AN INTERACTIVE CD-ROM TO TEACH STATISTICS APPLIED TO HEALTH NOTIONS TO STUDENTS IN THE FUNDAMENTAL SCHOOLING

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The Brazilian students of about 12 years old, in two Fundamental Schooling 6th grade classes of each of the three public schools willing to participate of the project of testing CD-Rom, to be used by all students of this grade in Araçatuba, SP, Brazil. The main of this paper is to offer a tool, a CD-Rom, to help the 6th grade students to learn about statistics and health. The assessment test and questionnaire were applied before and after the use of the CD-Rom, in order to have the results compared. Means, percentage, and graphs are included in the 6th grade curriculum, thus these were the topics explored in the interactive software program. Developed using the software Macromedia Flash MX 2004 and illustrated in a cheerful way, it presented using positive motivation. Comparing the results of the questionnaires we conclude the efficiency of this tool to help students to learn notions on basic statistics based in health subjects.

INTRODUCTION

The oral health condition of a population is verified by epidemiological surveys and the data obtained are important to aid the planning of governmental actions in oral health, as well as to assess the efficacy of the programs offered to the population (Costa, 1999). The best way to improve the health of a population is to educate the younger generation. (W.H.O., 1991). Oral health programs have been developed periodically in Brazil, and these have been assessed under our guidance (Pereira, 2002).

There have also been evaluations of the students' level in different fields of knowledge. The Ministry of Education in Brazil has carried out evaluations in an attempt to set parameters for the Regional Education Departments to plan a program of recovery of Brazilian education. Saeb is the national system for evaluation of the Basic Education in Brazil based on a rigorous sample methodology and carried on a bi-annual basis since 1993. Saeb evaluates students from the last year of each cycle on both Fundamental and Secondary levels. The levels evaluated are the 4th and 8th year of Fundamental Education and the 3rd year of Secondary Education. The students were tested on two disciplines: Portuguese and Mathematics. No individual mention is made. Saeb's results have the fundamental role of subsidizing the elaboration of educational policies in the federal, state and municipal levels of government, helping to identify the variables associated to the learning and teaching processes. (INEP, 2001)

This struggle to raise the educational level in Brazil must involve the cooperation of all teacher, directors, educators and researchers in our country.

The aim of this paper is to show a tool, a CD-Rom, to be used in the classroom in order to help the activity of teaching statistics associated with health notions to 12-year-old Brazilian students.

METHODOLOGY

A software program to aid in the teaching of notions of statistics was developed. In CD-Rom format, it was tested according to scientific procedures in three public schools in the city of Araçatuba, state of São Paulo, and finally offered to be used in all public schools in the city.

An assessment test and a questionnaire were applied twice to Brazilian students of about 12 years old, in two Fundamental Schooling 6th grade classes of each of the three public schools willing to participate in the project, in Araçatuba, SP, Brazil. Fundamental Schooling means the 8-year compulsory schooling for children aged 7 to 14 years old. So, 12-year-olds are usually attending 6th grade, and they were our goal. The assessment test and questionnaire were applied before and after the use of the CD-Rom in the classrooms, and the results were compared.

Means, percentage, and graphs are included in the 6th grade curriculum, thus these were

the topics explored in the interactive software program. Developed using the software Macromedia Flash MX 2004 and illustrated in a cheerful way, it presented some notions of basic statistics and health subjects.

Using positive motivation, 4 chapters were created, the first one covering dental health (Martins, 1998). The second chapter presents exercises in order to give the students some more opportunities to learn statistics. The third chapter is about nutrition and notions of statistics are applied using different kinds of food and their different prices. The theme of the forth chapter is water and its importance for life. In this chapter the comparison between pie graphs showing the percentages of water on the planet and in the human body was explored. The percentages of the correct answer were compared with 5% significance level. The two questionnaire isn't matched because no individual mention can be made, according the Ethics Committee.

RESULTS

The 1st stage was the development of the software program: as it is an interactive tool, the first screen shows some mouths moving and dancing to be funny and motivate the study of dental health.

After presenting some information on dental health, the first activity in statistics is to build data tables based on the problem: "In a school a research was made to know how many perfect teeth the 12-year-old students had."

Data base of students according sex and number of perfect teeth is presented.

Name of Student	Sex	Perfect teeth
André	M	18
Beatriz	F	19
Carla	F	18
Cristina	F	19
Fernanda	F	22
Gustavo	M	27
Helena	F	20
João	M	20
Maria	F	21
Pedro	M	20

The CD users need to count the number of male and female students, learning that gender is a qualitative variable. There are boxes to be filled in with the number of males and females. The software helps the students by checking the answers. If the answer is wrong, the program clears it and the box has to be filled again. The students have to answer the question: Which gender is more frequent? Male or Female? Thus, with the correct answer on the table, the pie graph is presented. The students can then observe the different areas according to the different frequencies.

The next step is about percentages. The students calculate them and type the answers in the appropriate boxes for the answers to be corrected by the program. When the results are correct the students see the graph built with perceptual frequency. The values are shown so that the students have an opportunity to learn them. Thus, the formula is presented before the calculation. The two graphs (distribution by number and distribution by percentage) are compared so that the students can observe that the correspondent areas are identical because they represent the same phenomena.

The students can also learn that the perfect teeth are those that have never been decayed, that is, Decayed + Missing + Filled teeth equals zero (DMF Index) (WHO,1991). Besides that, the students learn that it is possible to have perfect teeth over all their lives, as long as they take care of their teeth every day, cleaning them, choosing their food sensibly, and brushing their teeth after eating, before going to bed and when they wake up. Otherwise their teeth will decay.

By working with the number of "healthy teeth" or "perfect teeth" for each person in the

table, the students deal with quantitative variables. Again, a table is built and the students do some exercises about the interpretation of the data presented. In these exercises they also need to fill in the boxes with the correct number.

One screen is presented to just show the layout of the CD-Rom.
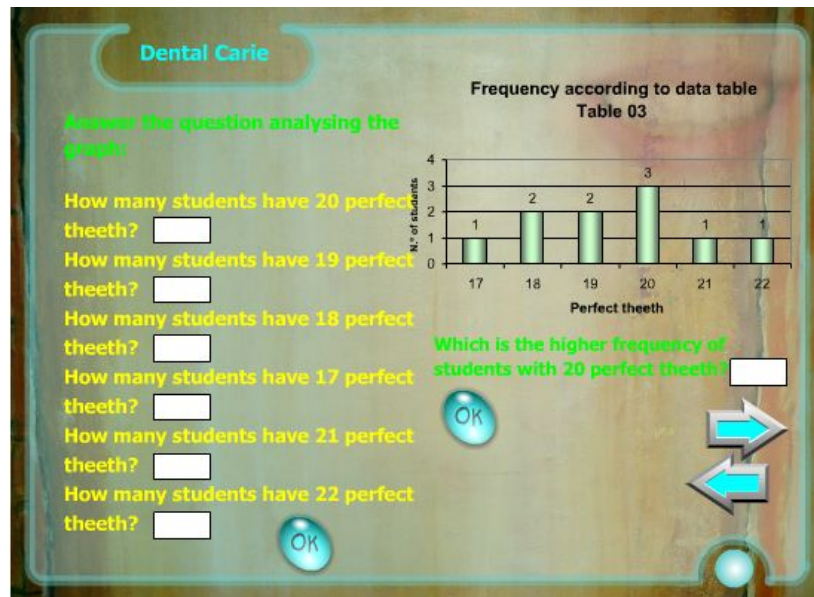
How many students have 20 perfect teeth? ☐
How many students have 19 perfect teeth? ☐
How many students have 18 perfect teeth? ☐
How many students have 17 perfect teeth? ☐

A column graph shows the values presented in the table, and thus the students can understand the correlation between the graph and the correct answers in the boxes. The interpretation of the graph is stimulated, as the students need to answer the same questions again, now analysing the graph.

As the students learn the concepts of higher, smaller, dip, fluctuation, etc., they become able to understand different graphs.

In chapters three and four, in which the themes are "nutrition" and "water," the sequence of information is similar to that of the "dental caries" theme.

The 2nd stage of this project was the application the assessment test and questionnaire before the use of the CD-Rom in the classroom.

The 3rd stage was the application the assessment test and questionnaire after the use of the CD-Rom.

After using the software for 4 hours in each 6th grade classroom separately, we verified that we could significantly raise the students' awareness of some health concepts and improve their understanding of basic notions of statistics.

1. Comparison of the results of the question about means ($p < 0.0001$): before the use of the CD-Rom, 25.6% of the 196 students answered correctly and after it, 60.2% of the students presented a correct answer.

2. Comparison of the results of the question about percentage ($p < 0.0001$): before studying the calculation of percentages with the aid of the software, only a meager 3.1% of the 196 students answered correctly, and after it, 17.5% of the students presented a correct answer. Although we did not ask questions about basic mathematical operations, it was necessary to calculate the percentage. We noticed the difficulty that the students had with division. Most of the students made mistakes when calculating percentages because of wrong divisions. So, we informed the Department of Education in the city about this issue and the needs of have some project to motivate the teachers and students to learn how do the mathematical operations, mainly

division.

3. Understanding of graphs: before the use of the software, when the students were asked if they could understand a graph, 49% declared "Yes," and after it, the positive answer increased to 60.2%. When asked if they would like to understand a graph, before the use of the CD-Rom, 71.4% of the children said "Yes," and after using it, this response increase to 82.52%. Although this cannot be compared because it depicts only interest and not knowledge, it is important to notice the increase in the interest of the students for the subject.

4. When asked if it is possible for a person not to have any caries in all his/her life (to have perfect teeth), 79.1% of the students answered "Yes" before the use of the software and after using it, the positive answer increased to 95.1% (p=0.0003). This is a important knowledge for the young people, because the probability of caries-free is increasing year by year all over the world. It is only necessary to take care of prevention.

5. When asked why we should brush our teeth, before the use of the CD-Rom, 28.6% of the children declared "To remove bacterial plaque" and after using it, there was a sharp rise in the correct answer to 69.9% (p<0.0001). Before using the software program, 49.5% answered that tooth brushing is important "To remove food between teeth" (an inadequate answer, for that is the function of the dental floss) whereas after getting information about dental health with the use of the software, this incorrect answer plummet to 20.4% (p<0.0001).

6. When asked if they brushed their teeth every day, before the use of the CD-Rom, 88.5% of the students answered "Yes" and after using it this answer stabilized in 98.1%. Even after getting informed through the software, two students answered "no" to this question. It is an interesting and coherent answer because they had not had time to change their behaviour. This answer may be a demonstration of their honesty when answering the questionnaire after the use of CD-Rom.

CONCLUSION

We can conclude that the software program is a tool that can be used by teachers of 12-years-old students and it can help the children learn notions of basic statistics and some topics in the health program.

After this test, the Regional Education Departments could distribute this CD to use in all public schools of Araçatuba, São Paulo State, Brazil.

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