

# Designing school programmes to be effective vehicles for changing oral hygiene behaviour

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Schools are a commonly used setting for dental health education, health promotion and interventions with preventive agents. However, traditional dental health education programmes are rarely designed to be effective change agents. Twice daily tooth brushing with fluoride toothpaste has consistently been shown to be an important behaviour for controlling dental caries in children. Ideally, parents incorporate twice daily brushing into their child's hygiene routine. Families where brushing is irregular are over-represented in areas of socio-economic deprivation and the effects of irregular oral hygiene are often compounded by cariogenic diets. Therefore, in communities with high caries levels, a targeted community approach to prevention can provide additional benefit, through fluoride programmes delivered in school. It is essential that dental health education programmes are designed to recognise the social, cultural and environmental context in which the behaviours occur. This paper provides a new framework to classify school programmes. In addition, evidence-based guidance is developed of the necessary components for programmes to enhance effectiveness in establishing the key behaviour of twice-daily tooth brushing with fluoridated toothpaste.

*Key words: Tooth brushing, school programmes, fluoride, families*

## **Schools as a setting for dental health education, health promotion and interventions with preventive agents**

Health education is an important part of health promotion; where, health promotion is defined as 'the process of enabling people to increase control over and to improve their health'<sup>1</sup>. Health education is 'any planned combination of learning experiences designed to predispose, enable and reinforce voluntary behaviour conducive to health in individuals, groups or communities'<sup>2</sup>. In many countries, schools have long been a setting for dental health education programmes. From the 1960s to the 1980s, some countries conducted large scale caries preventive programmes in schools by fluoride rinsing, brushing programmes<sup>3</sup> and fissure sealing<sup>4</sup>. With the decline in dental caries in developed countries from the beginning of the 1990s, the principal population prevention strategy is the regular use of fluoride toothpaste at home. In communities with high caries levels, a targeted community approach to prevention<sup>5</sup> can provide addi-

tional benefit, through fluoride programmes delivered in school for a whole classroom at a time<sup>6,7</sup>.

It is recommended that oral health promotion is part of general health promotion on the basis of a Common Risk Factor (CRF) approach to the prevention of chronic diseases<sup>8</sup>. In this context, it is helpful to distinguish between health-related behaviour and health-directed behaviour<sup>9</sup>. Health-related behaviour may have dental health benefits but is undertaken for non-dental health reasons, e.g. reducing dietary sugar to lose weight. Health-directed behaviours are actions which are carried out in the belief that they will benefit oral health directly, e.g. limiting sugar snacks to prevent dental decay. Therefore, taking a CRF approach could result in significant benefits for oral health by health-related behaviour changes. From this perspective, oral hygiene should be promoted within programmes addressing self-care and body hygiene. This approach would also recognise the principal reasons adults give for tooth brushing which relate to grooming and fresh breath rather than specific oral disease prevention<sup>10</sup>.

The World Health Organisation (WHO) has recognised the value of schools as a setting and endorsed a wider approach to prevention by introducing the concept of the Health Promoting School<sup>11</sup>. WHO has recommended using a CRF approach and additionally, provided guidance on oral health messages that can be incorporated in Health Promoting Schools<sup>12</sup>. Teachers often seek and welcome specific material for discussing dental health. Therefore, it is essential to consider whether traditional materials and methods are based on best evidence both from a prevention and behaviour change view.

### **Traditional Dental Health Education Programmes**

A review is being undertaken currently of dental health education programmes conducted in schools in 15 countries. Initial results from 12 countries (Rao, Personal Communication, 2007) confirm that a single programme typically contains the following recommendations:

- Brush teeth twice a day with a fluoridated toothpaste
- Change and have a healthy diet
- Visit a dentist at least once a year.

In addition, information is usually included on tooth development, tooth structure and the causes of oral diseases. Some programmes provide information on the need to replace toothbrushes regularly, how to floss, use of a mouthguard when playing sports and for older children, the dangers of smoking and excess alcohol consumption. It is rare to find programmes with a single message consistently reinforced. Multiple oral health messages in a single programme are problematic from a methodological perspective. Although they may raise awareness and possibly increase knowledge, they are very unlikely to achieve behaviour change. This lack of focus has been recognised in reviews that have identified that there is limited evidence for the effectiveness of oral health promotion<sup>13</sup>. It is well established that knowing that a behaviour is harmful to health does not of itself lead to changing that behaviour. However, health education programmes are often limited to healthy messages intended to improve knowledge or change attitudes. Beyond instinctive behaviour, knowledge is usually a necessary but not sufficient requirement for behaviour change. In fact, dental health educators' enthusiasm to be comprehensive may have taken over from scientific assessment as to whether a programme is effective in changing behaviour<sup>14</sup>. If the aim is to change behaviour, it is essential that the programme has simple messages given on a single topic and reinforced, and additional intervention other than the healthy message may be necessary; e.g. specific skills training<sup>9</sup>. Further, it is important that programmes are designed to recognise the social, cultural and environmental context in which the

behaviours occur. Therefore, from a behaviour change point of view, taking oral health-related behaviours and considering them separately in modules of a preventive programme is much more likely to lead to behaviour change. Due to its critical importance in caries prevention, the remainder of this paper considers school programmes aiming to establish the behaviour of twice daily tooth brushing.

### **The key behaviour of twice daily tooth brushing**

Twice daily tooth brushing with fluoride toothpaste has consistently been shown to be an important behaviour for controlling dental caries in children<sup>15</sup>. Many countries report around 75-80% of people claiming to brush twice daily, and the principal 'difference between (sub)populations with low caries prevalence and high caries prevalence seems to be the lack of regular toothbrushing with a fluoride toothpaste by members of the high prevalence subpopulation'<sup>16</sup>. Greatest dental health benefit is found if tooth brushing begins as teeth erupt. Ideally, parents should incorporate twice daily brushing into their child's hygiene routine. Families where brushing is irregular are over-represented in areas of socio-economic deprivation and the effects of irregular oral hygiene are often compounded by cariogenic diets<sup>17</sup>. Preventive efforts should be focussed on mothers and babies. However, these families are also over-represented as hard-to-reach families in all aspects of healthcare. Therefore, schools have become an increasingly important setting for health education and health promotion.

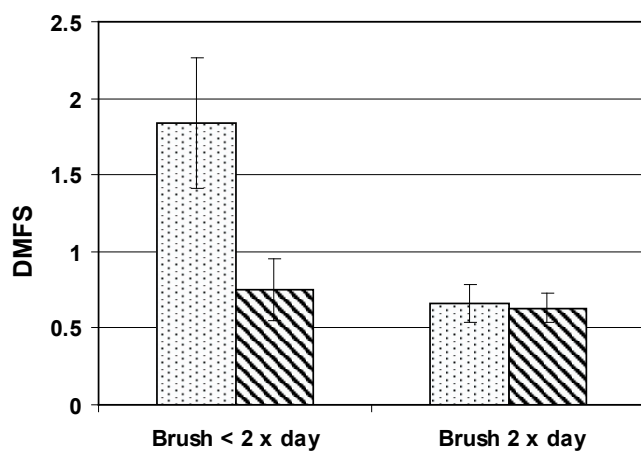
### **Designing a health education programme to be effective for changing oral hygiene behaviour**

There are several social cognition models that can inform the design and evaluation of health education programmes<sup>9</sup>. An important aspect for school-based programmes is how engaged children are in the programme. Written communication in the form of leaflets and posters can reinforce information but when used alone, they may have limited impact. Engaging children actively in the interaction through play and simulations has long been recognised as having a greater impact<sup>18</sup>. Achieving behaviour change is more likely with personalised interaction, skills training and reinforcement. The Communication-Behaviour Change model provides a framework for considering some of these design issues. A hierarchy of engagement the child will have with the programme provides a method for classifying health education programmes in terms of their probable impact and is presented in *Table 1*. Using this classification, most traditional dental health education programmes would be between Level 1 and 3. This would explain the

**Table 1** Communication-behaviour change framework for school-based interventions to enhance tooth brushing

Hierarchy of Engagement				
Level of school programme	Child	Communication method	Examples of methods & materials used in schools	Communication-behaviour change model*
Level 1	Passive	Written	Leaflets, posters	Expose to health message of brushing 2 x daily;
Level 2	Passive	Verbal	Lesson about teeth, plaque, brushing	approve and show interest; understand (Knowledge);
Level 3	Active	General Interaction	Colouring books; Brushing on model teeth; taking part in stories	Agree to the message (Attitude/Belief); acquire the skills (Behaviour);
Level 4	Active	General Interaction with Reinforcement	Lessons continued in a series; Parent involvement e.g. take home toothbrush & paste; brushing charts	incorporate the new attitude and knowledge into memory; retrieve information when necessary and make decisions from memory recall (Intention, contemplation)
Level 5	Active	Personalised Interaction	Counting own teeth; Brushing own teeth	Act on decision (Action). Reinforce behaviour and maintain the new health behaviour over time (Maintenance)
Level 6	Active	Personalised interaction with Reinforcement	Brushing own teeth on repeated occasions; Parent involvement e.g. take home toothbrush & paste; brushing aids; brushing charts	

\*McGuire<sup>23</sup>; adapted from Adair and Ashcroft<sup>9</sup>.



**Figure 1.** 2-year mean D<sub>1</sub>MFS caries increment (and 95% confidence intervals) at age 7 years. Left-hand columns: children whose usual brushing frequency at home was less than 2 x a day: control group (n=129) compared to the intervention group (n=155). Right-hand columns: children whose usual brushing frequency at home was 2 x a day: control group (n=45) compared to the intervention group (n=48). Significant benefit gained by infrequent brushers (p=0.02).

findings that they may result in knowledge gain, some initial change in attitudes but no long-term behaviour change.

In contrast, the Tayside Study, which has been recognised as an example of a participatory school-based programme involving local mothers<sup>8</sup>, would be a Level 6 programme in the model presented in *Table 1*. The programme was school-based, over 2-years, for children initially aged 5 years living in disadvantaged communities. It compared children undertaking daily supervised

tooth brushing with a fluoride toothpaste in school together with home support (intervention group) to children following their usual brushing behaviour (non-intervention group). Children in the intervention group had significant, long-term dental health benefits<sup>7,19,20</sup>. In one of the study questionnaires, parents were asked the child's usual brushing frequency at home. *Figure 1* presents the results of the study (2 year D<sub>1</sub>MFS increment on first permanent molars at age 7 years) according to the child's usual brushing frequency at home. Those children in the intervention group (n=155) who usually only brushed once a day had very significant benefit from the programme compared to their peers in the control group (n=129) developing 59% less caries (p=0.02). While children in control and intervention groups who already brushed twice daily had similar low caries development (p=0.85).

### Changing an established complex programme delivered by dental health professionals to a single behaviour change programme delivered by teachers with parental involvement

A health education programme known as *Signaline* and devised by Lever Fabergé with the support of the Union Française pour la Santé Bucco-Dentaire (UFSBD) has been delivered to 5-7 year old children in many schools across France by teachers, nurses, dentists or parents. The programme was broad and offered information on several aspects of dental and oral health using a cartoon mouse character, named *Signaline*. The programme was well illustrated but complex as it comprised several messages simultaneously, typical of dental health education programmes seen in many countries. The material

included information on the structure of teeth; tooth development; brushing technique; visiting the dentist twice a year; “good” and “bad” foods to eat for oral health.

Instead of a general information-based dental education programme, the aim of *new Signaline* is to encourage children with parental support to brush their teeth twice daily with fluoride toothpaste as part of an oral hygiene routine, once in the morning and once last thing at night. The message chosen for the *New Signaline* programme is evidence-based, addressing oral hygiene behaviour in young children with the ultimate aim of improving oral health. It was recognised that if the programme is to be sustainable in the school setting, it needed to be developed in collaboration with teachers, parents and pupils and delivered by teachers, in class as part of a lesson plan. The WHO CC team in Liverpool with Dr Angela Ashcroft as the health psychology lead in collaboration with the team at Lever Fabergé undertook the development work.

The revised programme was formulated into a teacher pack with lesson work plans, posters, letters to parents and handouts to take home, colouring sheets, quizzes and a video. The programme was divided into three lessons, each with a simple message, with a pupil worksheet for each.

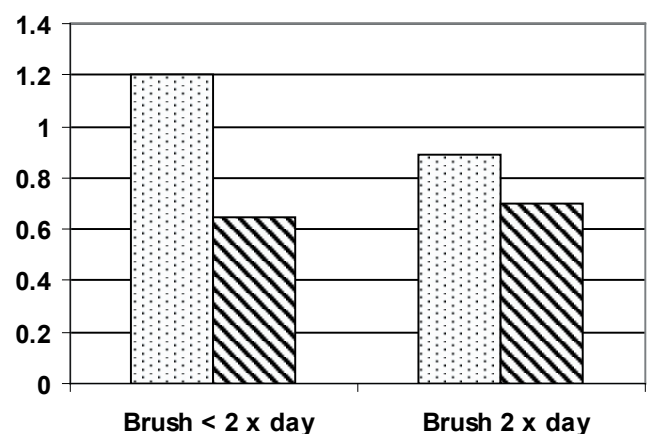
**Lesson 1** A picture of the *Signaline* mouse brushing her teeth in the morning and evening with descriptions of why this is important to do with fluoride toothpaste. Describing the action of fluoride on the tooth and how it helps prevent tooth decay. Quizzes and colouring sheets used as part of the lesson.

**Lesson 2** *Signaline* brushing her teeth in the morning and evening, importance of fluoride toothpaste – repeated from Lesson 1. Additional information was provided about the benefit of brushing both in the morning and evening; i.e. morning before breakfast protects teeth for the day. Brushing at bedtime brushes away the food eaten during the day and leaves the fluoride to work overnight.

**Lesson 3** *Signaline* brushing her teeth in the morning and evening and why this is important with fluoride toothpaste – repeated from Lesson 1. This includes new information about brushing each tooth on all sides. The pack included a take home chart for pupils and parents to record their day and night brushing.

**Evaluation** As part of the development and initial evaluation of the programme, opinions were sought from parents, pupils and teachers. In addition, a Before and After Study was undertaken in 15 classes in five schools in Paris to examine the practical details of implementation and whether there was any evidence that pupils and parents were acting on the message, i.e.

changing oral care behaviour<sup>21</sup>. Excellent co-operation was obtained with UFSBD and UFSBD dentists were trained by the author in the systematic measurement of plaque using a Modified Silness and Løe index<sup>22</sup> recording the presence or absence of plaque on index teeth. The parents of 299, 6-year old children gave consent for their children to participate in the study and 263 (88%) received a plaque examination both before and after the programme. Teachers reported that the programme was informative, easy to understand and use in class. Overall, there was a 23% reduction in plaque on index teeth ( $p=0.004$ ). Critically, for children whose parents reported that their child brushed only once a day before the intervention ( $n=51$ ), there was a 48% reduction in plaque ( $p=0.019$ ). This is detailed in *Figure 2*. This result is a very similar pattern to that seen in the Tayside study shown in *Figure 1* when the outcome measure was dental caries experience. The differential plaque reduction seen by those children who were previously only once a day brushers supports the conclusion that the programme achieved behaviour change. It is recognised that health education interventions can show short term benefits. A long-term study with control classes similar to that conducted in Tayside could quantify the dental health benefits. This evaluation was conducted to determine whether the programme was fit for purpose and had the potential to lead to behaviour change. The evaluation allowed the team to make refinements to the programme and recommend its implementation. *Signaline* has been transformed into a structured programme with lessons conducted in series with reinforcement, a Level 4 programme (*Table 1*). Since its development in 2005, the programme has been implemented in 35,000 schools and delivered to over 700,000 schoolchildren and their families across France.



**Figure 2.** Changes in mean plaque scores before and after the *Signaline* programme for children who brushed < 2 x daily before the intervention compared to those who already brushed 2 x daily before the intervention. Significant benefit gained by infrequent brushers ( $p=0.019$ ).

## Conclusions

Schools will continue to be an important setting for health education programmes. In terms of caries prevention, the key oral hygiene behaviour is brushing twice daily with fluoride toothpaste. For communities in which this behaviour is not established before school age, school-based behaviour change programmes involving parents may be effective. Many traditional dental health education programmes are not structured to produce behaviour change. Existing programmes can be modified to enhance effectiveness using social cognition models. Evaluation of the effectiveness and practical delivery issues is essential for school programmes both at the design stage and following implementation. This paper has provided a new framework for classifying school-based dental health education programmes. Evidence of the effectiveness of two programmes delivered in France and Scotland is presented. These programmes have now been implemented at the national level in both countries.

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