CHAPTER THIRTEEN

FOOD AND SENSORY EXPERIENCES: ISSUES TO CONSIDER WHEN DEVELOPING AN EDUCATIONAL PROGRAMME IN EXPLORATIVE FEEDING PRACTICES

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1. Introduction

Eating is much more than feeding oneself: food is the crucial area through which the individual explores the world and establishes a relation with it. Eating is a complex cognitive act, with many implications for the brain processing it.

When dealing with food education, considerations have to be made on the value and meaning of eating for a contemporary individual and on the manner in which food preferences, tastes, and distastes develop in a specific cultural and domestic context. Furthermore, food education cannot disregard corporeality and has to be related to the pleasure principle, which is the main link between man and food (Cabanac, 1985, 1992).

Food education can be poorly effective if the manifold implications of eating as a multifactorial behaviour and the information influencing the awareness of individual food choices are overshadowed.

Therefore, the basic assumption of this work is that a correct approach to food can be educated, influencing the flexibility of food preferences and the feeling of pleasure derived from eating.

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Referring to "education", further clarifications have to be made on the teaching technique needed to carry out food projects in schools: educational projects at school have to be really educational, which is not always the case. The requisite for any project defined as "educational" is that it is actually able to educate: it has to enable pupils to learn. For this reason, projects called "educational", such as food projects in schools, have to be tested to assess their educational validity. Only if they lead to significant changes in pupils' attitudes and behaviour patterns, through the treatment proposed, can they be named "educational". The effects of the food education project carried out in the schools in the Friuli-Venezia Giulia region, referred to in this paper, have been scientifically assessed. At this point, it is worth dwelling on the main issues to take into consideration when planning a food education project at school.

2. Food neophobia in children

First of all, children and adults do not eat what is good for them but what stimulates their imagination and salivation. On the other hand, it is almost impossible to convince individuals not to eat a food product they like, only because it is scientifically proved to be unhealthy. A food discourse focused on a healthy diet could be hardly comprehensible for children who have not interiorized the concept of "health" yet, not least because they have a cognitive system preferring repetitive and familiar choices, and they instinctively trust their own feelings of physical pleasantness.

Studies carried out on preschoolers underlined that the two factors that better predict children's positive approach towards food are sweet taste and the degree of familiarity with the food product (Birch, Zimmerman, & Hind, 1980; Birch & Marlin, 1982; Birch, 1987). On the other hand, they reject bitter and less familiar food. At this age, the rejection of vegetables is particularly common (Phillips & Kolasa, 1980). The term "food neophobia" refers to children's reluctance to try unknown food, entailing a range of behaviour patterns, from caution to the refusal of unfamiliar food.

Although data are not always unanimous, researches illustrate a certain variability of food neophobia according to the child's age. While children until 2 years of age willingly accept the products their mothers offer them, afterwards, the level of neophobia increases, reaching its maximum peak in children aged 6-7 years (Pelchat & Pliner, 1995; Pliner & Loewen, 1997). Then, until 10-11 years of age, there is a slight softening of children neophobic behaviour patterns, above all towards vegetables (Rigal, 2000). A recent survey carried out in Italy on the national population of students attending compulsory school (8-14 years old) underlined that food neophobia applies to the category of vegetables and legumes, avoided by 25% and 22% of students, respectively; high rejection levels were recorded for fish (15%) and fruit (12%) as well (Fondazione Italiana Buon Ricordo, 2007).

When trying to explain the onset of the acute phase of a child's food neophobia, different interpretations are possible. Rigal (2000) supposes it can be ascribed to what is known as the "no" phase, in which children systematically oppose their parents' requests. The neophobic behaviour in a young family member could lead to the creation of a different identity with respect to parents and siblings. However, the hypothesis has not been corroborated yet. According to Rigal, the highest level of neophobic behaviour occurs at about 6-7 years of age when the child enters school. The uncertainty created by the introduction into a new social context would be counterbalanced by the need for reassuring, repetitive and safe food.

However, according to Pliner (1994), neophobia can be generally described as the consequence of a child's lack of cognitive ability and experience related to food, bringing about a distrust of the unknown. For instance, if mashed potatoes with a sprinkling of parsley are offered to a 5-year-old, they will probably be refused. The highest level of a child's neophobia seems to correspond to the preoperative phase, in which it is sufficient to change a single feature of an object for children to believe that the object has been completely replaced (Pliner, 1994). According to Rigal (2000), the degree of familiarity with a food product depends on the sensory proximity with what the child already knows and expects to taste. For example, the colour, look, solidity, and taste of an unfamiliar banana mousse could resemble a more familiar banana yogurt; but Western children exposed to *sushi* would have many difficulties in tracing it back to a food product belonging to their experience. The less a food product is sensorially familiar, the more likely it will provoke neophobia in children. If food is not compared to something known, it loses its identity and becomes uneatable. Since children's exposure to food variety is lower than that of adults, children have less objective bearings and are therefore less disposed to taste novel foods.

When children learn to recognize/categorize food, they will become more willing to accept novelties. It is the same way in which "generalization" works: it is a mechanism broadening the categories of what food is and what it is not; therefore, for example, if an octopus is categorized as eatable, cuttlefish will be as well (Strepparava, 1997).

Although children start improving their method of classifying and categorizing objects by using first one feature (e.g., shape) and then two or more features at the same time (e.g., dimension and shape), in the preoperative phase they cannot grasp the concept of inclusion yet (Pliner, 1994). Children cannot understand that certain groups are completely embedded in others: mashed potatoes with parsley belong to the category of mashed potatoes, an apple is still an apple even if it is grated or cut into slices. Given that the concept of category is not mastered before age 7, children learn to recognize food products according to specific features and not as a sample of a group. The name of food products is associated only to a specific image. It enables us to guess what children are more willing to taste, whereas the smallest change in the presentation of food, contradicting their expectations, risks leading to neophobia.

In conclusion, a certain degree of food neophobia in children is unavoidable. However, far from being a developmental disorder, neophobic behaviour seems to correspond to a normal phase of development itself. It is gradually overcome through the acquisition of cognitive and learning abilities and through familiarization with food.

3. Innate tastes

What needs to be taken into consideration is that the behaviour patterns related to eating and the survival of a living creature depend on the basic biological background of a species. Research into taste and smell, the two senses most linked to eating, has provided clues on the “early” taste preferences of mankind. The sensory systems of taste and smell develop during the first months of gestation (Herbinet & Busnel, 2002). This enables the unborn child to distinguish chemical and sensory stimuli in the amniotic fluid, whose composition is influenced by his/her metabolism and by the mother’s diet (Schaal, Marlier & Soussignan, 1995). Therefore, it would be plausible that the individual personalization of taste starts in the womb.

Newborn babies reach out towards the source of their nourishment with a particular sensory ability, enabling many breast-fed neonates to distinguish their mother’s smell from that of another woman already at 1 week after birth (Cernoch & Porter, 1985).

Studies underline that newborns respond differently to basic tastes (Steiner, 1979). During experiments, photographs were taken of babies who had not been fed yet, showing how they can react to different flavours. The aim was to verify whether reactions changed according to different tastes of water. The newborns reacted to the sweet liquid with a relaxed face and an expression resembling a smile. To the sour liquid they responded by pursing their lips, whereas when exposed to a bitter liquid, they made a facial expression recalling distaste. The presence of such different expressions highlights that even babies can sense different flavours. These facial expressions are also known as the "gusto-facial reflex". It can lead to the assumption that the reactions to the four basic tastes (sweet, sour, bitter and savoury) are inscribed in our genetic background, universal, unconditional and typical of mankind (Chiva, 1985).

With regard to the relation between biological factors and food preferences, the question arises whether the parents' genetic background may affect individual taste, as happens when we inherit the colour of our parents' eyes or hair. In this regard, researches have been carried out on the food preferences of twins, siblings, parents and children (Rozin & Millman, 1987; Breen, Plomin, & Wardle, 2006), but studies to date are too few and discordant to draw reliable conclusions.

However, the answer to the question on taste hereditariness can be formulated as follows: parents cannot genetically determine their children's food preferences and rejections, meaning they do not pass their food tastes directly to them; rather, they pass a genetic background which determines the degree of sensitivity of the child's sensory receptors for the transduction of taste and smell. This will be dealt with in section 7.

4. Food choices between nature and culture

Understanding why individuals choose or refuse a particular food product is not easy, above all when the aim is how to generalize the reasons behind food choices and to fit them into a theory. Beyond biological factors, the effects of culture have to be taken into consideration.

Within a given culture, the variety of food preferences is shaped by personal experiences, which by definition differ from one individual to another, and by collective experiences, which instead aim to unify judgments according to codes accepted by the group. Flandrin (1994) coined the expression "structures of taste" to underline the collective and shared nature of such experience. When the concept of taste is used to indicate a cultural product, there are two organs of taste to consider: not only the tongue, but also the brain, a culture-bound organ, through which evaluation criteria are learned. Therefore, the criteria vary across time and space, and they determine the changeable success of different food products in different epochs. The geography of taste is also varied: what in one place is a delicacy can be rejected as disgusting in another. To sum up, "taste" has two possible meanings. The first refers to *flavour*, to the individual perception of degustation: personal and elusive experience, difficult to communicate. The second refers to *knowledge*, as a definition (judgment) of what the individual likes and dislikes, coming above all from cognitive processes (Montanari, 2004).

Rozin and Fallon (1980) proposed an interesting theory on the reasons behind food choices according to biological and cultural factors. They identified three main reasons for accepting or rejecting a particular food product, justifying the choice:

1. *Sensory factors*: the perception of the organoleptic characteristics of food.

2. *Ideatory factors*: the acceptance or rejection of certain substances based on the idea of what they are, where they come from or what their symbolic meaning is. These ideas play a modest role in justifying the acceptance of a particular type of food, but a greater role in rejecting it.

3. *Anticipation of the consequences*: the conviction that ingestion will have (positive or negative) consequences.

According to the combination of the above-mentioned justifications, the authors outlined four kinds of food rejection:

a) *distaste*: rejection based on sensory characteristics, which is the most common cause of food aversion;

b) *danger*: rejection based on anticipated harmful consequences (e.g., poisonous mushrooms, allergens);

c) *inappropriate*: rejection based on ideatory factors, substances are refused as inedible (e.g., paper, grass, sand and so on);

d) *disgust*: rejection based primarily on ideatory factors, regarding "offensive" foods, which can also be considered contaminants. It is usually due to sensory perceptions (e.g., worms, spiders or black beetles in Western society).

The authors noted that the aversion for a specific food is usually based on a combination of one or more of these justifications, and not just on one of them.

The first criterion of food acceptance is the evaluation based on sensory factors because it is innate; it is not fixed and immutable and therefore it can be changed by learning and experience.

The second criterion, based on ideatory factors, is the consequence of mental categorization, an ability resulting from a child's cognitive development, which is therefore not behind the choices of acceptance/refusal of food during early childhood. Using this criterion to reject food requires a certain ability of thinking which develops over time, as well as knowledge and the ability to process information on the associative reasoning that can be made on food (for example, reasoning on: origin, price, seasonality, what is healthy or unhealthy, what fattens, what is a possible contaminant or is disgusting from a cultural point of view). These are cognitive preferences/rejections, intellectual or cultural representations, making foods more or less acceptable and eatable. In this case, rejection is not based on the sensations given by a tasted food, but on its nature and the mental associations it produces. The more children grow and can make associations of ideas, the more the fear of contamination (*disgust*) and the influence of the "magic thought" increase, which seem to be behind the tastes of children aged 6-8 years (Rozin, Fallon & Augustoni-Ziskind, 1986). Generally, what culture defines as edible becomes appreciable, what culture vetoes becomes uneatable. For instance, in Asiatic cultures fried black beetles are as crispy and tasty as are French fries in Western cultures. In France, snails are a specialty, whereas they are considered inedible in Anglo-Saxon countries. Usually, these kinds of distastes develop from 3 years of age (Rigal, 2000).

The third method of food evaluation is an associative criterion, related to the consequences of post-ingestive effects. Indeed, food rejection can be based not only on sensory and cognitive repulsion, but also on a series of mechanisms linked to the individual's ability to assess the consequences of food intake. *Long-delay-learning* takes place when a strong indisposition arises after eating a specific food product, even within a few hours delay. That food becomes something to avoid. Nausea is the main symptom generating repulsion, whereas symptoms such as diarrhoea or respiratory disorders do not lead to such a drastic change of tastes. This category of acceptance recalls conditional learning. During their lives, animals and humans learn early to associate particular foods and tastes with particular consequences following their ingestion. For instance, if we eat a vanilla-flavoured food product that we really like, but soon afterwards experience nausea, even if it is not linked to the healthiness and quality of the product, the next time we will not be particularly attracted by it. The association between nausea and the flavour causing it could derive from an evolution strategy, enabling the survival of the species.

5. From mother-food to food within the family

When considering the influence of the family in children's approach to food, attention should be paid to the relation between children and their mothers during the first phases of life, and to the role of the family as a food educator, given that food habits are mainly shaped by the family context. The main processes through which the family educates its members to food preferences are: modelling, strengthening, restriction, and familiarization to stimuli. They take place and interact in every family and relational context. A positive experience of a context can play a significant role in the creation of a preference for a particular food product: the pleasure felt in a contextual or symbolic situation can then be more or less consciously associated with that food, affecting its hedonic assessment (Mac Leod, 1993). For example, if one get used to eat a particular food in a specific and joyful context, it is likely to have a willingness to appreciate that kind of food in different contexts.

6. Food cognition

Eating cannot be reduced to the mere satisfaction of a biological need, because it is cognitively processed. Therefore, it is worth analyzing the cognitive aspects of the relation between man and food in order to improve our understanding of the mechanisms underlying the hedonic assessment of food. The aim is to collect useful information to better organize food education programs for young people.

Cognitive psychologists study how individuals perceive, learn, remember and think. The term "cognition" usually refers to the functions enabling individuals to collect information related to their environment and then to store, analyze, assess, change, and use it to interact with the surrounding world.

If individuals are considered as thinking beings on the basis of the cognitive functions that enable them to use the collected information to change their behaviour, cognition will be fundamental to define food behaviour patterns even in the creation of food preferences. To this end, we now turn to the processes of perception and mental representation.

Perception enables us to gain direct knowledge of our surrounding reality. Through its activity, the numerous stimuli coming from sense organs, connected to the cerebral cortex, originate a limited number of perceptions, more or less clear with respect to an undifferentiated background. The consequent mental representation is useful to "keep in mind" situations and stimuli that have already been perceived. It is worth underlying that mental representation takes place gradually and through learning. The role of perception and mental representation is greater when comprehension is not achieved by summing fragmentary activities, but by grasping the essential relations and the meaning of the situation (Carlson, 2002).

It is therefore worth considering cognition with respect to the processing of information coming from our sense organs when we eat and how it is mentally represented. Food can be very stimulating for the brain. As will be shown later, when individuals are about to eat, all their sensory receptors are working. Sensory perception sends useful information to categorize and recognize what we eat. Our brain creates mental representations and associates them with food pleasantness or unpleasantness. It leads to assessments that will justify, at best, our food preferences, and at worst, our prejudices and food rejections. For example, if one get used to eat a particular food in a specific and joyful context, this will predispose to a certain amount of willingness for appreciating that kind of food in other contexts.

7. Food in all senses

Senses mediate at the cognitive level the individual reality of each human being. The prevailing forms of communication in our culture lead us to favour sight and hearing, overshadowing the other senses (De Martino, 2006). It impoverishes the processing of the surrounding world, losing the habit to "sense", which can limit the development of our cognitive abilities (Bear, Connors & Paradiso, 2005).

Each sense organ is highly specialized because it has particular cells, the sensory receptors, which react to physical and chemical stimuli. Although the experience of food is usually associated with the mouth and the tongue is considered the main organ of taste, the perception of food actually derives from a plurality of stimuli, through multisensory activation: sight, taste, smell, touch, hearing - we use all our senses to decipher the surrounding world and to classify and recognize food experiences as well. Our perception is almost always multisensory; we rarely analyze the stimuli perceived by individual senses separately. Stimuli conveyed by the senses are then transformed into sensations in the cerebral cortex and they tend to interact within our mind. For instance, the visual perception of a particular colour of a food product influences its taste perception (Zampini, Wantlin, Phillip, Spence, 2008; Zellner, Whitten, 1999; Grossenbacher, 2001).

In the perception of taste, smell plays a preponderant role through the retro-nasal olfactory sensations (Faurion, 2006). However, this does not have to overshadow the importance of the other sensory modalities with which food is experienced and the general sensation derived.

When we eat, the food molecules stimulate the olfactory cells of the nose, the papillae of the mouth, the pain receptors (for example, for spicy food), as well as mechanoreceptors and thermoreceptors. How do these different perceptions interact to create the synthetic notion of "taste"? In the 1980s, researchers started to understand that sensory information created in the mouth during tasting becomes a conscious representation of the object tasted. The representation takes shape through different steps. It starts at an entirely innate level, genetically programmed and unchangeable through life, constituted by various and numerous protein receptors making up our sensory cells. It then changes as it passes through five or six layers of neurons, regularly overlapped, the last two or three of which are the material support of our conscious representations. The taste of food, as conveyed by the senses, is recorded in our mind as a multisensory image; each *pixel* is a neuron connected to different sensory pathways (Faurion, Kobayakawa & Cerf-Ducastel, 2005; Mac Leod & Politzer, 2004).).

Recent findings in neuroscience on the understanding of taste-perception have radically changed our knowledge of taste-pleasure. Indeed, according to the theory prevailing until the middle of the 20th century, food pleasure came directly from the features of the tasted food: when eating, individuals blamed food for the sensations of pleasure or the lack of it. In other words, food had "good" or "bad" taste within itself. Neurophysiology radically challenges that concept: the sensory image received by the brain only conveys quantitative and qualitative information, without hedonic connotations. If we like a particular type of food product, it is actually because its sensory image is associated with pleasure in our memory. The mechanism of this cognitive association is not always conscious. If we are happy to eat a food product for an indirect reason, owing to a particular context for example, we will probably never be aware of it (Mac Leod, 1993).

8. Sensory responsiveness and genes

A recent study on sensory responsiveness reported that the equipment of sensory receptors is not identical in all individuals.

Sensory receptors can process information coming from outside. The same sensory stimulus can be perceived with different intensity and can also convey qualitatively different perceptions. In this case, it is not an error of perception, but a different way in which sensory receptors perceive molecules. The conscious multisensory image, representing external objects, derives from one or more mosaics of genetically programmed receptors.

Furthermore, there are differences between photoreceptor, mechanoreceptor and thermoreceptor systems on the one hand, and the chemoreceptor system on the other. As far as physical stimuli are concerned, receptors are homogeneous and their topography of activation depends only on the morphology of the stimulus; therefore, all individuals can easily identify themselves with the average observer. On the contrary, as far as chemical stimuli are concerned, receptors are incredibly varied, counting hundreds of varieties, even thousands if we consider their important genetic polymorphism (Froloff, Faurion & Mac Leod, 1996; Fast *et al.*, 2002 as cited in Froloff, Faurion & Mac Leod, 1996); Bachmanov & Beauchamp, 2007). Analysis of recognition and sensory thresholds demonstrates that interindividual differences are the rule and not the exception. Magnetic resonance images of a brain exposed to visual, auditory, olfactory and gustatory stimuli illustrate how quantity, intensity and quality of gustatory and olfactory stimuli differ from one individual to the other, and much more so than visual and auditory stimuli. This means that individuals see and hear in a similar way, but they perceive smells and tastes in a very personalized fashion (Mac Leod & Politzer, 2004).

Within the research on taste variability, Bartoshuk's studies confirmed that different perceptions among individuals have biological/anatomic reasons. Those who have higher than average taste sensitivity are called *supertasters*, a name that has been used even outside the scientific field (Bartoshuk, 1991, 2000).

As far as children's taste is concerned, the studies carried out by Chiva (1985) and Faurion (1982) attempted to verify the variability of children's perception of saccharose. According to Chiva, the perception of taste thresholds in a 6-month-old infant is manifold. The reaction thresholds, i.e., according to the gusto-facial reflex, the facial expressions of newborns are varied and permit to assess that intensity and quality of perception are different from individual to individual. Indeed, there are newborns who react to a certain amount of sugary concentrations, and others needing ten times higher concentrations to have significant responses on their faces.

Faurion's (1982) research demonstrated how increasing concentrations of saccharose diluted in water are perceived very differently: there are those who perceive it at low levels (0.2 g/l), and those at levels seven times higher (1.4 g/l). Hypersensitivity or hyposensitivity to saccharose could then explain specific food behaviour patterns, such as individuals who prefer sweetening more than others. For instance, "standard" yogurt (with about 12% sugar) will be considered too sugary or low sugared by some consumers.

The picture of interindividual differences is further complicated if, in addition to perceptive intensity, the changeability of perceptive quality is also taken into consideration, i.e., the experience of the perceived taste or smell. Indeed, it seems that certain flavours are universally identified in a similar way (for example, sodium chloride and saccharose), whereas others are not. Aspartame, for instance, is perceived as both sweet and bitter. Methyl-D-mannopyranoside is perceived as sugary by a third of individuals, bitter by another third, and sometimes sugary and sometimes bitter by the last third (Mac Leod & Politzer, 2004).

Research is now focusing on the perception of bitterish taste, which provokes contrasting reactions. Indeed, there are those who think it is palatable while others who will avoid it at any cost. The explanation could be found in the presence or absence of the gene called hTAS2R38 (Bufe *et al.*, 2005). The genetic influence of bitter-taste sensitivity could sometimes also depend on age: among individuals with the same particular genotype, children seem to be more sensitive to bitter than adults (Mennella *et al.*, 2005).

9. How to propose food education at school

Collectively, these considerations should lead to reflecting and wondering on the most efficient approach to deal with food education at school. Food education needs a multifactorial approach, combining both psychological and nutrition perspectives. The basic assumption is that food education can be done, but it has to be done through a plurality of actions: conscious use of sense organs through "sensory literacy", interruption of cognitive schemes inhibiting the tasting of novel foods, overcoming of prejudices, pleasure of discovery and play, kneading raw materials, convivial experiences, awareness of the wellbeing from physical activity, and games played in the garden.

9.1. Sensory literacy

It is worth recalling that, beyond being the satisfaction of a physiological need, eating is first of all a sensory experience. This kind of learning is proposed through "sensory literacy", aiming at decoding and becoming aware of the multiple pieces of information coming from sense organs and of the pleasure they stimulate (Nistri, 1998).

"Sensory literacy" entails all the processes that enable young people to knowingly and effectively use their senses, as instruments to understand reality. By putting the body at the core of knowledge acquisition processes, sensory literacy favours the learning of: correct use of tasting senses, appropriate sensory language and awareness of implicit experiences, contributing to the eradication of devaluating and inhibiting cognitive schemes.

9.2 The words of taste

In lack of the conventional usage of the right words to describe gustative or odorous sensations, individuals often prefer communicating through the emotions and pleasure a particular smell or flavour conveys. The absence of a descriptive vocabulary could be compensated by hedonic terms or non-verbal communication. Indeed, children can be highly influenced by their peers, manifesting a vivid judgment on a food product through grimaces or other expression of rejection.

The exploration of colours, flavours and consistencies originates sensations, which are initially "implicit" and can be translated into verbal labels. They will then be used as a touchstone to decipher other sensations and preferences, enabling the child to define the surrounding world more accurately. For instance, a child eating an ice cream cone receives numerous sensations which the brain analyses and organises: the flavour of the ice cream, its scent, the difference between the creamy consistency of the ice cream and the evanescence of the cream, the different temperatures, the fragrance of the cone, the mental associations stimulated by the perceived smell and aroma. The brain processes all these sensations. Only some of them will receive a linguistic label, because it is difficult to consciously decode the complexity of the experience. In other words, the majority of the sensations we experience remain implicit in our mind. Therefore, without an effort of awareness, forcing us to carefully analyse every single signal our sense organs collect, and without appropriate training with individuals who usually give a name to the sensations conveyed by food, we will not be able to decode and fully enjoy our surrounding world.

9.3. The teaching method to adopt in food education projects at school

To strengthen acquired knowledge, food projects should adopt experiential and inductive teaching methods (Antinucci, 2001). Didactics based on experience, letting children try and act on all the concepts taught, will enable children to easily understand cause-effect relations, helping them to make associations and draw evident conclusions from the particular to the general. This is an enjoyable, entertaining, natural and spontaneous learning method.

However, although it is known that experiential approaches are unlikely to be adopted in a school system where little attention is paid to practices and settings fostering learning, experience has demonstrated that, even under non-ideal conditions, the school can support and promote food education projects aiming at a lasting learning of good and responsible food approaches.

10. Summary of the results of the research project. A concrete example of a food project based on a cognitive-sensory approach and on experiential-inductive methods

We carried out our educational programs at school following three different directions (Gellini & Agostini, 2008; Gellini & Agostini, 2012).

1. Sensory education through cognitive-sensory games.
2. Presentation and tasting of specialities and local products, as well as garden vegetables.
3. Creation and manual work by children in gardens for didactic purposes.

The research compared *pre* with *post* data related to the approach of the target population towards the issue at stake, evaluating the effects of the project. This enabled us to assess the quality profile of the project and the significance of the changes in food behaviour patterns in tested individuals. This analysis was carried out taking into consideration the consumption of foods that are usually less known and appreciated by young people (e.g., vegetables, fruit and fish), and the sensory-cognitive awareness of their own food preferences.

The methodological scheme brought us to the conclusion that food education programs carried out with cognitive-sensory and experiential-inductive approaches contribute to:

1. Increasing willingness to taste novel foods (breaking down the neophobic scheme of thoughts),
2. Weakening cognitive schemes and prejudices precluding the tasting of fruit, vegetables and fish (known to be little appreciated by children),
3. Increasing the ability to make correct multisensory evaluations of food experience,
4. Increasing the ability to justify preferences and rejections on the basis of cognitive-sensory reasoning.

11. Conclusions

We believe that food education at school should aim at the following qualities:

– Systemic: going from the monothematic focus typical of a single approach (e.g., caloric values and nutritional tables typical of the nutrition approach), to the systemic approach, focusing on a wide range of eating implications (psychological-emotional, social, symbolic, cultural, environmental, economic, and so on) and considering the "food issue" the core to define the self-image and the relation between the individual and the world;

– Interdisciplinary: for a sustainable approach, included in a full educational curriculum and not considered as a separated matter to be dealt with only from time to time;

Sensory-cognitive: enhancing the act of tasting from an organoleptic point of view, strengthening sensory awareness, breaking the schemes of prejudices that inhibit tasting novel foods, promoting the hedonic value of food as non-prejudicial cognitive and verbal awareness and the pleasure associated with the context and the relation (conviviality) of eating,;

– Experiential-inductive: to learn functional food habits, students have to try to perform the act of eating correctly; they need to taste food, knead raw materials and raise crops. In doing so, educators can promote behaviour patterns, which when rightly shaped and strengthened, enable children to correct their knowledge and approaches to food;

– Ability to develop critical thinking: aiming at giving young generations the right instruments to consciously make their personal food choices.

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Summary

Individual food preferences are strictly dependent on social, cultural, and cognitive factors. More recently, the relevance of a genetic component in determining taste has been shown as well (Bufe *et al*, 2005). According to Rozin and Fallon (1980), who proposed a cognitive explanation of food preferences, the taxonomy of alimentary preferences is based on sensory and ideational factors and on anticipation of the consequences. The

authors claim that distaste depends on sensory factors, while disgust depends on sensory-ideational ones. Food phobias can often be observed in children (Birch, Zimmerman & Hind, 1980; Pliner & Loewen, 1997). In the present work, we address a number of issues that must be taken into account to promote a conscious eating behaviour in children.