A Critical Review of the Research on Learning during Field-trips

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ABSTRACT

This review is aimed at the understanding of learning in field-trips relating to education in outdoor activities. The review specifically concerns what studies have been undertaken by seeking evidence from research published between 1950 and 2004. The review indicates three common arguments on learning during field-trips. First, the learning in an informal learning environment based on first-hand experiences is most significant when it has meaning for the learner from field-trips. Second, learning aims and strategies in field-trips have evolved along with world-wide concerns towards the environment. Third, the experiences from field-trips can impact significantly on students' cognitive and affective learning. However, the research of field-trip experiences from outdoor activities has focused on learning outcomes far more than on the learning characteristics which facilitate students' learning. Therefore, further study is required, which can provide clear evidence on how such learning characteristics through field-trips can help studentsto successfully attain educational goals.

Key words: field-trips, learning effects and learning issues

I. Introduction

Researchers have long found that activities such as conservation studies and camping events can, in certain circumstances, be more effective in enhancing learning and achieving educational goals than classroom activities (Allen, 1975; Cooper, 2000; Holmes & Thomas, 2000; Leeming *et al.*, 1993; Orion, 1993; Ramey-Gassert *et al.*, 1994; Watson, 1978). Interestingly, whilst the field-trip is a popular locus of environmental education, offering ample and abundant learning in the natural environment, they have not been a focus of much research. Indeed, it is surprising that despite the fact that since the 1980s, researchers have repeatedly emphasised the need to study environmental education in natural environments, there has been no rigorous analysis of learning from outdoor experiences through field-trips (Balling & Falk, 1980; Fryer, 1991; Martin *et al.*, 1981; Orion & Hofstein, 1994; Schauble *et al.*, 1996). As highlighted by Robottom and Hart (1993) about the lack of literature, a critical review for field-trips was needed to provide understanding of learning in outdoor activities. Accordingly, to address what studies focused on field-trips were undertaken, research papers published between 1950 and 2004 were collected and reviewed.

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The initial search yielded a total of 93 articles a) 66 out of 93 articles presented learning characteristics and issues of field-trips, and b) 43 out of 93 articles centeredon learning effect were reviewed in section III and IV respectively. Some articles were covered in both sections. from four electronic databases (ERIC Education Research Information Center, British Education Index, Informal Science, Institute for Science Information Web of Science) and three library databases (The British Library, King's College Library, Institute of Education Library, London). Meanwhile, since the 1970's environmental education hasbeen more easily identifiable in the literature. However, as field-trips relating to environmental education were not fully established as an independent field until the 1970's (Linke, 1980; Martin, 1975), expansion of this review led to programmes between 1950 and the early 1970's which included an field-trip focus but were not labelled as environment education per se, to fall within the boundary and therefore be included this study.

Ⅱ. Definitions and Goals of Field-trips

In order to understand the orientation of learning in field-trips, definitions and learning goals will be presented in this section. Meanwhile, few studies in the literature focused on field-trips relating to environmental education, therefore, the review was expanded to cover learning from all out-of-school education programmes. For this reason the term 'field-trips' will be used in this study where other research have referred to 'fieldwork', 'field trips' and 'outdoor education'.

1. Definitions of Field-Trips

Researchers' efforts to define field-trips can be traced back to the 1950s. In fact, Donaldson and Donaldson (1958) highlighted about the importance of field-trips in outdoor settings. They argued that the field-trips should provide experiences that influence a learner's 'positive and moral approach (Donaldson and Donaldson, 1958, p.17)' about nature. More recent definitions however, suggest field-trips are a learning activity involving an experience outside of the formal context. Nairn (1999), for example, defines field-trips simply as 'trips away from an educational site' (p.272). Some studies, however, focus on the organised experiences of field-trips, with these experiences contributing to a range of gains including cognitive, affective and skills (Rudmann, 1994; Watson, 1978). Priest (1986) defined outdoor education as an experiential process of learning by doing, which takes place primarily through exposure to the out-of-doors and is based on six major pointsrelating to; a) a method for learning outside the classroom, b) the process of such learning is experiential, c) the learning takes place primarily, but not exclusively, in an outdoor setting, d) experiential learning, e) interdisciplinary curriculum matter, and f) relationships and concern not only natural resources, but also people and society (pp.13-16).

Whilst early definitions of 'field-trips' focused on educational experiences beyond the classroom (Donaldson & Donaldson, 1958), more recent definitions have focused on learning benefits, learning methods and learning factors of field-trips (Falk & Dierking, 1997; Lai, 1999; Thomas, 2001). In particular, Priest (1986) argues that the learning benefits of field-trips relate

to the relationship between people and nature. He identified the location of field-trips as taking place 'out of doors', the subject matter as 'learning about nature', and the purpose as being 'for the future benefit of our planets finite resources' (Priest, 1986, p.13). In addition, he stressed that outdoor education builds relationships; classifying relationships into four categories: (a) 'interpersonal' - cooperation and communication that occurs between people (b) 'intrapersonal' - the personal perception of abilities and limits (c) 'ecosystemic' - 'dynamics and interdependence of all parts of an ecosystem', and, (d) 'ekistic' 'the interaction between people and their surrounding' (p.14).

Based on the reviewed studies above, it is possible to identify some common ground:

- Field-trips provide the opportunity to experience real 'things' in learning.
- Field-trips involve first-hand experiences that promote engagement in learning.
- Field-trips facilitate learning by involving learners in relationships, not only with people, but also with nature and their society.

Building upon the perspectives and characteristics of field-trips described above, the term 'field-trips' in this study is defined as a form of planned experience which occurs in an out-of-school environment with an educational purpose that focuses on learning about real life through first-hand experience.

2. Learning Goals of Field-trips

Field-trips embody many of the characteristics of informal learning in that, in contrast to traditional schoolroom practices, they tend to be student-centred, provide a flexible learning climate, and offer opportunities for social interaction (Falk, 1983; Griffen & Symington, 1997). In addition, Cooper (2000) notes that field-trips also help to address the four core values (summarised below) identified in the National Curriculum (England) upon which school should base their work:

(a) The self - we value ourselves as unique human beings capable of spiritual, moral, intellectual and physical growth and development.
(b) Relationships we value others for themselves, not only for what they have or what they can do for us. We value relationships as fundamental to the development and fulfilment of others and ourselves, and to the good of the community.
(c) Society we value truth, freedom, justice, human rights, the rule of law, and collective efforts for the common good. In particular, we value families as sources of love and support for all their members, and as a basis of a society in which people care for others.
(d) The environment we value the environment, both natural and shaped by humanity, as the basis of life and a source of wonder and inspiration (p.27).

Field-trips can help to enhance the environmental education curriculum. Mason (1980) makes the case that field-trips should be 'used in conjunction with, or supplementary to, other methods of instruction' (p.165) as they provide 'an effective instructional technique' at all

educational levels and enable the goals of the curriculum to be reached (Mason, 1980, p.166).

The argument that field-trips enhance and enrich the curriculum has been made in many studies (Bancroft, 1991 Bitgood, 1993 Foskett, 2000 Keown, 1984 Krepel & Duvall, 1981 Lock & Tilling, 2002; Orion, 1989 Orion & Hofstein, 1991 Rudmann, 1994). Specific research on the contribution of field-trips to the acceleration of cognitive development through thinking skills and meaningful experience has been carried out by Foskett (2000)and Schauble *et al.* (1996). Other researchers have recommended active cooperation between science-rich educational resources such as science-centres and schools (Ramey-Gassert *et al.*, 1994). In addition, researchers gave evidences about the potential of field-trips being more effective than classroom-based work in spiritual and values education (Allen, 1975; Cousineau, 1989 Knapp, 1989 McRae, 1986 Prince, 1999).

Based on the review outlined above, this study argues that effective field-trips should share the following goals:

- Field-trips can enhance and accelerate school-based curricula.
- Field-trips can offer subjective and meaningful experiences that learners can actively and voluntarily engage in.
- Field-trips can impact on all learning domains, and offer affective learning gains through the development of environment ethics and values.

Ⅲ. Learning in Field-trips

Rudmann (1994) has traced the historical perception of the value of field-trips back to ancient Greece and the writings of Aristotle and Socrates who 'incorporated travel as a valued part of their teachings' (p138). However, research interest in field-trips has increased since the 1990s (Ash & Klein, 2000). Much of this research has argued that field-trips to informal (that is, non-school) learning environments, including museums and science centres, offer effective instructional strategies (Bancroft, 1991; Orion & Hofstein, 1994 Ramey-Gassert *et al.*, 1994;Schauble *et al.*, 1996).Accordingly, this section presents the learning characteristics compared with learning in school and learning issues employed in field-trips since the 1960s to the present day.

1. Learning Characteristics of Field-trips

Due to the difficulties in assessing learning in out-of-school environments, there little research was conducted until the 1990s. Two main arguments have been put forward to explain this fact. Falk (1976) argued that the assessment of learners' development, or learning gains, through observation of physical and verbal behaviours is more difficult in informal settings than in the classroom. In analysing these difficulties, Orion (1993) identifies three main factors in the limited interest in field-trips by schools: (a) Logistic limitations such as organisational cost factors, safety/security concerns and lack of time available in the school system (b) a shortage of teaching/learning materials, and, (c) teachers' unfamiliarity with the philosophy, organisation

and didactics of field-trips (p325). Despite the difficult logistics however, there are examples of field-trips being integrated into the school curriculum mainly based on the non-competitive assessments (Bitgood, 1993; Hoke, 1991; Orion, 1993 Rudmann, 1994), which may explain why field-trips play a significant role in environmental education.

Meanwhile, learning contexts provided by field-trips, especially in out-of-school environmental education programmes, are getting more complex and diverse as time goes by (Krasny & Lee, 2002). In fact, in order to respond to public and political concerns about environmental issues, field-trips relating to environmental education have developed more within an informal than a formal learning format (Eraut, 2000; Field & Spence, 2000). Thus, the wide array of contexts made possibleby out-of-classroom activities, and the variety of issues which may be brought to bear on the subject, may naturally result in diverse learning performance and outcomes (Resnick, 1987).

Since the evidence points to different learning contexts between school and out-of-school having different impacts on learning processes and outcomes (Dale, 2002; Keena & Basile, 2002 Kelly, 2000; Ninnes, 1995; Salili *et al.*, 2001), it is reasonable to infer that field-trips impact on learners and learning processes in different ways to teaching strategies used in classrooms. In order to assess the learning characteristics of field-trips from outdoor experiences, it is necessary to examine learning contexts and processes that are different from those found in classroom learning.

The characteristics of learning processes promoted by field-trips may be considered and identified under the category of informal learning (Coombs & Ahmed, 1974; Eraut, 2000; Narang, 1992; Nath et al., 1999; Ninnes, 1995). In practice, the field-trip is 'one of the most popular components of informal education' (Rudmann, 1994, p138), and may be identified as an activity, which, although planned, is highly focused on first-hand experience in various situations found in out-of-school contexts (Bitgood *et al.*, 1994; Maarschalk, 1986; Price & Hein, 1991; Tamir, 1990).

Based on the reviewed research above, three differences in emphasis between formal and informal education have been determined which help identify the particular learning characteristics of field-trip activities. The differences are as follows:

- Whilst formal education is more information-driven, informal learning emphasises meaningful, experience-driven performances which can be influenced by various factors such as learning contexts, instructional strategies and learning methods in out-of-school environments.
- Informal learning gives much more weight to social contexts and interactions, and their affective influences on learners than does formal learning.
- Informal learning places greateremphasis on application and enhancement of acquired knowledge than learning in a classroom by engaging in problem-solving typical of real life situations.

In a similar vein to arguments on learning characteristics in an informal learning format given above, there are studies on what field-trips provide, and how they encourage learners. Some of the studies are of school-related field-trips which involve visits to science centres or museums (Donald, 1991 Gottfried, 1980; Price & Hein, 1991). Accordingly, in order to cover researchers' studies for all types of field-trips relating to learning characteristics in an informal learning format, field-trips to museums and science centres were first reviewed, followed by further exploration of other field-trips.

Kimche (1978) was interested in why visitors visit science centres and museums. She found the reasons were related to 'dynamic experience' (p.271). This 'dynamic experience' involves learners' making decisions about what they are doing from the beginning to the end of the tour, and is facilitated by the social network of friends or family. Kimche (1978) has also suggested two learning perspectives offered by science centres and museums: 'Firstly, science centres help the visitor develop a better understanding of contemporary scientific issues in society, and secondly, museums provide alternative, participatory educational programmes' (p.273). Likewise, Ramey-Gassert *et al.* (1994) highlighted the potential learning advantages of museums that provided participative learning experiences in an informal learning environment. Wright (1980)found teaching about the human body to sixth-grade students through experiences in museums was more effective than through classroom-only experiences. In addition, there are studies of field-trips that highlight: the value of social settings in encouraging group learning (Falk *et al.*, 1986; Silverman, 2002): the value of first-hand experience in gaining practical knowledge in daily life (Thomas, 2000; Kelly *et al.*, 2002), and the value of learners' creating their own knowledge from objects in museums (Curtis, 1995; Falk & Dierking, 1995).

Compare with museums and science centres, there have not been as much as research on field-trips relating to outdoor activities (Manzanal *et al.*, 1999; Mcnamara & Fowler, 1975), some research groups and researchers have looked at this area. For example, in 1990, the UK Association of Heads of Outdoor Education Centres (AHOEC) made a statement promoting outdoor field-trips. Three organisations: theNational Association for Outdoor Education, the Outdoor Education Advisors Panel and the Scottish Panel for Advisors in Outdoor Education were involved in producing the statement. They argued that field-trips in natural environment contributed to 'the broadening of the education experience, the development of the learning world and relating learning to the real world' (AHOEC, 1990, p.26). In addition, Cooper (2000) noted the contribution of field-trips relating to outdoor activities to the curriculum in terms of promoting 'spiritual, moral, social and cultural development' and 'key skills' (p.27). Studies have also looked at the contribution of outdoor field-trips to processes of general learning relating to 'social growth and the development of intrapersonal and interpersonal skills' (Knapp, 1989: 41)and the opportunity to have direct, meaningful and significant experiences of nature (James, 1987; Lai, 1999 Mcnamara & Fowler, 1975; O'Neal & Skelton, 1994 Riban & Koval, 1971).

In summary, based on the studies reviewed above relating to the learning characteristics of field-trips can be categorised as shown in Table 1.

Table 1. Learning characteristics of field-trips in informal contexts

Programmes can involve:	Aims	information- and experience-driven educational goals
	Processes	experiential learning
		situated forms of competence
		shared cognition with peers
	Teaching strategies	non-competitive assessment
	Outcomes	gaining practical skills
		affective impacts
		Life-related knowledge learning
Programmes can promote:	a strong social climate among learners	
	cooperative relationship among peers	
	high learner participation	
	a strong communicative learning environment among learners, between learner and teacher, and between learners and the community	
	student-centred activities involving voluntary decision-making processes	

2. Learning Issues in Field-trips

Field-trips have been used to support the curriculum in many subjects in addition to science-related studies, including mathematics, English, physical education and art (AHOEC, 1990). Field-trips relating to outdoor activities have more commonly been used in the development of an understanding of nature. Interestingly however, the emphasis and curriculum themes of field-trips have changed since 1950. For instance Palmer (1998),claims that field-trips originated in the study of nature during the 1960's. In the 1970's, it became more focused on delivering knowledge about ecosystem, predominantly through conservation education and ecology education. Since the 1970s, field-trips have included a focus on social issues related to environmental concerns, particularly education for sustainable development both globally and locally. Accordingly, the development of field-trips relating to outdoor activities, which focuses on environmental education from the 1960's to the present day, will be explored here. Table 2 presents a summary of the key trends inlearning issues of field-trips.

Understanding of Environment (1960s) - Some researchers suggest that the story of environmental education begins with the teaching of geography since the 1960s (Rii, 2000). In fact, field-trips within the nature environments during the 1960s remain an essential strategy for supporting students' understanding of the discipline of geography, and in improving learners' conceptions and understanding of social and cultural geography as well as physical geography (Fisher & Norman, 2000; Lai, 1999 Nairn, 1999). Ballantyne (1999) found geography educators use field-trips to both focus on developing environmental knowledge and to change attitudes in order 'to support the notion of teaching environmental education across the curriculum' (p.40). The move towards education for the environment and the support of learners 'philosophicaland moral development is described in an article on the role of geography education by Reid *et al.* (2002). The authors' focus is on geographical education for sustainable

development, and as such, the links and intra-influences between nature and society, and the responsibility of citizens have become highlighted in nature education.

Environmental Conservation and Protection (1970s) - In the 1970's, field-trips relating to outdoor activities evolved along two paths. As Hanna (1995) noted, 'a dichotomy has occurred in education related to outdoor activities, splitting it into adventure education and environmental education' (p.21) whereby:

- Adventure education typically uses real or apparent risk and uncertainty to create dissonance. When an individual has successfully completed the task, he or she may experience personal and social growth.
- Environmental education, is structured to help students learn ecological concepts and environmental issues and become motivated to work on environmental problems (Hanna, 1995, p.21).

Prior to the 1970's, field-trips in natural environments 'dealt mainly with conservation and camping activities' (Watson, 1978, p85). Thus the aims of early field-trips relating to environmental education were either to provide experience of the beauty and importance of nature or to learn survival skills in the wild. According Wilson's (1996) survey of the nature and characteristics of environmental education programmes provided by nine organisations (including a child development centre, nature or naturalist centre, schools, and a rural community trust), this focus had been retained. Due to the field-trips sites being 'exceptionally rich in natural beauty and diversity' some programmes' aims were simply to stress the 'beauty and diversity of their outdoor areas' (Wilson, 1996, p.32).

The framework of conservation education in the 1970's was based partly on research at the end of 1960's into camping activities (Roth & Helgeson, 1972), and was developed based on ecological concepts. Ecology education has also used field-trips to teach concepts and principles (Hanna, 1995; Losowski & Disinger, 1991; Manzanal *et al.*, 1999). The benefit of learning ecology in the field is highlighted by O'Neal and Skelton (1994, p.233) who offer the example of students being better able to understand that biological communities change with a change in response to the climate, if they climb mountains and witness this principle for themselves.

The most recent incarnation of field-trips relating to environmental education has seen a change of focus from ecology to biodiversity conservation and action for environmental protection (Brackney & Mcandrew, 2001 Niesenbaum & Gorka, 2001). Bogner (1999) used a multiple choice questionnaire designed as a pre- and post-treatment evaluation, in his survey of outdoor ecology education. Completed by 700 students, it found that programmes were planned to 'foster responsible environmental behaviour, affecting long-term changes of students' attitudes toward conservation and nature, and providing basic ecological concepts (Bogner, 1999, p.17)'.

Teachers have also adopted field-trips as a means of practical instruction in teaching the importance of biodiversity conservation. In accordance with the global increase in concern for

the environment (Bogner, 1999 Chipeniuk, 1998 Wallace, 2000), biodiversity and conservation issues are being given a place in the science education curriculum. However, as Grace and Sharp (2000) noted in their study of student attitudes to biodiversity education, 'we have a long way to go if we are to encourage concern among adolescents for diversity between and within species' (p.56).

Global Issues on Environment (1980s up to the Present) - During the 1980's, field-trips relating to environmental education were expanded to incorporate local community concerns and the notion of global interrelationships. Palmer (1998) identified four key trends of environmental education in the 1980's as: (a) Global Education: a wider vision of environmental issues, (b) Development Education: environmental education with a political dimension,(c) Values Education: the clarifying of values through personal experience, and, (d) Action research: community problem-solving, pupil-led problem-solving and fieldwork-centred education (p.23).

Since the 1980's, field-trips relating to environmental education have focused attention on the role of international factors in domestic concerns, and 'the global aspect of local environmental issues' (Stapp *et al.*, 1996, p1). These trends have promoted the development of programmes which support problem-solving and decision-making skills concerning environmental issues by way of active involvement in science experiments in the field (Goodwin & Atkins, 1997). Solving environmental issues by cooperation with the community and through field activity are described by Disinger and Floyd(1990):

> During the 1980's, two significant environment-related foci 1) science/technology/society education and 2) global education, emerged in elementary schools, secondary schools, colleges and universities. Programmes focusing on these two areas have mainly been developed by groups outside the community identifying itself as environmental educators - the former primarily by science educators (with some input from social studies educators), the latter primarily by social studies educators (with some input from science educators). As most environmental educators are first and foremost science educators, with a significant (though smaller) number being primarily social studies educators, there is some cross-representation among science, social studies, and environmental educators in these groups (p.10)'.

In summary, the review of the literature on field-trips has shown that since 1950, the learning aims of field-trips have changed, becoming more in tune with perceived social and educational needs. Learning methods have also changed in line with changing aims. Between the 1960's and 1970's an awareness of the beauty and importance of nature was the dominant aim which was met by learning methods which provided experiences of nature and information-giving. From the 1980's, aims were modified to meet changing social demands for sustainable development both locally and globally. Responding to societal demands, field-trips have become more diverse in their methods, involving not only scientific studies, designed to impart knowledge and skills, but also social science studies designed to explore environmental values and attitudes. In short, building an environmentally friendly community is now given as the main purpose for environmental education field-trips. This has led to the establishment of a sense of responsible citizenship, and its empowerment of the community and the environment. This trend became a

key feature in field-trips relating to environmental education programmes. A summary of categories of issues in field-trips based on the above reviewed studies and other studies on field trips is given in the following Table 2.

Table 2. The key trends of learning issues in field-trips

Major related study fields	Periods	Learning issues
Nature Study Geography Education	1960s ↓	- learning about nature - understanding and knowledge
Conservation Ecology Education	1970s ↓	- increasing awareness towards nature - providing first-hand experience, constructing ecological concept, increasing environmental knowledge and awareness
Global Education Environmental Education Science Education Education for Sustainable development	1980s ↓ 1990s ↓ ↓ 2000s	- changing value and attitudes towards environment - building partnerships between communities and countries to solve environmental problems; developing learners' problem-solving and decision-making skills on environmental issues - constructing citizenship and increasing empowerment of education for sustainable development - participation in the problem-solving and decision-making processes related to environmental issues; participatory action based on reinforced responsibilities and changingbehaviours towards environment sand communities

Ⅳ. Learning Effects of Field-trips

Few studies have focused on outdoor field in field-trips as learning environments (Orion & Hofstein, 1991 Schauble *et al.*, 1996; Scribner & Cole, 1973). In an attempt to build on previous research, after reviewing studies in informal learning, this study moved on to focus on field-trips in outdoor settings. There follows a discussion on learning resulting from field-tripsrelating to environmental education. The question thus becomes: 'what do learners learn in environmental education programmes conducted in the field?' In the following two sections, the learning effects noted by research studies on field-trips in education will firstly be explored. This section is followed by a presentation of a further study on environmental education focused learning outcomes in reviews of empirical research, and finally a summary of views about learning from field-trip experiences.

1. Evidences from Educational Research

Bloom (1956) identified three domains of learning in his book Taxonomy of Educational Objectives: the cognitive, affective and psychomotor domains (p.7). These domains have been used in the classification of learning effects of field-trips and outdoor education programmes

described in reviewed studies.

Cognitive learning effects - Bloom's book (1956) presented the cognitive domain as the most dominant of the three. The cognitive domain derives from objectives of learning divided into 'remembering or recalling knowledge' and 'abilities and skills', and may constitute 'simple' or 'complex' behaviour within the learning process (Bloom, 1956,p.28). Bloom (1956) also expanded the term knowledge to mean 'the intellectual abilities and skills' whereby learners can apply their 'primary information or knowledge to new situations and problems' by use of an 'appropriate technique which has been labelled 'critical thinking' by some, 'reflective thinking' by Dewey and others, and problem solving by still others' (Bloom, 1956, p.38).

In line with Bloom's argument on Taxonomy of Educational Objectives relating to cognitive learning gains, Falk (1983) has attempted to measure the effects of field-trips by testing recall. The rationale for this method is based on the assertion, derived from his literature review, that students experience positive cognitive learning during a field-trip (Falk *et al.*, 1986 Falk & Dierking, 1995, 1997). Other researchers have argued that there is a positive increase in learners' knowledge following a field-trip (Balling & Falk, 1980 Bitgood *et al.*, 1994 Farmer & Wott, 1995; Orion, 1993; Orion & Hofstein, 1994). Furthermore, Falk & Dierking (1997) argued about the long-term impact of knowledge is supported by Foskett's research (2000) which highlighted evidence in the literature that field-trips develop learners' 'thinking skills' by virtue of recalling their 'acquired knowledge' whilst in the field (p.126).

Affective Learning Effects - Students' early, enjoyable experiences of science have been shown to impact on learning achievement and even future career interest (Joyce & Farenga, 1999). An enjoyable memory or experience of a field-trip, such as a memorable walking trip might be considered as influencing the psychological sphere of learning (Keown, 1984 Knapp, 2000; Martin *et al.*, 1981). Psychological impacts involve both attitude and emotional change, which constitute the affective learning domain (Bitgood, 1993; Silverman, 2002). Loomis (1987) and Roberts (1990)argue for the significance of affective domains in field-trip learning such as emotional feelings and motivation during an activity while Knapp (1989) and Watson (1978) suggest such affective impacts on students can defer to the affective and aesthetic aspects of a planned learning experience. In particular, the significance of environmental sensitivity became the issue in field-trips (Emmons, 1997). For example, Sivek (2002) demonstrated the environmental sensitivity could be developed and influenced by time spent outdoors. In fact, the most common activities in natural environments are related to aesthetic impression. However, there are contrary arguments on the 'significant life experiences' which influence students' environmental sensitivity that determine people's long term environmental value and behaviour. Researchers such as Chawla (1998a, 1998b) and Tanner (1998a, 1998b) argued that significant life experiences from the nature such as the riverside trips, using bicycles, canoes or walking contribute positively to children behaviours towards their environment in a long term period, and it led learners into effective environmental action (Chawla, 1999). However, some other researchers (Gough, A., 1999; Gough, S.,1999) debated about the importance of the 'significant learning experiences' in environmental education with sceptical questions such as 'the limits of replication' which described as follows:

> Replication of formative experiences, particularly negative ones, may not always be educationally and morally defensible.' (Gough, N., 1999, p.356)

Meanwhile, in the cognitive learning domain, the use and diversity of terms has varied little from Bloom's original, but in the affective domain, the variety of terms has increased from the outset (Ashby, 1999 Knapp, 1989 Lock & Tilling, 2002; Maher, 2000 Martin *et al.*, 1981 Outlaw & Bell, 2001; Price & Hein, 1991 Roberts, 1990). Furthermore, whilst the description and causes of affective influences are diverse, the evaluation of, for example, attitudes, emotional changes, curiosities or levels of participation is not a simple task (Bloom, 1956). Its complexity notwithstanding, the impact of novelty, or curiosity on a new learning milieu has been considered an influential factor in affecting learning during field-trips (Balling & Falk, 1980 Buckland, 1990; Falk, 1983 Falk *et al.*, 1978 Falk & Balling, 1982 Orion & Hofstein, 1994 Rudmann, 1994).

Psychomotor learning effects - Although the skills of manipulating scientific apparatus such as water-monitoring kits can be developed through field-trips, there are no descriptions of psychomotor learning outcomes found in the scope of this literature review. The situation today is therefore little different from Bloom' s description in 1956:

> A third domain is the manipulative or motor-skill area. Although we recognize the existence of this domain, we find so little done about it in secondary schools or colleges, that we do not believe the development ofa classification scheme which might tend to rigidify our thinking about education, the relatively chaotic nature of our field at present and the great emphasis on persuasive skills rather than on research findings for claims in the field of education justify some procedure such as this for ordering the phenomena with which we deal (Bloom, 1956, pp23-24).

In summary, experiences from field-trips can impact significantly on learners' cognitive and affective learning, and despite the separate domains of learning, we should view field-trips as constituting a total process of curriculum development (Bloom, 1956; Falk & Dierking, 1997). However, in viewing the domains as interlinked, one recommendation to researchers would be to study how learners learn manipulative skills during field-trips, and to examine to what extent those skills contribute to cognitive and affective learning.

2. Evidences from Research of Environmental Education

There are six empirical research reviews which trace the beginning of environmental education through to the late 1990's: Roth and Helgeson (1972: 1950s-1970), Leeming *et al.* (1993: 1974-1993), Zimmerman (1996: 1979-1993), Hart and Nolan (1999: 1990-1999), Rickinson (2001: 1993-1999) and Rickinson *et al.*, (2004: 1993-2003). As they reviewed environmental educational data within a specific period, it is possible to find information about learning characteristics relating to activities and learning outcomes in environmental education within the watershed regions. In thissection learning outcomes in environmental education programmes will be reviewed, a summary of learning effects from field-trip experiences will then be given, based on the evidence in this and the previous section.

Although environmental education did not become an independent field until the 1970's, some studies in the 1960's did report on positive learning effects relating to learners' changed attitudes and behaviours through the experiences of environmental education (Hoover & Schutz, 1964; Trexler, 1963). Such evidence of learning effects in the initial stages of environmental education is very clearly argued by Roth and Helgeson (1972). They reviewed 94 environmental education studies published between the 1950's and 1970, concluding that camping programmes could:

- promote a positive gain in self-concept by pupils and perhaps by teachers as well;
- affect positively social relationships both among peer groups and between teachers and pupils;
- stimulate interest and cause positive behavior changes thatsubsequently carry over into the classroom for pupils and teachers alike;
- effect some knowledge gains as indicated by some test instruments and perceived by many of the participants but produce only slight evidence for improved thinking skills (Helgeson, 1972, p.31).

Leeming *et al.* analysed 34 environmental education studies that included in-class and out-of-class programmes. According to their analysis, there were positive effects on environmental attitudes as well as knowledge and behaviour changes after activities, no matter whether the programmes were conducted in- or out-of-class (Leeming *et al.*, 1993). Zimmerman (1996) found 'reciprocal impacts between knowledge and affect in environmental education' as demonstrated by higher knowledge scores being associated with more positive attitudes' (p.43).

At the end of the critical analysis they conducted in the 1990's, Hart and Nolan (1999) concluded that 'environmental education has become a more complex and controversial field' than it was in the 1980s (pp.1-2). Changing attitudes, values and actions, as well as increasing knowledge about the environment and nature, were examined through course-based, experiential programmes whilst studies involving the probing of 'students' ideas, values, and beliefs about environmental issues' became another node of environmental education research (Hart & Nolan, 1999, p.27). Rickinson's study (2001) of over 100 articles published between 1993 and 1999, led to the following finding relating to students' environmental knowledge, attitudes, and behaviour:

- Learning outcomes can be facilitated by certain processes (such as role modelling, direct experience on outdoor courses, and collaborative group discussion in classroom lessons), and certain programme characteristics (such as duration and preparation/ follow-up work);
- Different kinds of programmes can affect learners'environmental knowledge, attitudes and behaviour in different ways; and,
- Different kinds of students (e.g. those with more or less environmental interest) can be affected differently by environmental learning experiences (p.274)

Recently, Rickinson *et al.* (2004) reviewed research on outdoor education that encompassed three main types of outdoor learning: fieldwork and visit, outdoor adventure activities and school grounds/community projects. Each of these types of outdoor learning wascarried out in primary,

secondary and universities. Based on the evidence drawn from 150 studies published between 1993 and 2003, they found these significant learning impacts as common evidences in the three types of outdoor learning: cognitive, affective, social/interpersonal and physical/behavioural impacts. In particular, they gave the following evidences relating to field-trips that were mainly conducted in outdoor settings:

- Substantial evidence exists to indicate that fieldwork, properly conceived, adequately planned, well-taught and effectively followed up, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom.
- Specifically, fieldwork can have a positive impact on long-term memory due to the memorable nature of the fieldwork setting. Effective fieldwork, and residential experience in particular, can lead to individual growth and improvements in social skills. More importantly, there can be reinforcement between the affective and the cognitive, with each influencing the other and providing a bridge to higher order learning (Rickinson *et al.*, 2004, iii)

In conclusion, there are two common perspectives that can be gleaned from the six studies reviewed above:

1) Studies of learning from environmental education field-trips have tended to focus on demonstrating the construction of knowledge. The reviews highlight the way in which cognitive learning relating to increased understanding of concept and thinking skills is mainly built on experience through learners' participation, understanding, conceptualisation and analytical problem-solving skills.
2) Whilst the reviews indicated that knowledge and affect are driving forces for participation in environmental education, there is no research to explain how the learning process helps in gaining those learning outcomes. This is due to the fact that 'most of the evidence simply reports whether or not a significant effect is measured' (Rickinson, 2001, p.274). In fact, even though 'the affective component is a factor that aids in the definition of attitude (Manzanal et al., 1999, p.451)', they could not show clear evidence of a relationship between affective experience and attitude. Likewise, many studies argued that the positive affective results, attitudes and behaviours resulting from significant and enjoyable experiences in the informal out-of school learning environment did improve and help learners' cognitive gains,but did not offer clear reasons as to why and how those learning outcomes had significance in environmental education.

V. Conclusion and Suggestion

As there were few studies which focused on learning in field-trips relating to environmental education, in order to identify general features and characteristics of learning while taking part in activities, and post-activity learning outcomes, the critical literature review was extended to incorporate out-of-school field-trips. This widening search identified significant learning effects of field-trip experiences relating to changing behaviours, increasing knowledge and gaining

skills. In particular, the first-hand experiences gained through field-trips in natural environments compared with other learning activities have been emphasised, indicating that experiences in an informal learning settings are most significant when they have a personal meaning for the learner.

However, the literature review has also indicated that the study of out-of-school field-trip experiences has focused on learning outcomes far more than on the learning characteristics which facilitate learning during activities. In addition, there is still no clear explanation for the association between learning outcomes and characteristics of learning while taking part in activities. Moreover, no clear evidence has been found of how such experiences helps learners to successfully attain educational goals. Accordingly, a further critical review of the empirical literature focused on field-trips relating to environmental education programmes is required.

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