

### 1. Title of Research:

Assessing the Attitudes of Primary School Children to Using Global Positioning Systems (GPS) Devices in Geography.

2. Name of Researcher: Francis Gray

3. Date: June 2010

### 4. Timeframe:

The research was carried out during the academic year 2009-2010. It comprised of the two year part time M.Ed course at St. Patrick's College Drumcondra. The action research took place over a four week period comprising of five lessons, each in duration of one hour.

The module consisted of five lessons, as follows:

<i>Lesson</i>	<i>Student Activity</i>	<i>Researcher's Activity</i>
<i>One: Introduction</i>	Brainstorming of GPS	Observation & Recording
<i>Classroom</i>	Uses of GPS in employment	Direct Teaching of GPS
	Exploration of GPS device	Lower & Higher Order Questioning
	Hotseating Activity	
	KWL Sheets	
<i>Two: Outdoors</i>	Storing Locations	Observation & Recording
	Navigation to a Point	Scaffolding the Learning
	Compass Work	
	Speed & Direction	

	GPS functions	
	Tracklog of their name	
<b><i>Lesson 3: Review</i></b>	Review locations stored on GPS device Placed their geocache on local map Compared and Contrasted Paper & Digital Maps	Observing & Recording Questioning
<b><i>Lesson 4: Outdoors</i></b>	Games using GPS device Swopped device with another pair to find their marked location	Observing & Recording Questioning Technical Support
<b><i>Lesson 5: Outdoors + Classroom + Computer Room</i></b>	Marked key locations in local town Used the Software to download their map Completed KWL Sheet	Observing & Recording Questioning Technical Support

## 5. Brief outline of Research Idea:

This research consisted of an investigation into the attitudes of children to using Global Positioning Systems (GPS) devices. It also explored avenues as to how teachers may incorporate the use of GPS devices into the teaching and learning experience in the classroom.

Specifically, this research focussed on the exploration of ways in which GPS may be used to motivate and encourage children to use and develop geographical thinking. Technology as an integral and growing part of children's lives in the twenty-first century, prompted this investigation as a means to further understand why and how

digital technologies may be used to facilitate and enhance the learning of pupils in the modern day classroom.

Society is advancing and changing at an immeasurable pace, in line with, and, indeed as a result of, advancements in technology. Veen & Vrakking (2006) referred to children as “the first-ever digital natives, they have grown up in a world in which information and communication facilities are available to almost everyone and can be used in an active way” (p. 29). Prensky (2002) had already placed technology and children in context, contending that technology had “shaped their way of being, they think in networks and in collaborations, more than former generations did. They rely on technology as a friend not as a foe” (Veen & Vrakking, 2006, p. 49).

The Government of Ireland (2008) published an Inspectorate Evaluation Report on ICT in Schools. This highlighted the impact of ICT on teaching and learning, citing ICT as an incentive for students to learn, rendering learning more interesting and engaging whilst facilitating child-centred learning, predicated on a much increased attention span. Furthermore, it posited that “the effective use of ICT puts the teacher in a facilitative rather than instructional role” (p.166). In the United Kingdom, Ofsted (2002) identified that only one school in five (20%) makes good use of ICT in teaching and learning of Geography (Russell, 2004, p. 165). Such findings gave rise to consideration of the incorporation of ICT in the teaching of Geography.

## **6. Summary of the Research Aims:**

My research question, therefore, was based on investigating children’s use of GPS devices, identifying the skills involved and analysing their attitudes to same. Incorporation of GPS devices in to the teaching and learning experience in Geography in the Irish context was new and heretofore never researched, hence the paucity of Irish

based research findings in this area and a reliance on American and English study findings. This study sought to bridge that gap somewhat.

The research key questions were namely, what can children use GPS devices for in Geography? What do they think of the experience? What knowledge skills are they learning? How can work with GPS devices be linked to the teaching and learning of Geography?

## **7. Methodology & Ethics:**

Action and qualitative research were reviewed and informed the choice of action research as the research design most suitable for this investigation.

This study adopted triangulation as controls in action research. Several modes for assessing children's attitudes on the GPS were employed, for example: observations on the children by the researcher, conversations conducted by the researcher with the children and semi-structured interviews conducted by the researcher with the children. The modes for acquiring insights on children's attitudes on the use of the GPS were also the modes used by the researcher to assess the children's state of knowledge on the GPS as the training progressed

Prior to conducting the action research, the researcher sought and was granted permission from the School Board of Management and the parents of participants invited to partake in the study. The School Board of Management were invited to monitor and supervise the action research process. These measures were implemented in order to conform to or approximate Nolen & Putten's notion of *informed assent rather than consent* (2007).

Diener and Crandall (1978) defined four elements namely; competence, voluntarism, full information and comprehension in relation to informed consent.

Competence ensured that the participants would make the correct decision if they are given the relevant information. As I was working with children, I requested permission not only from the child but from their parent/guardian. The letter sent with the children explained the function of my research and what was involved in taking part. Before I issued the letter to the children I explained to them in the classroom what was involved in the research. Voluntarism ensured that the principle of informed consent was applied and also ensured that the participant freely takes part. Full information referred to the letter requesting consent which was dispatched to the parents. This allowed parents/guardians the opportunity to discuss the letter and ask me any questions about my research. Comprehension referred to the fact that participants fully understood the nature of the research of the project. As well as providing a letter to be sent home, the research was explained to the class involved.

I also ensured commitment to confidentiality and implemented it in all aspects of the information-gathering process. During and after the research procedure, data was filed securely in a locked cabinet and the computer used was password protected and stored safely at all times. All sources of data which were indicative of the identity of participants in the action research were destroyed after completion of thesis. The names of participants were substituted by another name in the interview transcript.

## **8. Summary of Background Reading:**

Catling's (2008) work on children's geographies and new technologies stated that "there are indications that technologies old and new are becoming increasingly embedded in children's lives as geographies that affect them" (p. 8). Children's geographies related to experience, interaction, learning and understanding as well as to development of attitudes to places and environments.

Geography enables individuals to understand phenomena occurring in the world today. Furthermore, its study helps them to act appropriately and effectively and inculcates an appreciation of the physical elements of the environment that impact on mankind. Scoffham (2008) states Geography “also plays an important part in the pupil’s physical, intellectual, social and emotional development (p. 9). It has been argued that the neglect of geographic literacy in modern day schools is universal. In fact, findings of the National Assessment of Educational Progress (NAEP) concur with this view in that large numbers of students were found to be failing to update their knowledge of Geography (Weiss, A.R., Lutkus, A.D., Hildebrant, B.S., and Johnson, M.S., 2002). The advantages accruing to geographic literacy are all-encompassing, extending to an understanding of issues surrounding particular communities, their location, their way of life and the manner in which such communities have impacted on the lives of other communities around them (Backler, 1988).

Geographically-literate individuals are more likely to be capable of understanding the relationships between complex elements such as humans and places and in turn possess an ability to explain the changes and the consistencies in their characteristics. Moreover, a geographically literate individual is considered more likely to solve problems than his/her less informed counterpart, thereby positively impacting future decisions. Roper (2006) labelled Geographic literacy as “more than knowing state capitals. It is understanding how people and places interact, where things come from, and where we're going. Without Geography, our young people are unprepared for an increasingly global future”. Backler (1988) contended that Geography is practical, not only adding to one’s understanding of the world but also promoting an appreciation of the different elements that make up the world. (Backler, 1988). In a study conducted by Catling (2004), a group of primary school teachers expressed the belief that the study of

Geography promoted the student's sense of responsibility towards the earth and its inhabitants. On the other hand, another group of teachers felt that the role of Geography as a subject in schools was to develop the awareness of younger children, whilst developing their knowledge of other countries in the world. A further group of teachers felt that the concept of Geography as a subject was to provide students with the knowledge and the awareness of different countries in the world and their environments.

As no previous research was conducted on children using GPS devices, this chapter drew upon the literature associated with children's understanding, children's understanding in Geography, children and technology and technology in Geography.

According to Swiss psychologist and philosopher, Jean Piaget (1961), a child progresses through four stages of cognitive development, spanning from birth to 12 years of age. Beyond this age, Piaget believed that the child was already cognitively capable of handling any situation or task at hand. These four stages are denoted as: 1) sensory motor period, 2) the preoperational period, 3) period of concrete operations and 4) period of formal operations.

However, in order to view Piaget's work from a new vantage point, one could consider a perspective on cognitive development which has aroused a great deal of interest of late and which, it may be argued, goes to the heart of the study at hand in relation to the teaching of Geography to children i.e., the sociocultural theory of Lev Vygotsky (Rogoff, 2002, 2003). The kernel of the sociocultural perspective as advocated by Vygotsky lies in the argument that children's intellectual development is closely tied to their culture. Children, he argued, do not develop the same type of mind universally, but rather learn to use their species-typical brain and mental aptitudes to solve problems and to interpret their surroundings in line with the demands and values

of their culture. Human cognition, therefore, was viewed as being inherently sociocultural, affected and moulded by the values, beliefs and intellectual adaptation capabilities inherited by individuals from their specific culture. Such values and capabilities vary substantially from culture to culture, therefore Vygotsky held that neither the course nor content of intellectual growth was as universal as assumed by Piaget. Briefly, Vygotsky posited that one should evaluate development from the perspective of four interrelated levels in interaction with children's environments, namely: *microgenetic*, *ontogenetic*, *phylogenetic* and *sociohistorical* (Shaffer & Kipp, 2007). *Ontogenetic development* refers to the development of the individual over his/her lifetime; *microgenetic development* refers to changes that occur over relatively brief periods of time; *phylogenetic development* on the other hand refers to changes over evolutionary time, measured in thousands or millions of years. However, it is the *sociohistorical development* which has been emphasised most about Vygotsky's ideas and which is most applicable in this particular study in that it refers to the changes that have occurred in one's culture and the values, norms and technologies such a history has generated. In essence, Vygotsky believed that each culture provides its children with tools of intellectual adaptation which permit them to use their basic mental functions more adaptively, influencing not alone *how* they think and also *what* they think. Vygotsky's beliefs, placed within the setting of the modern day interactive classroom in the global village that has become the modern world, are indeed eminently applicable to this study at hand.

Learning Geography ... involves learning the nature of the environments and climates in which these places are embedded, what natural resources these places possess and the human aspects of such spatial contexts, such as cultures, political systems and economic activities."

(Newcombe & Chiang, 2007, p. 895).

Bennets (2005) acknowledged that “understanding has its roots in the complex inter-relationships between experiences, ideas and mental processes. While experiences help to inform and shape our ideas, the ideas that we construct enable us to interpret and make sense of those experiences” (p. 55).

McGrew (1993) argued that environmental issues such as deforestation, the waste management process, ozone depletion, global warming, to list but a few areas, are all integral to our daily lives. Such issues are also part of the field of Geography which integrates the physical environment with the human elements. Research studies have shown that the children’s understanding of environmental issues is considerably higher than expected.

In fact, surprisingly, primary school children were found to be able to comprehend complex issues in relation to the ozone layer and the dangers it faces as a result of global warming. Barraza (2001) in her research findings have found children to be most concerned with issues pertaining to the ozone layer, the occurrence of deforestation and the greenhouse effect. Furthermore, children showed heightened concern for the pollution of water bodies such as rivers and oceans, in addition to the proliferation of litter, gas combustions from cars and urban sprawl. Finally, children were also very concerned for animals, particularly endangered species. Studies have found that children are actually capable of understanding and being able to explain the interactions between chlorofluorocarbons (CFCs), the issue of global warming and deforestation. Much younger children were found to comprehend simpler issues with regards to experiments performed on animals, the ozone layer and pollution.

Selwyn (2004) posited that children adapt with ease to the usage of technology. Furthermore, he continued, they have also been considered to make more use of both information and communication technologies (ICTs) compared to adults.

This renders children an ideal vehicle in the research of how technology may enhance the quality of education and self-development. Lowenstein & Barbee (1990) believed that the establishment of technology in any institution develops mankind in a manner that expands human capacity. In addition, it helps to enhance and deepen one's human reasoning ability by allowing an individual gain more insight and depth towards new ways of thinking. In relation to the educational sector, adopting new technologies in classrooms promotes the transformation of educational systems for the better since it enhances the learning experience of the student, together with that of the educator, as facilitator in the process.

With the dawn of the 'world wide web' and the increase in the number of computers in households all over the world, personal computers and the boom of Web 2.0 have come to replace these tools. Kaiser (2010) surveyed the use of technology by those under eighteen years old. It reported that they spent 7 hours 38mins on average per day using technology. Thanks to the benefits of technology, students are now encouraged to venture even further than the Internet itself in the course of their discovery-based learning experience (Bauerlain, 2010).

## **9. Overview of Research Findings & Recommendations:**

The results that were gathered, collated and analyzed, highlighted the significance of maintaining clear expectations. Results were categorized in to five basic themes, namely: enjoyment of the device, interest derived from the device, ease of use, confidence in using the device and life-skills development.

The research facilitated the development of the key geographical skills of questioning, observing, investigating and predicting. There was an emphasis on children finding answers to their own questions. They set about answering key questions, forming hypotheses, identify appropriate strategies to carry out their task and test their hypotheses. This led them to re-evaluate their hypotheses and develop new ones. This was all part of a constructivist learning environment.

GPS devices may be easily linked to the teaching and learning of Geography. They are ideal tools to use in fieldwork. They can be used to mark and locate the site in question. The GPS device not only provides location in latitude and longitude, but it can also display location in other coordinate systems such as the Irish coordinate systems. The device has an internal almanac for exact sunrise, sunset, and moon phase, all based on location on the planet and correct time. A built-in mapping feature tracks the path and indicates the route taken. This is an important concept in the teaching of map work and developing the child's sense of place and space. Students were able to prepare excellent maps of point data of their local town by using the software. Some GPS devices allow one to view an OS map or aerial photo of your fieldwork location. GPS devices can be used to develop key skills and concepts. Knowledge is generated through a process of questioning and reflecting on the questions asked, the data is sourced through the activity tasks and the methods used to analyse.

The teaching of Geography, placed within the broad aims of the Primary Curriculum (1999) emphasises a hands-on approach through the development of key geographical skills of questioning, observing, investigating and predicting. Emphasis is placed on the child as an active agent in his/her own learning. '... Geographers observe, measure and collect data, make predictions, test hypothesis and draw conclusions about places, events and phenomena which they see.'(DES, 1999, p. 4).

Hand-held devices and other technological devices such as computers enhance the learner's learning environment by rendering the learning experience more exciting and fun (Mifsud, 2003). The overwhelming finding to emerge from this study was that participants were both interested and invigorated by the experience of using GPS devices in Geography. Nundy (1999) undertook key studies in the area of upper primary range students i.e., 9 – 11 year olds, and found that residential fieldwork not alone led to the generation of positive cognitive and affective learning amongst this sector of students, but that this may be enhanced significantly compared to standards achieved in a classroom environment. Fundamental to this finding was the recognized relationship between the key learning domains. Nundy went further by contemplating the possible link between the structure/approach applied in effective fieldwork and a greater educational application in terms of 'raising attainment' among school students. Nundy's findings were reflected in students' participation in this action research which greatly enhanced their motivation to fully participate in lessons each week and their engagement with technology in Geography gave them the opportunity to actively partake and indeed direct the learning experience. Participants clearly enjoyed the fun aspect of the activities such as accessing the virtual maze and writing their names using the track log feature of the device.

Findings reinforced the relevance of constructivist learning theory to the experience of technology in the Geography curriculum at primary level. In this research a technology-rich, constructivist learning environment was created to arouse and engage the participants, with its main thrust being student-centred and collaborative learning through enquiry. It required informed decision-making, viewed mistakes as opportunities for growth, and prompted collaborative discussion among all participants. This study reflects the work of Matusevich (1995), Wheeler (2001) and Papert (1990) in

relation to a teacher's role in the technology-rich setting of the classroom. The teacher/researcher *enabled* rather than *controlled* the learning activities, thereby becoming the facilitator of learning in the classroom. Outputs achieved were viewed as indicative of the students' comprehension of the lesson coupled with their attitude towards the GPS course. Conversely, non-completion of the output was viewed as indicative not only of knowledge but also of attitudes.

This research has given rise to many questions which prompt further investigation.

Firstly, there is undoubtedly a need for more capital investment in ICT in the Irish primary sector. While the National Council for Technology in Education (NCTE) recognizes the challenge in terms of provision, recent small, per-capita grant allocations to primary schools fell short in enabling schools to achieve NCTE's stated aims and objectives in achieving interactivity in every classroom in Ireland. Schools, yet again, are dependent on fundraising in order to purchase equipment, not to mention future maintenance, repair and replacement of same. While a business model is applied to the education sector in terms of IT, absence of proper ongoing financial input from the Department of Education & Skills, thwarts genuine efforts and impedes successful implementation of ICT in the primary sector.

Secondly, the issue of continuous professional development of teachers in the area of ICT lies at the very heart of all debate in terms of the successful implementation of IT in the classroom. The absence of ongoing, structured training inevitably impacts on the quality of delivery in the classroom and ultimately the quality of the education experience for the pupil. Again, lack of proper investment and an over dependence on the personal interest and goodwill of the teaching profession to pursue courses in their

own time and often at their own expense, lie at the root of the problem. Proper investment in training, from colleges of education upwards, is essential to the quality of ICT in the classroom.

Subsequently, as evidenced in the paucity of research findings of Irish origin in terms of the use of technology in the classroom, there is a great need for investment in research specific to the Irish experience. Much of the literature accessed in researching this paper had its origin in either England or the United States of America. The success of this research, for example, highlighted the need for further study in terms of using GPS devices with children and how they can be used to aid and develop knowledge in the area of Geography in the Irish context.

ICT is not given the status of a 'subject' area in the revised curriculum. In fact, it is simply given the status of the 'blackboard' in terms of its role in the delivery of the curriculum in the classroom of the twenty-first century. This must change if ICT is to play its rightful role in the education of our pupils and in preparing them for taking their place in the modern workplace.

The results of the study, however, cannot be deemed representative of how all children of similar age and class group would react to using such devices. A cross-national study involving children of similar age and class is needed to determine and acknowledge the positive effects of using GPS devices with children in the primary sector in learning Geography. Further investigation and experimentation into using technological devices is strongly recommended to promote the integration of ICT with the teaching and learning experience.

Finally, there are a number of important changes which need to be made in terms of policy and school planning. ICT is listed as a teaching methodology in the

Geography Primary Curriculum (1999). In the section relating to teaching methodologies, it is imperative that all efforts would be made to help advance the use and implementation of ICT in Geography. Unless schools adopt ICT and incorporate ICT into the teaching/learning experience, change in policy and practice will not be initiated or attained.