

Using “Thinking Tags” with Kindergarten Children: A Dental Health Simulation

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ABSTRACT

According to many dental professionals, the decay effects from the accumulation of sugar on teeth are a very difficult concept for young children to learn. Playing the dental hygiene game with Thinking Tags not only brings context into the classroom, but allows children to work with digital manipulatives that provide instant feedback. Instead of watching a demonstration of the accumulation of sugars on a screen or being told about dental health, this simulation allows 5-year old children to experience improving or decaying dental health without any real adverse effects. Small, wearable, microprocessor-driven tags were brought into the kindergarten classroom to simulate the decay process, providing information and creating a discussion about teeth. This program was effective and enthusiastically received by this age group.

Keywords

Science, technology, thinking tags, dental health, participatory simulation, discourse

INTRODUCTION

The principles of situated learning are that a) knowledge needs to be presented in an authentic context, and that b) learning entails social interaction and collaboration (Lave, 1999). An example of applied situated learning psychology is a Thinking Tags game designed to show children the concept of accumulation. Building on this basic concept, children are able to learn that sugar on the teeth can accumulate and over time cause tooth decay. Many dental professionals believe that this concept is thought to be too difficult for children to comprehend. In fact, the Canadian Dental Association recommends that children at this age should not be responsible for their own dental care (CDHA, 2000). Although the values of brushing are taught at this age, basic science concepts, which lie behind dental health, are not readily taught to this age group. Apart from an underdeveloped level of responsibility, it may be presumed that children are not able to grasp the complex concept of interactions of sugar on the teeth over time, which can cause cavities.

Resnick, Berg & Eisenberg, (2000) show that a constructionist “scientific instrument design has the potential to spark interest in scientific issues among students who otherwise avoid the subject altogether”. We aim to show that by concentrating on the most basic ideas relating to accumulation and applying the pedagogy of situated learning, we can successfully teach this difficult concept to children as young as five.

THINKING TAGS AND DENTAL HEALTH

The MIT Media Laboratory has been at work developing small wearable microcomputers called *Thinking Tags* (Tags). These Tags are about the size of a name badge and are equipped with infrared ports and sensors, lights and a small display panel. With these tags, children are given the opportunity to concretely explore abstract scientific ideas. Furthermore, studies with digital robotic bricks show students using the bricks were required to examine classic feedback strategies, which they might not otherwise formally investigate until university (Resnick, 1998). This exploration of feedback and emergence allows insight into scientific thinking, the basic building blocks for activities such as data collection and control.

Digital manipulative objects can be also be programmed to demonstrate interactive behaviours. When programmed in this way, digital tools, like children’s mechanical structures and toy model sets before them, provide insight into the type of interactive behaviour from which more complex systems arise (Resnick, Martin, Berg, Borovoy, Colella, Kramer, and Silverman, 1998). Due to its ability to allow students to explore feedback, emergence and control, this area of research may have many potential educational benefits. Digital tools can help students learn complex concepts by breaking those concepts down into basic levels and observing the behaviours that arise from these simple interactions. Students have the ability to tackle these concepts well before they are ready to learn them in an abstract, formalized educational setting. It is necessary then, to provide them with the tools to grasp them.

THE DENTAL HEALTH SIMULATION

Kindergarten aged children wear computerized Thinking Tags, that, through kinetic make-believe, show them the health status of their “teeth”. In the Dental Health Simulation, children are asked to wear the Tags for a short period of time while they pretend to “feed” on various food items placed around the room. The food items have other Tags buried inside them, which emit information via infrared signals as to the amount of sugar contained in a serving of that specific product. Sugar

amounts vary from food to food, with sugared cereal being the highest and water having no sugar value at all. Furthermore, a time-delay feature was added to simulate the temporal relationship between accumulation and decay. After a specific time, calculated according to the amount of sugar accumulated (more sugar means less time), healthy teeth (indicated by five green lights on the Tag turn red, indicating a state of dental decay. Children then have thirty seconds to get to the brushing station before one of their teeth, or LED lights, turns red permanently, indicating the presence of a cavity.

RESULTS & DISCUSSION

Our Thinking Tag game has been designed to introduce children to the concept of accumulation. Students made comments such as, "I'm eating the crackers" and "I have a cavity!", suggesting that they were able to personally identify with the characteristics of their Tag. The first-person experiences demonstrated in the study shows the extent to which children are drawn into the game, therefore enhancing the context for learning. Once the props were removed, children again referred to the Tag as "it".

The children were also observed collaborating with one another, urging their peers to brush their teeth when the lights on their Tag had turned red, suggesting that meaningful interaction is not impeded by the technology. It seems to be the case that the nature and quality of student discourse is in fact enhanced through the use of the Thinking Tags. Some of the children commented that "You brush before they go red!", indicating that they were able to identify proactive measures, before any observable evidence of decay had taken place.

Early work with this simulation suggests that 5-year olds are able to grasp the concept of accumulation of sugar. When the children were asked if they learned anything while they were doing this activity, they commented that they learned "not to eat too much" of the sugary foods. However, several questions still need to be addressed, including: Are children building on one concept after the other? What effect do the presence of classmates and the discourse have on learning? Furthermore, the temporal element in the simulation seems to indicate an important learning advance in children this age and future research may continue to explore the relationship between game time elapsed and amount of sugar.

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