Learning and Individual Differences 27 (2013) 234–240

Contents lists available at ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

'I used to be ashamed'. The influence of an educational program on tribal and non-tribal children's knowledge and valuation of wild food plants

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ARTICLE INFO

Article history:
Received 6 February 2012
Received in revised form 17 September 2012
Accepted 5 March 2013

Keywords:
Educational program
Wild food plants
Children
India
Knowledge
Social stigma

ABSTRACT

This study examines the influence of an extra-curricular educational program on children's knowledge and cultural valuation of wild food plants, which are an important component of their diets. This program aims to reinforce children's traditional knowledge and values around biological resources in Wayanad, India's Western Ghats, encouraging tribal and non-tribal children to learn from each other and from their own communities. Results show that the educational program has enhanced children's ability to identify selected wild food plants. Moreover, strong social stigma related to wild food plant gathering also appears to have been effectively countered, and the program seems to have created more self-confidence among the children about (a) the perceptions of others' social attitudes towards their gathering practices, and (b) the importance of these plants as part of their diets and cultures.

1. Introduction

Tribal groups and rural non-tribal peoples from Wayanad, a global biodiversity hotspot located in the Western Ghats of India (Kumar, Girigian, & Venugopal, 2003), depend on wild food gathered from forests and agricultural landscapes for their subsistence, where these plants are especially important to tribal communities (Narayanan & Kumar, 2007). Existing on a management continuum from truly wild to cultivated (Harris, 1989), wild food plants are essential sources of nutrients and provide seasonal dietary diversity for many communities across the globe (Bharucha & Pretty, 2010; Etkin, 1994; Heywood, 1999; Ogle, Dao, Mulokozi, & Hambraeus, 2001; Scoones, Melnyk, & Pretty, 1992).

It has been reported, however, that knowledge of wild food plants and their consumption are declining in Wayanad due to on-going modernization processes that are leading to decreasing availability of the resources and changing consumption values. There is growing social stigma in the region around wild food consumption as such species come to be seen as symbols of 'tribalness' or poverty (Narayanan, Swapna, & Kumar, 2004). This is also the case with other parts of the world where the consumption of exotic species and ready-made food have become symbols of modernity or wealth as food systems are delocalized (Kuhnlein & Receveur, 1996). Food is an important component of social status (Counihan, 1998; Wiessner, 1996), where food choices are symbolic and may reveal aspirations for social mobility: 'If one can eat like the group [s/he] aspires towards, [s/he] has a right to identify with that group' (Oths, 2003, citing Bennett, Smith, & Passin, 1942). The consumption of local wild food plant species and other indigenous foods is coming under increasing pressure since these are linked with concepts of social backwardness and poverty (see e.g. Daniggelis, 2003; Malaza, 2003).

Stigma around wild food consumption in Wayanad is reported to be widespread not only due to social discrimination, but also because of India's caste system where tribal people, who largely depend on wild food plants to meet daily nutritional needs, belong to the lowest caste. Although Narayanan, Swapna, and Kumar (2004) documented in depth the wild food plant species consumed by different tribal and non-tribal groups in the region, they did not attempt to provide a comprehensive analysis of the ongoing erosion of biodiversity, traditional knowledge about wild food species, and local cultural values. It was not the aim of the present study to accomplish this either, but the study does focus on children's values and practices on attitudes and practices of children with respect to wild plant gathering and consumption, since the continuity of traditional resource use now relies on this younger generation.

It has been reported for India that formal educational curricula largely ignores the local environmental, social and cultural context

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1041-6080/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.lindif.2013.03.001

(Samiti, Ashram, & Pratisthan, 2002; Singh, 1995), which is certainly the case in Wayanad. Indeed, it has been reported across the world that formal schooling frequently undermines the traditional values and practices of indigenous and local communities (Reyes-García et al., 2010); for example, among indigenous societies in the Pacific Northwest of North America (Turner, 2003), among Arawakan communities in the Venezuelan Amazonia (Hoffmann, 2003), and among Luo people in Western Kenya (Sternberg et al., 2001). For this reason, the Community Agrobiodiversity Centre (CAbC) of the M.S. Swaminathan Research Foundation in 2001 began to implement an extra-curricular educational program called 'Every Child a Scientist' (ECS), which seeks to foster scientific enquiry and sensitize and educate tribal and non-tribal children in Wayanad about the value of natural resources, providing an alternative to formal education (CAbC, 2002). Group interaction is promoted between children from different backgrounds (e.g. tribal, non-tribal rural, and non-tribal urban) in activities including music and theater, plant specimen collection, gardening, and visits to wildlife sanctuaries on weekends and during holidays. It has been argued (Reyes-García et al., 2010) that such 'contextualized schooling' not only improves local environmental knowledge and school performance among children, but also can counteract the loss of traditional knowledge and bio-cultural heritage.

The general objective of this study was thus to contribute to the understanding of the role of contextualized schooling in reducing the loss of traditional botanical knowledge and the erosion of associated local cultural values. Specifically, this research was designed to focus on the impacts of the ECS educational program on children's knowledge of wild food plant species (where their ability to identify such species served as a proxy), and their cultural valuation of wild food plants (where their actual gathering practices and their perceptions of others, attitudes toward such practices served as proxies). Knowledge and values are not independent variables: children's attitudes towards wild food plants are not only related to the values they associate with this resource, but also to their knowledge about them. The hypothesis that is examined here is that children who participated in the ECS are more knowledgeable about wild food plants and are less affected by the social stigma related to these plants and their associated practices compared with children who did not participate. Children who participated in the program were thus compared with others who did not. Inter-cultural differences may also influence knowledge, perceptions, and values, especially where a caste system is in place, and it has been widely acknowledged that sex and age are relevant when referring to plant resources (Cruz-Garcia & Ertug, in press; Howard, 2003). Therefore, it was further hypothesized that there would be inter-cultural differences in knowledge and values among the three socio-cultural groups involved (Paniya and Kuruma tribes and non-tribals), and by age and sex, so these sub-groups were also compared and analyzed to determine whether these affected the outcomes. To date, there have been very few attempts to carry out research of this kind and even fewer attempts to do so with children. This is certainly necessary because children's 'views, values and visions reflect broader social contexts' (Grodzins, 2002: 276) and because children are the knowledge bearers and resource users of the future.

In order to research local knowledge, perceptions, and values in relation to wild plant foods, it was necessary to first determine how to translate the term 'wild food plants' into the local language. Menendez-Baceta, Aceituno-Mata, Tardío, Reyes-García, and Pardo-de-Santayana (2012), for example, found no concept (emic domain) for 'wild food plants' among locals in Gorbeialdea, Basque country, Spain. In contrast, Price (1997) documented the existence of such an emic domain in the local *Isaan* dialect in Northeast Thailand. Children from different cultural and linguistic groups are certain to have different understandings of this concept (e.g. what do the terms 'wild', 'food', and 'plants' mean), which causes them to identify different groups of species from different locations (Martin, 2004). This emic concept also influences and is affected by the values, or 'conceptions of the desirable' (Kluckhohn cited in Graeber, 2001: 3) that children associate with wild food plants, as well as their perceptions of others' attitudes towards wild food plant gathering and consumption.

The indicator chosen to reflect children's knowledge about wild food plants was their ability to identify selected scientifically identified, local wild food plant species from photographs. Children were also asked whether they gather wild food plants for consumption at home and/or on the spot (e.g. on the way to school), and were queried about their perceptions of other's attitudes towards their gathering practices. Researching children's gathering practices presents a concrete means to understand their knowledge, perceptions, and values, where gathering represents not only potential knowledge transmission events or occasions when knowledge is in action, but also concrete public events around which values and attitudes are expressed.

2. Methods

2.1. Study site

Wayanad District is located in the Western Ghats, northeast of Kerala State, India (Fig. 1). This District, which lays between 700 and 2100 m above sea level, offers multiple habitats hosting a great diversity of flora and fauna with a high rate of endemism (Narayanan & Kumar, 2007) thus constituting an important biodiversity hotspot (Nayar, 1996). Fifty five percent of the area of Wayanad is for agriculture and 37% is forested (Josephat, 1997). Wayanad has a high diversity of ethnic groups, where tribal groups constitute 17% of the population (Josephat, 1997). Wild foods, consisting of plants, mushrooms, crabs, fish, and snails, among others, are an important component of tribal diets, and are gathered from paddy rice fields, canals, roadsides, plantations, home gardens, and forests. The edible parts of wild food plants include leaves that are consumed as vegetables, fruits, tubers, roots, seeds, nuts, and flowers. Some wild food plant species are eaten frequently, whereas others are only consumed during times of food scarcity and lean seasons. For an inventory of wild food species consumed by tribal people (including Paniya and Kuruma communities) and non-tribal people, see Narayanan et al. (2004).

This study relates to the Paniya and Kuruma tribes, which are two of the five major tribal groups in the region (Kumar et al., 2003), and non-tribal rural communities. The Paniya constitute 46% of the tribal population in Wayanad District and the Kuruma 15%. The Paniya are landless people who economically depend on wage labor in paddy rice fields and other agricultural activities, whereas the Kuruma own land and cultivate mainly rice (Narayanan & Kumar, 2007). Among tribal groups, the Paniya are the most dependent on wild food plants (Narayanan et al., 2004).

Non-tribal people, who are better off economically, are able to purchase more food and depend to a lesser extent on wild food plants. The non-tribal children who attend the ECS all attended public schools, so no children (including those who did not attend the ECS) whose parents could afford to pay for private schools were included in the study.

2.2. Data collection and analysis

Qualitative and quantitative methods were employed over a four-month field research period (July to October 2004). Data collection methods included focus group discussions, semi-structured interviews, and photo identification of selected wild food plant species.

Data were collected from children aged nine to 14 years old because, from a local perspective, teenagers older than 14 years are considered as adults. Ruddle (1993) also asserted that teenagers of this age and older have completed their basic 'training' regarding knowledge procurement about natural vegetation. All of those who participated in the study did so freely. The researchers also obtained consent

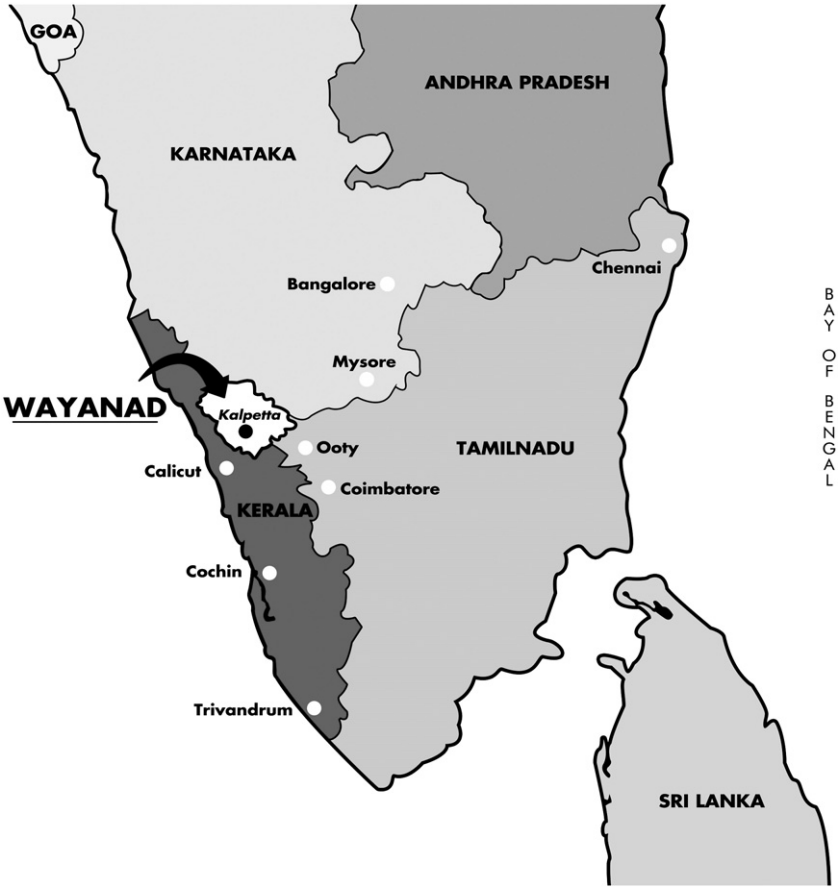

Fig. 1. Map indicating the location of the study site in Wayanad, India.

from the children's parents for their children's participation in the study whenever the parents could be contacted.

Focus groups were conducted with 31 children from the three socio-cultural groups, including both boys and girls varying in age. Fifteen children were ECS participants and 16 were not. Although tribal groups have their own dialects, focus groups were carried out in Malayalam, the official state language because it is spoken by all socio-cultural groups.

Semi-structured interviews were conducted with a total research population of 67 children (Table 1). Fifteen children were ECS participants and 52 children were not. All children aged between nine and 14 who participated in the ECS were interviewed. Children not participating in the ECS were selected as follows. First, a convenience sample was taken of tribal colonies and non-tribal villages in Wayanad while attempting to achieve a balanced number of villages from each socio-cultural group (Paniya, Kuruma and non-tribals), which resulted in the selection of seven tribal colonies and five non-tribal villages. All of the children from these locations were invited to come to the CAbC and participate in different group activities, including interviews and photo identification of wild food plants. However, not all attended, and such self-selection may have introduced bias to the sample. Children were interviewed at the CAbC and not at home because it was not possible to obtain individual interviews with them without their mothers intervening and influencing the outcomes. It was also not possible to interview children at school because this would have biased the sample, given that some children did not attend school or did so only infrequently. Interviewing children at the CAbC may also have introduced bias because they were not in the same context where they carry out their daily activities.

Individual interviews consisted of closed-ended and open-ended questions with most sensitive questions reserved for the end of the interview. Questionnaire pre-tests were carried out only with children who did not participate in the research and, from these, it was found that the best way to approach people from a specific socio-cultural group was to use interviewers from that same group, which apparently led to greater validity. Therefore, teenagers (15 years or older) participating in the ECS were trained to interview children belonging to

Table 1
Description of the sample of children (n = 67).

	Number of children:
Participation in the ECS:	
Participated in the ECS	15
Didn't participate in the ECS	52
Socio-cultural group:	
Paniya	22
Kuruma	26
Non-tribal	19
Sex:	
Female	42
Male	25
Age group:	
9–11 years	29
12–14 years	38

their own socio-cultural group. Interviews were conducted in either Malayalam, or in the Paniya or Kuruma dialect.

To assess children's knowledge of wild food plants, a photo identification exercise was conducted with all of the children that participated in the study, using a sample of 41 selected wild food plants drawn from previous botanical research conducted in this area by Narayanan et al. (2004) (Table 2). This previous research had identified vernacular names of these plants for each of the tribes and non-tribal rural groups in Wayanad. This test measured children's ability to provide a 'correct' vernacular name for those plants that they could identify when exposed to photos of their edible parts (leaf, tuber and/or fruit). Although children were expected to provide the vernacular name of a species given by their own socio-cultural group, the use of vernacular names used by another socio-cultural group was also accepted as a correct answer. All of those plants that children could not identify or for which incorrect names were given (incorrect for all socio-cultural groups) were considered as incorrect answers.

Results from interviews and photo identification exercises were analyzed according to participation in the ECS, tribal/non-tribal identity, sex, and age. In order to facilitate the analysis, children were classified into two age groups (9–11 years and 12–14 years). Statistical analysis was done with SPSS 12.0.1 and consisted of: (a) descriptive statistics (means and standard deviations) to compare children's answers with respect to their participation/non-participation in the ECS, socio-cultural group, sex and age; and (b) the use of the Chi^2 non-parametric test to analyze the influence of the ECS on children's perceptions of others' attitudes towards wild food plant gathering.

Table 2
List of selected wild food plant species including transliteration of vernacular names.

Scientific name	English transliteration of vernacular name
Adenia hondala (Gaertn.) W.J.de Wilde	Kumbichappu
Alternanthera sessilis Lem.	Ponnamkanny
Amaranthus spinosus L.	Mullancheera
Amaranthus viridis L.	Kuppacheera
Arenga wightii Griff	Njettipana
Baccaurea courtallensis Müll. Arg.	Mootipazham
Bacopa monnieri (L.) Pennell	Brahmichappu
Bidens biternata (Lour.) Merr. & Sherff	Alamchappu
Cassia tora L.	Thakara
Centella asiatica Urb.	Muthilila
Cissus repens Lam.	Marumachappu
Cleome viscosa L.	Naikkadugu
Colocasia esculenta (L.) Schott	Thalu
Costus speciosus (J. Koenig) Sm.	Unnithandu
Cryptocoryne retrospiralis Kunth	Panchithalu
Cyathula prostrata Blume	Cherukadaladi
Cycas circinalis L.	Eenthukaya
Dioscorea belophylla Voigt	Hekku
Dioscorea kalkapershadii Prain & Burkill	Nara
Dioscorea oppositifolia L.	Kavalakizhangu
Dioscorea pentaphylla L.	Noora
Dioscorea wallichii Hook.f.	Narra
Dioscorea wightii Hook.f.	Erakalasu
Diplazium esculentum (Retz.) Sw.	Churuli
Diplocyclos palmatus (L.) C. Jeffrey	Kuriyankaya
Euphorbia hirta L.	Palcheera
Flacourtia indica (Burm.f.) Merr.	Chaliru
Hygrophila erecta (Burm.f.) Hochr.	Kozhimullan
Lycianthes laevis (Dunal) Bitter	Kattumudunga
Momordica subangulata Blume	Kattukaipaka
Monochoria vaginalis C. Presl	Karinkoovalam
Mukia maderaspatana (L.) M. Roem.	Mukkapeera
Passiflora calcarata Mast.	Kattuthakkali
Physalis minima L.	Mottampuli
Polygonum glabrum Willd.	Chorkam
Portulaca oleracea L.	Kozuppacheera
Solanum nigrum L.	Mudanga
Sterculia villosa Roxb.	Kalanthatta
Trianthema portulacastrum L.	Sambarcheera
Vigna vexillata (L.) A. Rich.	Kattupayar
Waltheria indica L.	Maracheera

3. Results and discussion

3.1. Emic concepts of wild food plants

The Malayalam language has no precise word or phrase corresponding explicitly to the etic domain 'wild food plant'. It is possible to say 'wild plant' (*kattujadichedi*, where *kattu* is adjective for *kadu*), but the term *kadu* means both 'wild' and 'forest', depending on the context. A single word for 'wild' does not exist. Although people relate the forest with wilderness, these species are also collected from human managed areas such as paddy fields, ponds, marshes, and home gardens. The word 'food' is *bhakshanam*, but no semantic distinction is made between 'wild food' and other kinds of food. The main distinction appears to be between 'home-made food' (*veetiludebhakshanam*) and non-home-made, or 'outside food' (*puramebhakshanam*). Wild food plants could belong to either or both categories, depending on the groups of people in reference. The most remarkable evidence of this can be seen in the list of definitions that the children provided, where all definitions refer to the word 'food', but neither 'wild' nor 'plant' were terms that were always included (Table 3).

Especially tribal children did not clearly differentiate between wild food plants and other food items. Some of the tribal children that participated in the ECS said that, before they joined the program, they never thought about the concept of 'wild foods'. These foods were something normal, quotidian, and not a special component of their diet but a major part of it. They did not know that the opposite (non-wild food plants) exists as a food category for other groups of people. Perhaps the statement that best captures the indivisibility of wild food plants and food *per se* for some tribal children was, 'It is mother food. It is the basis of all food. It is a completely natural food.' During focus group discussions, it also became apparent that many children conceptualized wild food plants as 'healthy food' and 'food

Table 3
Children's emic conceptualizations of wild food plants. Data obtained in focus group discussions conducted with 31 children.

Wild food plant definitions	English transliteration of Malayalam term
In relation to value characteristics	
Poor people's food	*Paavangalude bhakshanam*
Mother food	*Mathre bakshanam*
Economical food; food from nature that is free	*Kashilla bhakshanam, pannachilavillyathe prakrithiyillninum lambhikuna bhakshanam*
Publically available food	*Pothujana bhakshanam*
Food obtained independently [e.g. of markets]	*Swathanthra bhakshanam*
Natural food	*Prakrithi othamaaya bhakshanam*
Food produced without the use of manure	*Vallaprayoganillyathe bhakshanam*
Healthy food	*Aarokya bhakshanam*
Food of great medicinal value	*Oushada gunamulla bakshanam*
sweet food	*Madura bhakshanam*
In relation to habitat	
Coastal/shoreline foods	*Theerapradesha bhakshanam*
Food from paddy fields	*Vayallile bhakshanam*
Food from forests	*Kathillula bhakshanam*
Food from the environment	*Chuttum kittavunna bhakshanam*
In relation to tribal group	
Tribal food	*Adivasikallude bhakshanam*
Food of the Kattunaikka[1] tribe	*Kattunaikka adivasikallude bhakshanam*
Unknown food[2]	*Ariyapedatha bhakshanam*

[1] Kattunaikka is another tribal group present in the study region.
[2] Definition provided by non-tribal children referring to tribal food.

of great medicinal value' (Table 3). On the other hand, non-tribal children referred to wild food plants as 'tribal food,' 'poor people's food,' and 'food that isn't known to me,' emphasizing the contrast with tribal children. This shows that differences in social identities and practices are indeed embedded in the emic concept of the domain. However, Malayalam folk taxonomy does distinguish between the edible parts of the species, and the Malayalam terms *kattu-chappu/ela*, *kattu-kizhangu* and *kattu-pazham* mean 'wild greens,' 'wild tubers,' and 'wild fruits,' respectively. These terms were then used to communicate with the interviewees during focus group discussions.

3.2. Ability to identify selected wild food plant species

It is remarkable that children who participated in the ECS identified twice as many plant species (mean = 15.7, SD = 4.9) as children who did not participate in the educational program (mean = 7.8, SD = 2.4). Moreover, it is notable that children who participated in the ECS presented higher values for the maximum number of wild food plants identified. Likewise, children who did not participate in the ECS, especially non-tribals, presented lower values for the minimum number of identified species (only two plants identified). This confirms what has been found in other world regions, that locally contextualized educational program curricula promote local knowledge acquisition. For example, Ruiz-Mallén, Barraza, Bodenhorn, and Reyes-García (2009), who conducted research in Mexico, observed that indigenous students who participated in Ixtlan's community-based environmental education program had greater local ecological knowledge than those indigenous students that did not participate.

Although the ECS program has largely enhanced children's ability to identify selected locally important species, there is substantial variance in the responses obtained from the identification test (SD = 4.9). Certainly there are other factors that might also affect children's motivation to learn, such as formal school education and family's knowledge of and interest in plants (Wyndham, 2010), which could partially explain this variability. Moreover, not all socio-cultural groups consume wild food plant species with the same frequency (Narayanan et al., 2004), which certainly affects the results. Therefore, low identification scores, especially evident among non-tribal children, cannot be seen exclusively as a consequence of knowledge erosion, but rather is likely to be attributable to lower consumption of wild plant foods at home.

Non-tribal children presented the greatest variability in their capacity to identify wild food plants from photographs. Non-tribal children who participated in the ECS identified a maximum of 27 wild food plants (mean = 17.4, SD = 5.9), whereas those who did not participate identified a maximum of nine species (mean = 6.6, SD = 2.0) (Table 4). It is notable, however, that non-tribal children who participated in the program were motivated to learn from their tribal peers, which was also reflected in a major decrease in social stigma that they previously associated with gathering practices (see below). Likewise, a previous study in the same region found that non-tribal children who participated in this educational program could identify more wild food plants than their mothers (Cruz-Garcia, 2006), thus ratifying that they acquired the majority of their knowledge from interaction with their peers. Kuruma children who did not participate in the program could identify more plants (mean = 8.7, SD = 2.7) than the other non-participants, followed by the Paniya (mean = 7.6, SD = 2.0), and then by the non-tribal children. This was contrary to the expectation that Paniya children would identify more species, given that their tribesmen are renowned as 'wild food plant eaters' (Narayanan & Kumar, 2007).

Regardless of participation in the educational program, on average girls identified slightly more species (mean = 9.6) than boys (mean = 9.4). Across the globe, the majority of plant gatherers are women, and women's extensive knowledge and management of plants is often related to the domestic sphere, including food production and preparation, home gardening, herbal medicines, fuel, and fiber production (Howard, 2003). Thus, it is also likely that girls know more about wild food plants than boys, as was reported, for example, in Northeast Thailand (Setalaphruk & Price, 2007). In Wayanad, Paniya girls wear traditional aprons that are designed to carry collected wild food items and that are worn over modern dresses (Narayanan & Kumar, 2007). Girls mainly collect from the village surroundings since their parents do not always allow them to go into the forests alone due to concerns for their security, which may explain why the highest number of species recognized was presented by the boys that participated in the ECS. These boys' scores, however, showed higher variability (SD = 6.7) compared with girls who participated (SD = 2.8) (Table 5).

It was surprising that the younger children (9–11 years) who participated in the ECS could, on average, identify more species (mean = 16.3, SD = 2.1) than the older children (12–14 years) who participated (mean = 15.5, SD = 5.4). Older children presented a higher maximum number of identified species and higher variability in their responses. It is likely that the more meaningful results correspond to the children that did not participate in the program, where the expected occurred: the older the child, the more wild food plants they were able to identify, although the difference was minimal (Table 6), indicating that knowledge about wild food plants is acquired relatively early in life.

3.3. Knowledge in practice: plant gathering

Although all of the children said that they ate wild food plants, 75% reported that they gathered these plants for home consumption. Not all wild food plant collection was associated with home consumption, because much gathering occurred for consumption on the spot, or 'snacking'. Sixty eight percent of children said that they collected these plants on the way to school. Collection on the spot constitutes an important channel of knowledge transmission in this region, where it has been documented that 41% of children learn about wild food plants from their friends (Cruz-Garcia, 2006). Peer interaction was also highlighted by Rogoff (1981), who found that, in highland Guatemala, children's interaction with adults decreases as they become involved in activities with children of the same age.

Children who collected wild food plants (either for home consumption, on the spot, or both) identified more species, presenting a mean of

Table 4
Identification of 41 selected wild food plant species according to participation in ECS educational program and socio-cultural group (Paniya, Kuruma and non-tribal) (n = 67).

	Socio-cultural group	Mean	SD	N
Participated in ECS	Paniya	16.5	3.4	4
	Kuruma	13.7	4.9	6
	Non-tribal	17.4	5.9	5
Didn't participate in ECS	Paniya	7.6	2.0	18
	Kuruma	8.7	2.7	20
	Non-tribal	6.6	2.0	14
Total	Paniya	9.2	4.2	22
	Kuruma	9.9	3.9	26
	Non-tribal	9.5	5.8	19

Table 5
Identification of 41 selected wild food plant species according to participation in ECS educational program and sex (n = 67).

	Sex	Mean	SD	N
Participated in ECS	Female	16.4	2.8	8
	Male	14.9	6.7	7
Didn't participate in ECS	Female	8.0	2.6	34
	Male	7.2	1.9	18
Total	Female	9.6	4.2	42
	Male	9.4	5.1	25

Table 6
Identification of 41 selected wild food plant species according to participation in ECS educational program and age group (n = 67).

	Age group	Mean	SD	N
Participated in ECS	9–11 years	16.3	2.1	3
	12–14 years	15.5	5.4	12
Didn't participate in ECS	9–11 years	7.6	2.0	26
	12–14 years	7.9	2.8	26
Total	9–11 years	8.5	3.4	29
	12–14 years	10.3	5.2	38

10.6 identified plants (SD 5.16), whereas those who did not collect had a mean of 7.4 (SD 2.95). This clearly shows that knowledge and practice are intrinsically related; knowledge is, to a large extent, acquired or reinforced through practice. As Reyes-García et al. (2010) asserted, a contextualized learning curricula should stimulate children to acquire knowledge through the establishment of a direct link between theory and practice, which is certainly the case with the ECS program. Participation in the ECS appears to have had an effect on wild food plant collection for home consumption: 79% of the children who participated in the program said that they collect these plants, compared with 72% of the children that did not participate. Likewise, 72% of children who participated in the ECS collected wild food plants on the way to school compared with 67% of children that did not participate (67%). As expected, more tribal than non-tribal children collected these plants for home consumption and on the way to school.

It appears that older children collected for home consumption less than younger children (71% and 79% respectively) and also collected less on the way to school (61% and 77%, respectively). Older children said that, because of the demands of schooling, they did not have time to collect plants. Moreover, while primary schools are closer to the colonies or villages, secondary schools and colleges are further away in larger towns, thus older children usually have to travel by bus, decreasing the possibility to collect on the spot. A previous study in this region mentioned that almost half of all mothers gathered wild food plants alone because their children did not have the time to go with them due to school attendance (Cruz-Garcia, 2006). Apparently, as seen among indigenous peoples in different parts of the world, formal schooling weakens this essential channel of traditional knowledge transmission (Hoffmann, 2003; Reyes-García et al., 2010; Sternberg et al., 2001; Turner, 2003).

Regarding children's perceptions of other's attitudes toward wild food plant collection, it is notable that 77% of the children who participated in the ECS and who gathered wild food plants did not have any problem with others observing them while gathering these plants, whereas more than half (54%) of the children who did not participate in the educational program disliked it. After analyzing the results using the Chi^2 non-parametric test, it was shown that this difference is significant at the 0.05 level, meaning that the ECS had a significant influence on children's perceptions of others' attitudes towards wild food plant collection and hence a positive effect on their own attitudes. The children who disliked it if others observed them gathering wild food plants repeatedly said that they felt 'ashamed' when they were observed because these plants are considered as, e.g. 'low caste food'. Moreover, they said that non-tribal people scolded, insulted, or otherwise made fun of them if they were observed collecting such plants. It was thus clear from the children's explanations that social stigma associated with wild food plant collection was the major reason that children disliked being observed while gathering and, as mentioned earlier, stigmatization of wild food plants is related to social identities and others' attitudes towards such identities and is embedded in the emic concept of the domain 'wild food plants'.

Participation in the educational program especially increased confidence about wild food plant gathering among tribal children. All of the Paniya children and 89% of the Kuruma children that participated had no problem with other people observing them while gathering, whereas 77% of Paniya and 53% of Kuruma children who did not participate in the program disliked it. The difference in confidence among tribal children is quite important given their high dependence on these plants for their food security and nutritional diversity (Narayanan & Kumar, 2007). There were significant differences, however, according to sex. More than half of the girls (44%) who participated in the ECS did not like to be observed by outsiders when collecting wild food plants, whereas no boys reported having problems with this. The effect of participation in the program was strong for both girls and boys, but especially for boys: 63% of girls who did not participate dislike being seen, in comparison with 41% of boys. More younger children who participated in the ECS disliked being seen collecting these species (67%) compared with 14% of older children, which could be explained by the fact that older children had participated in the program for a longer time period, and thus had more time to develop confidence about these practices. The children that participated in the program for at least three years coincided in the fact that they used to feel ashamed about being seen by others during wild food plant collection before they joined the ECS, but after participating they felt more confident about their practices.

The following are some of the responses of three tribal children that participated in the educational program when asked to compare their attitudes towards wild food plant collection before and after joining the program. All of these children coincided in that they used to feel ashamed before they joined the ECS but, after participating in the program, they not only felt more confident about their gathering practices, but also were aware of the importance of these plants as part of their diets and cultures.

- Manju (female, 13, Paniya): 'Before I was so ashamed since it is food for poor people, but now I want others also to know about wild food plants.'
- Vijisha (female, 13, Paniya): 'Before joining the ECS, I thought that all people eat the same; then I found out that other people eat different kinds of food and I felt ashamed. Especially when children had to share their food in the group, I felt inferior. But after I learned about the importance of wild food plants and their nutritional value, I think that others are not eating wild food plants because they are ignorant…Other children in my colony feel ashamed of collecting and eating wild food plants, since it makes them feel very inferior…But after attending the ECS, I teach children to value wild food plants. Even more, I am suggesting at school that they should eat *churuli* for lunch, because it is good for their health.'
- Aswathy (female, 11, Paniya): 'I used to feel ashamed to tell them [non-tribal people] that I am eating such foods at home, but now I am less ashamed and I told a man that *thakara* is good for his health.'

4. Conclusions

This study has shown that the Community Agrobiodiversity Center's program 'Every Child a Scientist' (ECS), which is an extra-curricular, locally contextualized educational program that, in opposition to formal schooling, is aimed at sensitizing tribal and non-tribal children in Wayanad about the importance of their local natural resources, has enhanced children's knowledge and positive valuation of wild food plants. This is reflected in the fact that the children who participated identified (in total) twice as many wild food plant species as those who did not participate. Also, more children who participated in the ECS reported that they gathered wild food plants compared with those who did not participate in the program. Moreover, the data compiled in this study indicates that knowledge is increased through practice: those children who gathered wild plant food species could identify more plants than those who did not.

The social stigma observed is embedded in the emic concepts of the domain of wild food plants, where tribal children did not readily distinguish between 'wild' and other food species but non-tribal

children did. It was also strongly reflected in their perceptions of other's social attitudes towards wild food plant gathering practices. Nevertheless, social stigma also appears to have been effectively countered amongst a majority of the children who participated in the program, especially boys and older children. Specifically, the program seems to have created more confidence about the perceptions of others' social attitudes towards wild food collection, and most of the children who participated for the longest in the program felt more confident about their practices.

A major point to note from this study is that the influence of this educational program on children's knowledge and values was both direct and indirect: direct insofar as positive values about wild food plants were explicitly transmitted to children through the curriculum, and indirect insofar as tribal and non-tribal children were not only encouraged to explore the knowledge of their own communities, but were also exposed to each other's values, knowledge, and behavior through constant interaction. Such extra-curricular educational programs are essential in a context where formal schooling neglects or even deprecates indigenous and traditional peoples' local knowledge. It is recommended that such programs be implemented taking into account the values and priorities of the target groups themselves.

Acknowledgements

The study was carried out with the support of the educational program 'Every Child a Scientist' of the Community Agro-Biodiversity Center in Kalpetta (CAbC), Wayanad, of the M. S. Swaminathan Research Foundation, India. We would like to thank Dr. Anil Kumar, Mr. Sajeev, Ms. Archana, and Ms. Vidja, and all others who facilitated the research for their support. We are indebted to the Wayanad children, especially Prasad, Nishal, Nisha, Remya, Anu, Satheesh and Sujesh, who provided support with data collection.

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