of teaching vocabulary about health behavior (also known as word knowledge), and then quantifying how these skills can prime children's intentions to brush teeth, floss teeth, eat healthy food, and go to

a dental checkup every six months. Future research should also investigate whether one or more cognitive skills has a priming effect on those same specific oral health behaviors.

### Limitations

A major limitation of this study was the use of a convenience sample without a control group, thereby limiting the generalizability of the findings. The fact that we were able to conduct any research with support from the school district was remarkable due to the complications of the global coronavirus pandemic. Even though the curriculum implementation was supported by external funding, the school's central administration postponed and significantly reduced the project one semester due to new time commitments of school nurses having to vaccinate children at school per guidelines by the federal government. In spring 2023, the decision was made to suspend the curriculum implementation in the new school-based health clinic. This was disappointing because we envisioned school nurses and/or a dentist doing dental exams during the curriculum intervention based on research by Wehby (2022) showing that children who had a comprehensive oral exam had higher reading and math scores ( $p < .05$ ). Instead, the eBook for Oral Health Literacy<sup>®</sup> curriculum was implemented in the computer classroom by a media specialist who taught all of the third graders in the school once a week. The fact that the curriculum could be implemented digitally facilitated this decision by the school principal. Due to added stresses of the coronavirus pandemic on student attendance and teacher stresses, the school district did not agree to a control group that was available from another elementary school in the district or support the goals of the grant implementation at other grade levels. A systematic review by Kim and Kim (2024) found that school-based oral health education for children across 20 studies included implementation by schoolteachers, dental or health professionals, and researchers. More research is needed to quantify the minimal curriculum time needed to effect more change in oral health behaviors, including attitudinal changes, when children are exposed to eight or more of the chapters in the curriculum. In the future, we anticipate positive results again when the pandemic does not play a significant role in student attendance rates and/or influence the limited curriculum time for health education. The eBook chapters should be implemented with students in other grades and or with students who also gain a second exposure to certain eBook chapters at home paired with actual toothbrushing. The addition of toothbrushing in tandem with the curriculum implementation at school seems like an important goal for measuring curriculum effects based on work by Ardekani et al (2022) who used a randomized controlled study and distributed

toothbrushes and fluoride-containing toothpaste on the first day of an oral health literacy intervention with high school girls. Additional research by Babaei et al (2023) have included supervised toothbrushing for schoolchildren during a one-day workshop with parents resulting in less caries and better oral hygiene compared to controls after one year of implementation. However, both studies did not use an educational intervention that was implemented over time like the current study. This is a strength because each chapter provides developmentally appropriate health information with an emphasis on cognitive behavioral skills (e.g., communication, goal setting, and decision making). Teachers and parents could choose to facilitate student learning from the eBook for Oral Health Literacy<sup>®</sup> curriculum via the digital app, which will make the curriculum more self directed and possibly more motivating for students to read more chapters and even repeat certain chapters that they like. Locomotor skills that use manipulatives or object-control skills (Chen et al., 2024) and 'sensorimotor, affective, oral and cognitive activity' that is explored and repeated as play (Neumann, 1971, p. 11) have great potential with theory-based educational interventions for oral health literacy with children.

The second limitation of the study was that students responded to the pretest and posttest assessments using self-report. Verification of accuracy could not be obtained for whether students had actual cavities and/or had actually visited their dentist as self-reported on the pretests each week. However, since children took the same pretest each week for eight weeks, we were able to observe the reported trends of individual student responses by using statistics to control for this effect. Due to the associations between attendance and student responses, there is likely to be some confounding issue due to the variable student attendance. One of the assumptions of our statistical analysis is that the student answers were missing at random. Therefore, the random effects in the GLMMs should have helped to mitigate this issue.

A third limitation of the study was the limited engagement between the researchers and the elementary principal who determined the implementation "place" for the curriculum intervention and research without our communications with or access to classroom teachers. Once the decision was made to implement the grant-funded project into one media specialist's classroom instead of two other locations, the oral health literacy curriculum was shared with third graders at the rate of 20 minutes per week. This time interval included five to eight minutes for third graders to answer the pretest questions, one to two minutes for the skill-based chapter to be read aloud, then 8 to 10 minutes for students to answer five questions for reading comprehension. The study is limited by the eBook having an insignificant reach

and impact on classroom teachers, parents, and nurses who could have influenced additional oral health messages for encouraging children to read, write, and speak about their oral health at school and at home. An ideal implementation of the curriculum would be with classroom teachers who instruct elementary students on different disciplinary literacies (Ortlieb et al, 2024) and with nurses who manage the school-based health clinic which had just opened in the school district.

A fourth limitation included the fact that the media specialist perceived the pretest and posttest assessments from the oral health literacy workbook as learning opportunities rather than a research project. There was no way to discern if children were able to actually read the words of the curriculum because the school did not allow researchers to enter the classroom to proctor the pretest and/or posttest each week due to the public health restraints of the coronavirus pandemic. The oral health literacy workbook proved to be useful because we could observe and see the actual handwriting of the third graders who varied widely in this ability. This part of the workbook meant that each student had personal engagement with the curriculum, because students had to think of the answer from memory then form the spelling of each word letter by letter in order to write it. This required a more sophisticated learning process for third graders and highlighted the basic literacy skills needed for mastery of health literacy. Follow-up research on handwriting, inventive spelling, and functional health literacy is warranted so we can further clarify the student grade level(s) for implementation of the oral health literacy curriculum.

## Conclusion

We conducted a pilot study with elementary school children who took a repeated written pretest prior to reading one chapter weekly from the eBook for Oral Health Literacy© curriculum over eight weeks. Students also completed a reading comprehension test after reading each chapter. Students had to recall and write answers to the fill-in-the-blank questions with accurate spelling to mirror exact sentences from the eBook chapters. The theory-based scripts emphasized action verbs to promote decision making skills and goal setting skills for oral health behaviors. Each eBook chapter highlighted a brief visual-textual-gestural narrative for several oral health behaviors (e.g., brushing, flossing, rinsing, dental checkups). Since oral hygiene behaviors are essential for disease prevention and quality of life, we assessed the changes in third graders' knowledge, attitudes, and behaviors toward their oral health.

Securing educational time for the implementation of an oral health literacy curriculum at school mattered because oral health has been tied to general health

and the prevention of many systemic diseases. The reason this study is important is because third graders enhanced their oral health knowledge and oral health behaviors through reading the eBook for Oral Health Literacy© curriculum during a brief intervention of only two hours over eight weeks. During the COVID-19 pandemic which caused school closures and further reduction of health education curriculum time, our multimodal digital curriculum was useful in identifying behavioral patterns among students who had attended school more often. Students with better attendance were also those who had brushed their teeth that morning, had a toothbrush, and had fewer cavities. Posttest findings from their reading comprehension scores and their written spelling scores suggested that third graders paid attention and retained oral health knowledge and oral health vocabulary after reading the skill-based eBook chapters.

A key outcome of this oral health literacy study was the fact that only a small commitment of instructional time resulted in significant changes in oral health knowledge and oral health behavior among third grade students. By placing the curriculum implementation into the media classroom when schools reopened after the COVID-19 quarantine period, the digital nature of the oral health literacy chapters found a new home. The oral health literacy workbook gave students access to valid and reliable information on oral health hygiene and oral health behaviors. Our project also offered a free iPhone and iPad app for use in the school classroom and in their newly opened school-based health clinics but there was little evidence that decision makers were eager to further the use of the curriculum in that way to support the oral health knowledge, oral health literacy, and oral health behaviors of children.

Future research should use an experimental research design to do a curriculum intervention across multiple classrooms, multiple grades, and multiple schools, including an intervention in school-based health clinics. The utility of using instructional time for health education in a regular classroom versus a media classroom should be further explored as a potential way for students to increase access to valid and reliable print and electronic materials for health literacy skill development. Student use of the eBook for Oral Health Literacy© mobile application is another way to promote oral health knowledge and oral health behaviors while building health literacy skills at school and at home. By extending the current project to home when students are actually practicing their oral health behaviors of teeth brushing, flossing, and rinsing, the digital app could reinforce the importance of building healthy habits through daily self-care routines. Reading or listening to a health literacy story before, during, or after their self-care routines for oral

health literacy will enable children to practice the functional health knowledge and beliefs that they need for a long and healthy life – even during a global pandemic.

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Authors declare no conflict of interest.

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**Appendix A: Pretest Questions for Oral Health Knowledge, Attitudes, and Behavior (KAB)**

Note: Items 2, 3, 5, 7, and 8 are pretest knowledge questions; Items 6, 9, and 12 are pretest attitude questions; and Items 1, 4, 10, and 11 are pretest behavior questions.

1. Did you brush your teeth today?
2. Do you have a toothbrush?
3. Do you have toothpaste at home?
4. Have you visited a dentist before?
5. Do you know why people floss their teeth?
6. Do you feel comfortable flossing your teeth?
7. Do you know what causes tooth decay?
8. Do you have any cavities (holes) in your teeth?
9. Do any of your teeth or gums hurt?
10. Do you plan to go to the dentist this week?
11. Do you plan to brush your teeth twice a day?
12. Do you like to read?

**Appendix B: Posttest Questions of Reading Comprehension and Spelling (Sample Chapter)****Chapter 5 eBook for Oral Health Literacy© Post Assessment**

Directions: Write the word on the blank line that you remember from reading the Chapter 5 story about setting food goals for healthy teeth.

1. I set a goal to visit and talk with my \_\_\_\_\_ every 6 months, so I can keep a healthy smile.
2. I set a goal to eat fibrous fresh foods, because \_\_\_\_\_ helps to remove plaque and sugar from my teeth.
3. I set a goal to buy floss and \_\_\_\_\_ when buying food at the grocery store with my Mom.
4. I set a goal to eat healthy foods that have fiber, because fiber helps to \_\_\_\_\_ plaque and sugar from my teeth.
5. I set a goal to buy a new toothbrush and floss when buying food at the \_\_\_\_\_ store with my Mom.
6. I set a goal to clean my teeth after our evening snack by watching how my Mom \_\_\_\_\_ her teeth.

Answer Key: 1. dentist 2. fiber 3. toothpaste 4. remove 5. grocery 6. brushes

## **Appendix C: Theoretical Framework for Chapters of the eBook for Oral Health Literacy©**

### **Chapter 1 Script: Setting Dental Hygiene Goals for Healthy Teeth**

<https://dlp.lib.miamioh.edu/ebook/01/>

Self Efficacy: I believe that I can set a goal to practice good oral health and dental hygiene.

Health Outcome Beliefs: I set a goal to buy toothpaste with fluoride, which helps strengthen my tooth enamel. I set a goal to brush my teeth every morning and night to keep my teeth strong and healthy. I set a goal to floss my teeth, because flossing helps to get rid of leftover foods that hide between my teeth and gums.

Social Normative Beliefs: I set a goal to buy floss and toothpaste with my Mom when shopping for food at the grocery store. I set a goal to visit my dentist every 6 months, so I can keep a healthy smile and practice good dental hygiene. I set a goal to help my little sister brush her teeth every night after her snack, so we can practice good oral health.

Self Efficacy: I believe that I can improve the oral health of my teeth and gums by setting dental hygiene goals each day.

Interactive Health Literacy: I set a goal for dental hygiene and oral health. How about you? Will you set a goal too for healthy teeth and gums?

Summary = 186 Words with 11 Sentences

### **Chapter 2 Script: Making Decisions to Have Fun with my Oral Health**

<https://dlp.lib.miamioh.edu/ebook/02/>

Self Efficacy: I believe that I can prevent infections in my teeth by deciding to practice my daily dental routine.

Health Outcome Beliefs: I decide to brush my teeth in the morning and before bedtime, so I can prevent cavities in my teeth. I decide to brush my teeth, tongue, and gums with a small amount of toothpaste, so that my mouth will be really clean. I decide to brush to a song for 2 minutes, so I can have fun while cleaning my teeth, tongue, and gums!

Social Normative Beliefs: I decide to brush my teeth right after I eat cereal with my brother, so we can get rid of sugar that damages our teeth. I decide to show off my teeth by smiling, because I want my parents to see that I can take charge of my own oral health. I decide to be a role model to my sister, so I can show her how well I take care of my teeth every single day!

Self Efficacy: I believe that I can make daily decisions to brush my teeth and rinse them with water, so that cavities do not form in my mouth.

Interactive Health Literacy: I've made the fun decision to clean my teeth, tongue, and gums. How about you? Will you decide to have fun with your oral health too?

Summary = 212 Words with 11 Sentences

### **Chapter 3 Script: Taking Action and Making Decisions to Have Healthy Teeth**

<https://dlp.lib.miamioh.edu/ebook/03/>

Self Efficacy: I believe that I can take action and make decisions to improve the health of my teeth.

Health Outcome Beliefs: I take action by brushing my teeth, gums, and tongue every morning and night, so I can have a refreshing smile. I take action by eating fruits and vegetables because they make my teeth and gums stronger. I take action by flossing my teeth, so I can get rid of leftover foods that will cause plaque buildup and cavities between my teeth.

Social Normative Beliefs: I take action by buying floss, toothpaste, and mouthwash while grocery shopping with my Mom. I take action by cooking calcium-rich foods with my family at dinner time, so our teeth and bones will be stronger. I take action by helping my little brother brush his teeth every night, so we can both have healthy teeth without cavities.

Self Efficacy: I believe that I can improve the health of my teeth by taking action and making decisions especially when I start to lose my baby teeth.

Interactive Health Literacy: I take action and make decisions every day for healthy teeth. How about you? Will you take action and make healthy decisions too?

Summary = 186 Words with 11 Sentences

#### **Chapter 4 Script: Setting Goals for Going to the Dentist**

<https://dlp.lib.miamioh.edu/ebook/04/>

Self Efficacy: I believe that I can be ready to go to the dentist for a check-up on my mouth, teeth, and gums.

Health Outcome Beliefs: I set a goal to get a toothbrush from my dentist when I need one, so I can brush my teeth. I set a goal to brush my teeth every night with my Mom, so I can have a fresh breath and clean teeth. I set a goal to visit my dentist 2 times a year, so I know I do not have any holes in my teeth (cavities).

Social Normative Beliefs: I set a goal to open my mouth wide, so my dentist can see and count my 20 teeth. I set a goal with my friends to learn the right way to brush on the front and the back of each tooth. I set a goal to show my dentist my bright smile during my 6-month check-up.

Self Efficacy: I believe that I can set a goal to have a healthy mouth, teeth, and gums at my 6-month check-up.

Interactive Health Literacy: How about you? Can you set a goal to have a healthy check-up at your dentist too?

Summary = 184 Words with 10 Sentences

#### **Chapter 5 Script: Setting Food Goals for Healthy Teeth**

<https://dlp.lib.miamioh.edu/ebook/05/>

Self Efficacy: I believe that I can improve the health of my teeth by setting fresh food goals every day.

Health Outcome Beliefs: I set a goal to eat fibrous fresh foods, because fiber helps to remove plaque and sugar from my teeth. I set a goal to also brush my teeth after eating fresh food for snacks and meals. I set a goal to eat yogurt, which has calcium, because calcium helps my teeth to grow strong.

Social Normative Beliefs: I set a goal to visit and talk with my dentist every 6 months, so I can keep a healthy smile. I set a goal to buy floss and toothpaste when buying food at the grocery store with my Mom. I set a goal to clean my teeth after our evening snack by watching how my Mom brushes her teeth.

Self Efficacy: I believe that I can improve the health of my teeth by setting fresh food goals every day.

Interactive Health Literacy: I set a goal to improve the health of my teeth by eating healthy meals. How about you? Will you set a food goal for healthy teeth too?

Summary = 160 Words with 11 Sentences

#### **Chapter 6 Script: Decisions to Keep My Teeth Healthy and Strong**

<https://dlp.lib.miamioh.edu/ebook/06/>

Self Efficacy: I believe that I can make healthy food decisions for my teeth.

Health Outcome Beliefs: I decide to keep my teeth healthy by eating vegetables like broccoli, because broccoli

contains calcium for my teeth. I decide to keep my teeth healthy by eating fresh fruits with milk at lunch.

Social Normative Beliefs: I decide to keep my teeth healthy by eating apples with my friends at school instead of candy. I decide to keep my teeth healthy by drinking milk as a delicious snack at home with my brother. I decide to eat fresh foods and drink nutritious beverages with my family to keep my teeth healthy.

Self Efficacy: I believe that I can make decisions to drink more water instead of sugary sodas, because water can rinse and clean my teeth and gums.

Interactive Health Literacy: I've made the decision to keep my teeth healthy and strong! How about you? Have you made the decision too?

Summary = 146 Words with 10 Sentences

**Chapter 7 Script: Deciding to Improve My Dental Health by Drinking More Water**

<https://dlp.lib.miamioh.edu/ebook/07/>

Self Efficacy: I believe that I can improve my dental health by making the decision to drink more water.

Health Outcome Beliefs: I decide to drink water every day, because most water from the faucet has fluoride in it to prevent cavities. I decide to drink water every day, because it keeps my mouth clean by washing away cavity-causing bacteria in my mouth. I decide to drink water every day, because water fights against dry mouth and uses my saliva to fight against tooth decay.

Social Normative Beliefs: I decide to drink water after meals with my family, because water washes away leftover food particles that could be in our mouths. I decide to help my brother drink more water, because water freshens his dry throat and improves his mood. I decide to drink water throughout the day with my friend, because water prevents against dry mouth that can lead to cavities in our teeth.

Self Efficacy: I believe that I can improve my dental health by deciding to drink more water.

Interactive Health Literacy: I made the decision to drink more water throughout the day for better oral health. How about you? Will you decide to drink more water too?

Summary = 188 Words with 11 Sentences

**Chapter 14 Script: Setting Goals for Going to the Dentist (Boys)**

<https://dlp.lib.miamioh.edu/ebook/14/>

Self Efficacy: I believe that I can be ready to go to the dentist for a check-up on my mouth, teeth, and gums.

Health Outcome Beliefs: I set a goal to get a toothbrush from my dentist when I need one, so I can brush my teeth. I set a goal to brush my teeth every night with my Mom, so I have a fresh breath and clean teeth. I set a goal to visit my dentist 2 times a year, so I know I do not have any holes in my teeth (cavities).

Social Normative Beliefs: I set a goal to open my mouth wide, so my dentist can see and count my 20 teeth. I set a goal with my friends to learn the right way to brush on the front and back of each tooth. I set a goal to show my dentist my bright smile during my 6 month check-up.

Self Efficacy: I believe that I can have a good check-up at my dentist, so I can have healthy teeth and gums.

Interactive Health Literacy: How about you? Can you set a goal to have a healthy check up at your dentist too?

Summary = 166 Words with 10 Sentences

**Chapter 15 Script: Setting Goals for Going to the Dentist (Girls)**

<https://dlp.lib.miamioh.edu/ebook/15/>

Self Efficacy: I believe that I can be ready to go to the dentist for a check-up on my mouth, teeth, and gums.

Health Outcome Beliefs: I set a goal to get a toothbrush from my dentist when I need one, so I can brush my teeth. I set a goal to brush my teeth every night, so I have a fresh breath and clean teeth before bed.

Social Normative Beliefs: I set a goal with my friends to learn the right way to brush on the front and back of each tooth. I set a goal to visit my dentist 2 times a year, so I know I do not have any holes in my teeth (cavities). I set a goal to show my dentist my bright smile during my 6 month check-up. I set a goal to open my mouth wide, so my dentist can see and count my 20 teeth.

Self Efficacy: I believe that I can have a good check-up at my dentist, so I can have healthy teeth and gums.

Interactive Health Literacy: How about you? Can you set goals for going to the dentist too?

Summary = 166 Words with 10 Sentences