Children's Mental Health and Wellbeing and Hands-on Contact with Nature

Perceptions of Principals and Teachers

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Abstract: Research on the health and wellbeing benefits of contact with animals and plants indicates the natural environment may have significant positive psychological and physiological effects on human health and wellbeing. In terms of children, studies have demonstrated that children function better cognitively and emotionally in 'green' environments and have more creative play. In Australia as well as internationally, many schools appear to be incorporating nature-based activities into their curricula, mostly via sustainability education. Although these programs appear to be successful, few have been evaluated, particularly in terms of the potential benefits to health and wellbeing. This paper reports on a pilot survey investigating the mental health benefits of contact with nature for primary school children in Melbourne, Australia. A survey of principals and teachers was conducted in urban primary schools within a 20km radius of Melbourne. As well as gathering data on the types and extent of environmental and other nature-based activities in the sample schools, items addressing the perceptions of principals and teachers of the potential effects of these activities on children's mental health and wellbeing were also included. Despite a lower than expected response rate, some interesting findings emerged. Although preliminary, results indicate that participants' perceptions of the benefits to mental health and wellbeing from participation in hands-on nature-based activities at their school are positive and encompass many aspects of mental health.

Keywords: Nature, Mental Health, Children, Hands-on Contact, Sustainability Education

Introduction

ALTHOUGH ENGAGING CHILDREN in activities involving hands-on contact with nature at school is not new, it appears that never before have these activities occurred in schools in such numbers (Louv, 2005). Despite a lack of research, many schools in Australia and internationally seem to be incorporating 'nature-based' activities into their curricula usually to meet sustainability education, environmental education or science learning objectives (Volk & Cheak, 2003; Hockenberry Meyer et al., 2001; Stoelzle Midden & Chambers, 2000; Rivkin, 1995). However, other reasons cited for the increase in these activities include beautification, habitat restoration, and fostering qualities of stewardship and nurturing in children (Louv, 2005; Robottom et al., 2000; Stoelzle Midden & Chambers, 2000; Coffee, 1998; Moore & Wong, 1997; Rivkin, 1997).

Nature-based activities provide children with direct ('hands-on') experience of nature as well as improving their school grounds by increasing the amount of green space and vegetation through planting (Coffee, 1998; Moore & Wong, 1997; Rivkin, 1995). Although the degree to which nature-based projects infiltrate the school ethos may vary greatly between schools, environmental and sustainability education organisations report that there is an increasing demand for these types of activities (Sharpley & Armstrong, 2005; Maller, unpublished data). The declaration by the United Nations that 2005-2014 is to be the Decade of Education for Sustainable Development (DESD) (UNESCO, 2004) may further influence this trend.

Research has not kept pace with this phenomenon; hence there is little existing data on hands-on nature-based activities in schools, particularly in Australia. Although many nature-based programs may be considered successful according to educational and/or learning criteria, it seems that very few have been evaluated in terms of their health and wellbeing potential. Furthermore, information is lacking on how many schools deliver such activities; the details of the activities themselves; and the perceptions of principals, teachers, and parents as to the potential benefits of these programs, particularly in terms of mental health and wellbeing.

The majority of benefits for human health from contact with the natural environment reported in the literature concern mental health and wellbeing (Seymour, 2003; Maller et al., 2002; Frumkin, 2001; Rohde & Kendle, 1994). Therefore, there is an opportunity to investigate the health-promotion potential of contact with nature from participating in nature-based activities encountered at school on

children's mental health and wellbeing. Specifically, research could examine on-site nature-based activities, such as school gardens and/or those activities run by environmental or sustainability education organisations, where children have the opportunity for experiential learning and to directly engage with the natural environment.

The importance of the potential of contact with nature to promote mental health and wellbeing gains greater significance in the context of the rise in mental illnesses, both in Australia and worldwide, and the high social and financial costs these disorders entail (Browne et al., 2004; Herrman, 2001; McMichael, 2001; Zubrick et al., 2000; Murray & Lopez, 1997). By identifying the potential of hands-on nature-based activities to promote health, many of which may already be incorporated into some schools' curricula, this research may reveal an effective means of improving the mental health and wellbeing of children.

The literature has demonstrated that children's mental health impacts directly on their ability to learn, in that children with poor mental health usually have learning (as well as other) difficulties (Sawyer et al., 2001; Zubrick et al., 2000). By identifying ways to improve mental health and wellbeing at the primary school level, children may be more likely to reach their full potential (both academic and personal), and may also have less chance of developing mental disorders later in adolescent and adult life (Browne et al., 2004; Sawyer et al., 2001; Raphael, 2000; Zubrick et al., 2000).

This paper presents the findings of a pilot survey which was conducted to investigate the potential of hands-on contact with nature to promote the mental health and wellbeing of primary school aged children (aged 5 to 12 years). The survey was conducted to gather data on hands-on nature-based activities in Melbourne primary schools (Australia) and to determine the perceptions of principals and teachers as to the benefits of these activities.

As schools adopt a more integrated approach to education, many activities they deliver do not occur in isolation. This is certainly the case with nature-based activities which occur in schools under the broader sustainability banner (UNESCO, 2002). The majority of activities covered by this research were associated with environmental or sustainability education in schools, hence the study is presented within this context. Although there is currently a state of flux for the preferred term, 'sustainability education' is used here rather than 'environmental education' as it incorporates a more holistic approach. Mental health and wellbeing is defined as the embodiment of social, emotional, and spiritual wellbeing, and not simply the absence of mental illness (VicHealth, 1999).

Method

In order to explore the potential of hands-on nature-based activities to promote the mental health and wellbeing of children, a number of questions need to be addressed. Specifically, data is needed on how many schools have such activities; what they involve; the duration of the activities; and how many children participate. Furthermore, since hands-on nature-based activities in schools are closely linked to sustainability education, data is required on whether sustainability education is incorporated in the schools charter, as this may affect the likelihood of whether they have hands-on nature-based activities. Most importantly, perceptions of principals and teachers at schools with hands-on nature-based activities on the effects of these activities on the mental health and wellbeing of children would be useful in determining their ability to promote children's mental health.

A pilot survey of urban Melbourne primary schools was conducted to identify the extent and types of hands-on nature-based activities, as well as the perceptions of principals and teachers on the potential benefits and outcomes. Although there are a number of ways to administer surveys, a mail survey was considered the best option for this study when compared to other methods.

Objectives

The survey had a number of objectives:

1.To describe the extent and types of hands-on nature-based activities in urban Melbourne primary schools;

2.To determine the amount of contact with nature experienced by children participating in hands-on nature-based activities;

3.To determine the perceptions of principals and/or teachers as to the overall benefits of hands-on nature-based activities, in particular benefits relating to children's mental health and wellbeing.

Questionnaire Design

The questionnaire was designed to incorporate any hands-on nature-based activity schools may have, from formal activities (such as those run by professional environmental or sustainability education organisations) to specific nature-based activities that schools may have implemented themselves (e.g. a school vegetable garden or wetlands). The questionnaire was designed to take approximately 30 minutes to complete and consisted of mostly closed questions, although some open questions were also included. The questionnaire was divided into three parts, Parts A, B, and C. Part A requested general information about the school and determined whether participants' schools had any activities involving hands-

on contact with nature (if in Part A, participants indicated they did not have any of the activities at their school, they did not need to complete Parts B or C). Part B contained mostly closed questions about activities involving hands-on contact with nature (e.g. the type of activity, the frequency of the activity, the target group); however, open questions were included on the objectives of the activities. Part C consisted of a series of closed questions as well as three open questions about the perceived outcomes and benefits from participation in the activities, in particular, the potential effects on mental health and wellbeing. Lastly, a series of twenty behavioural indicators of children's mental health and wellbeing (developed from the literature) that may be affected by taking part in these activities were included for participants to rate using a 5-point Likert scale (from 'Very Positively Affected' to 'Very Negatively Affected').

Pre-Testing

Feedback on the questionnaire was obtained from representatives from the main environmental or sustainability education organisations in Victoria: The Gould League, The Centre for Education and Research in Environmental Strategies (CERES), and The Victorian Environmental Education Association (VAEE) as well as feedback from one primary school teacher.

Sample

Because of the exploratory nature of the research, a purposive nonprobability sample was selected (Creswell, 1998; Morse & Richards, 2002). This was achieved by approaching all schools within the population, but asking only those schools with hands-on nature-based activities to participate in the survey. This way data could be collected from those schools that have both the knowledge and experience of these activities (Creswell, 1998; Spradley, 1979 in Morse & Richards, 2002). The sample was limited to include only those schools within a 20km radius of the Melbourne central business district (Melbourne City).

Data Collection

Survey packs were mailed to principals of all schools in the target population from August to October 2003. This was done on the assumption that the principal would complete the questionnaire, or alternatively pass it on at their discretion to the appropriate staff member. Hence, only one staff member per school was required to complete the questionnaire. To improve the response rate a second mail-out was sent to those schools that had not responded by the end of October, 2003. This was undertaken from November to December, 2003.

Data Analysis

Analysis

Primarily, data were analysed via descriptive statistics using Microsoft Excel. The unit of analysis for the majority of calculations was 'school', however where indicated, for some of the calculations the unit of analysis was 'nature-based activity' (where participants reported that their school had multiple activities, these schools were included in calculations more than once). For the open questions, dominant themes were searched for in the data (inductive content analysis) (Fink, 2003) and any themes and sub themes that emerged were fine-tuned and distilled to a number of categories which were assigned a code. Coding instructions (consisting of a detailed description of each category) were developed to aid the coding process. Since the survey was relatively small, this analysis was performed by hand. All qualitative components of the questionnaire were reviewed by two coders (after Robson, 2002).

Results

Results are presented in relation to the objectives stated at the beginning of this paper. For the open questions a random sample of questionnaires was cross-coded to compare inter-rater agreement. A high level of agreement (0.8) between co-coders was found (Robson, 2002). Due to word-count limitations some of the descriptive results for sustainability education activities (other than hands-on nature-based activities) have not been included here but are available from the authors on request.

Response Rate & Characteristics of Participants

Of the schools contacted (494), 18.2% (n=90) participated and these were distributed evenly within the sampling boundary. Of the individuals who responded to the questionnaire, 63.3% were school principals, 25.5% were teachers, and the remainder were spread across curriculum coordinators, wellbeing coordinators/school psychologists, or environmental coordinators. Of the schools that responded that they did not want to participate (n=57), 22.8% reported that they did not have any activities involving hands-on contact with nature, 26.3% reported that they were too busy to participate, and 50.9% reported that they were unable to complete the questionnaire, with no reason given.

Objective 1: Extent and Types of Hands-on Nature-based Activities in Urban Melbourne Primary Schools

School Policy Infrastructure for Sustainability Education

Nearly 39% of participants reported that sustainability education was incorporated in their school's charter, while almost 58% reported that it was not (Table 1).

The results for participants' responses to the degree to which sustainability education was incorporated into the curriculum are presented in Table 2. While the majority of participants indicated that it was incorporated to a moderate degree (43.3%), nearly 20% considered sustainability education to be incorporated in their school's curriculum to a high degree. However, 26.7% reported that it was incorporated to a low degree.

Table 1: Participants' Opinions on whether or not they have Sustainability Education in the School Charter, and whether or not they have Hands-on nature-based Activities at their School (Unit of Analysis 'School', n=90).

Variable	Yes	No	Not sure
	% (n)	% (n)	% (n)
Sustainability education in school charter	38.9 (35)	57.8 (52)	3.3 (3)
Hands-on Nature-based Activities	66.7 (60)	32.2 (29)	1.1 (1)
Hands-on gardening activities	55.6 (50)	42.2 (38)	2.2 (2)
Hands-on animal activities	38.9 (35)	60.0 (54)	1.1 (1)

Table 2: Participants' Opinion on the Degree to which Sustainability Education is Incorporated into their School's Curriculum (Unit of Analysis 'School', n=90).

Very High Degree	High Degree	Moderate Degree	Low Degree	Very Low Degree
5.6% (5)	18.9% (17)	43.3% (39)	26.7% (24)	5.6% (5)

Hands-on Nature-Based Activities

Of the 90 schools that completed the survey, more than 65% reported that their school had hands-on nature-based activities (Table 1). In terms of specific types of these activities, 55.6% of participants reported that their school had hands-on gardening activities, and 38.9% reported they had hands-on animal activities (Table 1). Of these schools, 41.7% (n=25) had both animal and plant hands-on activities.

Who Participates in Hands-on Nature-based Activities?

Most participants indicated that all year levels (Preparatory Year to Year 6, ages 5 to 12) were involved in their school's hands-on nature-based activities (61.1%). Nine percent responded that only Prep, Year 1 and/or Year 2 were involved in the activities, while 9.0% also responded that only Years 3 and/or 4 participated in the activity, and 4.0% indicated that only Years 5 and/or 6 participated in the activities. The remainder of participants indicated other numerous combinations of year levels were involved in the activities, but these occurred at very low frequencies. The mean number of children who participated each year across all schools was 189 (+ 178 standard deviation).

Objectives of Hands-on Nature-Based Activities

Participants were asked an open-question about the objectives of the activities at their school. Sixty participants described 140 different objectives which were sorted into five broad categories (see Table 3 for category detail). These were: 'Scientific Knowledge'; 'Environmental Awareness'; Connection with Nature; 'Cultivating a Sustainable School Culture'; and 'School Grounds'. This data is presented in Figure 1. The majority of responses related to establishing a 'Connection with Nature' (50.8%), although 'Cultivating a Sustainable School Culture' (26.6%) also scored highly (Figure 1).

Table 3: Codes, Coding Categories and Sub Categories for the Objectives of Hands-on Nature-based Activities as Reported by Participants

Objective Category	Code	Sub Category	Code
Scientific knowledge	SCI	Increase scientific knowledge and skills	SCI Knw
Environmental Awareness	ENV	Increase awareness/appreciation of environmental issues	ENV Awr
		Inspire to take environmental action/educate others	ENV Act
Connection with Nature	NAT	Connect with nature, learn about nature's cycles	NAT Con
		Learn to care for plants, gardens, animals, hands-on	NAT Care
Cultivating a Sustainable School Culture	CUL	Encourage/learn about sustainability/recycling	CUL Enh
		Build relationships between staff, students and parents	CUL Rel
		Connectedness with school/ownership	CUL Con
		Integrate curriculum	CUL Cur
School Grounds	GND	Beautification	GND Bea
		Shade provision	GND Shd

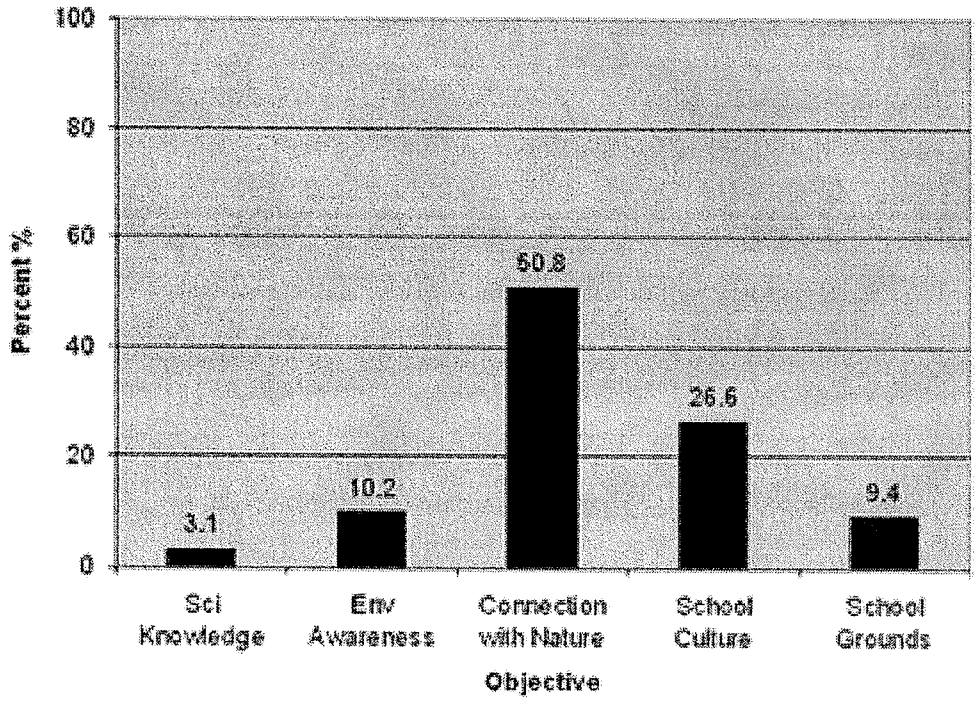

Figure 1: Distribution of Participants' Responses regarding the Main Objectives of the Hands-on Nature-based Activities at their School.

Objective 2: The Amount of Contact with Nature Experienced by Children

Longevity of Hands-on Nature-Based Activities

In terms of longevity, 58.1% of participants indicated that the activities in the program were 'Mostly Long-term', while 41.9% indicated that they were 'Mostly Short-term'. The majority of activities (78.0%) were introduced from the years 2000 to 2003 and of those 28.9% were introduced in 2003 (the year of the survey). The earliest activity was introduced in 1976.

How often do Children Participate in Hands-on Nature-Based Activities?

Table 4 presents data relating to the frequency of children's participation in one or more hands-on nature-based activities at their school. For the majority of these activities (82.2%), children participated at least once per week, with 24.3% participating everyday (or five to seven times per week), 30.8% participating every few days (or two to four times per week), and 27.1% participating once per week (Table 4).

Table 4: Percentages of Children's Participation in One or More Hands-on Nature-based Activities at their School (Unit of Analysis 'Nature-based Activity', n=107).

5-7 x Week	2-4 x Week	1 x Week	1 x Fortnight	1 x Month	Other
24.3% (26)	30.8% (33)	27.1% (29)	2.8% (3)	4.7% (5)	10.3% (11)

Objective 3: Perceptions of Principals and Teachers of the Overall Benefits and Success of Hands-on Nature-based Activities, in Particular Benefits relating to Children's Mental Health and Wellbeing

Perceptions of Overall Benefits

Participants were asked an open question about the types of benefits they believe hands-on nature-based activities can deliver. Sixty participants described 303 benefits which were sorted into six broad categories: 'Connectedness'; 'Learning'; 'Life Skills'; 'Environmental/Nature Awareness'; 'Social Skills'; and 'Physical Health' (see Table 5 for category detail). The majority of participants' responses related to 'Connectedness' (24.8%) and 'Environmental/Nature Awareness' (26.7%) (Figure 2). However, the benefits described were also spread relatively consistently across 'Learning', 'Life Skills', and 'Social Skills'. Benefits to 'Physical Health' were also mentioned in a small percentage of responses (5.9%) (Figure 2).

Success of Hands-on Nature-Based Activities

When asked about how successful participants felt the activities at their school were, 29.3% responded that they were 'Very Successful', 52.8% reported that they were 'Successful', and 16.9% responded that they were 'Neither Successful nor Unsuccessful'. Very few participants indicated that they thought their activities were 'Unsuccessful' or 'Very Unsuccessful' (0.9% and 0.0% respectively).

Table 5: Coding Categories and Code for the main Themes from Participants' Perceptions of the Overall Benefits of the Hands-on Nature-based Activities at their School.

Benefit Category	Code	Sub Category	Code
Connectedness	CON	Sense of belonging to school	CON Bel
		Involvement of whole school/sense of community	CON Com
		Links to other schools/parents/local community	CON Sch
		Sense of ownership/sense of pride	CON Own
		Positive attitude/less destructive behaviour/ resilience	CON Pos
		Enjoyment of being at school/happier/less stressful	CON Enj
Learning	LRN	Engagement in/enjoyment of learning/motivation	LRN Enj
		Sense of achievement/satisfaction	LRN Ach
		Improves self-esteem/self confidence/sense of self	LRN Con
		Language development	LRN Lan
		Caters to different learning styles, ages and cultures	LRN Sty
Life Skills	LIF	Balanced education/real-life focus/meaningful/hands-on	LIF Bal
		Responsibility/planning skills	LIF Res
		Empowerment/making a difference/educate others	LIF Emp
Environmental/ Nature Awareness	ENV	Understanding/interest in nature/the environment	ENV Und
		Empathy and care for living things, other people	ENV Emp
		Awareness of environmental issues/environmental action	ENR Awr
		Spirituality/connecting with nature/looking beyond self	ENV Spr
		Sustainability/awareness of/waste reduction/marketing	ENV Sus
		Beautification of school grounds	ENV Bea
Social Skills	SOC	Working with adults and teachers/seeing in a different light	SOC Adl
		Working with others/cooperation/ interpersonal skills	SOC Awr
Physical Health	PHY	Improves nutrition and physical fitness	PHY Nut
		Being outside/alternative to sport/extra-curricular activities	PHY Out

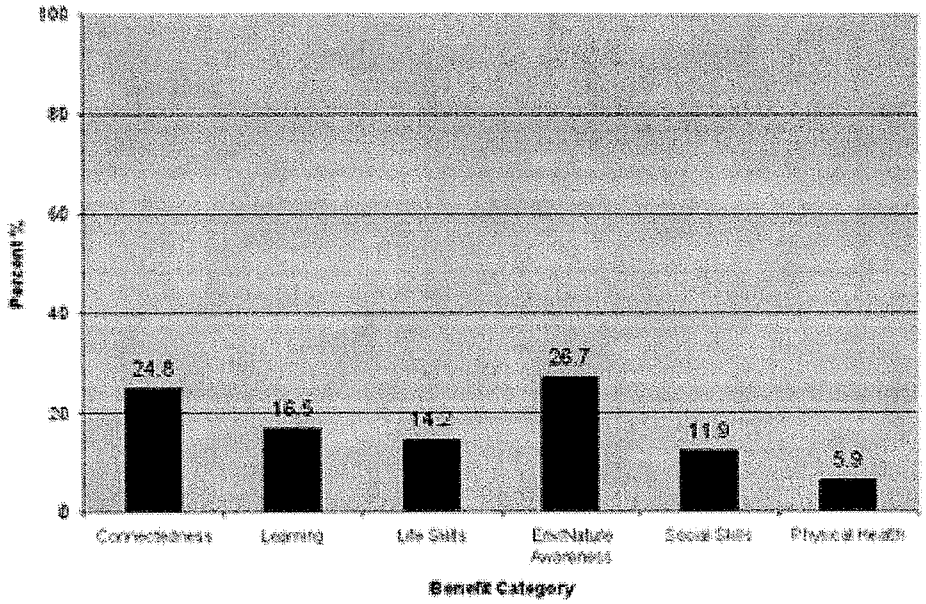

Figure 2: Distribution of Participants' Responses regarding the main Benefits of the Hands-on Nature-based Activities at their School.

Perceptions of Principals and/or Teachers as to the Effects on Mental Health and Wellbeing of Children Participating in Hands-on Nature-based Activities

Participants were asked to rate the effect of nature-based activities at their school on a range of indicators of children's mental health and wellbeing. These results are presented in Figure 3. Although the survey instrument contained a five-point Likert scale (from 'Very Positively Affected' to 'Very Negatively Affected') very few participants (3.5%) selected the negative options for any of the indicators.

For example, the indicators 'Working with Others', 'Self-confidence', 'Care for Living Things', 'Attitude to School', 'Interpersonal Relationships with Peers', 'Interpersonal Relationships with Adults', 'Interest in the Environment/Nature', and 'Interest in Learning' were all mostly rated by participants as either 'Very Positively Affected' or 'Positively Affected' by participation in hands-on nature based activities (Figure 3). Figure 3 also reveals that although 'Responsiveness to [Teacher's] Instructions', 'Connection to School', 'Self-concept/Identity', 'Overall Behaviour', and 'Self-esteem' are generally rated by participants as being 'Very Positively' or 'Positively Affected', a significant percentage also considered that these indicators were not affected by participation in hands-on nature-based activities at their school.

The indicators 'Problem-solving Abilities', 'Ability to Articulate Concerns', 'Concentration', 'Temperament', and 'Learning Ability' attracted higher percentages again of 'No Effect'. Nevertheless, overall the majority of participants believed these indicators were positively affected by participation in the activities (Figure 3).

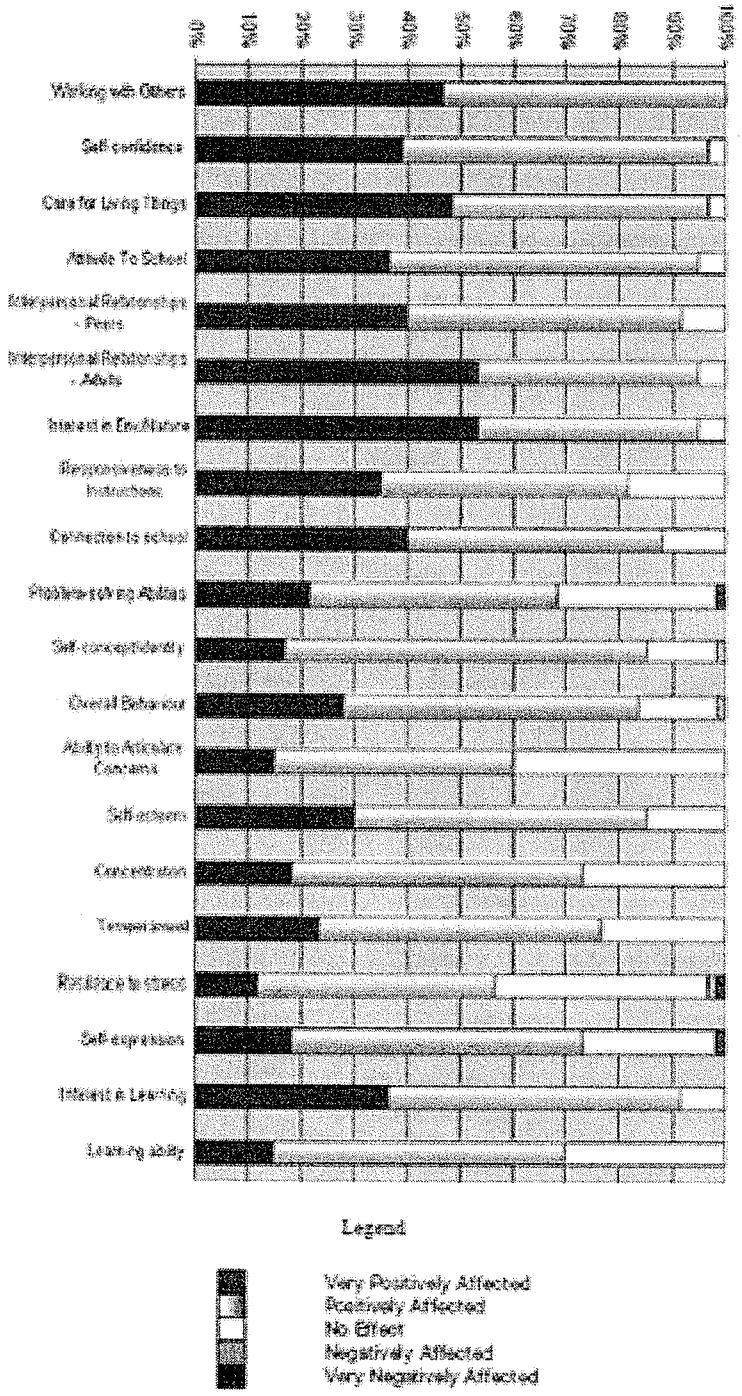

Figure 3: Participants' Perceptions regarding the Effects of the Hands-on Nature-based Activities at their School on various Indicators of Mental Health and wellbeing (Unit of Analysis 'School', n=60).

Discussion

Extent of Sustainability Education in Primary Schools

A high proportion of participants reported that sustainability education was not incorporated into their school's charter. Although data on other aspects of policy infrastructure were not collected, it is likely that this is perhaps a true indication of the level of sustainability education policy in schools, which when compared to other policies concerning children's education and development is likely to have a lower priority. Evidence for this comes from a national review of environmental education in Australia by Tilbury et al (2005) who report that sustainability education is not mandatory in Victorian schools, and despite the existence of a Victorian environmental education policy and trends internationally, implementation in Australian schools is slow.

In contrast, however, a relatively high percentage of participants reported that sustainability education was incorporated into their school's curriculum. This indicates that despite a low level of policy infrastructure, sustainability education appears to occur at high levels in the curriculum. This supports the findings of Tilbury et al (2005) and the Australian National Environmental Education Council (Curriculum Corporation, 2003) who found that sustainability education had a wide spread across the curriculum. Furthermore, high levels of sustainability education may be the result of passionate teachers who use the curriculum to incorporate sustainability in their teaching. The literature reports that many of these types of activities are often driven by one or two motivated individuals (Tilbury et al., 2005). Interestingly, this is also supported by high levels of hands-on nature-based activities reported in the participating schools (discussed below). Despite high levels however, sustainability education in the curriculum of Australian schools has been reported to be patchy, and somewhat lacking in depth and substance (Curriculum Corporation, 2003).

Types of Hands-on Nature-Based Activities

A high percentage of participants reported their school's involvement nature-based activities, and of these most had hands-on gardening activities. This may reflect a trend where schools are increasingly turning to nature and natural environments for teaching. Coffee (1998) reports on the increasing use of natural environments for enriching teaching in North America. He states that it is not only environmental organisations, but natural resource agencies, community and parent groups, and school administrators that are influencing this trend (Coffee, 1998). Similarly, Rivkin (1997) reviews data in the U.S. that found that more than 40 organisations were either devoted to enhancing school grounds via nature-based programs, or supported programs to that end. Yet, research is still lacking, and there is very little documentation of the development of hands-on nature-based activities in Australian schools.

Interestingly, the majority of participants indicated that all year levels (Preparatory Year to Year 6) were involved in the hands-on activities at their school. This indicates that these activities are applicable across the whole school and are capable of engaging a range of ages. Furthermore, it suggests that nature-based activities have the potential to facilitate interaction between different year levels and age-groups of children, an engagement known to be beneficial to children's development.

When describing the main objective of the nature-based activities at their school, the majority of participants' responses related to establishing a 'Connection with Nature'. Surprisingly, this was more frequently reported by participants than the more obvious objectives of increasing 'Scientific Knowledge' or improving 'Environmental Awareness', objectives more directly related to the teaching curriculum. There is some support for this in the literature; however according to literature, the majority of hands-on nature-based activities appear to be introduced for reasons similar to, or including, increasing scientific knowledge and improving environmental awareness (e.g. Stoelzle Midden & Chambers, 2000; Hockenberry Meyer et al., 2001). An explanation for this may be that there is varying interpretation of what these terms mean. Also, it may suggest that participants believed that it is important for children to connect with nature, a belief that is expressed in an extensive body of literature on children and nature (Louv, 2005; Kahn & Kellert, 2002; Chawla, 2002; Capra, 1999; Kahn, 1997; Moore & Wong, 1997; Rivkin, 1995; Nabhan & Trimble, 1994; Lyman, 1994; Kirkby, 1989; Cobb, 1969).

The second most frequently described objective of hands-on nature-based activities is to 'Cultivate a Sustainable School Culture'. This involves several main aspects: learning about sustainability (and improving the school's environmental management), as well as to establish a positive and sustainable school culture by developing ownership and by building relationships between staff, parents, students and teachers. Again, this objective was described more frequently than increasing 'Scientific Knowledge' or raising 'Environmental Awareness'. There is considerable evidence to support this from other research where gardening activities in particular are introduced to foster relationships between children, adults and the local community (Dyment, 2004; Volk

& Cheak, 2003; Coffee, 1998; Nagata & Raid, 1997; Alexander et al., 1995).

Further explanation of these findings may be that principals and teachers are using hands-on nature-based activities as a way of addressing gaps or inadequacies in the curriculum. This is illustrated by participants' responses to the open questions regarding the benefits of participating in nature-based activities, where a reference is made to "...developing skills/interest in other areas outside the main curriculum" (Respondent 71) and "...[these activities] seem to strike a chord with a set of deep needs often overwritten by our 'official' focus on numeracy and literacy" (Respondent 46). Further research in progress by the first author aims to investigate this further.

In terms of participation in the activities, the majority of participants' responses indicated that children are engaged in these activities at least once per week, with a high proportion of children engaging everyday (or from five to seven times per week), therefore they are not just sporadic occurrences. The majority of participants also reported that the nature-based activities at their school were mostly long-term. This provides further support to the high levels of involvement children have in nature-based activities (mostly between two and seven times per week), as reported by participants.

In terms of success, most participants felt that the nature-based activities at their school were 'Successful', while nearly one-third felt that they were 'Very Successful'. Virtually no participants indicated that they thought the activities were 'Unsuccessful' or 'Very Unsuccessful'. This most likely reflects a participant bias in that respondents want the activities to succeed. Perhaps future research with a larger sample size could clarify these findings.

Hands-on Contact with Nature and Children's Mental Health and Wellbeing

Overall, participants rated the effects of participating in hands-on nature-based activities on the mental health and wellbeing of children as being positive. When asked about how a range of mental health indicators were affected by participating in these activities, participants consistently responded that they were 'Positively Affected' or 'Very Positively Affected'. For example, among the most positively affected indicators were: 'Working with Others', 'Self Confidence', 'Care for Living Things', 'Attitude Towards School', 'Interpersonal Relationships with Peers', and 'Interpersonal Relationships with Adults'. There is some evidence in the literature to support these findings. Waliczek et al (2001) found that interpersonal relationships and attitude to school were improved amongst children who participated in a school garden project. A study by Alexander et al (1995) reported that after participation in gardening, children learnt the value of living things and had increased interactions with parents and other adults.

The findings however are not entirely clear-cut. The indicators 'Responsiveness to [Teacher's] Instructions', 'Connection to School', 'Self-Concept/Identity', 'Overall Behaviour', 'Resilience to Stress', and 'Self-esteem' were also generally rated as being positively affected by hands-on contact with nature. Yet, a small percentage of participants also indicated that these indicators were not affected (either positively or negatively). Thus the data show that there are differences in participants' perceptions of how certain indicators of mental health and well-being are affected by participation in hands-on nature-based activities. This is somewhat contrary to the literature which reports significant benefits to children's self esteem and reduction in stress levels from contact with nature (Wells & Evans, 2003; Waliczek et al., 2001; Waliczek et al., 2000). Of further interest is that the indicators 'Problem-solving Abilities', 'Ability to Articulate Concerns', 'Concentration', 'Temperament', and 'Learning Ability' also attracted a significant proportion of participants who indicated that these aspects of mental health are not affected by nature-based activities.

Despite this, a number of benefits that emerged from the open questions are consistent with the indicators of mental health rated positively or very positively affected by participants, and support previous research. These include 'Connectedness' (with school and local community, ownership) (Volk & Cheak, 2003; Waliczek et al., 2001), 'Awareness of the Environment/Nature' (understanding and interest in the environment/nature) (Stoelzle Midden & Chambers, 2000; Nagata & Raid, 1997), 'Learning' (engagement in and enjoyment of learning) (Somerset et al., 2005; Volk & Cheak, 2003), and 'Social Skills' (working with others, awareness of others) (Waliczek et al., 2001; Alexander et al., 1995). These findings indicate that principals and teachers perceive that there are benefits to children's mental health and wellbeing from participating in hands-on nature-based activities at school, however, research underway explores these perceptions in greater detail.

Limitations

A low response rate to the questionnaire resulted in a relatively small sample size. Although response rates to mail surveys vary considerably, the minimum expected for reliable data from mail surveys is usually greater than 20% (Fink, 2003). In this case, the size of the sample may be due to a number of reasons as discussed below.

Timing of Survey

Perhaps the most significant factor influencing the response rate is timing. The questionnaire was sent during Victorian school terms Three and Four, which traditionally are the busiest times in the school year. The questionnaire was sent to the principal of each school (as difficulties were experienced in obtaining the correct contact details of particular staff members involved in hands-on nature-based activities). Due to the heavy demands on principals' time (particularly in the second half of the year), participating in the survey may not have been a priority for some potential participants. Additionally, the questionnaire may not have been passed on to the appropriate staff member for completion.

Language used in Questionnaire

Little explanation was given in the materials sent to schools as to what constitutes a 'hands-on nature-based activity'. This may have resulted in potential participants not recognising the activities at their school to be nature-based and may have resulted in their not undertaking the survey. Furthermore, potential participants who considered their activities to be 'nature-based' may have lacked confidence in the success of these activities (particularly if in the fledgling stages of development) and they may have been reluctant to describe them.

Importance of Nature-Based Activities

If potential participants did not value the nature-based activities at their school they would have been less inclined to respond to the survey. Many nature-based activities fall into 'fringe' curriculum areas, which is likely to make them a lower priority for some principals. Also, nature-based activities must compete with more traditional curriculum areas for a school's resources. This gains significance in view of the heavy curriculum load faced by many schools.

Sample Size

A final factor could be that although nature-based activities appear to be popular, the number of schools with these activities is actually quite low. Therefore, the response rate to the survey may be a reflection of the true proportion of schools with hands-on nature-based activities in the population. It may have been useful to have undertaken a nonprobability quota sample (Fink, 2003) where the number of schools with sustainability education activities was obtained before sampling.

Bias

Further to the above limitations, there is likely to have been a participant bias. The positive perceptions of participants about the potential benefits of hands-on nature-based activities at their school could be due to a vested interest in the success of these activities and participants would therefore subconsciously be more likely to believe that there are benefits to children's mental health and wellbeing. Also, because of the use of purposive sampling there is an inherent selection bias. This could be addressed in future research by conducting a larger survey including both schools with and without hands-on nature-based activities.

Conclusion

This research set out to describe the extent and type of hands-on nature-based activities in urban Melbourne primary schools, as well as to determine the perceptions of principals and teachers as to the potential benefits to children's mental health and wellbeing. To some extent, these objectives were achieved, yet the response to the survey was not as great as expected. Despite the small sample size, some interesting findings emerged. It was found that a low level of policy infrastructure for sustainability education was reported. Yet, participants also reported that sustainability education was incorporated into their school's curriculum to a relatively high degree.

The most noteworthy finding is that principals' and teachers' perceptions of the benefits to mental health and wellbeing of children participating in hands-on nature-based activities at their school are positive and encompass numerous aspects of mental health: if so, hands-on contact with nature at school could be an important, yet currently undervalued, means of improving children's mental health and wellbeing. However, perhaps of equal importance is the finding that these activities are introduced in schools with the primary objective of connecting children with plants, animals and other elements of nature. Although findings reported here must be considered with caution due to the small size of the sample and inherent bias, they beg further investigation. Future research could also consider the perceptions of parents and of children.

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